

BIDDING BEHAVIOUR OF SRI LANKAN CONTRACTORS

by

W.P.S. Dias and R.L.D. Weerasinghe

Abstract

A questionnaire survey was carried out on a sample of large, medium and small contractors, in order to make some assessment of the bidding behaviour of construction firms. This paper reports the results of this survey, which covered organisational profiles, factors affecting the bid/no-bid and percentage mark-up decisions and bidding policy of contractors. While the nature of client was a key factor affecting both types of bid decisions, the bid/no-bid decision was influenced more by factors of the "certain" type, whereas the percentage mark-up decision was influenced more by factors of the "uncertain" type. The annual turnover of construction firms was an index that was reasonably well correlated with many other entities queried in the survey. The results of this survey can be used to establish whether or not bidding behaviour is rational and coherent and to develop computer models of bidding behaviour.

1.0 Introduction

Most construction contracts are awarded on the basis of competitive bidding. Bid decisions involve the question of whether to bid or not, and also the question of the value of mark-up to apply (Ahmad and Minkarah 1988). These decisions have often to be made under very tight time constraints, as the time given for submitting bids is often very short in duration. Furthermore, there are a multiplicity of factors that affect these decisions, not all of which are amenable to quantification or analysis. The objective of this study was to shed some light on the bidding behaviour of Sri Lankan contractors. It was based essentially on a questionnaire survey.

2.0 Questionnaire Survey

The survey questionnaire followed the general form of that used by Ahmad and Minkarah (1988) in the U.S.A., but was modified and customised for the Sri Lankan context on the basis of preliminary discussions held with a sample of small, medium and large scale contractors. The survey was carried out in 1992.

The first part of the questionnaire contained questions regarding the construction firm. For example, there were questions regarding

- (i) Annual turnover (in millions of rupees)
- (ii) Number of permanent employees
- (iii) Number of temporary employees
- (iv) Value of construction equipment owned (in millions of rupees)
- (v) Percentage of construction equipment leased or rented
- (vi) Percentage of work subcontracted on an average job

All the answers to the above questions were obtained by asking respondents to tick off boxes corresponding to ranges of value. Each question had four to six boxes, corresponding to four to six ranges.

In the second part of the questionnaire, respondents were asked to indicate the weightage on a scale of 1 to 5 (1=lowest, 5=highest) they would give to 12 factors that were considered to affect (i) the bid/no-bid decision and (ii) the percentage mark-up decision. These 12 factors were based on Ahmad and Minkarah (1988) and on a preliminary round of discussions with a sample of contractors. They are

- (i) Size of job
- (ii) Type of job
- (iii) Current workload
- (iv) Location of the project
- (v) Nature of client (i.e. whether reasonable, reliable etc.)
- (vi) Difficult nature of job

Dr. W.P.S. Dias, BScEng(Hons), PhD, DIC, CEng, MIE(SL), MStructE, graduated from the University of Moratuwa in 1980 and obtained his doctorate in 1986. He is a Senior Lecturer at the University of Moratuwa.

Eng. R.L.D. Weerasinghe, BScEng(Hons), CEng, MICE, MIE(SL) graduated from the University of Peradeniya in 1978 and is presently attached to Japan Port Consultants.

- (vii) Competition among contractors
- (viii) Reliability of subcontractors
- (ix) Risk involved in investment
- (x) Type and numbers of labour required /available
- (xi) Type and numbers of equipment required/available
- (xii) Past experience of the firm

The third part of the questionnaire focused on the policies and practices of the firm regarding bid decision making. For example, there were questions regarding

- (i) The best (i.e. preferred) job sizes for the firm (in millions of rupees)
- (ii) The best (i.e. preferred) job durations for the firm (in years)
- (iii) The percentage of work obtained through competitive bidding

The above questions also had boxes and corresponding ranges, as for the questions in the first part. In addition there were questions regarding the factors that make contractors optimistic, and those that make them feel desperate with respect to being awarded a contract.

The full questionnaire is available in Weerasinghe (1995). It was circulated among a sample of 30 contractors registered under the Institute for Construction Training and Development (ICTAD); the sample represented a fair cross section of large, medium and small contractors. The response received was very good, with 26 out of 30 contractors (87%) returning the questionnaire.

