FACTORS INFLUENCING THE ACCURACY OF PRE-CONTRACT STAGE ESTIMATION OF FINAL CONTRACT PRICE IN NEW ZEALAND

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ABSTRACT

Establishing and prioritising the factors that may influence the final contract price when responding to a call for tenders is crucial for proper risk analysis and reliable forecasting; it could make or mar the ability to achieve expected profit margin in an era of lump sum fixed price contracts where clients often contest variation claims. In New Zealand, these factors have not been researched; hence estimators rely only on judgement to 'guess-estimate' in their price forecasting. This study aimed to fill the knowledge gap by investigating the priority factors. 150 responses from professional members of the New Zealand Institute of Quantity Surveyors were analysed using multi-attribute method. Results showed thirty-seven factors which could influence the final contract price; the three most influential being poor tender documentation, complexity of design & construction, and completeness of project information. Other factors relating to project, client and contractor characteristics, design consultants and tendering conditions, estimating practice and external factors were reported. Concordance analysis indicated high level of agreement amongst survey participants in the rank-ordering of the relative importance of the identified factors. The findings could assist quantity surveyors to prepare more reliable contract price estimates at the pre-contract stage. It would also improve construction-stage cost control.

KEYWORDS: Construction contract, Construction cost control, Contract price, Cost estimating, Estimating accuracy.

INTRODUCTION

The aftermath of the global financial crisis (GFC) has introduced stiff competition for jobs in the construction industry. Tendering risks are at now at all-time highs, with the popular saying these days that "projects are awarded to the tenderers who make the biggest mistakes" (O'Brien *et al.*, 2014, p.9). This is mainly because of several risks which might not have been accounted for in the short period allowed for tender estimation and submission. The risks are compounded by the frequent use of fixed price lump sum contracts; with clients being eager to contest contractors' claims for the variations they ordered (Mbachu, 2011). Inaccurate estimation of the contract price has resulted in insolvency and liquidations of many contracting firms of all sizes. The recent collapse of Mainzeal – one of the leading contracting firms in New Zealand is a case in point. Establishing and prioritising the factors that may influence the final contract price when responding to a call for tenders is therefore crucial for proper risk analysis and reliable construction cost forecasting. This is because it could make or mar the ability of the tenderer to achieve expected profit margin and maintain credibility with the client, which is a condition for future invitations to tender. In New Zealand, these factors have not been

researched; hence estimators rely only on judgement to 'guess-estimate' in their price forecasting (Mbachu, 2011; O'Brien *et al*., 2014). It is therefore important to contribute to filling the knowledge gap by examining the key influential factors and their relative levels of influence from the quantity surveying practitioners' points of view.

LITERATURE REVIEW

Construction Tender Price in Context

Tender price for a proposed construction project consists of the actual cost of carrying out the agreed scope of construction works plus a mark-up (Wong, Holt, & Harris, 2001). The actual cost of construction contains material cost, labour cost and plant cost; whereas, the mark-up contains allowances for overheads, profits and risks/ contingencies (Mbachu, 2011). The usual practice is for the contractor's estimator to provide an estimate of the actual construction costs, while the tendering committee considers the appropriate mark-up to arrive at the final tender price for submission. The risk margin constitutes the bulk of the mark-up, which largely will depend on a range of risk factors such as the level of competition for the job, how important it is for the contractor to win the job, the current workload, the anticipated risks associated with the state of the design, the nature of the client, the nature of the consultants, familiarity with the job, the project characteristics, the time allowed for proper risk analysis, and the general market conditions. Where there are prospects of getting future jobs from the client, the mark up and the final tender price may be deflated in the hope of making up losses incurred in the current project in the future jobs.

Elhag *et al*. (2005) argued that only quantitative factors can be taken into consideration when estimating tender prices of projects. Since the nature of qualitative factors is difficult to measure, most qualitative factors, such as client priorities, project characteristics, and procurement methods are often ignored in the actual cost estimation process. A firm understanding of these qualitative tender cost-influencing factors could improve the competence of quantity surveyors to prepare more reliable and accurate tender estimates. This knowledge is also critical for quantity surveyors to achieve cost control at the construction stage.

