TENDERING FACTORS CONSIDERED BY SYRIAN CONTRACTORS

M. Wanous, A.H. Boussabaine and J. Lewis

School of Architecture and Building Engineering, The University of Liverpool, P.O. Box 147, Liverpool, L69 3BX, UK

For construction contractors, it is not an easy decision whether to bid or not to bid for a new project. That involves quantifying the combined impact of many factors and then producing a quick cost estimation for the project. All that should be done within a short limited time. Developing a decision-support system for making "bid/ no bid" and "mark up size" decisions will be of great help to contractors. This paper reports the progress of the first stage of developing a decision-support system to help contractors in bidding situations. The Syrian tendering system is presented and, through a questionnaire survey supported by six semi-structured interviews with interested expert contractors, thirty-eight factors were uncovered and ranked according to their importance to contractors operating in Syria. Meeting the "to-tender" conditions, financial capability of the client, and relations with and reputation of the client are the most important factors in the bidding decision. On the other hand, relation with other contractors/suppliers, the proportions to be subcontracted and the local customs are the least important factors in making this decision.

Keywords: Practical bidding model, bid/no bid criteria, Syria.

INTRODUCTION

It is generally accepted that all construction projects are liable, to some extent, to be affected by uncertainty. The contractor's journey through uncertainties and risks associated with a new construction project starts when an invitation to bid for this project is received. Contractors should decide whether to bid or not. Consequently, if the decision was to bid, the mark up size will need to be determined. The "bid/ no bid" and "mark up size" decisions are complex. This complexity is due to their monetary importance and because they are influenced by many interrelated factors.

Most of the current bidding models emphasise the "mark up size" decision more than "bid/ no bid" decision. These models tend to produce a recommendation for the mark up size decision and then try to assist in making the bidding decision. That is not the case in the construction practice where a contractor starts with making "bid/ no bid" decision and only if the decision was to bid the contractor will study the project in depth to determine a proper mark up percentage.

The main purpose of this study is to identify the parameters that characterise the bidding decision in Syria and to develop a bidding model that reflects how contractors make this decision in practice. This model is based on the findings of six semi-structured interviews conducted among interested expert contractors and , through a written questionnaire survey, thirty eight factors were identified and ranked according to their importance in making the "bid/ no bid" decision.

Wanous, M, Boussabaine, A H and Lewis, J (1998) Tendering factors considered by Syrian contractors. *In:* Hughes, W (Ed.), *14th Annual ARCOM Conference*, 9-11 September 1998, University of Reading. Association of Researchers in Construction Management, Vol. 2, 535-43.

That is the first step of a study being carried out to develop a decision-support system that will be able to help contractors in making "bid/ no bid" decision and, if required, the "mark up size" decision.

PREVIOUS STUDIES

The literature contains a great deal of theoretical bidding models based on the works of Friedman (1956) and Gates (1967). All these mathematical models proved to be suitable for academia but not for practitioners. Gates (1983) introduced a none-mathematical bidding strategy based on ESPE (Expert Subjective Pragmatic Estimate). Ahmad and Minkarah (1988) concluded that only 11.1% of top American contractors use some sort of mathematical models. Very few qualitative studies, which study how the bidding decisions are made in practice, have been carried out. Ahmad and Minkarah (1987) developed an optimum mark up bidding approach and, in 1988, they conducted a questionnaire survey to uncover the factors that characterise the bidding decision-making process in the United States. This survey revealed that type of job; need of work and the client are major bidding criteria in the United States.

Moselhi *et al.* (1991) demonstrated, by the way of an example, how neural networks could be used to develop a mark up model. They concluded that neural networks could be integrated with expert systems to form an ideal decision support system. Shash and Abdul-Hadi (1992) presented thirty seven factors affecting the mark up size decision with their relevant importance to contractors operating in Saudi Arabia. They concluded that contract size, availability of the required cash and type of contract are the most important factors to contractors in Saudi Arabia.

