Cost Modeling of Preliminaries for Building Projects

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ABSTRACT

Estimators and project administrators often administer preliminaries as either function of project cost, time or adjudication parameters. There had been a lot of problems on this administration of preliminaries and it had lead to dispute between the consultant and contracting quantity surveyors. This study therefore aims to develop a predictive model for the cost of preliminaries of building projects. Questionnaires were used to obtained information from respondents.60 questionnaires were distributed and 45 were returned. The data obtained were analyzed using percentage, mean values, linear and multiple regressions. It resulted into three linear equations using total contract sum, contract period and percentage of 2.81%,1.65% and 0.25% of total contract sum (Tc) for time related, initial lump sum and terminal sum respectively as exogenous variables against preliminaries as endogenous variable. The model was found to be reliable and it confirmed that preliminaries cost is a function of project cost. It shows that the higher the project cost the higher the preliminaries cost. In conclusion cost of preliminaries is on the average of 5% of contract sum. In stance pricing of preliminaries should be done on first principles and the consultant should breakdown the preliminaries items and pricing into cost, initial and time related to ensure the contractors priced accurately.

Keywords: *Preliminaries, cost related, time related, initial related, building projects*

INTRODUCTION

The success of any construction industry depend on how effective is the company planning policy responding to its control and objective standard. An evaluation of preliminaries should be given a prime consideration right from the design stage of construction development to the completion stage. This is an important section of the bills of quantities because all temporary works required for the efficient performance of the main works are described and listed out for pricing.Babalola and Jagboro (2001) confirmed that preliminaries position as the first bill in the whole bills of quantities indicates its primary importance to the other sequence work of the project. Also Ogunsemi and Jagboro (2001) opined that preliminaries covers financial matters which relate to the contract, thus contractors are given the opportunity to calculate for their preliminaries since it would determine if they will succeed in winning the contract. Overvaluing or undervaluing of the preliminaries items by contractors will affect the level of his profitability (Ayeni, 1989).

However Ramus (1981) noted that the value of preliminaries can be calculated as a cost or time related. For cost related, this is taken as a percentage of the contract sum or project cost while time related is the total preliminaries divided by the contract period. Viewing preliminaries from perspective of valuation, a percentage sum calculated need to be broken down into constituent parts in order to be able to arrive at a realistic valuation(Wainwright,1973).The constituent parts included time related, ongoing periodic cost, work related cost, site overhead cost, lump sum, establishment cost and terminal lump sum.

The preliminaries items cover many important financial matters which crelated to the contract as a whole and are not confined to any particular work sections (Seeley, 1993).These items are important to construction works because they consist of all temporary works required for the efficient performance of the main construction work.

This study tends to form a model bases on the objective relationship between the constituent elements of preliminaries.

REVIEW ON PRICING OF PRELIMINARIES

Preliminaries are defined in the chartered institute of builders (CIOB) code of estimating practice as the cost of administering a project and providing general plant facilities and site-based services. Preliminaries are unique in nature as they form resources which are not incorporated into permanent works, but which are necessary for its construction. This was supported by Seeley(1993) which defined preliminaries as those item that cover many important financial matters which related to the contract as a whole and are not confined to any particular sections(BESMM,2008)

Standard works of interpreting and pricing preliminaries are in general lacking in detail, but it is often a common practice among the project administrator or project estimators to calculate preliminaries either as function of project cost, duration or an adjudication parameters. According to Cooke (1983) each construction project is a combination of individual activities and material with varying parameters, therefore contract with seemingly similar physical characteristics result in different preliminaries amount, and it is thus important to carefully price the preliminaries to each contract. The way the preliminaries are priced would influence the method of valuation (Gray, 1983).

Bowen, Hall and Edward (1996) are of the opinion that the quantity surveyors need to have confidence in the accuracy of their pricing and they listed out the following as the factors determining the accuracy of preliminaries, they include:-

1. Detailed knowledge of project
2. Experience in estimating
3. Extensive knowledge of construction techniques
4. Feedback from previous projects
5. Extensive data base
6. Time spent in estimating
7. Quality of tender information
8. Client organization
9. Method of construction
10. Closeness to adjacent building(proximity)

The adjudication within a construction organization of a tender estimate and its conversion to a tender bid according to CIOB (1983) is the responsibility of senior management. It constitutes a separate commercial function based upon the cost estimated and it is supposing documentation. The functional separation of design and construction has been reflected in the development of price forecasting/cost estimating techniques. For quantity surveyors, they should inform the architect of the price implication of

design decision and to predict the tender price for the contractors so as to be informed of the anticipated cash flow implication should the contract be awarded.

METHODOLOGY

A descriptive research survey is used for this study. The population of the study entails contracting and consulting quantity surveyors undergoing building projects such as residential, commercial, industrial and institutional project from 2007 to date. A purposive sampling technique is used to collect data. A total of 60 questionnaires were distributed and 45 were returned, representing a response rate of 75%.Data collected were analyzed using SPSS. The data obtained were analyzed using percentage, mean values, linear and multiple regressions. .

RESULT AND DISCUSSION OF FINDINGS

Cost significant of priced preliminaries items

Table 4.1 below shows the various items of preliminaries and their priced significant according to how important they are. It was realized that foreman in charge is of very high cost significant follow by access for architect to the works and site administration and security, while the least significant is maintenance of public and private roads.

Method of pricing preliminaries

Table 4.2 shows the response of respondents on the method used in pricing preliminaries. The mean item score was calculated and rank. Computation from first principle was rank the highest, follow by based as a percentage of project cost, as a function of project duration and lastly as an establishment by intelligence guesswork. It shows that the preliminaries items should be breakdown to initial cost, and time related when pricing them.

