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Factors affecting a contractor's mark-up size decision in Saudi Arabia

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Deciding upon the right mark-up to add to an estimate is not an easy task for a contractor. The mark-up must be small enough to ensure a good chance of winning the contract, yet big enough to realize a reasonable profit. The determination of the proper mark-up size entails the evaluation of numerous factors. This study presents 37 factors, with their relative importance to contractors operating in Saudi Arabia, underlying the mark-up size decision. The size of contract and availability of required cash, not competition, labour availability and profitability, are the most important factors that affect mark-up size decision.

Keywords: Mark-up, bidding, construction, Saudi Arabia.

Introduction

A construction firm may secure the right to provide services in a new job in one of two ways: (1) by direct negotiation with an owner or representative, or (2) by competitive bidding. This study is concerned with the competitive bidding situation in Saudi Arabia.

The government, semi-government, and private companies are the major clients who render construction services in Saudi Arabia through competitive bidding. Each client has its own bidding system for awarding construction contracts. The government system is used in almost all of its projects. Under this system, a government agency announces in trade and local newspapers its intention of selecting a lowest responsible bidder for constructing a project that is described in plans and specifications. A contractor studies the bidding documents and decides either to bid or not to bid. A contractor who is interested in performing the job will independently prepare a bid price and submit it in a sealed envelope to the owner or representative prior to a designated time of bid opening. During bid opening, envelopes are opened, bids are announced and the apparent lowest bidder is declared. The qualification process is performed and the job, usually, is awarded to the lowest responsible bidder.

The semi-government organizations do not follow a unified competitive system. One semi-government organization invites all contractors to submit specified documents for qualification. After the qualification process, qualified contractors are contacted and asked to submit technical and price bids in two different sealed envelopes. The technical bid contains the contractor's plan of utilizing its resources to accomplish the specified work. The price bid contains the contractor's consideration for doing the specified work. The technical bid is opened first and evaluated quantitatively against predetermined criteria. A contractor receiving evaluating points greater than a preset cut-off point will be included in the

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competition. The price bids of those technically qualified contractors will be opened and the job will be awarded to the lowest bidder. Another semi-government organization uses a closed competitive bidding system. It selects a number of contractors randomly from a list and asks them to submit specified documents for qualification. Qualified contractors are invited to bid on the project. The project is then awarded to the lowest bidder.

Private companies have the choice of using either the open or closed bid system. Some companies go farther and negotiate the price with the three or four lowest bidders.

A submitted bid is an offer. When the bid is accepted by the owner, it is binding. The bid price comprises an estimate of the direct cost, indirect cost and a mark-up. The estimated direct cost is the sum of labour, material and equipment costs that are assumed to occur in the execution of the project plans and specifications. The indirect cost is the sum of all costs which are traceable to the project but which are not traceable to a single activity. This account is designated as job overhead. The mark-up is a percentage of the estimated direct cost which a contractor adds to the estimated direct and indirect costs to account for overhead cost, profit and contingencies. The size of the mark-up for a contractor varies from one bid to another, depending on a multiplicity of internal and external factors that are encountered in each mark-up decision. The very existence of a construction firm depends on its ability to assign an appropriate mark-up (Morse, 1977) which produces enough jobs and significant profits. Therefore, it is a must that each contractor develops a strategy for determining this mark-up which allows the company to achieve its objectives under different bidding situations.

Statement of the problem

Oil income holds a dominant share of the Saudi Arabian government revenues. The increases in world oil prices and the country oil production share during the 1970s and early 1980s generated substantial government revenues as shown in Fig. 1 which shows the government revenues and expenditures over the last two decades. These huge revenues created opportunities for the government to invest in building the infrastructure for the country. The construction industry was the greatest recipient of Saudi Arabian spending during both the First (1970–1975) and Second National Development plans. During that period, money was not an issue. Funds were easily obtainable for all needed projects. The government did all it could to assist rapid development. This environment created a very high demand for construction in Saudi Arabia and very limited competition (Al-Jarallah, 1983; Al-Mansouri, 1987). Naturally, contractors were operating at full capacity, realizing a very large profit margin. This environment did not encourage the use of bidding strategies. Nowadays the situation is the opposite. The drop in oil prices in the international market coupled with substantial reduction in the country oil production after 1982 decreased the government revenues substantially, affecting the whole economic situation in Saudi Arabia. The sharp decline in revenues created financial constraints on planned expenditures. Expenditures were reduced sharply to match the revenues and reallocated to reduce the impact of reduced spending on the country's economy. Municipalities and the housing sector received the largest cut. The actual expenditure in this sector was about 50% of its planned level (Ministry of Planning, Fifth Development Plan, 1990). Construction demand decrased until it became very low and the construction industry was clearly in recession (Al-Jarallah, 1983; Al-Mansouri, 1987). Consequently, construction costs dropped sharply as shown in Fig. 2. The

