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THE PRICING OF CONTRACT PROFIT AND OVERHEADS: QUANTITY SURVEYORS AND CONTRACTORS COMPARED

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Abstract

This paper documents the results of an empirical study into the methods adopted by quantity surveyors and contractors for estimating the profit and overheads components of project tenders. The pricing procedures of twenty-seven quantity surveying firms and twenty-five contracting organisations were studied through an opinion survey, using a structured questionnaire supplemented by formal interviews. Differences found between the two groups are discussed.

Keywords: Contractors, pricing, mark-up, profit, overheads, tendering, quantity surveyors.

Procjena ugovorenih profita i režijskih troškova: uspoređivanje nadzorne službe i izvođača

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Sažetak:
Ovaj članak navodi rezultate empirijskih istraživanja načina kako nadzorne službe i izvođači odredjuju profite i režijske troškove u ponudama. Procijenjen je način određivanja tih troškova u 27 nadzornih tvrtki i 25 izvođačkih tvrtki. Istraživanje je ispitivalo stavove, strukturiranim upitnicima dopunjenim formalnim intervjuima. Pronađene razlike između te dvije grupe posebno su razrađene u članku.

Ključne riječi: izvođači, procjene, postavljanje cijene, profit, režijski troškovi, ponude, nadzorna služba

1 Introduction

The adjudication within a construction organisation of a tender estimate and its conversion to a tender bid is the responsibility of senior management. It constitutes a separate commercial function based upon the cost estimate and its supporting documentation [1]. The adjudication process may well entail the setting up of two-tiered meetings dealing with, firstly, a review of the estimate and, secondly, commercial decisions and `mark-up'.

During the adjudication process, consideration should be given to: knowledge of competitors and historical tender results; the quality of the project information upon which the estimate is based; risk; head office overheads; and profit [1]. This paper is primarily concerned with the pricing of the head office overheads and profit components of a tender, collectively referred to as `mark-up'.

The Chartered Institute of Building's *Code of Estimating Practice* [1] defines head office overheads as the *`cost of administering a company and providing off-site services'*, the apportionment of such overheads to individual projects and to the company as a whole being seen as part of senior management policy. Mark-up is defined as *`the sum added to an estimate in respect of head office overheads and profit'*. The *Code* does not provide guidance on the determination of overheads and profit, save for itemising them separately on the final summary sheet; nor is the term `profit' defined.

The purpose of this paper, then, is to document the results of an empirical study into the methods adopted by quantity surveyors and contractors in pricing the overheads and profit components of project tenders.

2 Theoretical discussion of the pricing function

The functional separation of design and construction has been reflected in the development of price forecasting/cost estimating techniques. For quantity surveyors, the object is to inform clients and architects about the price implications of design decisions and to predict the anticipated tender price. For contractors, the need is to be informed of the anticipated cash flow implications should the contract be acquired. Although the nature of the competitive tendering process is such that quantity surveyors and contractors are essentially concerned with the same function (forecasting the market price of the project), the potential for contractors to access *production cost information* is a determining factor in the type of technique used [2].

The generic form of quantity surveyors' traditional price models are given below. These equations were developed by Bowen [3] from the work of Skitmore and Patchell [2].

$$P = [(p_1 + p_2 + ... + p_n) + G].I \qquad \text{(Eq. 1)}$$

$$= [\sum_{i=1}^{n} (q_i r_i) + G\ ].I_i \qquad (i = 1, ..., n) \qquad \text{(Eq. 2)}$$

$$= [\sum_{i=1}^{n} (q_i r_i).I_i + \sum_{j=1}^{k} (q_j r_j).I_j\ ] \qquad (i = 1, ..., n;\ j = 1, ..., k) \qquad \text{(Eq. 3)}$$

where:

P = total price of the work
p = the individual product price of each item or work package
q_i = measure (quantity) associated with the i^{th} item or work package
r_i = price per unit measure of the i^{th} item or work package
q_j = the measure associated with the j^{th} preliminaries item or work package
r_j = price per unit measure of the j^{th} preliminaries item or work package
n = the number of items or work packages
k = the number of preliminaries items or work packages
G = the price of the preliminaries
I = a general price index for time adjustment
I_i = a price index for the time adjustment of the i^{th} item or work package
I_j = a price index for the time adjustment of the j^{th} preliminaries item or work package

Consider the method adopted by most quantity surveyors in the pricing of builders' work; the basic form in which individual items of work are represented in bills of quantities is that of `$S(q_i r_i)$' (Eq. 3). Throughout the pre-contract phase of the building procurement process, from early design stages when approximate price forecasting techniques are used, to the pricing of bills of quantities as the final pre-tender price forecast, quantity surveyors utilise price rates *inclusive* of an allowance for profit and overheads. These data are invariably obtained from analyses of priced bills of quantities for `similar' projects, with an intuitive adjustment for differences between projects. Adjustments can also be made for different tender and economic conditions. This presupposes knowledge of the composition of the overheads and profit components.