Factors influencing accuracy of construction price estimation

Nor Azmi Ahmad, Rosnah, Napsiah, Aini, and Rizan (2012) investigated construction cost influencing factors for Industrialized Building System (IBS) projects in Malaysia. They used the method of a Relative Importance Index (RII) to rank the importance of factors. The total factors were divided into seven main groups including characteristics of general contracts, methods of procurement, attributes of contractors, design parameters and external market factors. The RII index of project characteristics, contractor attributes and market factors were higher than in other groups.

Memon *et al*. (2010) investigated factors influencing construction cost in the projects of Malaysian government agencies. The questionnaire survey method was used as empirical source of data. The study revealed seven main factors; these included cash flow and financial difficulties faced by contractors, poor site management and supervision (contractors), shortage of contractor experience, insufficient site labour, and inadequate construction planning and

scheduling. This study identified design changes as the lowest influential factor on the cost of construction.

A study by Tebin (2009) identified two critical determinants of tendering price: client responsibility and contractor responsibility. The study emphasised the importance of having comprehensive knowledge about the construction process by both the project client and contractor to accurately calculate the tender price.

Elhag *et al*. (2005) carried out a similar study to the above in the United Kingdom and investigated tendering cost influencing factors from the standpoint of quantity surveyors. The study identified 67 variables that could influence tender price through a literature review and a questionnaire survey of quantity surveyors who were members of Royal Institute of Chartered Surveyors (RICS). The factors were ranked in accordance with their relative levels of significance. Severity index computation was used for rank-ordering all the identified factors. Results showed a severity index value of more than 65%, for the 52 factors. Furthermore, the top ranked factor was consultant and design parameters, while the least influential factor was contractor attributes. This study's results indicated that designer impact on construction project cost is more significant than the contractor's influence.

Chan and Park (2005) measured and evaluated factors that influenced construction costs in Singapore, based on national construction project data. The projects were divided into three main groups based on project characteristics, contract type and type of owner/consultant. The findings indicated that special requirements influenced construction costs; these included level of technology, special skills of the contractor and publicly administered contracts. Technical expertise of contractors, financial factors and level of construction familiarity were also high level influence factors.

Bubshait and Al-Juwairah (2002) evaluated 42 factors that could affect construction costs in Saudi Arabia. These factors were divided into five main groups. Results indicated that material cost, incorrect planning, contractor experience, contract management and poor financial control had significant influence on costs.

Another study, conducted by Akintoye and Fitzgerald (2000) in the UK identified 24 cost influencing factors, of which project complexity, scale and scope of construction, market conditions and method of construction were identified as the most significant factors. Dissanayaka and Kumaraswamy (1999) investigated factors influencing construction cost, based on projects in Hong Kong. The study used multiple linear regressions and identified four main construction cost influential factors: level of client confidence in the construction team; payment method; risk of client's quantity variation; and complexity of construction.

The above literature shows that different researchers have used different approaches to classify factors affecting construction tender prices and cost overruns. Figure 1 summarises all the construction cost/ tender price influencing factors identified from the literature under six main categories: project characteristics, client characteristics, contractor characteristics, tendering situation, consultant and design, external factors and market conditions, and inaccuracy of cost estimating. The subsections that follow discuss each category in detail.

