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The factors influencing bid mark-up decisions of large- and medium-size contractors in Singapore

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The construction industry in Singapore is dominated by a competitive business environment that is being driven by a lowest cost mentality. The pressure on contractors' profit margins has further increased after a prolonged recession in this sector, which has seen construction demand and output shrinking significantly. This paper examines the factors that contractors perceive to be important when they are considering the size of their bid mark-up. The research hypothesis is that contractor size would have a significant bearing on the factors that would influence the bid mark-up decision. Forty factors were identified and a survey was conducted. The results showed that contractor size has a significant impact on their attitude towards bid mark-up decision-making. The analysis also showed that when deciding the size of a bid mark-up large contractors tend to be more concerned with the nature of the construction work while medium-size contractors are more concerned about the state of their own companies finance.

Keywords: Mark-up, tendering, Singapore, contractor size, procurement

Introduction

The construction industry in Singapore is dominated by a competitive business environment driven by a lowest cost mentality that has significantly eroded the profit margins in the industry. Generally, construction projects in Singapore are awarded on the basis of the lowest tender that meets the stated specification. Construction demand and output in Singapore have increased gradually from 1991 to 1997. This trend was disrupted in 1998 with a 35.9% drop in demand for construction (BCA, 2001). The drop was due mainly to the sharp fall in private sector demand during the regional financial turmoil in 1997 and 1998. During this period the industry experienced significant pressures to reduce tender prices as construction firms struggled to improve their competitiveness.

Over the last 50 years models for competitive bidding have been developed for application in the

construction industry (Friedman, 1956; Gates, 1967; Morin and Clough, 1969; Park, 1979). However, the utilization of these mathematical models is not widespread among contractors (Ahmad and Minkarah, 1988; Runeson and Skitmore, 1999). Researchers have argued that bidding decisions tend to be based on intuition and experience and involve emotional responses to the pressures of the moment (Fayek, 1998; Xu and Tiong, 2001). Moselhi *et al.* (1993), Li (1996) and Li and Love (1999) explained that mark-up decisions simply emerge in a single step without going through a sequence of discourses or deep reasoning steps. Akintoye (2000) argued that contractors will set the mark-up at a level perceived to be sufficient to win the tender at a margin that is in line with the strategic position of the firm within the market. More recently, researchers proposed the use of tools such as artificial neural networks to develop a decision support system for estimating bid mark-up size (Moselhi *et al.*, 1991, 1993; Li and Love, 1999). Thus possessing a sound knowledge of the factors influencing the contractors' bid mark-up decision is imperative in identifying the 'optimum' bid mark-up. The present study has

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examined the impact of contractor size on their attitudes towards the factors influencing bid mark-up decisions in Singapore's construction industry.

Factors influencing contractors mark-up decisions

Ahmad and Minkarah (1988), Shash and Abdul-Hadi (1992) and Shash (1993) suggested that a thorough investigation of the underlying factors affecting the bid/no bid decision and bid mark-up decision is essential before attempting to develop a realistic bidding strategy. Lifson and Shaifer (1982) argued that knowing the importance of the factors influencing the decision-making process would allow key and major decisions to be reviewed and discussed regularly. Dozzi *et al.* (1996) stated that contractors need to take into consideration numerous factors when evaluating their bids.

Mannerings (1970) indicated that factors influencing the growth, security and reputation of a company should be taken into consideration during the bid mark-up decision. Drew and Skitmore (1997) identified several factors affecting competitiveness in bidding. However, their research was focused only on contract type and size. Ahmad and Minkarah (1988) identified 31 factors affecting the bid mark-up decisions made by the top general contractors in the USA. Shash and Abdul-Hadi (1992) further developed this research and presented 37 factors underlying the mark-up size decision, with their relative importance to contractors operating in Saudi Arabia. Shash (1993) revised the questionnaire by Ahmad and Minkarah (1988) and suggested 55 factors that they argued to be appropriate and applicable to the tendering decisions considered by top UK contractors. An earlier research effort in Singapore by Mak (1977) identified several factors influencing the profit consideration in a bid mark-up decision. These factors are related to the issues of perceived risks, construction efficiency, survival and expansion of the contractors. Lai (1982) suggested that the determination of the mark-up during tender adjudication is dependent on factors such as overheads, capital availability, staff quality, machinery, political trends, market potential, and technological changes.