Traditional methods of price forecasting employed by quantity surveyors attempt to predict the tender price of the project (or some derivation thereof). Their data purport to include a consideration for `macro' factors such as the current market activity in the building industry, contractors' current work-loads, desired profit levels and the proportion of head office overheads to be apportioned to the project in question. Clearly, these considerations bear little direct relation to the sequence of activities on site, and hence should be considered as an issue distinct from that of the *cost* of the production process [4]. The management decision on the level of `mark-up' is a function of the `micro' climate, this consideration reflecting what is believed to be the level of keenness of the

bidders for the particular project in comparison with the general level of keenness for contracts at that time.

Beeston [5] supports the separation of the `mark-up' and `cost' components of the tender price, stating that such an approach will permit more accurate forecasting of the latter as it is largely unrelated to the former. Combining the two serves only to obscure the factors affecting the *cost* of the project. Traditional price models do not usually distinguish between the two. Various methods of adjusting for the `macro' and `micro' climates are presented by Beeston [4], these adjustment mechanisms falling within the realm of contract bidding in construction.

Ogunlana [6] investigated the accuracy of design price forecasting. This research focused specifically on the accuracy achieved by quantity surveyors at the tender stage compared with that realised by contractors. Ogunlana concluded that, theoretically, irrespective of the method of price forecasting used, the quantity surveyor's error band is 25% wider than that of the contractor's estimator. The reason for this difference lies in the fact that the quantity surveyor's forecast includes an assessment of `mark-up', whereas the contractor's estimator is concerned only with the *cost* to the contractor. In other words, the greater the proportion of error attributable to `mark-up', the greater the difference between the achievable accuracy by the quantity surveyor and the contractor's estimator.

Contractors recognise the dangers inherent in this approach, preferring to cost building work on a *net* basis. Once the cost of the resources is computed, an amount in respect of `mark-up' is added. The magnitude of the `mark-up' is influenced by certain strategic factors. Four possible combinations of fixed and variable cost estimates and `mark-up' exist, these being fixed estimate with fixed `mark-up', fixed estimate with variable `mark-up', variable estimate with fixed `mark-up' and variable estimate with variable `mark-up' [7] [10]. Newton [8] asserts that the process of cost generation produces tender distributions which display variability very much in accordance with that described by the variable estimate and variable `mark-up' combination.

The pricing function employed by contractors in tender bidding may be represented by:

$$B = Cm \qquad \text{(Eq. 4)}$$

$$= [(c_1 + c_2 + \ldots + c_n) + G'].m \qquad \text{(Eq. 5)}$$

$$= \left[\sum_{i=1}^{n} (q_i r'_i) + \sum_{j=1}^{k} (q_j r'_j)\right].m \qquad (i = 1, \ldots, n;\ j = 1, \ldots, k) \qquad \text{(Eq. 6)}$$

where:

B = the value of the market price bid made by the contractor
C = the estimated costs of production
m = a `mark-up' value to be determined by the bidder
c = the product cost of each item or work package
G' = the cost of the preliminaries
q_i = measure (quantity) associated with the i^{th} item or work package

r_i' = cost per unit measure of the i^{th} item or work package
q_j = the measure associated with the j^{th} preliminaries item or work package
r_j' = cost per unit measure of the j^{th} preliminaries item or work package
n = the number of items or work packages
k = the number of preliminaries items or work packages

The emphasis in bidding theory is the determination of a suitable value for `m' which will provide the best trade-off between the probability of winning the contract and the anticipated profit should the bid be successful. Component `C' of the model is essentially similar to the basic price forecast model for `P' (Eq. 3). Costs are usually current with little use being made of indices. *If the same items* are used (a basic assumption inherent in Eq. 6) in providing both design and construction price forecasts (e.g., pricing the bills of quantities as the basis for the bid), Eq. 6 may be simplified, in terms of the design price forecast model, to:

$$B = \sum_{i=1}^{n} (q_i r_i').m = \sum_{i=1}^{n} (q_i r_i) = P \qquad (i = 1, ..., n) \qquad \text{(Eq. 7)}$$

as `B' and `P' are essentially forecasts of the same value, namely, the market price of the contract.

