EFFECTS OF INACCURATE COST ESTIMATE ON CONSTRUCTION PROJECT STAKEHOLDERS

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ABSTRACT

The aim of this paper is to assess the effects of inaccurate cost estimates on construction project stakeholders in order to establish mitigation measures. The paper reviewed literature relating to cost estimation and the empirical data was obtained through a structured questionnaire. Furthermore, the study involved convenient purposive sampling of construction professionals working in quantity surveying practices and construction firms within and around Cape Town. A quantitative approach was used to conduct the study and data were reported using central tendency descriptive statistics. The findings revealed inaccurate cost estimates resulting in loss of reputation and credibility of project stakeholders, risk exposure, and financial loss as the effects of inaccurate cost on construction projects. In view of the confidential nature of some project costs in the private construction sector, the research experienced limitations in gathering statistics on the actual extent of projects that were underestimated or overestimated for comparative studies on private sector projects. The study draws the attention of construction project stakeholders to the negative effects and consequences of inaccurate cost estimation in order to proffer a mitigating mechanism.

Keywords: Accuracy, Cost estimate, Cost overrun, Construction project, Project stakeholders, Underestimation

1. INTRODUCTION

Since construction project cost estimation has been viewed as a mere budgetary allocation, its accuracy remains uncertain, and this often causes a gap between the initial project cost and completion cost. Unfortunately, little attention has been given to the shortcomings that emanate from inaccurate cost estimation, including the centring factors and effects. The effects of inaccurate cost estimation are unnecessary risk, financial loss, loss of reputation and credibility of estimator, and a rise in claims and dispute (Flyvbjerg et al., 2002; Mahamid & Dmaidi, 2013). According to Flyvbjerg et al. (2002), cost underestimation appears to exist as a global norm and occurs on construction projects ranging from infrastructure to other types of projects. Cost performance has an effect on the successful delivery of construction project in many areas which give rises to cost overrun, claims and dispute. Hicks, as cited by Akintoye (2000), in emphasising the importance of cost estimate, reveals that without an accurate cost estimate, nothing short of an act of God can prevent a loss, regardless of management competence, the financial strength of the contractor, or know-how.

In order to avert inaccurate cost estimation, improvement in the costing concept tends to be the consensus. However, the studies of Flyvbjerg et al. (2002) on transport infrastructure projects across twenty countries around five different continents reveal that there has been precisely no improvement in the accuracy of cost estimates over seventy years; thus inaccurate cost estimation persists in the construction industry. Various studies identify the problems of inaccurate project cost to include human error and the competence of cost professionals (Nijkamp & Ubbels, 1999; Flyvbjerg et al., 2002; Doloi, 2013). The primary aim of project stakeholders is to achieve good value for money; however, with the prevalence of inaccurate cost estimation on construction projects, these objectives are rarely achievable and this will expose project stakeholders to risk, damages, loss of reputation, financial loss, disputes and claims. The aim of this paper is to identify the effects of inaccurate cost estimation and its implications for construction project stakeholders in order to establish a mitigating mechanism. While empirical data have been collected, the literature relating to the accuracy of estimation, including tools and techniques for cost estimation, factors influencing the accuracy of cost estimate, and the effects of inaccurate cost estimation, was reviewed.

Inaccurate cost estimates have significant effects on project delivery, and thus give rise to cost overrun, claims and disputes on construction projects. The awareness drawn from the study can be used as a template for identifying a mitigating mechanism of inaccurate cost estimation for project stakeholders, especially the estimators and contractors.