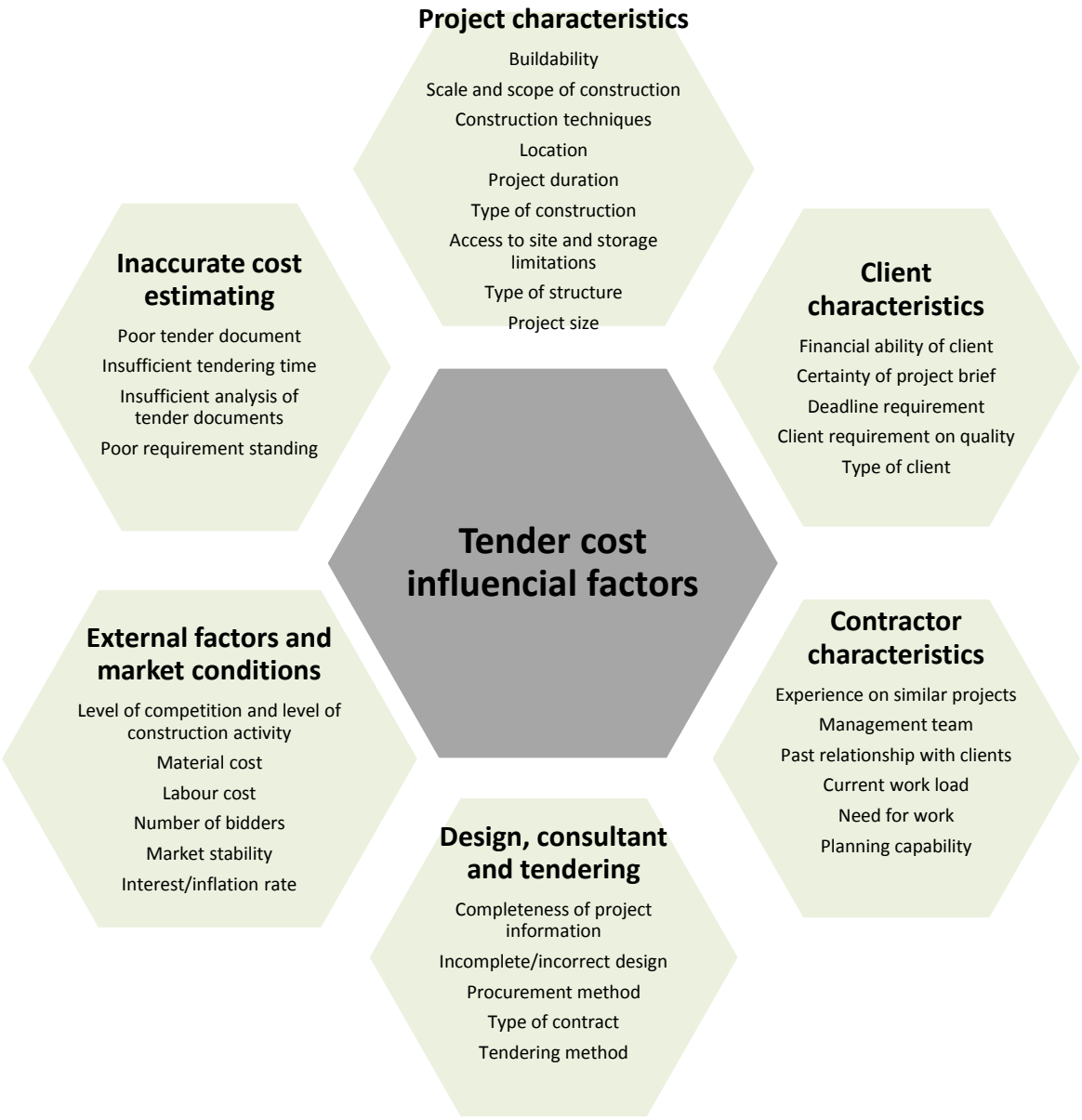

Figure 1: A model of tender price influential factors (Source: adapted from literature)

Project characteristics

In the literature, project characteristics have been shown to be the most significant tender cost influencing category. A number of studies identified the size of building/floor area as one of the highest tender cost influencing factors (Sonmez, 2004; Stoy & Schalcher, 2007). Also, project location can influence tender cost as delivery charges for materials vary from location to location. Apart from the above, construction can be influenced by local government policies (Akintoye, 2000; Chan & Au, 2009; Dulaimi & Hong Guo, 2002; Elhag et al., 2005). Buildability and complexity of design are other important factors that influence the construction cost of a structure (Dulaimi and Guo, 2002). Additionally, type of structure, and construction techniques also influence construction cost. For instance, a steel structure is more expensive than a timber framed structure (Akintoye, 2000; Chan & Au, 2009; Dulaimi & Hong Guo, 2002; Elhag et al., 2005). Construction duration is also another critical factor (Akintoye, 2000; Chan

& Au, 2009; Dulaimi & Hong Guo, 2002). Long duration of construction can increase on-site labour costs, plant costs, site overheads and risks. Type of construction is another major factor that influences tender cost, as different types of buildings have different requirements such as heavy building service needs. Furthermore, Akintoye (2000) Elhag *et al*. (2005) identified limited access to site and storage facilities as another critical factor that influences tender price.

Client characteristics

Type of client was identified by many past researchers as another significant tender cost influencing factor (Akintoye, 2000; Chan & Au, 2009; Dulaimi & Hong Guo, 2002; Elhag *et al.*, 2005).There are many differences between public clients and private clients, as their priorities vary. For instance, public projects need to be more accountable than private projects. The financial situation of clients can also be a significant tender cost influencing factor as there are different economic environments and payment systems for different countries. Quality requirement is another factor (Akintoye, 2000; Elhag *et al.*, 2005). A high quality project means a high construction cost. High cost means a high tendering price from contractors. Construction deadlines indicate how long construction cost continues. Not allowing sufficient time for construction could increase construction cost (Elhag *et al*., 2005). A clear and firm project brief is important for establishing a realistic tender price (Elhag *et al*., 2005).