Given this underlying theoretical framework to the pricing of the overheads and profit components of tenders, how do quantity surveyors and contractors differ in their practical approaches to this task?

3 Opinion survey

3.1 Survey design and administration

An opinion survey, using interviews and incorporating a structured questionnaire, was conducted in the Western Cape region of South Africa to establish the methods used by quantity surveyors and contractors for the pricing of the overheads and profit components of tender bids. Telephone contact was made with twenty-seven quantity surveying practices and twenty-five contracting organisations and their participation sought. The quantity surveyors were selected using the directory of registered (regional) practices of the Association of South African Quantity Surveyors. Contracting organisations were drawn from the membership directory of the local Master Builders' Association. In all instances interviews were arranged with a quantity surveying partner or chief estimator/contracts manager.

The survey interviews addressed a number of issues relating to quantity surveying and construction management processes. The questionnaire for quantity surveyors amounted to fifteen A4 pages; while that for contractors contained forty-seven pages. The interviews were thus quite lengthy. However, participants were sent a copy of the relevant questionnaire beforehand, thus enabling them to offer more informed and more considered opinions. The interviewer does not think that any of the question responses was affected

by survey fatigue. The section of the questionnaire dealing with the pricing of overheads and profit was similar in content and format for both sets of participants.

After a number of questions relating to company demographics and work-load statistics, the questionnaires dealt specifically with levels of overheads and profit; participants' methods of calculating overheads and profit; the use of bidding models; detailed pricing of overheads and profit; and factors influencing the level of overheads and profit.

3.2 Survey results

The survey results are dealt with in three parts, dealing with issues relating to profit levels, overhead allowances and mark-up. The results are discussed question by question and compare the participating quantity surveyors' and contractors' opinions about each issue. Questions 1 to 6 deal with the pricing of contractors' profit levels.

Question 1 (contractors only): Are item rates adjusted to incorporate tendering strategies in order to optimise cash flows?

The purpose of this question was to establish the extent to which strategic manipulation enters into the pricing process, and refers specifically to 'front-end loading'. Participants were given the choice of five possible alternatives in responding to this question, ranging from 'always' to 'never'. Interestingly, of the twenty three respondents to this question, twenty (87%) claimed to use such a pricing strategy *at most* occasionally. Only two contractors (9%) reported 'always' using this strategy. It is suggested that this result be treated with a certain degree of circumspection given the findings of Beeston [9] and the generally held view amongst quantity surveyors in practice that such activities are commonplace. Contractors may have been reticent about disclosing such practices.

Question 2(a) (to quantity surveyors): In the pricing of estimates and bills of quantities, do you make separate allowances for profit and overheads?

Question 2(b) (to contractors): In the pricing of tenders, do you make separate allowances for profit and overheads?

While quantity surveyors and contractors participating in the survey hold broadly similar opinions about this question, there is an underlying difference between them. The vast majority of quantity surveyors (86%) claimed not to make separate allowances for profit and overheads, whereas contractor opinion is not so unequivocal. More specifically, 40% of contractors reported making separate allowances for the components of margin. Clearly, the majority of contractors see the need for separation.

Question 3: If 'Yes' (to Question 2), please indicate which of the following methods you use to calculate the profit.

This question was intended to explore how quantity surveyors and contractors might differ in their overall approach to calculating the allowance for profit. Participants were given the choice of two alternatives, plus 'other'. The questions related to whether profit is based on the project cost *net* of an overhead allowance, or whether profit was based on project cost *inclusive* of an overheads allowance. Of the three quantity surveyors who answered this question, only one reported basing profit calculations on project cost inclusive of overheads. The remaining two quantity surveyors claimed that profit is not based in any way on project cost.

The ten contractors who responded to this question appear to be divided in their opinion regarding profit computation. Sixty per-cent reported the addition of an allowance for profit to project cost net of any overheads allowance, whilst 40% stated that profit is added to project cost inclusive of overheads.

Question 4(a) (to quantity surveyors): What has been the average contractor's profit level for the following types of projects over the last three years (profit expressed as a percentage of net project cost)?

Question 4(b) (to contractors): What has been the average profit level in your company for the following types of projects over the last three years (profit expressed as a percentage of net project cost)?