2. LITERATURE REVIEW

2.1 Estimating variables to produce accurate estimates

Skitmore (1990) identifies bases of estimate generation on variables such as items, quantities, and rates. The accuracy of the combination of these variables has a resultant effect on the accuracy of the cost estimate. In essence, it is important to specify the right item and apply correct quantities with appropriate rates to arrive at an accurate estimate. Morrison (1984) indicates that the accuracy of a cost estimate predicts the degree of the quantity surveyor's efficient performance and detailed estimating technique employed for the budgeted cost. Al-Hasan, Ross and Kirkham (2006) indicate that in order to derive a more accurate cost estimate, a more sophisticated estimating technique is required to be developed and used in estimating project cost. Nichols (2007) identifies inconsistence in the estimating techniques of estimators, as well as the lack of a clear definition of purpose, scope and contents during the production process of cost estimate. Azman and Samad (2011) maintain that continuous training, the acquisition of knowledge and skills, and improving the estimating technique of the estimator regarding modern technology will fine-tune the inadequacy of cost performance on construction projects. According to Skitmore (1988), several factors associated with the accuracy of cost estimates in terms of bias and the consistency of the estimator are the state of the market and the location of the project. Akintoye (2000) affirms the factors that relate to the accuracy of the cost-estimating practice as the complexity of project, the scale and scope of construction, the market conditions, the method of construction, site constraints, the client's financial position, buildability and the location of the project. In addition, Olatunji (2012) asserts that the utilization of information technology (IT) advancement and modern business behaviour that integrates innovation as a means of improving accuracy in estimating practice are essential. The Royal Institute of British Architects (RIBA) established construction work stages in relation to Royal Institute of Chartered Surveyors' (RICS) order of cost estimates. The different stages of construction require a suitable technique of estimate, and these estimates are developed in detailed form as the stages of work progress, with more information and planning intensity (RICS, 2012). Hence, in order to avoid inaccurate cost estimation, an improved cost estimating concept is paramount.

2.2 Tools and techniques for cost estimation

Seeletse and Ladzani (2012) reveal that inadequacy in cost concept, scheduling tools, risk management and price estimation are common in project cost estimation. Stewart (1991) highlights the basic tools for estimating such as information, method, schedule and skills.

- Information: Every cost estimate should include detailed and complete information concerning the process, product, project and service being estimated. In construction projects, the information is based on many forms to include drawings, specifications, historical cost data, labour and workmanship, material, plant, supervision, establishment, specialist services, levies and taxes. The greater the amount of project information available, the greater will be the reciprocal effect on the accuracy of cost estimate (Skitmore, 1987).
- Method: There are different methods of estimation. Depending on the timing, stages and degree of accuracy required, a suitable method of estimation should be carefully considered.
- Schedule: This is a tool that is required to develop the estimate. Details of the timing of activities and completion dates should be planned and incorporated into the scheduling tool in order to highlight the phases of the estimating cycle.
- Skills: Different skills are required in the relevant areas relating to the project cost estimate. It is important to acquire the necessary skills, either individually or collectively, in order to achieve a viable or accurate estimate.

Skitmore, Stradling and Tuohy (1994) propose that the skill of the estimator is a key dependant in the practice of forecasting construction price. This is associated with other factors which affect the quality of cost estimates such as information, technique and expertise of forecaster. The Project Management Institute (1996) categorises tools and techniques for cost estimating into analogous estimating, parametric estimating, and bottom-up estimating, including computerized tools.

- Analogous estimating: Also called top-down estimating, this estimating technique uses the actual cost of a similar or pervious project as the basis for estimating. This is used in the early stage of project planning when a limited amount of information is available. Analogous estimating is in the form of expert judgement, when previous projects are similar in appearance to a new project that needs to be estimated.
- Parametric estimating: This technique of estimating is when project parameters (characteristics) in a mathematical model are used such as per square meter of residential building or per unit beds of hospital.
- Bottom-up estimating: This technique of estimating is derived from the cost of individual work items summarized to obtain the project cost.
- Computerized tools: These estimating tools such as project management software and spreadsheet are used in assisting with cost estimating. Such products simplify the use of the techniques mentioned above.

According to Olatunji (2012), estimators are moving beyond the conventional estimating procedure towards an information technology (IT)-based estimating procedure such as CAD-enabled or BIM-enabled. As the IT-based solution increases, estimators need to develop their skills beyond the conventional estimating procedure. A diverse range of expertise of forecasters is called for in

different generic building contracts such as educational, medical, industrial, retail, offices, housing and other engineering contracts; hence such expertise is perceived to be specifically focused and suggests a difference in the forecasting processes of different types of projects. The expertise of the cost estimator does not cut across a wide range of project types (Skitmore et al., 1994).

2.3 Factors influencing accuracy of cost estimate

The choice of estimate depends on several factors such as the end-use of the estimate, the amount of time and money available to prepare the estimate, the estimate tools, the available data, the project definition, and the project timing (Seeltese & Ladzani, 2012). According to Flyvbjerg et al. (2002), technical, economical, physiological and political factors are considered as explanation for inaccurate cost estimates.