A review of the above literature has revealed 40 common factors that the different researchers have argued influence local contractors' bid mark-up decisions. These factors have been grouped under five broad categories describing project characteristics, project documentation, company characteristics, bidding situation and the economic environment (Table 1).

Research method

The research involved a postal survey to collect the necessary data and information from main contractors currently operating in Singapore. It was decided to limit the investigation to a certain sector of the construction industry by focusing on contractors classified under the 'general building' category from the register of contractors for public-sector projects. This register is maintained by the Building and Construction Authority (BCA) in Singapore. Two different groups of contractors were selected for the study. The first group represents the large contractors in the BCA registration categories G7 and G8. The BCA's system of registration involves eight groups, with G1 being the smallest and G7 and G8 the largest. G7 contractors are eligible to bid for projects up to a value of S\$50 million (US\$1 = S\$1.8) and G8 contractors may bid for projects of any size. The second group selected for this study covered G4 and G5 building contractors, representing the medium-size contractors. G4 contractors are allowed to bid for projects up to S\$5 million and G5 may bid for projects to the value of S\$10 million. G6 contractors were left out of the survey so as to make a distinction between the large and medium contractors. Small contractors in G1 to G3 were contacted by telephone and it was found that most of them are renovation contractors, and not suitable for inclusion in this study.

The questionnaire was developed in three parts. Part one was an introductory section and included questions regarding the profile of the respondent and their company. This part of the questionnaire was shortened by codification of the survey form, as general information about these companies can be obtained from the Internet. In part two of the questionnaire the respondents were asked to give a score for each of the 40 factors identified by the research (Table 1). Respondents were asked to indicate the extent to which their company would consider these factors to be important in their bid mark-up decisions. Their response was required on a Likert scale from 1 (low importance) to 5 (high importance). The third part of the questionnaire contained questions that focused on aspects of the bidding environment related to the procurement of labour, equipment and finance for construction projects.

Data analysis

The data collected from the survey were compiled and processed using mathematical and statistical techniques. They included simple mathematical calculations together with the more sophisticated statistics

Table 1 Factors influencing the contractors' bid mark-up decision

Category	Factors	Category	Factors
Project characteristics	Size of contract Duration of project Project cash flow Location Type of owner Degree of difficulty Degree of safety	Economic environment	Overall economy Risk involved in investment Anticipated rate of return Availability of labour / equipment Government division requirement Tax liability
Company's characteristics	Availability of required cash Uncertainty in cost estimate Need for work Past profit Current workload General overhead Portion subcontracted to others Experience in similar project Need for public exposure Availability of qualified staff Establishing long relationship with client	Project documentation	Type of contract Type of procurement Completeness of document Owner's requirement Use of nominated sub-contractors Value of liquidated damages Risk of fluctuation in material price Insurance premium
Bidding situation	Tendering method Tendering duration Pre-qualification requirement Bidding document price Availability of other projects Number of competitors Identity of competitors Requirement of bond capacity		

program Statistical Package for the Social Sciences (SPSS). These techniques made it possible to analyse and examine certain aspects of the bidding environment, the 'importance index' of the different factors that may have an impact on contractors' bid mark-up decisions, and the likely variation between responses from large and medium contractors. The research used the importance index to assess the importance contractors attach to the different factors.

$$\text{Importance index} = \sum aX \times 100/5$$

Here a is a constant expressing the weight given to each response, the weight ranging from 1 (least important) to 5 (most important). $X = n/N$, with n the frequency of the response and N the total number of responses. This index helps in ranking the factors in accordance with their importance to the contractors, and also determines any similarities or differences between the medium and the large contractors (Shash and Abdul-Hadi, 1993).

The SPSS package was used in the analysis of variation between the two groups of contractors in their attitude towards the factors influencing their bid mark-up decision. Due to the sample size and the nature of

the data, the research has decided to use the non-parametric Mann-Whitney – two independent sample tests. These tests would enable the research to establish whether the medium and large contractors' evaluation of the various factors varied significantly.

The research null hypothesis states that the means of the two categories of contractors are the same, and the alternative hypothesis states that they are not the same. The mean rank value reveals any differences between the two categories of contractors in evaluating the importance of the various factors influencing the bid mark-up decision. A higher mean rank value in one factor represents a higher importance level stressed by that particular category of contractors for that particular factor. The 2-tailed $p > |Z|$ value will determine whether the differences between the two categories vary significantly at 95% significance level. If p is less than the reference probability of 0.05, the result is statistically significant, and the null hypothesis is rejected, i.e. the two categories of contractors have varied significantly in their evaluation of a particular factor. If p is greater than 0.05, the null hypothesis is not rejected, concluding that there is no significant difference between the two groups of contractors.