Twenty five quantity surveyors and seventeen contractors answered this question. It is noteworthy that significant numbers of quantity surveyors admitted to not possessing a good idea of contractors' profit levels. This shortcoming is particularly true in the case of housing projects (45%), industrial projects (44%), and engineering projects (55%). On commercial and maintenance contracts, quantity surveyors fared marginally better, with 24% and 29% of respondents, respectively, disclaiming knowledge of profit levels.

To facilitate inter-group comparison and obviate the distortion created by the option 'do not know' available to the quantity surveyors, the figures were recalculated ignoring this option. In addition, given the similarities of responses within percentage groups for the two groups of participants for the period 1990-1992, it was decided to restrict detailed comment to 1992. The raw statistics are given in Table 1 (figures in parentheses indicate numbers of respondents) and the descriptive statistics are depicted in Table 2. The low level of responses from contractors is probably indicative of a desire to maintain confidentiality.

It appears that in all categories of projects, with the notable exception of 'engineering' projects, the mean profit percentage applied by contractors is higher than that assumed by quantity surveyors. The measures of dispersion (standard deviation and coefficient of variation) indicate that the pricing of profit by contractors displays more variability than

the levels assumed by quantity surveyors. To test whether or not *statistically significant* differences in pricing exist, the means and variances were analysed. The differences between the two population variances were tested using the two sample F-test with the null hypothesis that no difference between the variances exists at the 95% confidence level. In all project categories a significant difference was found to exist; for example, commercial projects displayed the greatest difference in variability (F-value = 7.5165; critical value = 1.9158; P = 0.000075). It was concluded that the variances of the two population groups are significantly different at the 95% confidence level.

The differences between the two sample means for the various types of projects were tested using the two sample t-Test, assuming unequal variances (established above). In all project categories the null hypothesis that no significant difference exists between the means was upheld, even in the case of 'engineering' projects (t-Test = 0.9370; critical value = 2.0150; P = 0.1959). These results were confirmed using the ANOVA single factor test for differences between sample means.

Thus, it may be concluded that no significant difference exists between the mean pricing of profit by contractors and the levels assumed by quantity surveyors. However, significant differences in the variability of profit levels was found to exist, with contractors displaying greater variability than quantity surveyors.

Question 5 (contractors only): Once you have decided upon a level of profit, how is it incorporated into the priced bills of quantities?

According to the CIOB *Code* [1], it is the function of senior management to decide upon the level of profit, this allowance being added to the net tender estimate. The purpose of this question was to determine the manner in which the profit is incorporated into the priced bills of quantities to form the tender price. The responses are summarised in Table 3, with numbers of responses given in parentheses.

The method of applying an equal profit percentage to each item rate attracted the most support amongst contractors, with 30% claiming to use this method. Other methods finding favour with contractors include the addition of a varying profit percentage to each item rate (22%) and the addition of a lump sum to each item rate. Contractors did not appear to favour the addition of profit allowances to *selected* item rates. The participants claiming to use 'other' methods did not elaborate on this choice.

Table 1 Profit levels for 1992 expressed as a percentage of net project cost: quantity surveyors' and contractors' opinions

Type of project	Profit levels expressed as a percentage of net project cost													
	0 - 5%		6 - 10%		11 - 15%		16 - 20%		21 - 25%		25 - 30%		Exc. 30%	
	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)
Housing: (Q=13; C=15)	31(4)	20(3)	38(5)	27(4)	15(2)	33(5)	15(2)	7(1)	0(0)	0(0)	0(0)	7(1)	0(0)	7(1)
Industrial: (Q=14; C=16)	21(3)	31(5)	57(8)	44(7)	14(2)	6(1)	7(1)	6(1)	0(0)	12(2)	0(0)	0(0)	0(0)	0(0)
Commercial: (Q=19; C=14)	16(3)	36(5)	74(14)	36(5)	11(2)	7(1)	0(0)	7(1)	0(0)	14(2)	0(0)	0(0)	0(0)	0(0)
Engineering: (Q=10; C=5)	10(1)	60(3)	80(8)	20(1)	10(1)	20(1)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)	0(0)
Maintenance: (Q=17; C=17)	6(1)	24(4)	42(7)	18(3)	29(5)	18(3)	12(2)	24(4)	12(2)	0(0)	0(0)	6(1)	0(0)	12(2)

Table 2 Descriptive statistics for pricing of profit by quantity surveyors and contractors