3.0 Results of Survey

3.1 Organisational Profiles

Table 1 indicates the type of work undertaken by the contractors surveyed. Almost 60% were confined to building works alone, while only around 20% were involved in highway construction.

Table 2 gives the distribution of annual turnover. This indicates that the Rs. 20-50 million range is somewhat under-represented. The distribution of average job sizes (Table 3) follows virtually a normal distribution, with almost half the contractors having average job sizes in the range of Rs. 5-20 million.

Table 4 indicates that half the sample used less than 25% of subcontracted work on an average job. Table 5 shows that the percentage of construction equipment leased or rented was under 25% for around 60% of the contractors; this low figure is probably due to the fact that equipment use is low among Sri Lankan

contractors. The value of construction equipment owned by the contractors is shown in Table 6.

Figure 1 shows a plot between the number of permanent employees and temporary employees for the 26 firms surveyed. This figure indicates that there tends to be a greater number of temporary employees than permanent employees. This reflects no doubt the long term uncertainty in the construction industry.

3.2 Factors Affecting Bid Decisions

The relative importance of the 12 factors was determined by ranking them on the basis of the percentage of respondents scoring 4 or higher (Ahmad and Minkarah 1988). The choice of 4 as a cut-off can be justified because anyone scoring 4 on a scale of 1 to 5 would have had to overcome the central tendency of scoring 3. The order of mean scores also followed this ranking fairly closely, but the order of modes deviated from it somewhat. The rankings for the factors affecting (i) the bid/no bid decision and (ii) the percentage mark-up decision are shown in Tables 7 and 8 respectively. If two factors received identical percentages of respondents scoring 4 or higher, they were ranked on the basis of mean scores or modes.

In the present survey, the nature of client was found to be important for both types of decisions. Supplementary responses to the questionnaire also revealed that contractors try to maintain a good relationship with clients. Other factors which influence both types of decisions are current workload, location of project, and risk involved in investment.

As suggested by Ahmad (1990) following the U.S. survey (Ahmad & Minkarah 1988), the present survey results also indicate that the bid/no bid decision depends more on factors of the "certain" type (i.e. those that can be easily ascertained and/or quantified), such as nature of client, size of job, current workload and past experience of the firm (Table 7); while the mark-up decision depends more on factors of the "uncertain" type (i.e. those that cannot be easily ascertained or quantified), such as difficult nature of job, risk involved in investment and competition among contractors (Table 8).

The respondents also indicated that, in addition to the 12 factors in the questionnaire, the time available for preparing the bid also influenced the bid price. They also advocated the practice of pre-qualification of contractors.

3.3 Organisational Bidding Policy

Table 9 indicates that most firms obtained a high percentage of work through competitive bidding. Of

Table 1 - Classification of Respondents by Type of Work

Type of construction work	Respondents (%)
Buildings	58
Buildings, Water Supply & Sewerage	23
Buildings, Water Supply & Sewerage, Highways	19

Table 2 - Annual Turnover

Range (Rs.million)	Respondents (%)
<1	4
1 - 5	4
5 - 10	19
10 - 20	26
20 - 50	11
> 50	36

Table 3 - Average Job Size

Range (Rs. million)	Respondents (%)
< 1	12
1 - 5	15
5 - 10	23
10 - 20	23
20 - 50	15
> 50	12

Table 4 - Percentage of Work Subcontracted on Average Job

Range (%)	Respondents (%)
Zero	-
< 25	52
25 - 50	28
50 - 75	12
75 - 100	8

Table 5 - Percentage of Construction Equipment Leased/Rented

Range (%)	Respondents (%)
Zero	27
< 25	35
25 - 50	19
50 - 75	19
75 - 100	-

Table 6 - Value of Construction Equipment Owned

Range (Rs. million)	Respondents (%)
< 1	15
1 - 10	38
10 - 20	7
20 - 50	19
> 50	19

Table 7 - Factors Affecting Bid/No-Bid Decision

Rank	Factors	Percentage of respondents scoring 4 or 5 (on scale of 1 to 5)	Score	
			Mean	Mode
1	Nature of client	73.1	4.27	5
2	Size of job	73.1	4.03	5
3	Current workload	61.5	3.89	5
4	Past experience of the firm	61.5	3.73	4
5	Risk involved in investment	57.7	3.81	5
6	Location of the project	57.7	3.62	4
7	Type of job	42.3	3.42	3
8	Type & number of equipment required / available	38.5	3.00	2
9	Difficult nature of job	34.6	3.04	2
10	Competition among contractors	26.9	3.00	2
11	Type & number of labour required / available	23.1	2.73	2
12	Reliability of subcontractors	7.7	2.35	3