Null hypothesis $H_0: \mu_L = \mu_M$

Alternative hypothesis $H_a: \mu_L \neq \mu_M$

Here μ_L and μ_M are the means for large and medium contractors, respectively.

Sample profile

A total of 150 questionnaires were sent out, 75 for each group and 32 respondents replied, which represents an overall response rate of 21.3%. The response rate of the medium contractors was 17.3% compared with the valid rate of return of 25.3% from the large contractors. Such a low response rate is typical of studies involving construction practitioners in Singapore (Tan, 1995). Respondents to the survey included quantity surveyors, project managers, contract managers, general managers and managing directors.

Of the 32 surveys completed, five of the respondents were reluctant to reveal their companies' turnover as they considered such information too sensitive and confidential. Table 2 presents the annual turnover of the responding construction firms in 1998. The table shows that 37% of the firms had turnover of less than S\$20 million, and thus were mainly medium-size contractors; 14.8% had a turnover of S\$20–50 million; and 11.1% had a turnover of S\$50–100 million. Another 37% of the responding firms, made up solely of the large contractors, had a turnover of S\$100 million and above.

Aspects of the bidding environment

The research collected data to examine certain aspects of the current bidding environment within which contractors would have to decide their bidding mark-up size. These aspects are related to the procurement of labour, equipment and finance for construction purposes. First, the research examined the extent of use of subcontractors on site. Of the responding firms,

68.8% subcontracted 50% or more of their works. Only 9.4% of the responding firms subcontracted less than 25% of their works, and 21.9% subcontracted 25–50% of their works. This shows that general building contractors in Singapore rely to a great extent on subcontractors to carry out the majority of the work. This would allow such contractors to increase the level of certainty of achieving the set mark-up. Outsourcing in this case would enable contractors to minimize their overheads by reducing their reliance on their own resources, because certain construction activities could be subcontracted for fixed lump sums.

Further, the contractors' reliance on leasing rather than making a capital investment to purchase the necessary construction equipment was examined. Of the responding firms, 68.8% indicated that they leased less than 50% of the construction equipment and 28.1% indicated that they leased 50–75% of the equipment they used. The results seem to suggest that the trend is for contractors to own items of key equipment and plant. This may expose such firms to higher maintenance and investment costs and all the advantages and disadvantages of own versus leased equipment.

Also, data have shown that the majority of contractors tend to obtain new work through competitive bidding: 84.4% of the respondents indicated that more than 50% of their jobs were obtained through competitive bidding, with 63.2% of the large contractors acknowledging that 75–100% of their jobs were obtained through competitive bidding. Only 6.2% of the respondents obtained more than 50% of their jobs through negotiation. These results indicate that contractors in Singapore are more likely to obtain work through competitive bidding than negotiation. This very competitive environment would put greater pressure on the likely size of their mark-up. A recent study of the construction industry in Singapore has shown that the most serious challenges facing contractors are related to competitive tendering fuelled by clients focusing on obtaining the lowest cost (Dulaimi *et al.*, 2001). Such challenges included narrow profit margins and low productivity because of the over-reliance on cheap unskilled foreign workers.

The extent to which contractors and subcontractors are required to provide a performance bond is seen to indicate the level of confidence and trust that exists in the industry (Shash, 1993). The results show that in 78.1% of the sample the contractors reported that they were required to provide performance bonds in 75–100% of the works obtained. We might infer from these results that contractors would be subjected to further pressures and uncertainty, when preparing their bids, as they have to include the cost of providing such bonds knowing that there is a level of doubt about their ability to deliver the required level of performance.

Table 2 Annual turnover of responding contractors in 1998

Turnover in S\$ million (S\$1.8 = US\$1)	No. of large contractors (% total sample)	No. of medium contractors (% total sample)
20<	1 (3.70%)	9 (33.33%)
20 to <50	2 (7.41%)	2 (7.41%)
50 to <100	3 (11.11%)	
>100	10 (37.04%)	

The results also show that contractors tend to 'always' or 'most of the time' demand performance bonds from their subcontractors: 6.3% and 21.9%, respectively. The majority, 65.6%, indicated that they would 'sometimes' demand a performance bond from subcontractors. These results may be a reflection of contractors' unwillingness to increase the financial burden of subcontractors, especially those involved in certain low risk, repetitive and less complex tasks, to achieve better prices and hence increase their own competitiveness.