- Technical: This is commonly referred to as a forecasting error. This type of error encompasses imperfect techniques, incomplete data, mistakes, errors in future forecast and inexperience on the side of forecaster.
- Economical: This error is explained in terms of both self-interest and public interest. The engineer and construction company interest in the likelihood of the project being built prompts the rational for an increase in revenue and profit, while public interest provides public officials with incentives to cut costs and save public funds. This explanation would be regarded as deceptive as most public regulations forbid misleading information.
- Physiological: This touches on the mental state, psyche, and bias appraisal of the project stakeholders due to the optimistic plans of the promoters about the successful outcome of the project. Flyvbjerg et al. (2002) indicated a problem with the physiological explanation; however, they concede that appraisal optimism would be a credible explanation of underestimation if the estimate were produced by an inexperienced forecaster. It was concluded that appraisal optimism is deceptive.
- Political: This error factor ascribes interests and power to a political explanation for underestimating cost. The question of deception is further raised in relation to legal, economic and moral reasons. According to Flyvbjerg et al. (2002), forecasters or promoters are not likely to admit to a researcher or others that they have intentionally fabricated the estimate for a project to proceed.

Flyvbjerg et al. (2002) recommend checks and balances in the following areas of transparency, namely the use of performance specifications, the formulation of a regulatory regime and the involvement of private risk capital. In related studies on the accuracy of cost estimates, Pickrell (1990) concludes that cost estimates are highly inaccurate based on error in forecast, with actual costs being typically much higher than estimated costs. Skitmore et al. (1994) deduce that early stage cost estimates by their nature are imprecise. Nijkamp and Ubbels (1999) carried out a

comparative analysis of cost estimates on infrastructure projects in the Netherlands and Finland, the findings of which indicate that cost estimates tend to be fairly reliable. However, on the other hand, Flyvbjerg et al. (2002) contend that there has been no improvement in the accuracy of cost estimates.

2.4 Factors influencing cost change

In examining the factors that influence the cost of projects, Doloi (2013) proposes factors which critically impact on project cost as project planning and monitoring, design efficiency, effective site management, communication, contractor's efficiency, project characteristics, due diligence, and market competition. As projects commence, the prices rarely remain constant as some factors necessitate changes in cost during different stages of the project (European Commission, 1998). Ponte (2009) suggests several factors to be considered when preparing construction cost estimate to include fluctuation of cost, traffic conditions, restrictive work hours or method of work, small quantities of work, separated operations, handwork and inefficient operations, accessibility, geographic location, construction season, and material shortage. Figure 1 illustrates some technical and economic factors which change the cost of a project over time.

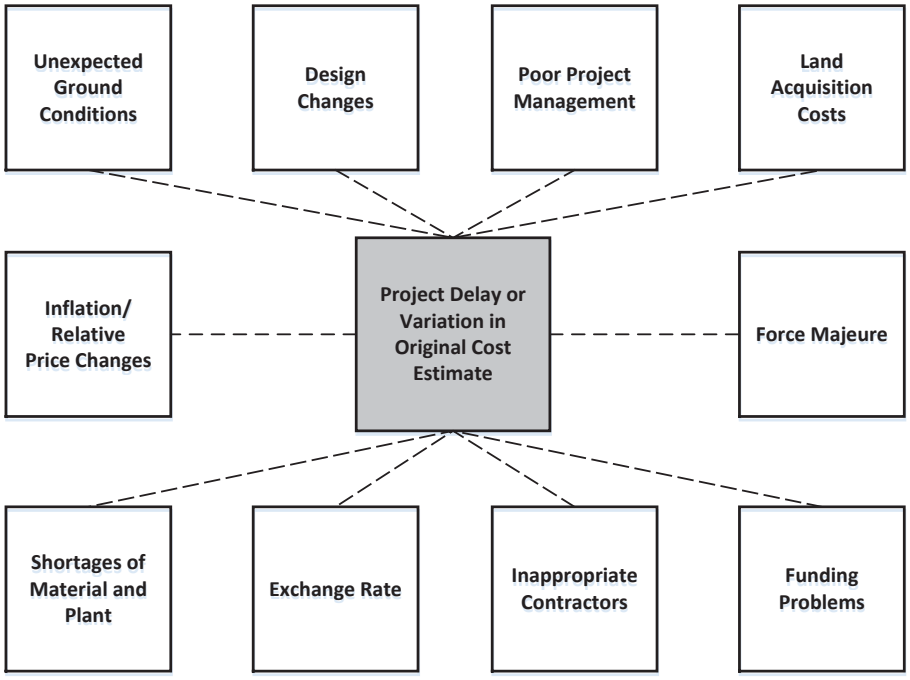

Figure 1: Cost-changing factors
Source: European Commission (1998)