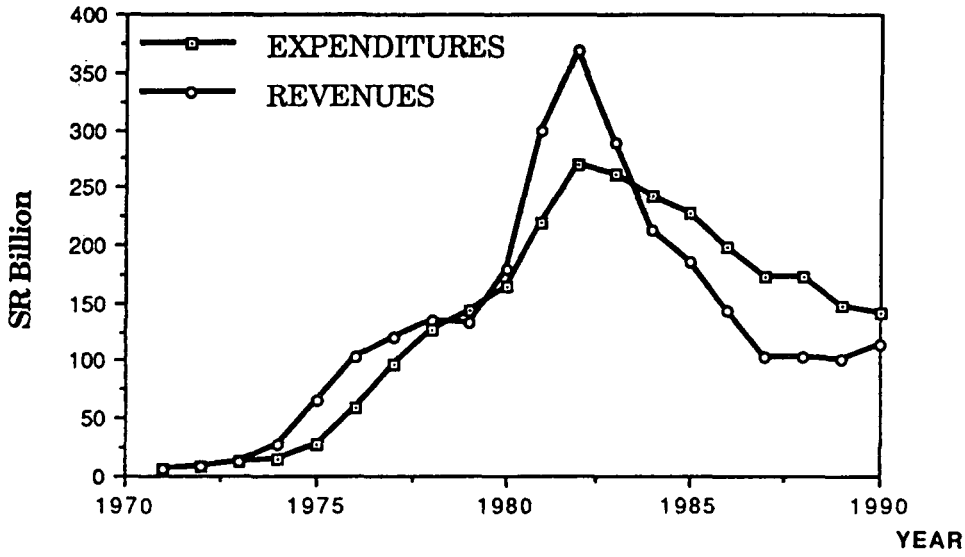

Fig. 1. Government revenues and expenditures.

economic situation did not improve much, competition became very high, and the profit margin substantially decreased. In this tough environment only the strong would survive. Contractors in such an environment are forced to develop a strategy by which they can optimize all their available resources. They are more inclined to use more rational ways of understanding the current market situation to improve their competitive situation.