Methods and tools used for determining bid mark-up

The entire sample surveyed indicated that the contractors did not make use of any statistical/mathematical technique or program in determining their percentage mark-up. This indicates that general building contractors would determine their percentage mark-up solely based on their experience, intuition and judgement. Contractors seem to be more comfortable with the way they make their bid mark-up decision without relying on scientific methods. This picture is similar to that of the earlier findings. Ahmad and Minkarah (1988) stated that bid decisions were heuristic in nature, and thus they were made on the basis of experience, judgement and perception. They also noted that very few contractors were reported to use mathematical or statistical models in the determination of their mark-up sizes. Shash (1993) reiterated these observations and indicated that, despite the availability of mathematical models, their utilization was not widespread among the contractors.

The respondent contractors indicated that they were relatively comfortable with the way they make the mark-up decision: 56.3% were 'somewhat' comfortable, only 6.3% were 'uncomfortable', and the remaining 37.5% were 'comfortable'. The majority of the respondents who indicated that they were comfortable with their decisions were the large contractors. The study therefore concluded that the majority of the general building contractors were rather comfortable with the way they made their bid mark-up decisions, even without the use of statistical/mathematical techniques or programs.

Factors influencing contractors' bid mark-up decisions

The attitude of contractors towards the factors influencing the bid mark-up decisions has been assessed by evaluating the level of importance contractors placed on the factors identified in Table 1. Respondents were

asked to indicate, on a scale from 1 (low importance) to 5 (high importance) the level of importance they attach to the different factors and issues. The importance indices (introduced above) and the rank order of the factors influencing the contractors' bid mark-up decisions presented in Table 3 were compounded from the average mean value of each factor generated from the SPSS program.

Attitude of the medium-size contractors

The top 10 factors identified by medium-size contractors as the most influential in their bid mark-up decision were: (1) the overall economy; (2) the need for work; (3) establishing relationship with clients; (4) past profit in similar job; (5) anticipated rate of return; (6) risk in investment; (7) type of owner; (8) experience in similar project; (9) project cash flow; and (10) current workload.

The results in Table 3 show that medium-size contractors have assigned the highest level of importance to 'economic situation'. Factors such as the overall economy, risk involved in investment and anticipated rate of return on a project were given a higher importance level because they reflected the availability of works in the market and the feasibility and profitability of projects, which would be key to the survival of such contractors.

'Company related issues' was the second highest ranking category. Factors such as the need for work, current workload, past profit and experience in similar projects were given a higher level of importance. It may be argued that due to the relatively limited capacity, low working capital and low turnover of the medium contractors the acceptable level of uncertainty in their profit margins tends to be lower. Medium-size contractors also placed a higher emphasis on establishing long relationship with their clients, because having a good relationship with clients would help them generate future contracts crucial to their long term business operations.

The top 10 factors identified by medium-size contractors are all listed under the above two categories with the exception of the factors ranked 7 and 9 (Table 3). Medium-size contractors placed a high emphasis on the type of owner (ranked 7) when making a bid mark-up decision. It seems that medium-size contractors feel that for the owner to be private or public has a significant influence on their desired mark-up. The relatively limited financial capacity of the medium-size contractors may have influenced them to place a higher emphasis on the project cash flow (ranked 9) because this factor will determine the short term liquidity of such contractors and their economic leverage to function profitably.

Table 3 Importance indices and rank order of the factors for medium size and large size contractors