Type of project	Descriptive statistics					
	Mean		Standard deviation		Coefficient of variation (%)	
	Q.S.	Cont.	Q.S.	Cont.	Q.S.	Cont.
Housing	8.769	12.333	5.341	8.633	60.9	67.0
Industrial	8.357	9.250	4.144	6.708	49.6	72.5
Commercial	7.737	9.429	2.621	7.187	33.9	76.2
Engineering	8.000	6.000	2.357	4.472	29.5	74.5
Maintenance	12.118	14.176	5.656	9.926	46.7	70.0

Table 3 Methods of incorporation of profit into tenders

Method of incorporation	Frequency of adoption of method Contractors (n=23) (%)
Equal percentage addition to each item rate	30 (7)
Varying percentage addition to each item rate	22 (5)
Equal percentage addition to selected item rates	4 (1)
Varying percentage addition to selected item rates	13 (3)
Lump sum edition to item rate	22 (5)
Lump sum addition to selected item rates	0 (0)
Other (please describe)	9 (2)

Question 6: Please indicate the extent to which each of the following factors influence the profit level chosen.

The purpose of this question was to see to what extent quantity surveyors and contractors were in agreement about causal factors on profit levels. Survey participants were offered a list of twenty different factors, plus 'other'. Against each factor, five possible response choices ranged from 'no influence' to 'strong influence'. An importance index was constructed using weightings for the various responses (none=0; strong=4). The results are shown in Table 4. No additional factors were specified by either group of respondents.

It can be noted from the importance index values that, in the majority of instances, quantity surveyors consider the listed factors to be more influential than do contractors. This is particularly so in the case of the perceived influence of the *state of the economy*, the *time for tender preparation*, the *tenderer's resources*, the *quality of the tender information*, the *anticipated claims* and the *perceived riskiness of the project*. These perceptions on the part of quantity surveyors may, conceivably, adversely influence the pre-tender price advice given by quantity surveyors to clients and architects. Notable exceptions to the above-mentioned trend occur in the case of *project value* and the *type of client*. The greatest discrepancy between the opinions of quantity surveyors and contractors arises in the case of the *state of the economy* and the *time for tender preparation*. Clearly, quantity surveyors do not possess a thorough understanding of the factors affecting the choice by contractors of profit level. No inter-group comparison could be made in respect of the *financial state of tenderers*, as this factor was inadvertently omitted from the questionnaire used for quantity surveyor participants.

Having discussed various issues pertaining to the profit levels of contractors, questions 7 to 13 deal with the pricing and incorporation of head office overheads into tender bids.

Table 4 Influence of project factors on determination of profit level

Factor	Degree of influence of factors (quantity surveyors: n=23; contractors: n=23)										Importance Index	
	None		Little		Moderate		Significant		Strong			
	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S.	Cont.
Project type	5	13	14	13	29	22	38	22	14	30	2.429	2.435
Project value	9	9	4	9	30	22	52	35	4	26	2.391	2.609
Project size	0	9	5	9	43	22	43	44	10	17	2.571	2.522
Contract duration	0	13	19	22	33	26	33	26	14	13	2.429	2.043
Location	0	13	14	13	43	22	14	30	29	22	2.619	2.348
Expected competitors	0	13	14	9	29	35	43	22	14	22	2.571	2.304
State of economy	0	9	5	17	10	17	38	35	48	22	3.286	2.435
Quality of tender information	10	13	14	39	29	17	38	22	10	9	2.238	1.739
Project complexity	0	9	5	4	24	35	57	17	14	35	2.810	2.652
Type of client	0	9	24	17	38	22	29	35	10	17	2.238	2.348
Escalation conditions	0	17	33	26	43	22	14	13	10	22	2.000	1.957
Contract conditions	0	13	19	26	57	26	14	9	10	26	2.143	2.087
Level of inflation	5	13	29	52	33	4	14	9	19	22	2.143	1.739
Work-load of tenderers	0	9	10	4	29	39	24	26	38	22	2.905	2.478
Tenderers' resources	0	13	10	22	43	39	24	9	24	17	2.619	1.957
Financial state of tenderers	-	13	-	4	-	39	-	17	-	26	-	2.391
Perceived riskiness of project	0	9	5	4	14	30	38	17	43	39	3.190	2.739
Time for tender preparation	0	13	20	44	45	22	15	13	20	9	2.350	1.609
Expected claims	0	14	38	50	38	23	14	5	10	9	1.952	1.455
Expected variations	0	13	45	52	30	22	20	4	5	9	1.762	1.435

Question 7(a) (quantity surveyors): Do you use formal accounting procedures or techniques to estimate the contractor's overhead costs?