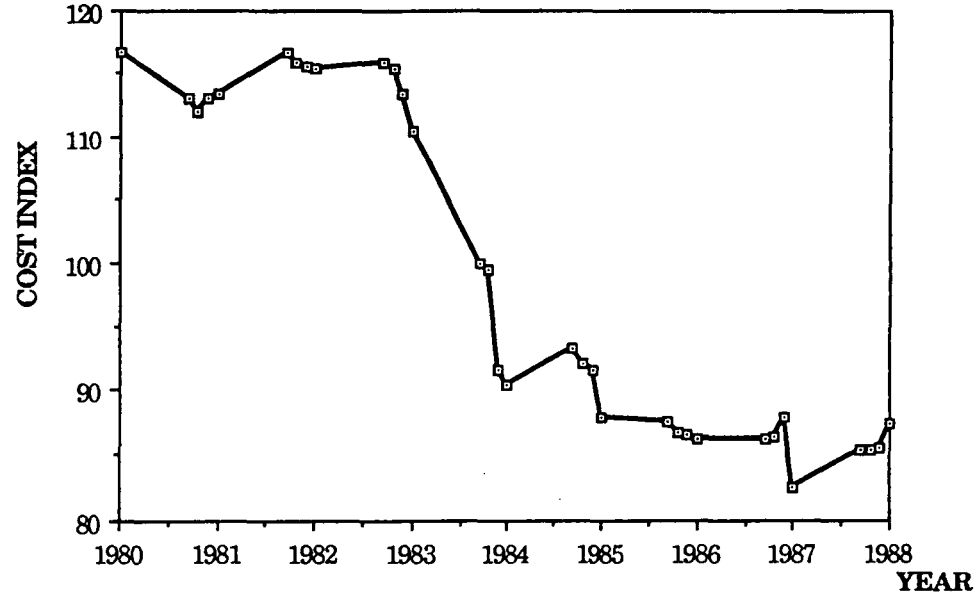

Fig. 2. Quarterly construction cost indices (1980–1988).

The determination of the right amount of mark-up is an essential task of all contractors. However, how to determine this amount is not an easy task. Very few top American contractors use mathematical models to aid them in determining the proper mark-up size while the majority use subjective judgement (Ahmed and Minkharah, 1988). However, is it possible to determine the mark-up that will help the contractor be the lowest bidder and at the same time maximize his profit? Neither mathematical models nor pure subjective judgement proved to be the answer to this difficult question (Gates, 1967).

Contractors need to use a more rational way to determine their mark-ups. This way of thinking is essential for all contractors including those operating in the Saudi environment, because the awarding system depends basically on the lowest bidder criterion.

This study is an attempt to investigate the different factors affecting the amount of mark-up a contractor adds to his estimated cost. If the most important factors can be identified and their effects are understood, a more objective and rational way of determining the mark-up may be introduced.

Objective of the study

The main objectives of this study are (1) determining the factors that affect decision making on the size of mark-up to be applied to different jobs undertaken by contractors in the Saudi bidding environment, and the level of influence of these factors, (2) testing the hypothesis that the importance of the different factors affecting the mark-up size decision changes as the size of the contractor changes and (3) determining the factors that are considered by a 'successful' contractor when he decides on the mark-up size. The first objective will be covered in this paper while the other two objectives will be covered in succeeding papers.

Previous studies

The literature contains several hundred articles addressing competitive bidding strategy. The studies could be classified into either a quantitative or qualitative category.

Quantitative studies

Two quantitative approaches appear in the litrature as solutions for the competitive bidding problem. The first approach depends on statistical decisions and the second is the game theory approach which is not widely implemented in the construction industry. There are some basic differences in the assumptions of the two approaches. Game theory assumes a rational intelligent opponent whose interests are completely opposed to those of the other opponents. The game theory assumes, also, that the utility of the possible outcomes for each player is known to all ther opponents. On the other hand, statistical decision theory assumes that competition is of a consistent nature and that it can be described by a probability distribution (Benjamin and Meador, 1979).

In this literature review the emphasis is on statistical decision theory models because they

constitute the majority of all mathematical models developed for use in the construction industry. Another reason is the fact that game theory has certain shortcomings that would make it difficult to apply to the competitive bidding problem (Benjamin and Meador, 1979).