Table 8 - Factors Affecting Percentage Mark-up Decision

Rank	Factors	Percentage of respondents scoring 4 or 5 (on scale of 1 to 5)	Score	
			Mean	Mode
1	Difficult nature of job	76.9	4.04	4
2	Nature of client	73.1	3.89	5
3	Location of the project	73.1	3.89	4
4	Risk involved in investment	53.9	3.50	5
5	Competition among contractors	50.0	3.54	3
6	Current workload	42.3	3.31	3
7	Type of job	30.8	3.23	3
8	Size of job	26.9	2.96	3
9	Past experience of the firm	15.4	2.62	3
10	Reliability of subcontractors	15.4	2.50	3
11	Type & number of equipment required / available	11.5	2.50	3
12	Type & number of labour required / available	11.5	2.42	3

Table 9 - Percentage of Work Obtained Through Competitive Bidding

Range (%)	Respondents (%)
<25	27
25 - 50	27
50 - 75	15
75 - 100	31

Table 10 - Factors That Make Contractors Optimistic

Factors	Respondents (%)
Owner	50
Competitors	38
Type of job	42
Firm's strength in industry	35
Experience of firm	69
Overall economy	31

Table 11 - Factors That Make Contractors Desperate

Factors	Respondents (%)
Need for work	88
Firm's strength in industry	12
Size of job	35
Location of project	39
General overhead requirement	23

Table 12 - Preferred Job Sizes

Range (Rs. million)	Respondents (%)
<1	8
1 - 5	8
5 - 10	15
10 - 25	38
25 - 50	19
> 50	12

Table 13 - Preferred Job Durations

Range (years)	Respondents (%)
< 1/2	8
1/2 - 1	38
1 - 2	46
2 - 3	8
> 3	-

the factors that made contractors feel optimistic about winning a contract, the experience of the firm and the owner (i.e. client) were the most important (Table 10). Of the factors that made contractors feel desperate to obtain a contract, the need for work was by far the most predominant (Table 11).

Table 12 indicates the spread of preferred job sizes. These are distributed approximately normally, with the most preferred job size being in the range of Rs. 10-25 million. Table 13 gives the preferred job durations. Around 85% of the firms preferred durations ranging from 1/2 to 2 years.

Most of the contractors were somewhat comfortable about the way they made bid decisions, even though the large majority did not use any mathematical or statistical techniques for arriving at them.

3.4 Correlations Between Responses

In addition to the within-response analysis depicted in Tables 2 to 13, some cross-response analysis was also performed. It was found that the annual turnover was a factor that was reasonably well correlated with many other entities, such as value of construction equipment owned (Figure 2), preferred job duration (Figure 3) and especially with average job size and preferred job size (Figure 4).

On the other hand, the preferred job size is not that well correlated with the value of construction equipment owned (Figure 5) or with the number of permanent employees (Figure 6). It is probably not correlated at all with the percentage of work subcontracted on an average job (Figure 7).

4.0 Modelling Bidding Behaviour

While the information gleaned from this survey is valuable in its own right, it can also be used to develop computer models for bidding behaviour.

Consider for example the correlations between the responses to the questions on organisational profile (e.g. annual turnover, value of construction equipment owned, number of permanent employees, percentage of work subcontracted on average job etc.) and the responses to the questions on bidding policy (e.g. preferred job size), as depicted in Figures 4 to 7. If some sort of multiple regression analysis could be performed, construction firms would be able to determine what job size is best suited for them, based on their organisational profile. This would assist them in the decision as to whether to bid or not. Such an exercise has in fact been carried out, using an artificial neural network (ANN) approach and will be reported elsewhere (Dias and Weerasinghe 1995). It may be recalled that the size of job was the second most important factor affecting the bid/no-bid

decision (Table 7). The results of the ANN exercise could help construction firms to actually estimate the range of job sizes that is most suitable for them.