No.	Factors	Medium		Large	
		Importance index	Rank	Importance index	Rank
	PROJECT CHARACTERISTICS	65.1%	4	63.3%	1
1	Size of contract	67.7%	15	75.8%	5
2	Duration of project	67.7%	16	66.3%	12
3	Project cash flow	78.5%	9	60.0%	19
4	Location of project	41.5%	38	42.1%	37
5	Owner (private/public)	80.0%	7	47.4%	32
6	Degree of difficulty	64.6%	21	82.1%	1
7	Degree of safety	55.4%	31	69.5%	9
	PROJECT DOCUMENTATION	59.4%	5	59.6%	3
8	Type of contract	64.6%	22	64.2%	14
9	Type of procurement method	56.9%	30	60.0%	20
10	Completeness of document	60.0%	28	70.5%	8
11	Owner's special requirement	64.6%	23	60.0%	21
12	Use of nominated subcontractor	61.5%	26	53.7%	28
13	Anticipated value of liquidated damages	69.2%	14	61.1%	17
14	Risk in fluctuation in materials prices	58.5%	29	67.4%	10
15	Percentage of insurance premium	40.0%	40	40.0%	38
	COMPANY RELATED ISSUES	69.2%	2	56.0%	5
16	Availability of required cash	67.7%	17	56.8%	25
17	Uncertainty in cost estimate	67.7%	18	66.3%	13
18	Need for work	87.7%	2	62.1%	15
19	Past profit in similar job	86.2%	4	55.8%	27
20	Current work load	78.5%	10	60.0%	22
21	General overhead	64.6%	24	67.4%	11
22	Portion subcontracted to others	50.8%	34	45.3%	33
23	Experience in similar project	80.0%	8	62.1%	16
24	Need for public exposure	41.5%	39	36.8%	39
25	Availability of qualified staff	49.2%	35	44.2%	36
26	Establishing long relationship with clients	87.7%	3	58.9%	23
	BIDDING SITUATION	65.2%	3	59.5%	4
27	Tendering method	73.8%	11	56.8%	26
28	Tendering duration	67.7%	19	57.9%	24
29	Pre-qualification requirement	52.3%	32	53.7%	29
30	Bidding document price	61.5%	27	51.6%	31
31	Availability of other projects	66.2%	20	61.1%	18
32	Number of competitors tendering	73.8%	12	72.6%	7
33	Identity/competitiveness of competitors	73.8%	13	76.8%	3
34	Requirement of bond capacity	52.3%	33	45.3%	34
	ECONOMIC SITUATION	70.3%	1	62.1%	2
35	Overall economy (availability of work)	93.8%	1	80.0%	2
36	Risk involved in investment	84.6%	6	76.8%	4
37	Anticipated rate of return on project	86.2%	5	74.7%	6
38	Availability of labour/equipment	64.6%	25	53.7%	30
39	Governmental division requirement	49.2%	36	45.3%	35
40	Tax liability	43.1%	37	36.8%	40

Attitude of the large-size contractors

The top 10 factors identified by the large-size contractors as the most influential in their bid mark-up decisions were: (1) the degree of difficulty of the project; (2) the state of the overall economy; (3) identity/competitiveness of competitors; (4) risk in investment;

(5) size of contract; (6) anticipated rate of return; (7) number of competitors tendering for a particular job; (8) completeness of document; (9) degree of safety of the work on the project; and (10) risk in fluctuation in materials' prices (Table 3).

The response from large-size contractors showed that the category 'project characteristics' is the most

important (importance index of 63.3%) in influencing their bid mark-up decision. This may reflect the fact that larger contractors are likely to be involved in larger and more complex projects compared with the medium-size contractors. It is not surprising that these contractors have given factors such as the degree of difficulty and safety of construction work a higher importance level (Table 3). Large contractors also placed emphasis on contract size, because increased value in a project would contribute positively to their annual business volume, sustain their overheads and give them the potential to earn a better profit.

The second most important category influencing large contractors' bid mark-up decisions is 'economic situation' (importance index of 62.1%). Under this category, factors such as the overall economy, risk involved in investment and anticipated rate of return on project were given higher emphasis by large contractors (Table 3). These factors are likely to influence the availability of works as well as the perceived feasibility and profitability of the project.

The third most important category is 'project documentation' (importance index 59.6). Risk in fluctuation in materials prices and the completeness of the document, within this category, were identified to be the most important factors that large contractors would consider in deciding on their bid mark-up (Table 3). The larger contractors also emphasized both the number and the identities of their competitors during their bid mark-up decisions. The above 'intelligence' can be argued to provide these contractors with a level of confidence about how much they can mark-up their bid and still have a good chance of winning a tender.

Differences between the medium-size and large-size contractors' attitudes

The previous section highlighted the level of importance the two groups of contractors have attached to the different factors in considering their bid mark-up decision. A hypothesis was set up to test whether both groups of contractors varied significantly in their attitudes toward these factors. The factors that contributed significantly to the differences between the two groups of contractors in evaluating their bid mark-up decision are discussed under four categories.