Many quantitative studies have been conducted in the construction industry in an attempt to replace the mental model with a formal model which contractors can use in determining the most desirable mark-up. All the studies that have appeared in the construction industry literature are based on the pioneering work of Friedman (1956). Friedman defined competitive bidding as a situation where firms submit bids with the objective of maximizing expectation values of profits to be recognized. Employing the same argument, Park (1962), Casey and Shaffer (1964), Shaffer (1965), Broemser (1968), Gates (1971), Morin and Clough (1972), Wade and Harris (1976) and Carr (1982) developed their strategic models. On the other hand, Benjamin (1969) and Neufuille *et al.* (1977) introduced strategic models with the intention of maximizing the expectation value of a contractor's utility value rather than monetary value. While all the current models share a common objective, they differ in their assessment of the winning density functions, the randomness of the cost estimate, the determination of the joint probability of beating more than one competitor and the inference of the number of competitors that will enter the competitive bidding. The most controversial issue that exists among those models is the assumption of dependency among contractors letting when the joint probability of winning is calculated. When independence is assumed, as it is by Friedman, Park, Shaffer, Morin and Clough, the joint probability is simply the product of the probabilities of winning against each individual competitor. On the other hand, when dependence is assumed, the joint probability is found by an equation that Gates (1967) introduced. This controversial issue has created a tremendous argument among researchers about which models are correct and more appropriate for the construction industry. It has shifted the direction of research from extending the current models or developing new models to studies attempting to resolve the controversy. Rosenshine (1972) and Dixie (1974) mathematically attempted to resolve the controversy. They found that both assumptions are correct, but the independence assumption, and all models based on this assumption, are more appropriate to the users in the construction industry. Fuerst (1976) disagreed with Rosenshine's findings and mathematically disproved the independence assumption and, hence, falsified all models that are based on this assumption. Gates (1976a) conducted the Monte Carlo experiments to investigate which assumption is more correct. He found that the dependency assumption is more correct, but Fuerst (1977) explicitly illustrated the faulty approach of Gates's experiments. Benjamin and Meador (1979) have also investigated the issue and arrived, via a Monte Carlo simulation, at the conclusion that the dependency assumption is more appropriate and more representative for the bidding situation in the construction industry. Carr (1982) attempted to resolve the controversy by introducing what he referred to as the general model. Unfortunately, no satisfactory solution has been made to date and none of these quantitative models seem to have been implemented in the construction industry. Ahmed and Minkharah (1988) found that fewer than 10% of American top contractors use some kind of mathematical or statistical model to aid them in their mark-up decisions.

In addition to this controversy, the assumptions that those models stand on oversimplify the situation (Benjamin, 1969), so that they yield outcomes that gave no significant value to the practitioners. The models are incomplete and only model a tiny part of the situation (Gates, 1976b). Also, they require excessive historical data. Gates (1983) believed that these models are good for academia but not for the practitioners. Gates (1983) has abandoned all

current mathematical strategic models, including his own, and suggested a nonmathematical approach to determine the mark-up size.

Qualitative studies

Gates introduced a qualitative approach, based on the Delpi technique, designated as the expert subjective pragmatic estimate (ESPE) as a solution to the mark-up size problem. ESPE improves and refines the strategic thinking that pervaded the bidding process (Gates, 1983). The procedure starts with making an estimate of the range and distribution of the possible low bids of the competitors. Then another estimate is made for the firm's range and distribution of its possible low bids. The two sets are then compared to determine the most appropriate bid. Finally an adjustment is made to correct the implied continuous distribution for the actual discrete situation (Gates, 1983). This method is a simple forecasting method based on ESPE. The ESPE is done by a group of experts who, through an iterating process, will finally estimate the optimal bid.

Recently, Ahmed and Minkharah (1988) addressed the competitive system qualitatively. Their study attempts to determine the factors affecting contractor's bidding strategy. It investigates the level of importance of each factor on the contractor's decision to bid and on the size of the mark-up.

A point to be highlighted here is the fact that the literature contains very few studies concerning the qualitative approach. Thus, it is hoped that this study will be another step towards that way and that the results will open the door for more studies.

Research methodology

This section presents all the steps that were performed to achieve the objectives set for this study. The procedures include all information relevant to what data are needed where and how these data were secured, and the method whereby a sample was selected.

Required data

The study objectives necessitated the identification of the various factors that influence the decision related to the appropriate mark-up size. A thorough review of the literature was conducted for the purpose of studying the available bidding models. The intensive literature review resulted in identifying 37 potential factors affecting a contractor's decision on proper mark-up size.

These factors are classified into five categories. (1) The 'project characteristics' category includes all qualities that describe the project such as size, owner's identity, duration, etc. (2) The 'project documents' category constitutes all factors and characteristics of the bidding documents such as type of contract, design quality, owner special requirements, etc. (3) 'Company characteristics' includes factors relevant to the company such as need for work, current work load, experience in such projects, etc. (4) 'Bidding situation' includes all factors operating in the awarding of contract situation. This category includes factors such as competition, required bonds capacity, etc. (5) The 'economic situation' category involves all economic indicators that may operate on the project. Indicators such as labour availability, government regulations, etc. are the elements of this category. The relationships between