2.4.1 Technical factors

According to Akintoye (2000), the tender sum submitted by the contractor combines the cost estimate and the mark-up. In addition, the mark-up comprises a general allowance for overhead recovery, profit and other indirect costs. Skitmore and Wilcock (1994) in their study noted that contractors estimate a lump sum amount for the complexity of work items based on a subjective decision and experience. This further revealed that behavioural and environmental factors such as personality, motivation, incentives and habit do influence the experiential-based technique of estimating. A high degree of subjectivity is involved in estimating indirect cost during tender price submission. Senior management considers a subjective percentage added to the cost estimate: this subjective decision making is characterised by qualitative data and knowledge that are vague and not easy to quantify (Akintoye, 2000). In addition, Morrison (1984) maintains that factors which influence estimate depend upon the variability of the project which is to be estimated. Skitmore (1887) implies that many estimators, rather than providing accurate cost estimate, provide an imprecise forecast based on the high level of project complexity and uncertainty associated with construction works. Akintoye (2000) sums up the factors that relate to the accuracy of the cost-estimating practice as the complexity of the project, the scale and scope of construction, the market conditions, the method of construction, site constraints, the client's financial position, buildability and the location of the project. In order to achieve accurate estimate in construction projects, the estimator is required to consider significant factors which affect the project cost.

2.4.2 Economic factors

According to Ponte (2009), in arriving at cost estimate, a project estimator should not only consider the scope of work or design which they are estimating. Therefore additional information relating to external factors, which are different from the technical factors, will be deducted as factors which contribute to project cost estimate. Estimators use cost data taken from previous projects as a benchmark of cost estimate. According to Morrison (1984), cost data selected for estimate are adjusted in order to convert the relevant data from the previous time, location and prevailing market situation to the anticipated time, location and market situation surrounding the new project. Seeletse and Ladzani (2012) identify some common cost change concepts as inflation, deflation, escalation, taxation, and currency variation.

- Inflation (price index): According to Ashworth and Skitmore (1983), the type of index used for updating the historical cost data affects the accuracy of estimate. Inflation of cost has a significant effect on the cost of a project, similar to the time value of money, and should be carefully considered when calculating cost estimate.

- Economic cycles (market conditions): This refers to the fluctuation of the economy between periods of expansion (growth) and contraction (recession). These are changes in the economic situation of a nation. Ashworth and Skitmore (1983) contend that market conditions are considered to have an effect on the accuracy of estimate. Cost professionals make logical reference to these changes when providing cost advice.

In Figure 2 Danto (2013) illustrates the different economic cycles which have a significant effect on the demand and supply of construction industry, which in turn impacts on the costing of a project.

- Growth: This is manifested in an increase in demand for construction, reduced competition, increased profit, reduced resources, increased prices, and contractors insisting on fair conditions.
- Peak: This is demonstrated by a demand increase, little competition, high profit margin, resource long delay, resources exceeding the budget and every one becoming a builder.
- Recession: This is characterised by the demand weakening, competition increasing, profit margins declining and resource costs being reduced.
- Trough (narrow depression): During a trough there is a high rate of competition, profits are discounted, resources are not readily available, and the industry is fragmented, but building conditions are good and productivity is high.