Shash (1993) concluded that need of work, number of competitors tendering and experience in similar projects are the most important amongst fifty five factors that affect the bid/ no bid decision in the UK.

Moselhi *et al.* (1993) implemented a neural network application to develop an analogy-based decision support system for bidding in construction. This model accounted for the uncertainties in the contractor's assessment of the project's risks by a sensitivity analysis conducted using Monte Carlo simulation technique. Hegazy (1993) developed a prototype for integrated bid preparation with emphasis on risk assessment using neural networks. This prototype was designed to produce an optimum mark up value that maximise the potential profit and predicts the probability of winning the contract at such profit and then data obtained through detailed cost estimate will be utilized to optimally unbalance the final bid.

Schroeder (1993) combined bidding models using the theories of utility, probability, and present value concepts to develop an integrated construction bidding system for the purpose of determining a bid mark up on a construction tender.

Abdelrazig, A. A. (1995) considered thirty-seven factors that affect the bid/ no bid decision in Saudi Arabia and utilized an analytic hierarchy process to develop computer software called Expert Choice to help contractors in this decision. Dozzi *et al.* (1996) developed a utility theory model using twenty one criteria for bid mark up determination. This model is, generally, complex and it assumes that the higher the competition the higher the mark up which is not the generally accepted view of how the competition works.

TENDERING SYSTEM IN SYRIA

Every registered contractor regularly receives a copy of the Bulletin of Official Tenders (BOTs), which is an open invitation to bid for a very wide range of projects that the construction industry's clients (usually the public sector agencies) intend to construct. The BOTs usually contain the following information about each of the advertised projects:

(1) The project location; (2) The project name (type); (3) The project size; (4) The estimated project duration; (5) The client identity; (6) Conditions that should be met by the tendering contractors; (7) The place where to submit the bids; (8) Bids' submission date; (9) Date of bid opening; (10) The temporary deposit (bid bond); (11) The final deposit (performance bond); (12) The place where the complete specifications and drawings are available; (13) The code of technical, financial, and legal conditions that would be applied; (14) The duration within which the contractor will be committed to his offer; (15) Number of announcements made to the same project so far; (16) Type of the tendering procedure.

The two most frequently used tendering procedures adopted in the Syrian construction industry are:

1. Addition / Reduction Tender (A/RT): In this case the client's design department produces the project's cost estimate, bill of quantities (all items are included with their standard units, quantities, individual prices and cumulative prices), detailed specifications, drawings and the codes of technical, financial, and legal conditions. Then the project is advertised in the Bulletin of Official Tenders and, sometimes, in the local/ national newspapers. Interested contractors can compete on this project by submitting a bid in a sealed envelop, which is an offer to construct the project within the client-estimated cost increased or reduced by a certain percentage, which would be compared with other competitors' percentages.
2. Price Offer Tender (POT): Very similar to the A/RT but the client is not involved in a detailed cost estimate. The bills of quantities contain only the items' descriptions, standard units, and approximate quantities. Interested contractors fill in the missing individual prices and cumulative prices for each item and then, by summing up the cumulative prices, calculate the final price, which would be compared to other competitors' prices.

The lowest bid will win the contract. There are some other procedures such as direct negotiation, which is used by some agencies for small projects.

DATA COLLECTION

The general nature of this approach dictated what data is required and how to collect it. Two techniques were adopted in the process of gathering the required data. Six semi-structured interviews were conducted among interested expert contractors to gain an overall understanding of how Syrian contractors make "bid/ no bid" and "mark up" decisions in practice. A formal questionnaire survey was designed and mailed to randomly selected contractors

Semi-Structured Interviews

This technique has some of the advantages of reliability, structure, and control associated with more structured interviews and some of the advantages of the scope, flexibility of responses obtainable by less structured interviews. Six semi-structured

interviews were conducted among interested and successful contractors with considerable experience (19-31 years) in the Syrian construction industry. The main objective of these interviews was to gain an overall understanding of how contractors make their tendering decisions in practice. Certain open-ended questions (e.g. please explain how you make the bid/ no bid decision, when it is recommended not to bid for a new project,) were asked in the same order. The interviews were tape-recorded and a written report was produced for each one.