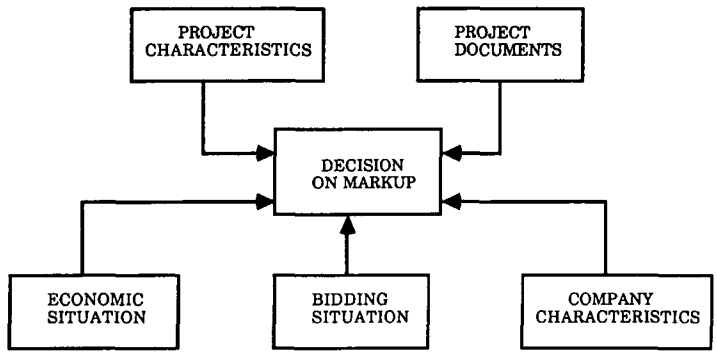

Fig. 3. Broad categories of factors affecting mark-up size decision.

these broad categories and the decision relevant to mark-up size is graphically portrayed in Fig. 3.

In general, the assumption is made that different internal and external factors affect a contractor's mark-up size decisions. The internal factors are those related to the contractor's organization with all its assets, experience and strength. The external factors are those related to the owner and his representative, the designer, the competitors, and finally the project and its related conditions. These parties interact in a changing social, economical, technological and political climate. The data collected should reflect the aggregate effect of the different parties on the contractor's bidding decisions.

Data collection

The necessary data were collected primarily from the top management of the classified construction contractors in Saudi Arabia.

The method used for the collection of the information is a written questionnaire. The questionnaire that was originally prepared for a study done at the University of Cincinnati by Ahmed and Minkharah (1988) sets the foundation for the development of the written questionnaire. Their questionnaire was modified to suit the bidding environment in Saudi Aradia. Some factors were added and others removed depending on which were deemed appropriate and applicable.

The questionnaire is divided into three parts. The first part contains questions about the firm, its type, its capacity, and other biographical data. The second part of the questionnaire contains questions about the importance level of 37 potential factors affecting the decision on the size of mark-up to be assigned. In this part, a scale from 1 to 7 is used to measure the level of effect of each factor on the underlying decisions, where '1' means low level of effect and '7' means high effect. The respondents were asked to check a number on the scale which reflects their assessment regarding the different factors. The last part of the questionnaire contains questions that reflect the firm's policy regarding bidding decision making.

Sample selection

The questionnaire (English and Arabic) was sent to a randomly selected sample contractor. The sample was selected from the 1990 classified contractors list which is published by

Dammam Chamber of Commerce. The procedures that were followed to ensure the randomness of the sample are as follows:

1. A list which had all classified contractors was sequentially numbered.
2. Random numbers were selected from a statistical table according to a preset criteria (i.e. begin from right to left, top to bottom take one row and leave the other, etc.).
3. The random numbers selected were then compared with the number on the list, and accordingly certain subjects were selected.

Sample size

The total population of this study includes all the classified contractors operating in Saudi Arabia. According to the Chamber of Commerce, there are 1600 classified contractors.

The size of the sample was determined using the following formula: (Kish, 1965)

$$n = n'/(1 + n'/N) \tag{1}$$

Where n = sample size, $n' = S^2/V^2$, N = total population = 1600, V = the standard error of sampling distribution = 0.05, S = the maximum standard deviation in the population elements. (Total error = 0.1 at a confidence level of 95%), $S^2 = (P)(1-P) = (0.5)(0.5) = 0.25$, P = the proportion of population elements that belong to the defined class.

Substituting the pre-defined variables a sample size of $n = 94$ is introduced.

It is usually the case in such a study that the response rate will not be high, thus in this study a response rate of 30% was assumed, and thus a total of 300 questionnaires were mailed in February 1990 to classified contractors all over the country. A total of 71 questionnaires were received. Thus, the actual response rate was 24%. Sixty-eight per cent of the questionnaires were answered by general managers.

Data analysis

The analysis of the data was through the use of the statistical analysis system (SAS) which is a package available on the main frame of the King Fahd University of Petroleum and Minerals.

The data collected from the survey was coded and entered into the system which calculated all required statistics, such as the mean, the standard deviation, and the correlation coefficients. The multivariate technique, discriminant analysis, was employed in a major portion of the data analysis.