Then again, the key factors that influence the mark-up can be obtained from Table 8. Any given company could characterise the jobs they have bid for by levels assigned to the key factors on a scale of say 1 to 5 again (e.g. how difficult was the job?, how difficult was the client? etc.). A correlation can then be sought between the combinations of key factor levels and the corresponding mark-ups applied by the company in their bids for those jobs. This will assist the company to choose a mark-up for future bids, depending on the key factor levels of those jobs. This exercise too has been carried out using an ANN approach (Moselhi et al. 1991) and will be reported elsewhere (Dias and Weerasinghe 1995).

5.0 Conclusions

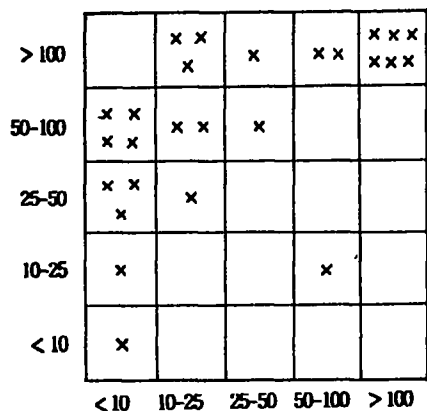
The following are the main general conclusions from this study.

1. The nature of client is important both for the decision regarding whether to bid or not and for the decision regarding the percentage of mark-up to apply. Other factors which influence both types of decisions are current workload, location of project, and risk involved in investment.
2. The bid/no bid decision depends more on factors of the "certain" type, such as nature of client, size of job, current workload and past experience of the firm, while the percentage mark-up decision depends more on factors of the "uncertain" type, such as difficult nature of job, risk involved in investment and competition among contractors.
3. The annual turnover was an index that was found to be reasonably well correlated with many other entities, such as average job size, preferred job size, preferred job duration and value of construction equipment owned.
4. While the information gleaned from this survey is valuable in its own right, it can also be used to develop computer models for bidding behaviour.

6.0 Acknowledgements

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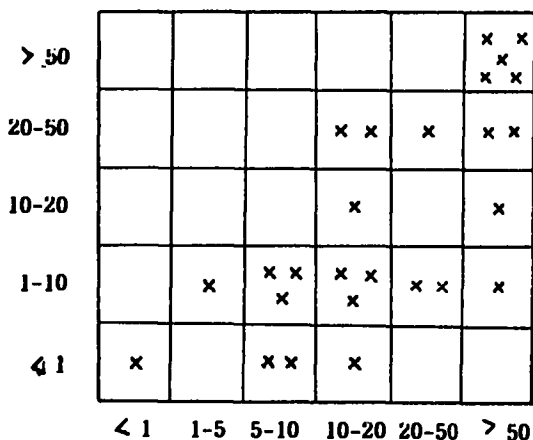
NUMBER OF TEMPORARY EMPLOYEES



NUMBER OF PERMANENT EMPLOYEES

Figure 1 - Numbers of Employees

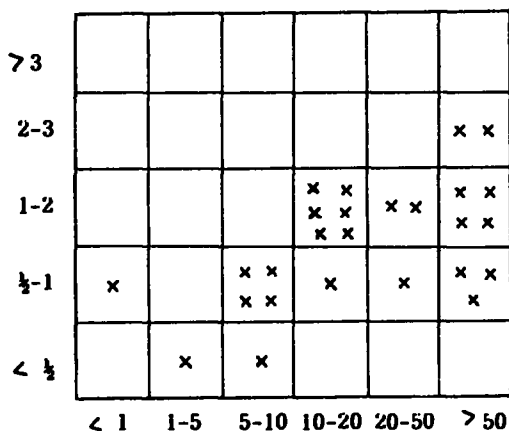
VALUE OF CONSTRUCTION EQUIPMENT (Rs.m.)