Interviewees agreed that contractors start studying a new project by skimming through the BOTs with attention paid to the following points:

(1) Relations with/ reputation of the client;
(2) Financial capability of the client;
(3) Project Size;
(4) Fulfilling the to-tender conditions imposed by the client;
(5) Availability of capital required;
(6) and the availability of time for tendering.

After considering these factors, if "no bid" decision has not been made, contractors will proceed and buy a copy of the related conditions, specifications and drawings from the client's contract division. Sometimes, contractors prefer to visit the intended project site. However, this has not been considered necessary in some situations (e.g. small building projects). Then contractors will study, in some details, the related drawing, specifications, and the other financial and legal conditions. In this stage the following points will be emphasised:

(1) Risks expected due to the project's nature; (2) Method of construction (manually or mechanically); (3) Rigidity of specifications and conditions.

Contractors also consider other factors (e.g. experience in similar projects, availability of qualified staff, availability of equipment, availability of materials required, availability of other projects).

Usually contractors combine the effects of all the mentioned factors and then decide whether to bid or not. No single factor is enough to make bid decision but sometimes a single factor could be enough to make "no bid" decision. Each of the following factors was considered to be enough, in itself, for making "no bid" decision:

1- The project size is lower than the contractor's interest.
2- The project size is higher than the contractor's capacity.
3- The contractor has very low experience in such a project.
4- Bad reputation of the client.
5- Low financial capability of the client.
6- Many problems with the public about the project's site.
7- The required cash can not be available.
8- The to-tender conditions imposed by the client cannot be fully met.

The bidding strategy explained here before was translated into a bidding model that reflects how the "bid/ no bid" decision is made in practice. This model is outlined in Figure 1.