Discussion

A contractor who decides to bid on a project prepares a cost estimate for the project. The contractor studies the bidding documents and estimates the direct and indirect costs of the project.

Direct costs include all costs that are directly related to cost items of the project. However, costs are not known for certain, so an uncertainty in the cost items is the usual case. In the Saudi construction industry, contractors use different means for treating this uncertainty.

The results indicate that about 37% of the contractors apply a correction factor, 41% adjust their mark-ups, and 22% do not consider it at all.

Indirect costs include all costs that are necessary to perform the job but not directly related to a particular project. Costs such as office overhead and job related contingencies are some examples of indirect costs. These costs must be recovered by some way or another. This study revealed that about 46% of the firms include office overhead in mark-up, 23% charge it as a cost item, and 31% do either depending on the project.

Job related contingencies are handled in the same manner as the indirect costs. Thirty seven per cent of the firms include it in the mark-up, 23% charge it as a cost item, 37% do either depending on the project, and 3% take other precautions.

Mark-up size determination

When deciding on the proper mark-up size, a contractor realizes that the right size is a function of many factors. Table 1 embodies 37 factors that are thought to influence the mark-up size decision. The factors are ranked in accordance to their importance to Saudi contractors. The importance of each factor was measured using the following formula:

$$\text{Importance index} = \Sigma(aX) \times 100/7 \tag{2}$$

where: a = constant expressing the weight given to each response. The weight ranges from 1 to 7 where 1 is the least important and 7 is the most important; $X = n/N$; n = the frequency of the response; N = total number of responses.

The results indicate that when deciding on the mark-up size for a project, a contractor looks into the project characteristics, project documents, economic situation, company characteristics, and bidding situation in descending order of importance. However, despite the broad categories' order of importance, there are factors which are considered heavily and others which are considered lightly regardless of their category position. For example, availability of required cash and uncertainty of cost estimate are in the fourth category. However, the former is ranked second and the latter is ranked fifth in importance among the 37 factors. The second column of Table 1 presents the rank order of the 37 factors.

It is evident that project characteristics is the most important category and bidding situation is the least important category for contractors whenever they decide on the mark-up size. Because of the complexity associated with the mark-up size decision, it is very difficult to determine the additive and/or interactive effect of the factors. The following paragraphs will attempt to describe the observed results. Some factors will not appear in their perspective category because they are used in explaining some other factors in other categories.

Project charscteristics

The size of a project is found to be the most heavily contemplated factor among the 37 listed factors by a contractor when he makes a decision concerning the mark-up size for a project. It seems that the larger the size of a project is, the more attractive it is to contractors. The level of attractiveness may be higher in a recessive economy. The attractiveness of a large size project may arise from its big contract price and long construction duration. The big contract price will contribute positively and substantially to the annual business volume of a

Table 1. Importance index of the factors affecting mark-up size decision

Factors	Importance index	Rank
A. Project characteristics	75.02	
Size of contract in SR	81.51	1
Duration	78.23	4
Project cash flow	76.96	7
Type of equipment required	75.11	10
Location of project	74.47	12
Owner	72.56	20
Job start time	66.34	30
B. Project documents	72.64	
Type of contract	79.69	3
Design quality	72.15	21
Owner special requirements	71.66	22
Designer (A/E)	67.05	28
C. Company characteristics	71.64	
Availability of required cash	80.41	2
Uncertainty in cost estimate	77.52	5
Confidence in work force	75.28	9
Strength in industry	74.71	11
Availability of qualified staff	73.66	13
Need for work	73.04	14
Past profit in similar jobs	72.58	19
General (office) overhead	70.71	24
Current work load	69.79	26
Reliability of subcontractors	66.59	29
Portion subcontracted to others	63.26	32
Public exposure	59.56	35
D. Bidding situation	64.12	
Required bond capacity	72.88	16
Competition	70.51	25
Time allowed for submitting bids	63.13	33
Time of bidding (season)	61.75	34
Bidding document price	58.37	36
Prequalification requirements	58.11	37
E. Economic situation	71.86	
Risk involved in investment	77.09	6
Availability of equipment	75.28	8
Overall economy (availability of work)	72.79	18
Quality of available labour	70.98	23
Availability of labour	68.93	27
Governmental division requirements	66.07	31