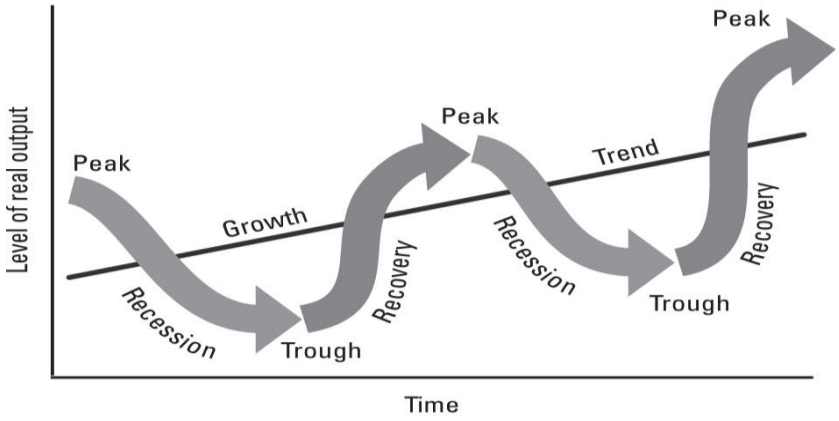

Figure 2: Economic cycles
Source: Danto (2013)

2.5 Effects of inaccurate cost estimation

Gupta (2009) explains the similarities between cost underestimation and cost overrun. Cost underestimation is the act of assessing (planning) the cost of a project lower than what the actual cost turns out to be after implementation, while cost overrun is the excess of the actual cost over budget. Cost underestimation

occurs at the planning stage and cost overrun occurs at or towards the final stage: therefore both occurrences represent inaccurate cost estimation. Mukuka, Aigbavboa and Thwala (2014) highlight the consequences encountered by stakeholders in the construction industry as a result of inaccurate cost estimation in respect of the following:

- The client: added cost over the budget agreed upon and less return on investment;
- The end user: additional cost passed on rental or lease cost or prices;
- The design team and professionals: inability to deliver value for money which results in loss of reputation or loss of confidence by client;
- The contractor: loss of profit. If at fault, it would imply further damages that could jeopardise chances of getting additional jobs; and
- The industry as a whole: brings project abandonment and a drop in building activities, bad reputation, and the inability to secure finance or securing finance at higher cost due to risk exposure.

2.5.1 Loss of reputation and credibility

Cheung, Wong and Skitmore (2008) maintain that clients have little tolerance for cost underestimation. In their study on clients' and estimators' tolerance towards estimating error, it was reported that clients are more tolerable to overestimation than underestimation because cost underestimation leads to severe effects. Skitmore and Cheung (2007) suggest that overestimating a project cost estimate seems to be a medium of risk reduction for the estimator in order to preserve their reputation with the client. Cheung et al. (2008) conclude that estimators or quantity surveyors perceive estimating error as something to be eliminated rather than minimised.

2.5.2 Risk exposure

The techniques of risk management commonly used by contractors are judgement and experience, sensitivity analysis and risk premium insurance (Akintoye & MacLeod, 1997). According to Mahamid and Dmaidi (2013), cost overruns have negative effects on project stakeholders, especially clients, contractors and consultants, and lead to adversarial relationships, cash flow problems, claims, mistrust, arbitration, litigation, and a general feeling of apprehension towards each other. Akintoye and MacLeod (1997) highlight several ways in which construction risk can be transferred such as to subcontractors, through contractual terms, to design teams and consultants, to the client, to insurance, and to the contractor. Most forms of construction contracts transfer the majority of construction risks to the contractor, hence it is important for a contractor to manage risk in an effective way to avoid consequences such as loss of profit, claims, litigations, injuries, and damage to property. Nijkamp and Ubbels

(1999) highlight risks that influence the cost of a project, making it difficult for estimators to derive accurate cost estimates:

- Political risks, such as changes in transport policy or regulations by the government;
- Financial risks, such as fluctuations in interest rates and exchange rates, and false expectations about inflation;
- Construction risks, such as delays, unexpected and higher or lower costs;
- Operational risks, such as damage by accidents and vandalism; and
- Commercial risks, such as wrong cost estimates or wrong forecasting.

2.5.3 Financial loss

Gunner and Skitmore (1998) maintain that estimators unavoidably make errors in such a way that forecasts are positively biased, thus overestimating the actual price, and negatively biased, thus underestimating the actual price. Akintoye (2000) emphasises the negative impact of both overestimated cost and underestimated cost, and notes that while overestimated costs result in a higher tender price and a tender being unacceptable to a project owner and the loss of work to contractor, underestimated costs lead to situations where project contractors incur losses. According to Flyvbjerg et al. (2002), the strategic misrepresentation which is attributed to cost underestimation leads to misallocation of scarce resources, thus effectively causing a loss to those financing the project, and bearing a negative effect on the end users of the project.