Contractor characteristics

The management team is regarded as the most important factor in terms of contractor characteristics (Elhag *et al.*, 2005). A perfect management team with experienced staff is more expensive than others, but bring more benefits than shortfalls for most construction bidding. Moreover, capability of executing the construction plan is regarded as an influencing factor by Elhag *et al*. (2005). Meanwhile, contractors having experience on similar projects are important. This is also corroborated by other studies (Dulaimi & Hong Guo, 2002; Elhag *et al.*, 2005). Dulaimi and Hong Guo (2002) agree that current work load is also important for tendering. However, Elhag *et al*. (2005) deduced it is not highly important, if there will be proper coordination and management of the various work programmes.

In addition, past relationships between clients and contractors can affect tendering price (Chan & Au, 2009). To keep long-term relationship with clients, contractors can submit a lower price by reducing profit margins. This is because long-term relationships will help contractors to get more projects and gain more benefit in the future. This is also because an urgent need for work is thought to be an important factor in influencing tendering cost. This in turn could be underpinned by many factors, including idling of resource such as plant and labour. The more the contractor is in need of the project, the lower the price. A lower price can improve competition (Chan & Au, 2009; Dulaimi & Hong Guo, 2002). However, Mbachu (2011) cautions against lowest price tenders as they often lead to frivolous claims and disputes during the project implementation phase.

Tendering situation, consultant and design characteristics

Another main category of factors influencing tendering costs comprises tendering situation and characteristics of the consultants and the design. Elhag *et al.* (2005) investigated all factors listed in this group and found that absence of alteration and late change can significantly influence tendering cost. Not having enough information for the project at the time needed can

influence tendering accuracy. Even though it might lower cost by missing out on important cost parameters, it can produce more variation at a later stage of construction (Mbachu, 2011). Therefore, the practice could easily lead to construction time and cost overruns. Furthermore, the more the variations ordered by clients, the higher the final contract costs. These three factors are regarded as the main factors in terms of consultant and design costs. Also, Dulaimi and Hong Guo (2002) found that the tendering situation is an important factor influencing tendering cost. The tendering method, tender procurement and type of contract are the main factors in terms of a bidding situation.

There are many methods for selecting contractors. The open tendering method generally produces lowest tenders. It should be noted that contractors can bid for projects even while facing serious handicaps/ limitations, largely to avoid being shortlisted in future jobs. Some other contractors only go for negotiated tendering, which are less competitive and time-wasting. In the open tendering system, contractors, who have been pre-qualified and shortlisted by the client, have opportunities to bid for the project. It causes higher tendering costs (Smith, Merna, & Jobling, 2006).

The traditional method and the design-build method are two main procurement methods in the bidding process. When using the traditional method, contractors simply bid for the stage of construction. Cost of tendering focuses only on construction based on a design from a separate design team (Greenhalgh & Squires, 2011). However, costing the design-build method needs to cover fees for design and construction stages. The tender price is based on client's plan and negotiation with clients. A lump-sum fixed price contract is popular for this method (Hughes, 2006; Ojo, Aina, & Adeyemi, 2011).

External factors and market conditions

Another group of factors that could influence tendering price relate to external factors and market conditions. Factors under this category were investigated by Elhag *et al.* (2005). They found that construction competition is the most important factor. Contractors will make a tender cost lower to get the project in a highly competitive situation. Additionally, the material cost of a construction project is important for reducing the tendering sum. In estimating a tender, costs of materials based on the quantities measured off plans do get as large as half the total tendering price. In addition, labour costs and inflation rates are important. Akintoye (2000) found that stability of market conditions is quite crucial. A stable construction market can make all costs of construction stable. From a related perspective, Dulaimi and Hong Guo (2002) found that the number of bidding contractors can influence tender price. This is often the reason most clients go for open tendering so as many bidders as possible could tender and hence drive the tendered amount to the lowest value possible.