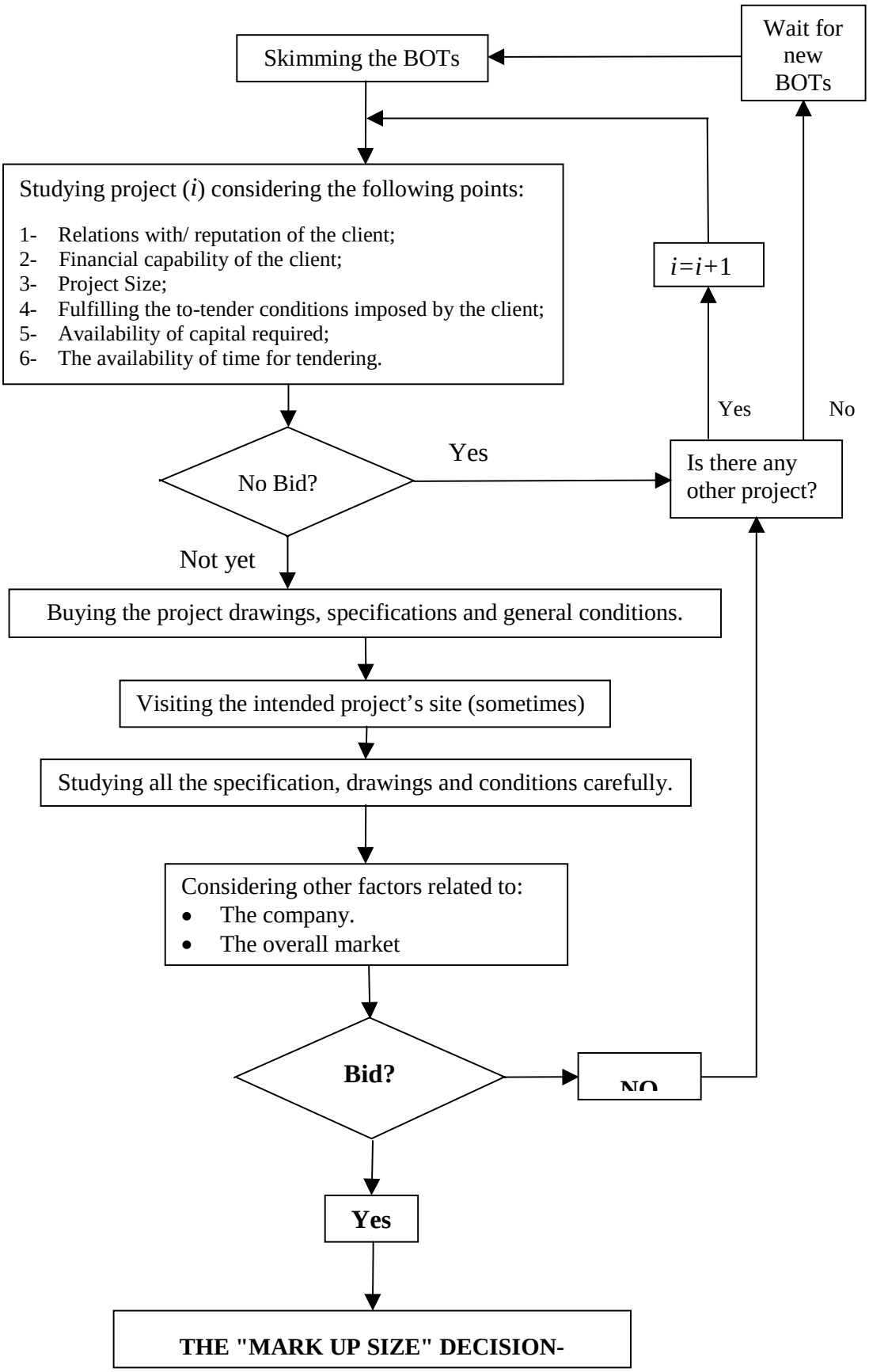

Figure 1: The "bid/no bid" decision

Sample Selection

The sample was selected from the 1996 classified private contractors/ companies list provided by the Syrian Contractors Association.

The following formula was implemented to determine the required sample size (Parasuraman 1990):

$$n_{\max} = \frac{z_q^{\,2} \times s^2}{H^2} \qquad (1)$$

Where n_{max}: the sample size; s: the estimated standard deviation in the population elements; z_q : the normal standard-deviate value corresponding to a q% confidence level in the interval estimate; H: the desired level of precision.

For normal distribution, the standard deviation (s) can be estimated as follows:

S=(maximum value-minimum value)/6 (2)

For this study, the contractors' years of experience was considered as the population's parameter.

The lest, i.e. sampling frame, provided by the Syrian Contractors Association contained 2231 contractors (the total population) with (1 to 35) years of experience in the Syrian construction industry.

The normal distribution was assumed. Thus the standard deviation could be estimated using formula (2): s = (35-1)/ 6 = 5.667

Also, for a normal distribution, we can estimate the mean value (years of experience) as: M= (35-1)/2=16 years

The mean value "years of experience" of the required sample was considered to be acceptable in the range M±2 years, i.e. H=2.

To achieved that in 99% confidence level (z_q = 2.575), the formula (1) can be used to calculate the required sample size as follows:

n_{max} =$(2.575)^2$*$(5.667)^2/2^2$=53.25

A sample of fifty responses was assumed to be enough to give an indication of the importance level for each of the bidding parameters. Response rate of 25% was expected, thus 200 companies/ contractors were randomly selected and approached by the way of formal questionnaire along with an accompanying letter explaining the purpose of the survey. Sixty-one Syrian contractors filled in and returned the questionnaire. The response rate was higher than expected (30.5%).

Factors Affecting The "Bid/ No Bid" Decision

Using the scores given by the contractors, an importance index (I_j) was produced for each factor (F_j).

Ahmad and Minkara (1988) considered the percentage of the respondents who scored a factor by 4 or higher (in a range of 1to 6) as an importance index for this factor. Shash (1993) implemented the following formula:

Importance index = Σ (a * X) * 100/7 (3)

Where a: is a weight, ($1 \leq a \leq 7$), given to the factor in each response.