3. METHODOLOGY

3.1 Research approach

In conducting the research, a quantitative research method was adopted where data were collected using a structured questionnaire through an online SurveyMonkey. Quantitative research is considered to be the classic scientific approach to doing social science research. It involves the generation of data in quantitative form which is subjected to accurate quantitative analysis (Kothari, 2004). The questionnaire was developed and divided into different sections. The first section related to the general information of respondents and the second part related to research data collection on the effects of inaccurate cost estimation. The questions focused on the following areas: loss of reputation and credibility of project stakeholders, exposure to risk, and financial loss as the effects of inaccurate cost estimation.

3.2 Population and sampling

According to Babbie (2013), purposive sampling is a type of non-probability sampling in which the researcher selects the units to be observed based on judgment about which sample will be the most useful or representative. Owing to the different range of attributes, behaviours and experience of respondents, a purposive sampling technique was adopted. A total of one hundred and forty-two (142) emails were sent by means of a survey website link. The respondents were selected from the available register of the South African Council for Quantity Surveying Professions (SACQSP), general building contractors registered with the Construction Industry Development Board (CIDB), construction professionals working in quantity surveying practice and construction firms within and around Cape Town. A high response rate of 52% was recorded, which accounts for seventy-four (74) respondents who completed and returned the questionnaire. The survey was open for one month: during this period reminder emails were sent out online through the web link: https://www.surveymonkey.com/r/X7S3FW8. The online survey and reminders accounted for the high response rate.

3.3 Data processing and analysis

The questionnaire for the study was designed to generate statistics for quantitative data. In designing the rating scale for the questions, a five-point Likert scale was used and the respondents were asked to rate the importance of the different variables relating to loss of reputation and credibility of project stakeholders, exposure to risk and financial loss as effects of inaccurate cost estimation where 1 = insignificant, 2 = little significance, 3 = fairly significant, 4 = significant, 5 = very significant. Analysis of data involved closely-related operations conducted in a manner that summarised and organised the collected data in order to yield answers to the research questions (Kumar, 2008). Data were inputted and analysed on the computer using Statistical Package for Social Sciences (SPSS). The quantitative data gathered were analysed using descriptive statistics. In analysing the research data, the measures of central tendency using mean value were used to analyse the data.

4. FINDINGS AND DISCUSSIONS

4.1 Profile of respondents

The selected respondents work in the private sector and public sector, while some work in both sectors as indicated in Table 1. The majority, namely 73% of the respondents, work in the private sector, 10.8% work in the public sector, while 16.2% of the respondents work in both private and public sectors. These data

suggest that the respondents possess a blend of experience in both private and public sectors.

Table 1: Working sector of respondents

Respondents' working sector	N	Percentage (%)
Private	54	73.0
Public	8	10.8
Both	12	16.2
Total	74	100.0

The results indicated that the respondents had adequate educational qualifications. The majority, namely 97% of the respondents, had acquired a minimum of a bachelor's degree as indicated in Table 2.

Table 2: Respondents' formal qualification

Respondents' formal qualification	N	Percentage (%)
Diploma	1	1.4
BTech degree	5	6.8
BSc degree	9	12.2
BSc Honours	21	28.4
Master's	27	36.5
Doctorate	10	13.5
Others	1	1.4
Total	74	100.0

4.2 Reliability of research instrument

Tests on the reliability of the research instrument were conducted based on Cronbach's alpha coefficient value. According to Lakshmi and Mohideen (2012), the coefficient alpha method is the most common method of attaining consistent reliability. Cronbach's alpha is the average of all possible split-half estimates which measure inter-item reliability or the degree to which items measuring variables attain constant results. Table 3 presents the overall Cronbach's alpha coefficient value for the total questions which was 0.93, which indicates an excellent result. According to George and Mallery (2003), the following rules on the degree of reliability indicate > 0.9 to be excellent, > 0.8 to be good, > 0.7 to be acceptable, > 0.6 to be questionable, > 0.5 to be poor, and < 0.5 to be unacceptable. Test on the reliability of the research instrument were conducted based on Cronbach's alpha coefficient value, the result of which shows a coefficient value 0.95 which indicates that the reliability of the research instrument is found to be satisfactory.