Project characteristics

Under this category, Table 4 shows that 'project cash flow', 'type of owner', 'degree of difficulty' and 'degree of safety' have p less than the significance level of 5%. Hence their null hypothesis was rejected, concluding that there are significant differences between the two

Table 4 Test statistics of factors under the category 'project characteristics'

Project characteristic	Mean rank		p (2-tailed)
	Large contractor	Medium contractor	
Size of contract	17.89	14.46	0.274
Duration of project	16.16	17.00	0.782
Project cash flow	12.89	21.77	0.005
Location of project	16.58	16.38	0.951
Owner (private/public)	11.45	23.88	0.000
Degree of difficulty	20.39	10.81	0.001
Degree of safety	19.37	12.31	0.027

groups of contractors in evaluating the importance of these factors influencing their bid mark-up decisions. The mean rank values in Table 4 show that medium-size contractors are significantly more concerned than large size contractors about project cash flow and the type of owner being public or private, while large contractors viewed the degree of difficulty of the construction work more important than medium-size contractors when considering their bid mark-up decision. The different capacities and availability of working capital for the contractors may explain the differences between their attitudes toward these factors. The medium-size contractors, who are expected to have relatively limited working capital compared with the large size contractors, are more sensitive to the project cash flow; hence they have to place a higher emphasis on that factor. On the other hand, the large contractors are usually involved in bigger and more complex projects; hence they viewed the degree of difficulty and safety to be more critical in deciding their mark-up.

The rest of the factors, like 'size of the contract', 'duration of project' and 'location of project' have $p > 0.05$. Hence, the null hypothesis was not rejected, concluding that at the 95% confidence level, the two groups of contractors did not vary significantly in evaluating the importance of these factors in influencing the contractors' bid mark-up decision.

Company characteristics

Table 5 indicates that the factors 'need for work', 'past profit in similar job', 'current workload', 'experience in similar projects' and 'establishing long relationship with clients' have $p < 0.05$. Hence their null hypotheses are rejected, concluding that there are significant differences between the two groups of contractors. By comparing the mean rank value for these factors, medium-size contractors demonstrated that when deciding on their bid mark-up size they are significantly more concerned with these factors than are the large

Table 5 Test statistics of factors under the category 'company characteristics'

Company characteristic	Mean rank		<i>p</i> (2-tailed)
	Large contractor	Medium contractor	
Availability of required cash	14.37	19.62	0.106
Uncertainty in cost estimate	16.74	16.15	0.851
Need for work	12.26	22.69	0.001
Past profit in similar job	11.11	24.38	0.000
Current work load	13.08	21.50	0.009
General overhead	17.74	14.69	0.335
Portion subcontracted to others	14.79	19.00	0.170
Experience in similar project	13.21	21.31	0.010
Need for public exposure	16.08	17.12	0.744
Availability of qualified staff	15.66	17.73	0.509
Establishing long relationship with clients	11.71	23.50	0.000

contractors. The differences between the two groups of contractors may be explained, again, by the limited operating capacities, limited working capital and the relatively low turnover of the medium-size contractors. Their limited operating capacities and low working capital led the medium-size contractors to place a higher importance level on current workload and the need for work, while making the bid mark-up decision.

The medium-size contractors also placed higher emphasis on their experience and the level of profit they achieved on similar projects. This may reflect the greater sensitivity of such contractors to the likelihood of a desired mark-up affecting their long term survival in the industry. The medium-size contractors have also given higher emphasis to establishing long relationship with clients. They seem to be more keen to ensure that they are able to secure further work from such clients in a market dominated by competitive tendering.

The rest of the factors, 'availability of cash', 'uncertainty in cost estimate', 'general overhead', 'portion subcontracted to others', 'need for public exposure' and 'availability of qualified staff' have $p > 0.05$. Hence, the null hypothesis was not rejected, concluding that at the 95% confidence level there was no significant difference between the two groups of contractors in evaluating the importance of these factors in influencing the bid mark-up decision.

Bidding situation

Under the category 'bidding situation', Table 6 shows that factors like 'tendering method' and 'tendering duration' have $p < 0.05$. Hence, the null hypothesis is rejected, concluding that there is a significant difference between the two groups of contractors. Based on the mean rank values, medium-size contractors placed significantly more emphasis on the tendering method and duration while making their bid mark-up deci-

sions. Medium-size contractors tend to have, relatively, smaller resources available, and this may have increased their sensitivity to competition and the risks posed by the tendering environment. The higher cost of tendering associated with competitive tendering, which dominates contracting in Singapore, would put greater pressures on medium-size contractors' mark-ups, which would then attract more attention when tendering for a job.