Inaccuracy of cost estimating

Tendering price can be influenced by the estimating experience of the tenderer. Inaccuracy of cost estimating is often a result of inexperience, and hence influences tendering costs directly. There are many other factors influencing inaccuracy of cost estimating, as found by Akintoye and Fitzgerald (2000). Based on research, the most important factors included insufficient time for estimating. Not providing enough estimating time will cause estimators to miss out on critical cost components. For instance, details of site drawings and specifications could be easily ignored, which can cause errors in estimating. Poor tender documentation is regarded as one of

the main factors responsible for inaccuracy of cost estimating (Mbachu, 2011). The tender documents comprise the drawings and specifications, which are critical for project specific and reliable cost estimating. Poor tender documentation provides insufficient information about the building for accurate estimating.

Gap in the literature

The above review of related literature has provided insights on the key factors influencing construction tender prices/ costs. The insights have particularly identified the major and sub-categories of factors which this study relied on as a starting point. However, the insights related to foreign countries. New Zealand construction industry, on account of its unique culture and characteristics, may have unique factors affecting tender prices; these may be different from those of other countries in nature or relative levels of influence. In the absence of New Zealand specific research on the issue, this study will evaluate the relevance of the identified factors in the New Zealand context. More importantly, the myriads of factors identified in the literature constitute information overload for quantity surveyors. There is a need to prioritise the factors in accordance with their relative levels of influence in the New Zealand context. This study aimed to fill this knowledge gap.

METHODOLOGY

A two-stage research methodology was selected in this research. The first stage is a review of relevant literature. Thirty-seven construction cost-influencing factors were identified and segregated into six groups via thematic analysis.

The second stage involved a pilot study during which constructs/factors that were unique to New Zealand construction industry were identified. The identified factors were validated - along with the identified 37 factors - in a questionnaire survey via respondents' ranking of their relative levels of influence. The pilot study and questionnaire survey participants comprised professional members of the New Zealand Institute of Quantity Surveyors (NZIQS). To gain data on the factors considered important by quantity surveyors in New Zealand, all members of NZIQS were invited to participate in this research. An invitation email with the link to the online questionnaire survey was circulated to all the members via the NZIQS secretariat. At the cut-off period set for the survey, 152 completed online questionnaires have been collected.

Method of data analysis

The survey responses were analysed using the multi-attribute method (Mbachu, 2011). This involved computing the mean rating of all responses to a particular variable. Respondents were asked to rate each variable on a five-point Likert rating scale; rating point 5 being highest rating for most important factors and rating point 1 being for factors that were perceived to be 'not at all important'. The mean rating or severity index (SI) that represents the average of the responses for a particular variable was computed using the expression below.

$$SI = \left(\sum_{i=1}^{5} wi \times fi\right) \times \frac{100\%}{n} \qquad \text{(Eq. 1)}$$

Where:

SI = Severity Index; this is computed as summation of importance rating (i.e. the mean or representative rating assigned to a specific cost factor by all the respondents)
wi = rating point, ranging from 1 to 5)
fi = frequency of response; i.e. number of responses associating a cost factor with a particular rating point.
n = total number of respondents rating a particular cost factor in the survey.

A SI score of 70% and above implies that a particular cost factor is perceived as being highly important.

Measuring respondents' level of agreement

Coefficient of variation (COV) indicates the standard deviation as a percentage of the mean. It is useful in comparing relative variability of different responses. It could therefore be an indicator of the level of validity and reliability of the research design, measuring instrument and findings (Elhag et al., 2005). The following expression was used to compute the COV.

$$COV = \frac{S}{\overline{X}} \times 100\% \qquad \text{(Eq. 2)}$$

Where:

COV = Coefficient of variation,
S = Standard deviation
$\overline{X}$ = Weighted mean of sample.

The COV results will reflect the divergence or convergence of opinions among the participants in their ratings. A lower number of COV means higher agreement between all participants.

DATA PRESENTATION AND ANALYSIS

Tables 1 to 6 summarise the results of the analysis for each of the six categories of influential factors. The tables show that 28 factors have severity index values that range from 70% to 88%. Severity index values of the remaining 9 factors range from 61% to 70%. Therefore, 27 factors were perceived by quantity surveyors in New Zealand as highly important factors influencing tendering costs of construction projects. Top three factors have more than 75% as severity indexes. The range of COV values for the research is from 12.71% to 25.91%, which means there is high agreement amongst the participants in their ratings of the factors.