Table 3: Consistence reliability for scale items

Research variables	Number of items	Cronbach's alpha coefficient values	Degree of reliability
Loss of reputation and credibility	10	0.95	Excellent
Exposure to risk	7	0.88	Good
Financial loss	12	0.95	Excellent
All questions combined	29	0.93	Excellent

4.3 Effects of inaccurate estimates

4.3.1 Loss of reputation and credibility

Respondents were asked to rate the effects of inaccurate cost estimation on the loss of reputation and credibility of project stakeholders where 1 = insignificant, 2 = little significance, 3 = fairly significant, 4 = significant, 5 = very significant, and U = unsure. Table 4 shows that 'loss of reputation and credibility for the contractor to be awarded another project for execution' had the highest ranking with a mean value (MV) =3.42. 'Loss of reputation and credibility for the quantity surveyor to gain a commission to manage another project' had the second highest ranking with MV=3.40. 'Loss of reputation and credibility for the project owner to implement new projects' had the third highest ranking with MV=3.39.

MacDonald (2011) determines the credibility, reputation and survival of project stakeholders, especially the forecaster, contractor's estimator and promoters, as the contributing agents for inaccurate cost estimation. It is apparent from the findings that inaccurate cost estimation jeopardises the chances of project stakeholders being awarded new projects.

Table 4: Effects on reputation and credibility of stakeholders

Loss of reputation and credibility	N	Mean Value	S.D	Rank
Contractor to be awarded another project for execution	74	3.42	1.26	1
Quantity surveyor to gain commission on another project	73	3.40	1.17	2
Project owner to implement new project	74	3.39	0.99	3
Project manager to gain commission on another project	74	3.22	0.99	4
Financing institution to finance another project	74	3.15	1.00	5
Architect to gain commission on another project	74	3.07	0.95	6
Civil engineer to gain commission on another project	74	3.01	0.98	7
Mechanical engineer to gain commission on another project	74	3.00	1.13	8
Electrical engineer to gain commission on another project	74	2.92	1.03	9
Structural engineer to gain commission on another project	74	2.89	1.02	10
Average mean value		3.14		

The average mean value (AMV) of 3.14 is between average to high of all the variables measured in terms of the loss of reputation and credibility of project stakeholders as effects of inaccurate cost estimate on construction projects. Mukuka et al. (2014) sum up the effects of cost underestimation on project stakeholder as ranging from financial loss, tarnished reputation, project abandonment and drop in building activities in the construction industry. Furthermore, Zainudeen, Kumari, and Seneviratne (2010) contend that cost underestimation brings about project abandonment, bad reputation and inability to secure project finance.

4.3.2 Exposure to risk

Respondents were asked to rate the significance of risk exposure as effects of inaccurate cost estimation on construction projects where 1 = insignificant, 2 = little significance, 3 = fairly significant, 4 = significant, 5 = very significant, and U = unsure. Table 5 shows that the risk of bankruptcy as a result of shortage of funds had the highest ranking with MV=3.78. The risk of delay in completion as a result of cash flow problems had the second highest ranking with MV=3.78. Finally the risk of an increase in claims due to an increase in the contract price had the third highest ranking with MV=3.73.

In addition to the findings on the effects of exposure to risk due to inaccurate cost estimation, Akintoye and MacLeod (1997) further contend that risk elements associated with construction projects have an influence on time, cost and quality. These risks associated with construction activities comprise environmental, design, logistic, financial, legal, political, construction and operational risks. Risks not adequately managed are perceived to adversely affect the successful completion of a project and consequently lead to loss on the side of the contractor.

Table 5: Risk exposure due to effects of inaccurate cost estimation

Exposure to risk	N	Mean Value	S.D	Rank
Risk of bankruptcy as a result of shortage of funds	74	3.78	0.74	1
Risk of delay in completion as a result of cash flow problems	74	3.78	0.83	2
Risk of increase in claims due to increase in contract price	74	3.73	0.66	3
Risk of project abandonment as a result of shortage of funds	74	3.66	0.68	4
Risk of litigation as a result of claims for additional payment	74	3.43	0.81	5
Risk of poor quality of work as a result of shortage of funds	74	3.35	1.18	6
Risk of physical damage due to poor workmanship	74	3.28	0.58	7
Average mean value		3.57		

The average mean value (AMV) of 3.57 is between average to high in all the variables measured in the exposure to risk of project stakeholders as effects of

inaccurate cost estimate on construction projects. Akintoye and MacLeod (1997) reveal that contractors perceive project risk as an adverse possibility which affects the successful completion of project in terms of cost, time and quality.