contractor. This increase will lead to a reduction in the discrepancy between the contractor's desired and actual operating capacity. In addition to this the big contract price allows sizeable monthly cash inflows to a contractor's account. The results indicated that project cash flow is considered heavily in the mark-up size decision. This factor is ranked seventh among the 37 factors by contractors. The substantial emphasis that is given by contractors to project cash flow may reflect their need for cash. Monthly cash inflow will help a contractor to pay the monthly wages of the contracted imported work force and other permanent employees. Also, the monthly inflow will increase cash availability to a contractor giving him an economic leverage to compete for other projects. The results indicated that the second most influencing factor among the 37 factors is availability of required cash at the front of the construction phase. It seems that if the required cash is available to a contractor, he will have the control in setting the interest rate for using the money. But, if the required cash is not readily available, the contractor will approach a bank for a loan. In this case the interest rate is dictated by the bank. In addition, obtaining a bank loan may freeze a contractor's short and/or long term assets that are held against the loan as collateral.

The long construction duration will allow a contractor to keep his resource in revenue generating state for, at least, a period extending over the project duration, hoping that a more prosperous economy will emanate before the completion of the project. This assertion is supported by the heavy weight that is given by contractors to project duration in mark-up size decisions. The project duration is ranked third among the 37 factors.

Finally, a contractor may be attracted to large size projects because they may give him a prestigious business, a wider reputation and a strength in the industry. The result indicated that a contractor does consider his strength in the industry heavily in the mark-up size decision. The factor is ranked eleventh among the 37 factors.

The results indicated that equipment required by a project and equipment availability play a heavy role in determining the mark-up size for the project. The former is ranked tenth and the latter factor is ranked eighth among the 37 factors. It seems that a contractor who is deciding on a mark-up size evaluates equipment required by the project against equipment available in his fleet. In a situation where a contractor's own equipment make up a major portion of the required equipment, he may trade off high mark-up size with setting his available equipment in a revenue generating condition. This factor might have heavier weight on the mark-up size decision in a situation where the majority of the contractor's equipment are inactive in the storage yard.

The results indicated that a contractor casts heavy emphasis on the project location in mark-up size determination. It is ranked 12th among the 37 factors. The heavy importance that is given to the project location may originate from its potential effect on a contractor's competitive strength. A contractor bidding for a project that is located outside his business area is assumed to be in a weak competitive position. He has to compete against local contractors who have already established good business relationship with local suppliers. Also, he may have to reflect the cost of transporting and accommodating his imported work force in his bid price. The project location may have heavier influence on a contractor's mark-up size decision in a recessive economy which does not promote business expansion.

Project documents

Contractors account for the type of contract heavily in the determination of mark-up size for a project. It is ranked third among the 37 factors. There are two types of contract that are

used in competitive bidding in Saudi Arabia. These contracts are the lump sum and the unit price. The former is more popular in government and some semi government projects (Al-Jarallah, 1983). This type of contract is rigid and inflexible for changes. The price of changes are usually determined through negotiation between the contractor and the owner. Changes are very expensive for the owner and they usually bring extra cash to the contractor.

The unit price contract is used by some government agencies and some semi government organizations when the scope of their projects are defined but the quantity is undefined. This type of contract is gaining more popularity in both government and semi government clients. Its increased popularity may emerge from its ease in determining a price of a change order and in determining an amount of a penalty. In government projects under a unit price contract, a provision is included to dictate the upper and lower limits of the increase and decrease in the scope of the project upon which changes can occur without changing the unit price of the contract items.

Therefore, it seems that contractors recognize the importance of the type of contract in view of their anticipation of the size of change orders that will be issued. Also, both type of contracts transfer the construction risk from an owner to the contractor. The results indicated that contractors do recognize this risk in the determination of the mark-up size. The risk involved in investment is ranked sixth among the 37 factors.