X = n/N; n: frequency of response; N: Total number of responses.

Σ (a * X) = Σ (a * n/N), which is the weighted average of a.

In this paper the weighted average was produced using the following formula:

$$M_j = \frac{\sum_{i=0}^{i=6} (s_{ij} * n_{ij})}{N_j} \qquad (4)$$

Where M_j: the mean importance level of factor *j*;
s_{ij}: score between 0 and 6 given to factor *j* by each contractor;
n_{ij}: number of contractors who scored factor *j* by s_{ij};

N_j: number of contractors who gave a score to factor *j*. $N_j \leq N = 61$ (total number of respondents). That to discount the missing values' effects.

The score of 6 represents 100% importance. Thus the importance index I_j for factor *j* was computed using the following formula:

$$I_j = M_j * \frac{100}{6} \qquad (5)$$

Table 3 represents thirty-eight factors in a descending order of importance in making the "Bid/ no bid" decision in Syria.

In the case of two, or more, factors having the same importance index, the factor whose Skewness is greater was ranked first because that indicates that more extreme scores are greater than the mean.

Fulfilling the to-tender conditions, i. e. qualifications, imposed by the client was ranked the first among 38 factors that affect the bidding decision. It was given a very high importance (89.88%) but not 100% presumably because a contractor who does not fully meet the required conditions can submit a tender in partnership with other contractors who do fulfil these conditions.

Availability of the required capital was ranked the sixth with a high importance (68.33%), which is less than expected perhaps because contractors can borrow the capital they require until they receive the first payment from the client. That will affect, to some extend, their mark up. On the other hand a moderate importance was assigned to the expected risks, which have more effect on the "mark up size" decision. Surprisingly the project location was assessed as a very low important factor in the bidding decision. Very little importance was assigned to competition. Number of competitors and competence of the expected competitors were ranked thirty second and thirty sixth respectively. Fluctuation in labour/materials' prices has little effect on "bid/ no bid" decision because labour/ materials' prices are currently very stable in Syria.

The mark up decision is out of the paper scope. However it is worth noting that the same aforementioned factors affect the mark up size decision but to different degrees.

For example risks expected, which is the eighteenth bidding criterion was ranked the first amongst thirty eight factors that affect the mark up decision.

Table 1: "Bid/ no bid" factors in descending order of importance

Factors		Mean (Mj)	Importance
j		0-----6	Index Ij
1	Fulfilling the to-tender conditions imposed by the client.	5.39	89.88%
2	Financial capability of the client.	4.66	77.67%
3	Relations with and reputation of the client.	4.61	76.83%
4	Project size.	4.39	73.17%
5	Availability of time for tendering.	4.25	70.83%
6	Availability of capital required.	4.10	68.33%
7	Site clearance of obstructions.	4.08	68.00%
8	Public objection.	4.07	67.83%
9	Availability of materials required.	3.98	66.33%
10	Current work load.	3.95	65.83%
11	Availability of equipment required	3.84	64.00%
12	Experience in similar projects	3.84	64.00%
13	Method of construction (manually, mechanically).	3.84	64.00%
14	Availability of skilled labour.	3.48	58.00%
15	Availability of qualified staff.	3.34	55.67%
16	Original project duration.	3.33	55.50%
17	Site accessibility.	3.23	53.83%
18	Risks expected.	3.13	52.17%
19	Degree of hazard.	3.13	52.17%
20	Rigidity of specifications.	3.00	50.00%
21	Expected project cash flow.	2.82	47.00%
22	Degree of builability.	2.82	47.00%
23	Availability of other projects.	2.77	46.17%
24	Confidence in the cost estimate.	2.72	45.33%
25	The project geological study.	2.41	40.17%
26	Project location.	1.90	31.67%
27	Original price estimated by the client.	1.71	28.50%
28	Past profit in similar projects.	1.59	26.50%
29	Expected date of commencing.	1.48	24.67%
30	Availability of equipment owned by the contractor.	1.33	22.17%
31	Expected number of competitors (Degree of competition).	1.07	17.83%
32	Local climate.	1.05	17.50%
33	Specific features that provide competitive advantage.	0.98	16.33%
34	Fluctuation in labour/ materials price.	0.90	15.00%
35	Competence of the expected competitors.	0.75	12.50%
36	Relations with other contractors and suppliers.	0.62	10.33%
37	Proportions to be subcontracted.	0.33	5.50%
38	Local customs.	0.25	4.17%