4.3.3 Financial loss

Respondents were asked to rate the significance of financial loss due to the effects of inaccurate cost estimation on construction projects where 1 = insignificant, 2 = little significance, 3 = fairly significant, 4 = significant, 5 = very significant, and U = unsure. Table 6 shown that loss of profit to contractors had the highest ranking with MV=3.88. The loss of resources of the project owner had the second highest ranking with MV=3.80, while loss of income to the financing institution had the third highest ranking with MV=3.55.

Akintoye (2000) emphasises that the loss incurred by contractors due to underestimated project cost in the construction industry is significantly low compared to other industries. However, project cost that is inaccurately estimated will have a negative effect on a contractor's profitability as well as that of other stakeholders.

Table 6: Financial loss on construction project due to effects of cost underestimation

Financial loss	N	Mean Value	S.D	Rank
Loss of profit to contractor	74	3.88	0.95	1
Loss of resource of project owner	74	3.80	0.84	2
Loss of income to financing institution	74	3.55	1.21	3
Negative effect on project end user	74	3.36	1.21	4
Misallocation of financial resources	73	3.22	1.05	5
Loss of income to mechanical engineer	74	3.09	1.13	6
Loss of income to quantity surveyor	74	3.07	1.10	7
Loss of income to structural engineer	74	3.07	1.11	8
Loss of income to electrical engineer	74	3.05	1.12	9
Loss of income to civil engineer	74	3.01	1.10	10
Loss of income to architect	74	3.00	1.07	11
Loss of work in construction industry	74	2.98	1.12	12
Average mean value		3.25		

The AMV of 3.25 is between average to high of all variables measured in the financial loss of project stakeholders as effects of inaccurate cost estimate on construction projects. In addition to the finding on loss of profit, Babalola and Adesanya (2007) suggest that an underestimated cost would lead to a situation where

a contractor incurs losses on the contract. Flyvbjerg et al. (2002) reveal that the misrepresentation of project cost will lead to the misallocation of resources which will result in losses to those financing the project.

4.3.4 Effects of inaccurate cost estimation

From the ranking of average mean values of subsets of the effects of inaccurate cost estimate on construction project stakeholders, Table 7 shows that risk exposure is the most significant effect of inaccurate cost estimation.

Table 7: Effects of inaccurate cost estimation

Effects of inaccurate cost estimation	Average Mean Value	Rank
Risk exposure due to effects of inaccurate cost estimation mechanisms on cost	3.57	1
Financial loss as effects of inaccurate cost estimation	3.25	2
Loss of reputation and credibility of project stakeholders	3.14	3

5. CONCLUSIONS AND RECOMMENDATIONS

The paper explored the consequences which emanate from the effects of inaccurate cost estimate. The findings revealed that inaccurate cost estimation adversely affects project stakeholders. The findings based on empirical data revealed that risk exposure is the most rated effect of inaccurate cost estimation which leads to bankruptcy, delay in completion, increase in claims, project abandonment, litigation, poor quality of work, and risk of physical damages. From the findings, financial loss to project stakeholders is another effect of inaccurate cost estimation which leads to a loss of profit to contractor, loss of resources of the project owner, loss of income to the financing institution, a negative effect on project end-users, misallocation of financial resources and loss of work for project stakeholders. In addition, loss of reputation and the credibility of project stakeholders, particularly leading to the non-award of new projects to professional team and contractors, and the lack of motivation on the part of financial institutions and client to implementation of new construction projects are additional consequences of inaccurate cost estimate. The effects of inaccurate cost estimation have detrimental consequences for the construction industry and bear damaging effects on construction project stakeholders.

The paper recommends that project stakeholders responsible for cost estimation should take adequate precautions in the process of estimating project cost, with particular attention being paid to factors that influence the accuracy of cost estimation. It is recommended that these findings will contribute as a policy

guide in the construction sector by improving the accuracy of project cost estimate, and assisting project stakeholders in identifying, planning, managing and mitigating negative risk associated with cost-significant items.

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