Question 7(b) (contractors): Do you use formal accounting procedures or techniques to determine the total annual overhead costs?

The majority of contractors (73%) claimed to make use of formal accounting procedures or techniques in the determination of total annual overhead costs. Quantity surveyors were unanimous in their assertion that no such techniques were used - it has previously been

established that 86% of quantity surveyors do not make separate allowances for profit and overheads when estimating the cost of building work. Of the six contractors who reported not using accounting techniques, five claimed that such procedures were *unnecessary*; the remaining contractor cited a *lack of time* as the reason. Insofar as the quantity surveyors' responses are concerned, the most frequently given reasons for not using accounting procedures were that it was *unnecessary* (53%), *lack of expertise* (16%) and a *lack of confidence* in such procedures (5%).

Question 8 (contractors only): Once you have decided upon a level for head office overhead costs, how is it incorporated into the priced bills of quantities?

The purpose of this question was to determine the manner in which the recuperation of overhead costs is incorporated into the priced bills of quantities to form the tender bid. The responses are summarised in Table 5, with the number of responses given in parentheses.

Table 5 Methods of incorporation of overheads into tenders

Method of incorporation	Frequency of adoption of method Contractors (n=22) (%)
Equal percentage addition to each item rate	23 (5)
Varying percentage addition to each item rate	18 (4)
Equal percentage addition to selected item rates	5 (1)
Varying percentage addition to selected item rates	9 (2)
Lump sum addition to each item rate	14 (3)
Lump sum addition to selected item rates	14 (3)
Other (please describe)	18 (4)

The method of applying an equal overheads percentage to each item rate attracted the most support amongst contractors, with 23% claiming to use this method. Other methods finding favour with contractors include the addition of a varying overheads percentage to each item rate (18%) and the addition of a lump sum to each item rate (14%). Generally speaking, contractors did not appear to favour the addition of overhead allowances to *selected* item rates. The participants claiming to use `other' methods did not elaborate on

this choice. These results are in line with the findings relating to the incorporation of profit allowances.

Question 9: Please indicate the extent to which each of the following factors influence the overheads level chosen.

The purpose of this question was to see to what extent quantity surveyors and contractors were in agreement about causal factors on overheads levels. Survey participants were offered a list of twenty different factors, plus 'other'. Against each factor, five possible response choices ranged from 'no influence' to 'strong influence'. In addition, quantity surveyors were provided with the option 'do not know'. An importance index was constructed using weightings for the various responses (none=0; strong=4). The results are shown in Table 6. No additional factors were specified by either group of respondents.

In contrast to the perceptions of participants regarding the influence of factors on contractors' profit levels, *all* of the quantity surveyors consider the listed factors to be more influential than do the contractors. This is particularly so in the case of the perceived influence of the *state of the economy*, the *tenderer's resources*, the *perceived riskiness of the project*, the *quality of the tender information*, the *level of inflation* and the *expected competition*, where differences in opinion are marked. Clearly, quantity surveyors and contractors hold very different opinions regarding the factors affecting the level of overheads incorporated in tender bids. The 'do not know' option provided to quantity surveyors elicited a response from only one participant. Given the limited 'do not know' response, the percentage responses to the remaining options were not recalculated. Again, no inter-group comparison could be made in respect of the financial state of tenderers, as this factor was also inadvertently omitted from the questionnaire used for quantity surveyor participants.

Question 10 (contractors only): Do you, as a standard procedure, use feedback from previous projects to assist with the determination of the expected value of annual overhead costs (e.g., to determine under- or over-recovery)?

It is interesting that, of the twenty-three participants who answered this question, eight (35%) do not utilise feedback from previous projects for the estimation of future head office overhead costs. Participants declined to give reasons for, or elaborate on, their answers.

Question 11 (contractors only): Do you record the actual overhead costs pertaining to an individual project and compare them with the estimated costs?

Eight of the participating contractors (36%) reported that such procedures are not followed within their organisations. These contractors did not provide information as to how corrective action is taken within their firms in relation to the estimation of head office

overhead costs. The persons responding negatively to this question are the same participants who responded negatively to Question 10.