Discussion of Results

The following sub-sections discuss the results in details in relation to each broad category of influential factors.

Project characteristics

Table 1 summarises the results of the analysis of the relative importance and variance of the cost factors under project characteristics. There are 10 factors under this category. Top six factors achieve severity index values of more than 70%, which means these six factors are

regarded as highly important factors influencing tendering costs in New Zealand. Two factors were ranked in the top ten important factors, overall. Covariance analysis results show that factors under this category achieve COV values lower than 20% - with the exception of two factors. This shows high level of agreement amongst the participants in their perceptions of the relative importance of the factors.

Table 1: Cost factors related to project characteristics

Sub-factors	SI	Total Rank	Group rank	COV
Complexity of design and construction	85%	2	1	22.46%
Buildability	83%	6	2	20.82%
Scale and scope of construction	81%	12	3	19.31%
Construction techniques	78%	19	4	18.41%
Construction location (regions / rural; urban)	75%	24	5	17.70%
Project duration	73%	28	6	15.31%
Type / function of construction(residential, commercial, industrial, office)	70%	30	7	12.71%
Access to site and storage limitation	70%	31	8	13.95%
Type of structures (steel, concrete, brick, timber, masonry)	70%	32	9	18.87%
Project size/ gross floor area	69%	34	10	14.83%

From Table 1, it could be seen that complexity of design and construction is regarded as the most important factor in this group. Overall, it is the second most important factor that influences tender costs. The complexity of projects was found by Elhag *et al.* (2005) as the second most important factor in project characteristics category. Additionally, Shash (1993) also saw complexity of design and construction as being a key issue in influencing tendering costs. Buildability is ranked as the second most important factor, with overall ranking of sixth. However, compared to the findings of this study, a number of past studies (Akintoye, 2000; Dulaimi & Hong Guo, 2002) found this factor as being of a relatively low rank.

Results in Table 1 show that scale and scope of project is another important factor. Akintoye (2000) also found this factor as being important when studying cost estimating practice influencing factors. In Akinloye's (2000) work, the factor's overall ranking was second. Project size and gross floor area can be noted as the least important factor in this category based on severity index value of 69% and overall ranking of 34. However, size of floor area was regarded elsewhere (Sonmez, 2004; Stoy & Schalcher, 2007) as being highly important factor. Elhag *et al.* (2005) indicated that site size ranked as 30th of 67 factors, which showed mid-level influence.

Client characteristics

Table 2 summarises the results of importance and variance analysis of the cost factors relating to the client characteristics. There are five factors in this group, out of which, three factors were rated among top 10 having severity index values of more than 80%. This indicates that client characteristics have a high influence on tendering price in New Zealand. The covariance

analysis results indicate a coefficient of variations ratio range from 19.55% to 22.65%, which is relatively low. It therefore shows a high level of agreement among the participants in their ratings.

Table 2: Cost factors relating to client characteristics

Sub-factors	SI	Total Rank	Group Rank	COV
Financial ability of client	83%	5	1	22.65%
Certainty of project brief	82%	7	2	19.60%
Deadline requirement	82%	9	3	21.36%
Client requirements on quality	79%	15	4	19.55%
Type of client (public/private)	69%	33	5	15.56%

It should be noted that the highest ranked factor in the client characteristics category is 'financial ability of client'. However, according to the research done by Elhag *et al*. (2005) this factor was ranked as the least important factor in the category. The reason for this significant difference might be the economic environment of the local industry at the time. Compared with the United Kingdom, market of construction industry in New Zealand is relatively small and has less stability. The second ranked factor within this group is "certainty of project brief" which ranked seventh overall. Type of client was regarded as least important factor, with a ranking of 33 out of 37. The COV values are relatively low in this category which shows strong agreement in quantity surveyors' views on these factors.

Contractor characteristics

Results of the relative levels of importance of the cost factors relating to the contractor characteristics are summarised in Table 3. The table shows that six factors were clustered under this category. Severity index values of all factors in the group ranged from 73% to 80%, which confirms the significance of these factors' influence on tender price. However, their overall ranking varied from 13 to 29 showing middle range influences on tender price. Apart from the highest ranked factor in the category all the other factors received less than 20% COV values, showing high agreement among the respondents. Most important factor in this group is experience on similar projects, which is ranked as 13th out of 37 factors. Previous studies by Elhag *et al*. (2005) and Dulaimi and Hong Guo (2002) also confirm the same result and highlighted client's experience on similar projects as an important factor to accurately predict the tender price. The second most important factor is experience and performance of management, which is ranked 14th out of 37. Ahmad *et al*. (2012) and Elhag *et al.* (2005) also confirm the above findings. Planning capability is regarded as the least important factor in the group. However, Elhag *et al.* (2005) found it as one of top three factors in their study.