Company characteristics

The production of an accurate cost estimate for a project involves the determination of all direct and indirect costs that will go into the construction of the project. The acuracy of the produced estimate depends upon many factors like the skill of an estimator and the certainty of the scope of the project. The latter may be of little concern to contractors because most projects that are let are defined by plans and specifications. This assertion is supported by the light consideration that is given by contactors to design quality in mark-up size determination. Despite the indicated little concern to design quality, a contractor does reflect the uncertainty in cost estimate heavily in the decision of mark-up size. This factor is ranked fifth among the 37 factors. This heavy emphasis is an indication of an unsatisfactory cost estimate preparation. Unavailability of standardized construction data in Saudi Arabia and unavailability of qualified cost estimators may be the prime causes for the production of a poor cost estimate. The results indicated that availability of qualified staff is heavily considered when a contractor determines a mark-up size for a project. This factor is ranked 13th in the order of importance among the 37 factors.

Contractors indicated that they give weight heavily to confidence in their work force when deciding mark-up sizes for projects. The work force is usually imported labour from different far eastern countries such as India, Philippine, Korea, Pakistan and Thailand. It seems that each contractor has developed a certain system for building a confidence level in the performance of his work force. The system may involve the evaluation of labour skills, labour acceptance to the new culture, labour beliefs, labour motivation, labour productivity and other parameters.

The current work load and the need for work are taken into account interdependently in determining the proper mark-up size for any project. These factors couple a contractor with the surrounding economic situation through the availability of work condition. It looks as though in a depressed economy where the availability of work is very scarce, the need for work may be considered the dominating factor on mark-up size decision. However, in a

recessive economy where a contractor's current load is low, he puts less weight on the need for work in the mark-up size decision. The weight of the need for work may be reduced to minimal when the contractor's current work load is high and work is available. The results indicated that the need for work, the current work load and the availability of work are ranked 14th, 26th and 18th, respectively, among the 37 factors. These factors have lower consideration in mark-up size than was expected. This is evidence that work is available and contractors are operating below their business capacity. It seems that contractors may not have adjusted their business capacity to reflect the reduction in work availability from that of the 1970s and early 1980s. It could also be inferred that the Saudi construction economy was not as bad as we expected. This assertion is supported by the noteable low priority that is given to competition factor by contractors. It is ranked 25th among the total factors.

The experience of a contractor in similar projects is considered moderately in the determination of the mark-up size. It has a similar weight as the need for work. The contractor's past experience may provide an ability to foresee the project requirement more clearly which will help the contractor in putting proper estimate, plans and schedule.

Establishing long relation with clients is also considered by contractors when they want to determine the mark-up size. This factor may be taken into account to satisfy a contractor's long term business plan.

Bidding situation

The majority of the elements of this category are given low priority in the determination of the mark-up size for a project. They may have more weight to the bidding decision. The required bond capacity is the only factor that is considered moderately in the mark-up size decision. The bond is usually in the form of cash or a bank guarantee. In any case the contractor should commit an amount equal to the bond capacity until the expiration of the warranty period. The commitment of cash reduces the contractor's economic leverage. This factor may have heavier weight when availability of cash in a contractor's account is limited.

Economic situation

The results revealed that the availability and the quality of the labour force are of low importance to mark-up size decision. This is evidence of the availability of labour in Saudi Arabia. A contractor may obtain the required work force from his own imported labour and/or from other contractors' imported labour. It seems that a contractor who does not win a contract functions as a labour supplier, supplying surplus labour, for other busy contractors. This strategy may be used by the contractor for the purpose of reducing the cost of contracted imported labour to the firm.

Conclusion

To contractors operating in Saudi Arabia this study presents the most important factors affecting the mark-up size determination. The authors believe the study can be useful to contractors in two ways. First, by identifying and evaluating the importance of the many factors affecting the mark-up size decision, the study can help contractors to focus their

attention on the most important factors and, hence, enhance their chances of assigning the right mark-up size to the right job. Second, this study sets the foundation for the development of an expert system that will help a contractor decide on how much mark-up to add to his cost estimate. In addition, the study sets the foundation for studying each factor individually for the purpose of the development of a procedure for contractors to make sure that they study each factor according to its importance.

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