Table 6 Influence of project factors on determination of overheads level

Factor	Degree of influence of factors (quantity surveyors: n=19; contractors: n=21)											Importance Index	
	None		Little		Moderate		Significant		Strong		Don't know		
	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. (%)	Cont. (%)	Q.S. only (%)	Q.S.	Cont.
Project type	0	14	11	29	26	10	32	29	26	19	5	2.778	2.095
Project value	0	10	6	14	18	33	59	24	12	19	6	2.813	2.286
Project size	0	10	0	10	37	29	37	33	21	19	5	2.833	2.429
Contract duration	0	10	5	10	37	19	32	38	21	24	5	2.722	2.571
Location	0	10	16	14	37	29	16	29	26	19	5	2.556	2.333
Expected competitors	5	20	11	43	42	19	32	5	5	14	5	2.222	1.524
State of economy	0	15	11	20	16	30	32	15	37	20	5	3.000	2.050
Quality of tender information	6	19	17	43	22	19	39	5	11	14	6	2.353	1.524
Project complexity	0	10	5	19	26	29	42	14	21	29	5	2.833	2.333
Type of client	6	20	22	35	22	10	28	15	17	20	6	2.294	1.800
Escalation conditions	0	19	33	43	39	14	17	5	6	19	6	1.941	1.619
Contract conditions	0	19	24	29	47	19	12	10	12	24	6	2.125	1.905
Level of inflation	6	25	22	40	28	10	17	5	22	20	6	2.294	1.550
Work-load of tenderers	0	10	17	29	22	29	28	10	28	24	6	2.706	2.095
Tenderers' resources	0	10	11	48	22	14	39	5	22	24	6	2.765	1.857
Financial state of tenderers	-	10	-	29	-	19	-	10	-	33	-	-	2.143
Perceived riskiness of project	0	10	0	14	22	38	33	10	39	29	6	3.176	2.333
Time for tender preparation	0	29	39	29	33	24	11	5	11	14	6	1.941	1.476
Expected claims	0	24	44	38	33	19	11	0	6	19	6	1.765	1.524
Expected variations	0	19	50	43	22	19	17	0	6	19	6	1.765	1.571

Question 12: Please indicate the extent to which the following cost centres contribute to the total cost of the head office overheads on an "average" project undertaken over the past three years (express cost centre as a percentage of total overheads value).

This question was intended to establish the extent to which quantity surveyors and contractors were in agreement about the cost significance of individual overheads items. Interestingly, the majority of the quantity surveyor respondent group (85%) declined to answer this question, claiming they 'did not know'. The results are shown in Table 7, with those for the quantity surveyors reflecting the views of the reduced group size. The displayed statistics represent the *means* of the values expressed by participants. It might be argued that the *modal* values would be a better indicator of group opinions in this instance, and future extended analysis will explore this.

Compared with the contractors, the quantity surveyors appear to over-value most of the cost centres. This is particularly so in the case of *management personnel*, *capital provisions*, *rental of other premises* and *insurance*.

Table 7 Contractors' and quantity surveyors' opinions regarding the significance of individual head office overheads cost centres

Overheads cost centres	Mean group values for percentage contribution of overheads cost centres	
	Contractors [n = 19] (mean response values %)	Quantity surveyors [n = 4] (mean response values %)
Management personnel of supplementary departments (e.g., estimating and planning)	45	50-60
Administrative personnel (e.g., clerks and secretaries)	10-15	10-20
Other personnel (e.g., cleaning staff)	0-5	0-10
Office rental	5-10	0-10
Office equipment and furniture	0-5	0-10
Sundry office expenses (e.g., stationery)	5	0-10
Capital provisions	5-10	10-20
Rental of other premises (e.g., storage facilities)	0-5	20
Insurance	5-10	10-20
Other (please specify)	10	0-10

Question 13: On average, what proportion of the total contract value (tender bid) do the head office overhead costs represent?

The literature is silent on a comparison of the assessments of quantity surveyors and contractors regarding head office overheads expressed as a percentage of total tender bid value. This question sought to explore this issue, the results of which are given in Table 8.

Although a total of seventeen quantity surveyors responded to the question, seven (41%) claimed that they 'did not know'. Thus, the statistics relating to the quantity surveyor respondents given in Table 8 refer to the reduced sample size of ten.

Most respondents believe that head office overheads, expressed as a percentage of total tender bid, lie in the range 1% - 6%. Some contractors (20%) believe that overheads may, on *average*, amount to more than 15% of contract value. While quantity surveyors and

contractors participating in the survey hold broadly similar opinions about this question, there is an underlying difference between them. Quantity surveyor response depicts bi-model traits, with 20% of respondents being of the opinion that overheads, on average, lie in the 11% - 15% range. The contractors opted for a wider range: 1% - 10%; 13% - 20%. Clearly, contractors expect greater variability in overheads costs than do quantity surveyors.