Table 4.1: Cost significant of priced items

Site overhead cost	total ranking	relative%	rank
1. Leveling and setting out	101	5.66%	8
2. Foreman in charge	140	7.84%	1
3. Access for architect to the works	130	7.28%	2
4. clerk of works	120	6.72%	4
5. Plants, tools and vehicles for the			
Work	101	5.66%	8
6. Compliance with the			
Building regulations	37	2.07%	21
7. Employment of work people	43	2.41%	19
8. transport for work people	83	4.65%	10
9. Site administration	127	7.11%	3
10. Maintenance of public and			
Private roads control noise, pollution	0	0.00%	22

11. Statutory obligation	71	3.98%	14
12. Water for the works	78	4.37%	12
13. Lighting power for the works	111	6.22%	5
14. Temporary roads	68	3.81%	15
15. Temporary accommodation	106	5.94%	7
16. Rates on temporary buildings	66	3.70%	16
17. Temporary telephone facilities	42	2.35%	20
18. Temporary hoardings and gantries	53	2.97%	17
19. Temporary scaffolding	91	5.10%	10
20. Heating and drying out facilities	51	2.86%	18
21. Cleaning	109	6.10%	6
22. Protection	58	3.25%	15

Table 4.2: Method of pricing preliminaries

Methods of pricing preliminaries	mean	rank
1, computation from first principle	3.67	1
2. As a percentage of project cost	3.60	2
3. As a function of project duration	3.33	3
4. Establishment by intelligence guesswork	2.67	4

Modeling preliminaries

The cost data of the completed ongoing projects were used to calculate the actual and index project values in order to bring all the projects to the same base year using 2001 as the base year. To calculate the index value, consumer index method was used. The index value calculated for each year is:

2007=100
2008=108
2009=188
2010=189

Using regression analysis, the linear regression equation is

$Y=C+bTc$………………….. (1)
$Y=C+bTd$………………… (2)
$Y=C+b1Tr + b2Ts + b3Is$….. (3)

For all values of Tc, Td, Tr, Ts and Is >0 i.e.

Tc>0, Td>0, Tr>0 and Is>0

Where:

Y=the value of preliminaries
Tc=Total contract sum
Td=Project duration
Tr=Time related cost
Ts=Terminal lump sum
Is=Initial lump sum

Table 4.3 Regression statistic result for modeling the equation

Model equation	parameter	intercept	t^2	R^2	F	DW
$Y=\beta Tc+C$	-2.912	0.506	12.63	0.787	159.33	2.312
	0.0604	0.000	-			
$Y=\beta Td+C$	-30.716	0.051	4.393	0.294	19.3	1.426
	5.393	0.000				
$Y=C+\beta^1 Tr+\beta^2 Ts+\beta^3 Is$	-0.0001866	0.617	66686.625	1.000	8.07E+9	2.044
	1.000	0.000				

Based on this result as show in table 4.3, the model is described as follows:-

$Y = C + bTc$
$Y= 0.0604Tc -2.912$
(0.0)   (0.51)

$Y = -30.716 +5.393Td$
(0.0)   (0.051)

$Y = -0.0001866+ Tr + Ts + Is$

From Table 4.4 Tr, Ts, Is are 2.81%, 1.65% and 0.25% of Tc respectively

Therefore $\qquad Y = -0.0001866 + 0.028Tc + 0.017Tc + 0.0025Tc$
$\qquad\qquad Y = 0.0475Tc - 0.0001866$

CONCLUSION

Based on the analysis above, the following conclusion can be drawn:

1. The predictive model for determining the cost of preliminaries in a building project is $Y=0.0604Tc - 2.912$ and with the value of R=89.76% and F=159.33

    This confirms that
    a. Preliminaries cost is a function of project cost. That is the higher the project cost, the higher the cost of preliminaries.
    b. cost of preliminaries is on the average of 6% of total construction cost.

2. The predictive model for determining the cost of preliminaries in a building project is $Y= 5.393Td -30.716$ and with the value of R=55.7% and F=19.3 and R^2= 31% shows that there is low but positive relationship between cost of preliminaries and contract duration.

3. The predictive model for determining the cost of preliminaries in a building project is $Y = -0.0001866 +Tr +Ts +Is$ but with values of Tr, Ts and Is to be given as 0.028, 0.017, 0.0025 of Tc respectively, the model $Y= 0.0475Tc -0.0001866$ and the value of R= 100% and F= 8.07E + 9

    This confirm the reliability of the model and that
    a. Preliminaries cost is a function of project cost i.e. the higher the project cost, the higher the cost of preliminaries.
    b. The cost of preliminaries is on the average of 5% of total construction cost but with the higher mean absolute deviation, the model's reliability seems to be shaking.

4. The study also shows that the only three categories of preliminaries usually considered in practice are time related, initial lump sum and terminal lump sum and they are 2.81%, 1.65% and 0.25% of project cost respectively.

5. Time related item is the most cost significant items of preliminaries

6. It also confirms the model of Babalola and Jagboro (2001) and Ogunsemi and Jagboro (2001) that the only independent variable in the model is the contract sum.

RECOMMENDATIONS

The following are recommended based on this study
1. Consultants should provide adequate information on the contract preliminaries to enable the estimator to price the preliminaries accurately.
2. Consultant should always ask the contractors to categorize the preliminaries breakdown in the bills of quantities to time related, initial lump sum and terminal lump sum. It will prevent overpayment or underpayment to the contractor and it will make valuation easy for the consultant.

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