CONCLUSION

This paper reports the findings of six semi-structured interviews and a questionnaire survey conducted among randomly selected contractors operating in Syria. The interviews' findings were translated into a bidding model that reflects how "bid/ no bid" decision is made in practice. Thirty eight factors were ranked according to the

influence they have on "bid/no bid" decision as Syrian contractors have assessed them. Meeting the to-tender conditions, financial capability of the client and relation with/ reputation of the client are the most important factors in making "bid/ no bid" decision in Syria. The findings of past similar studies were referred to. Need of work, number of competitors tendering and experience in similar projects are the major bidding factors in the UK. Type of job, need of work and the owner are major bidding criteria in the United States.

The finding of this survey will be used to develop a decision-support to help contractors in making "bid/ no bid" decision and then, if required, determining a competitive mark up percentage. In the case of many new projects, the system could recommend the most suitable project for bidding.

REFERENCES

Ahmad, I. and Minkarah, I. A. (1987). Optimum mark up for bidding: A preference-uncertainty trade off approach. *Civil Engineering Systems*, **4**, 170-174.

Ahmad, I., and Minkarah, I. A. (1988). Questionnaire survey on bidding on construction. *Journal of Management in Engineering, ASCE,* **4**(3), 229-243.

Abdelrazig, A. A. (1995). MSc dissertation, King Fahd University of Petroleum and Minerals/ Saudi Arabia.

Dozzi, S.P., Abourizk, S.M. and Schroeder, S.L. (1996) Utility-theory model for bid-mark up decisions. *Journal of Construction Engineering and Management,* **122**(2), 119-124.

Friedman, L. (1956). A Competitive Bidding Strategy. *Operational Research*, **4**, 104-112.

Gates, M. (1967) Bidding strategies and probabilities. *J. Construction Division, ASCE* **93**(1), 75-103.

Gate, M. (1983). A bidding strategy based on ESPE. *Cost Engineering*, **25**(6), 27-35.

Gordon, W. and Langmaid, R (1989). Qualitative marketing research.

Hegazy, T. (1993). *Integrated bid preparation with emphasis on risk assessment using neural networks*. Ph.D. Thesis, Centre for building studies, Concordia University, Montreal, Canada.

Kish, L. (1965). *Survey Sampling*. John Wily & Sons, Inc, New York.

Li, H. (1994). Neural Network Models for Intelligent support of Mark up Estimation. *Engineering, Construction and Architectural Management*. **3**(1), 69- 82.

Moselhi, O., Hegazy, T., and Fazio, P. (1991). Neural networks as tools in Construction. *ASCE, Journal of Engineering and Management*. **117**(4), 606-625.

Moselhi, O., Hegazy, T. and Fazio, P. (1993). DBID: Analogy Based DSS for Bidding in Construction. *ASCE, Journal of Engineering and Management*. **119**(3), 466-470.

Parasuraman, A. (1991). *Marketing research.*

Raj, D. (1972). *The design of sample survey*.

Schroeder, S. L. (1993). *Integrated construction bidding system*. MSc thesis, Dept, of Civ, Engrg, Univ. of Alberta, Edmonton, Alberta, Canada.

Shash, A. and Abdul-Hadi, N. H. (1992). Factors affecting a contractor's mark-up size decision in Saudi Arabia. *Construction Management and Economics*, **10**(3), 415-429.

Shash, A. (1993). Factors considered in tendering decisions by top UK contractors. *Construction Management and Economics*, **11**(2),111-118.