Table 8 Contribution of the head office overheads to total contract value

Percentage contribution	Assessment of quantity surveyors and contractors	
	Quantity surveyors [n = 10] (%)	Contractors [n = 19] (%)
0 - 1%	10	5
2 - 3%	20	11
4 - 6%	30	37
7 - 8%	0	11
9 - 10%	0	11
11 - 12%	10	0
13 - 15%	10	5
15 - 20%	0	16
Exceeding 20%	0	5

Finally, questions 14 and 15 are concerned with contractors' mark-up or margin.

Question 14: Do you use any statistical/mathematical models or techniques (i.e., bidding models) to determine the optimum level of mark-up?

Quantity surveyors were unanimous in their assertion that they do not avail themselves of statistical techniques in the determination of mark-up. Ninety-six per-cent of contractors were of the same opinion. The one contractor who claimed to use modelling techniques declined to describe the technique used.

Question 15: If you do not use statistical models to determine mark-up, which of the following reasons apply?

This question sought to explore reasons why quantity surveyors and (particularly) contractors did not utilise modelling techniques for determining the level of mark-up. Participants were given a choice of four reasons, plus 'other'. By far the most common reason cited for not using modelling techniques was that it was not deemed necessary, by

46% of quantity surveyors and 48% of contractors, respectively. Participants considered the remaining reasons to be of lesser importance, namely, lack of time (0%; 10%), lack of expertise with modelling techniques (17%; 14%) and lack of confidence in modelling techniques (17%; 19%). A small minority of participants cited a combination of the above reasons under `other'.

4 Concluding discussion

This research has shown that some important differences exist, between professional quantity surveyors and contractors, in their approaches to pricing mark-up.

More importantly, it has shown that substantial intra-group differences occur, particularly among contractors. The implication of this is that improvements in price forecasting by quantity surveyors, by attempting to reflect more closely the pricing approaches of contractors, will be difficult to achieve unless the characteristics of each of the contractor tender groups is known with confidence. This situation rarely occurs in practice.

Few professional quantity surveyors treat the overheads and profit components of mark-up separately when price forecasting on projects. Yet many contractors make this separation deliberately, in order to incorporate strategic management decisions relating to profit.

The research evidence suggests that professional quantity surveyors view project profit expectations more conservatively than do contractors. This helps to explain quantity surveyors' reluctance to treat profit and overheads separately. The strategic and commercially sensitive nature of profit renders it more difficult to investigate from outside the company concerned. However, if a more-or-less consistent view of profit is assumed (e.g., by expecting a narrow range of profit expectations among contractors), then the need for detailed consideration is diminished. If contractors tend to take a more disparate view of profit expectations, as the research evidence implies, then professional quantity surveyors should reflect this by paying closer attention to the factors which influence profit.

While the research shows that quantity surveyors do consider factors likely to influence contractor profit on projects, it also shows that they seem to pay more attention to some factors, possibly at the expense of others. Compared with contractors, quantity surveyors pay less attention to project factors such as size and location. They also undervalue the importance of client type, price escalation provisions, and general contract conditions. These factors, of course, all impact upon the perceived riskiness of a project. Given the risk/reward relationship, they must directly influence contractors' profit decisions in tendering.

In exploring the relative strength of factors influencing the overheads component of mark-up, the research shows that, in comparison with contractors, professional quantity surveyors tend to under-estimate the influence of project factors such as contract duration, location and contract conditions. This suggests that quantity surveyors should pay closer attention to the time performance aspect of projects. Projects with contract durations requiring a time performance significantly higher than normal will generally attract a premium in the overheads component of mark-up, as their resource demands will be greater. Similarly, projects in difficult locations (or with restricted access) will also

adversely affect the level of overheads expenditure, as will projects with unusual requirements incorporated in the contract conditions.

The disparity between contractors and professional quantity surveyors, in their assessment of profit and overheads levels on projects, and in their views on the strength of factors influencing these components of project mark-up, suggests that quantity surveyors at least should be concerned to use forecasting techniques which incorporate some form of simulation. The research, however, indicates that this is not the case. This does not augur well for improving quantity surveyors' price forecasting in this area. Future research should explore the development of more appropriate forecasting techniques.

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