ANNUAL TURNOVER (Rs.million)

Figure 2 - Value of Construction Equipment vs. Annual Turnover

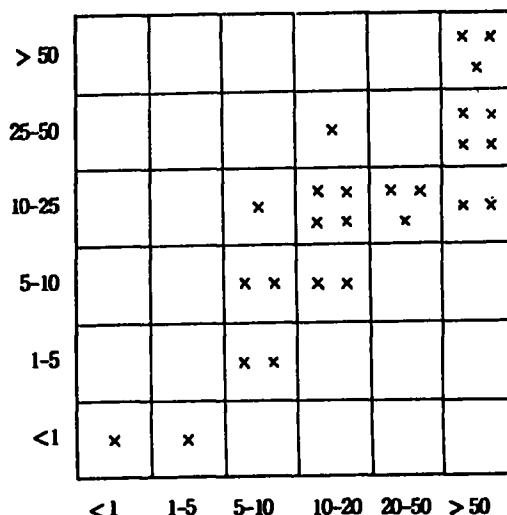
PREFERRED JOB DURATION (years)



ANNUAL TURNOVER (Rs.million)

Figure 3 - Preferred Job Duration vs. Annual Turnover

PREFERRED JOB SIZE (Rs.million)



ANNUAL TURNOVER (Rs.million)

Figure 4 - Preferred Job Size vs. Annual Turnover

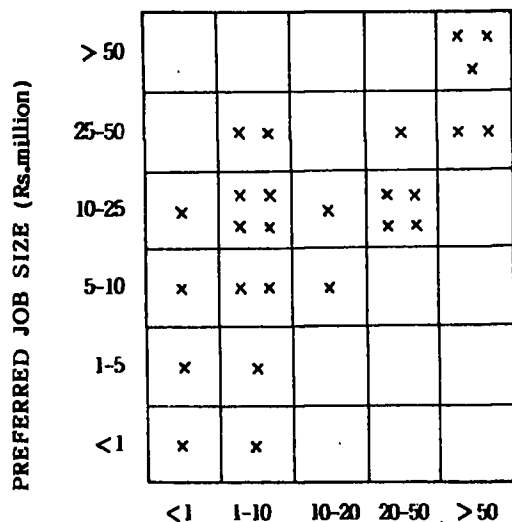


Figure 5 - Preferred Job Size vs. Value of Construction Equipment

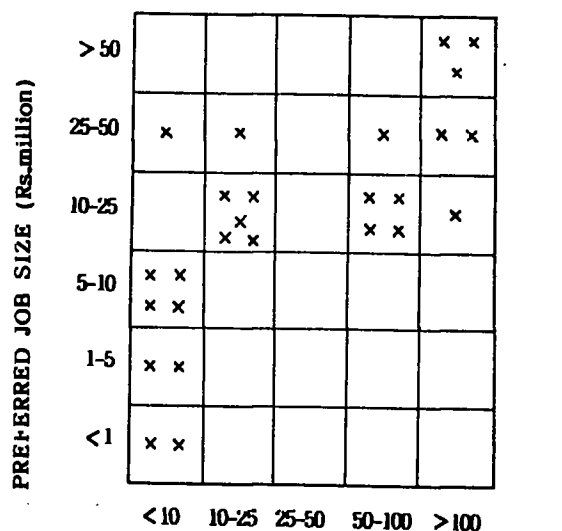


Figure 6 - Preferred Job Size vs. Number of Permanent Employees

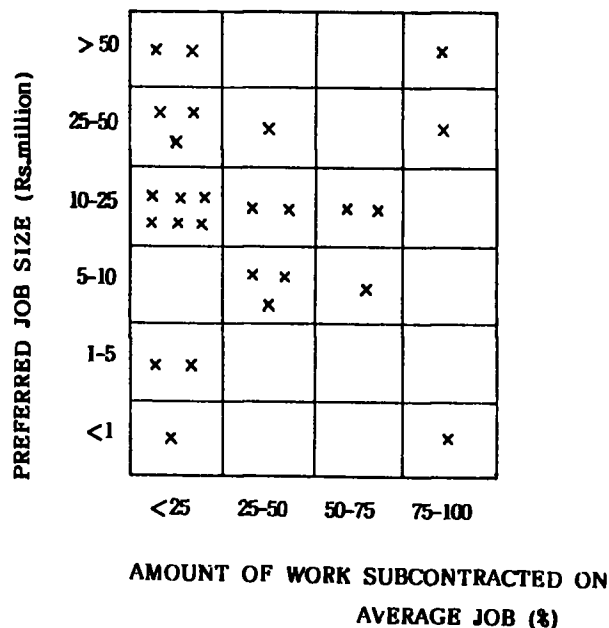


Figure 7 - Preferred Jog Size vs. Amount of Work Subcontracted

7.0 References

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