The rest of the factors, 'pre-qualification requirement', 'bidding document price', 'availability of other projects', 'requirement of bond capacity', 'number of competitors' and 'identity of competitors tendering' have $p > 0.05$. Hence, the null hypotheses were not rejected, concluding that at the 95% confidence level there are no significant differences between the two groups of contractors in evaluating the importance of these factors in influencing the bid mark-up decision.

Economic situation

Table 7 indicates that 'overall economy' and 'anticipated rate of return on project' have $p < 0.05$. Hence, the null hypotheses were rejected, concluding that there are significant differences between the two groups of contractors. The mean rank values show that medium-size contractors placed higher emphasis on these two factors when deciding their bid mark-up decision compared with large contractors. This may be related again to the fact that medium-size contractors have relatively limited resources and liquidity compared with those of large-size contractors. This would make medium-size contractors more vulnerable during unfavourable times and more sensitive to variation in the expected rate of return on a job in comparison with large-size contractors.

The rest of the factors, 'risk involved in investment', 'availability of labour or equipment', 'governmental

Table 6 Test statistics of factors under the category 'bidding situation'

Bidding situation	Mean rank		<i>p</i> (2-tailed)
	Large contractor	Medium contractor	
Tendering method	13.45	20.96	0.016
Tendering duration	14.08	20.04	0.046
Pre-qualification requirement	16.87	15.96	0.774
Bidding document price	14.66	19.19	0.153
Availability of other projects	15.08	18.58	0.263
Number of competitors tendering	16.16	17.00	0.782
Identity/competitiveness of competitors	16.58	16.38	0.952
Requirement of bond capacity	15.53	17.92	0.460

Table 7 Test statistics of factors under the category 'economic situation'

Economic situation	Mean rank		<i>p</i> (2-tailed)
	Large contractor	Medium contractor	
Overall economy (availability of work)	13.18	21.35	0.009
Risk involved in investment	14.76	19.04	0.164
Anticipated rate of return on project	13.92	20.27	0.045
Availability of labour/equipment	14.32	19.69	0.081
Governmental division requirement	15.61	17.81	0.496
Tax liability	15.13	18.50	0.292

division requirements' and 'tax liability', have $p > 0.05$. Hence, the null hypothesis was not rejected, concluding that at the 95% confidence level there was no significant difference between the two groups of contractors in evaluating the importance level of these factors in influencing the bid mark-up decision.

Conclusion

The construction industry in Singapore is dominated by competitive tendering fuelled by clients choosing the lowest cost tender. This study investigated the attitude of contractors towards mark-up size and the likely effect of contractor size on such attitudes. The study examined two groups, medium- and large-size contractors.

The research has shown that bidding models and statistical techniques are not used by general building contractors in Singapore to determine their bid mark-up. This is consistent with practices reported by other researchers, which show that experience, judgement, and subjective assessment based on gut feelings are more favoured by contractors in bid mark-up size decision-making. However, the contractors identified several factors as important and influential. It might be inferred that such factors are seen to influence the mind set of the decision makers rather than be involved in the decision making process methodologically.

Contractors' attitudes towards the importance of these factors varied with contractor size. Some factors are strongly emphasized by both categories of contractors, medium and large, but for other factors there are significant differences: e.g. both the medium and the large contractors gave significant emphasis to the economic situation during their bid mark-up decision-making.

The results show that there were significant differences in the attitudes of the two groups of contractors when evaluating the importance of factors influencing bid mark-up decisions. The results have shown that large contractors tend to be more concerned with the nature of the construction work of the tendered project when they make the decision on the mark-up size. By contrast, the medium size contractors are more concerned about their own company's finance, and how bidding for a particular project would enable the company to maintain a viable business. It may be argued that this is a function of size, because medium size contractors are likely to have relatively limited resources and capabilities, making them more sensitive to marginal changes in the expected profits from a particular project. In addition, medium size contractors are more likely to be involved in construction projects as subcontractors. In the view of the lowest price mentality that seems to dominate Singapore's construction industry and the extensive use of subcontractors, the medium-size contractors will be under maintained pressure to reduce their prices.

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