Tendering conditions, consultants and design

Results of the relative importance of the cost factors relating to tendering conditions, characteristics of the consultants and the design features are summarised in Table 4. All the six factors listed under this group achieved severity index values ranging between 68% and 85%. Completeness of project information was identified as the most significant tender price

influencing factor in this category with a 21.98% COV. This shows a high level of agreement amongst the respondents. It should be noted that the rankings of all the other factors were higher than 20, which showed less significant impact on tender prices. Interestingly, the above findings are in line with the previous research done by Elhag *et al.* (2005).

Table 3: **Cost factors relating to contractor characteristics**

Sub-factors	SI	Total Rank	Group Rank	COV
Experience on similar projects	80%	13	1	23.58%
Management team (suitability, experience, performance)	80%	14	2	19.86%
Past relationship with clients	79%	16	3	18.82%
Current work load	78%	18	4	19.96%
Need for work	75%	22	5	15.00%
Planning capability	73%	29	6	20.93%

Table 4: Cost factors relating to tendering situations, consultants and design

Sub-factors	SI	Total Rank	Group Rank	COV
Completeness of project information	85%	3	1	21.98%
Absence of alterations and late change	76%	21	2	16.24%
Procurement method	75%	23	3	18.86%
Type of contract	74%	26	4	18.13%
Tendering method	73%	27	5	15.76%
Variation order	68%	36	6	14.68%

Table 5: **Cost factors external environment and market conditions**

Sub-factors	SI	Total Rank	Group Rank	COV
Level of competition and Level of construction activity	82%	8	1	20.00%
Material cost	81%	11	2	18.76%
Labour cost /performance	79%	17	3	18.44%
Number of bidders on competitive projects	78%	20	4	17.33%
Stability of market conditions	68%	35	5	18.39%
Interest rate/inflation rate	61%	37	6	15.58%

External factors and market condition

Table 5 presents the results of the relative importance analysis of the cost factors relating to the external and market conditions. As shown in the table, overall ranking of factors and severity index values vary significantly within the category. Results clearly indicate that some factors such as ‘level of competition’ and ‘material cost’ have significant influence on the tender price

as their severity indexes are above 80% and overall rankings are 8 and 11, respectively, out of 37. However, results show that factors such as 'stability of market conditions' and 'interest/inflation rates' were not very significant. Coefficient of variation for all factors is less than 20.00%, which means results gained high agreement from participants.

Inaccuracies in cost estimation

Table 6 summarises the results of analysis for the cost factors associated with inaccuracies in cost estimation. The table shows that apart from the factor on 'shortage of project requirement standing', each of the other factors in this category has above 80% severity index value and overall ranking below 10. This clearly indicates that cost estimating accuracy exerts the highest influence on accuracy of tender price. COV value for poor tender documentation is 25.91%, while all the other factors achieved relatively low COV. Akintoye and Fitzgerald (2000) also confirm the results.

Table 6: **Cost factors associated with cost estimating inaccuracies.**

Sub-factors	SI	Total Rank	Group Rank	COV
Poor tender document	88%	1	1	25.91%
Insufficient estimating time	83%	4	2	19.60%
Insufficient analysing of tender document	82%	10	3	20.14%
Shortage of project requirement standing	74%	25	4	18.20%

CONCLUSIONS AND RECOMMENDATIONS

This study has established and prioritised the factors that may influence the final contract price when responding to a call for tenders. Results of a multi-attribute analysis showed thirty-seven factors which could influence the final contract price; the three most influential being poor tender documentation, complexity of design & construction, and completeness of project information. Other factors relating to project, client and contractor characteristics, design consultants and tendering conditions, estimating practice and external factors were also established and prioritised. Concordance analysis indicated high level of agreement amongst survey participants in the rank-ordering of the relative importance of the identified factors.

The findings of the study were compared with corresponding results in previous research. Similarities in the results were found in 80% of the cases, with 20% being of significant variance. The unique culture and characteristics of the New Zealand construction industry and operating environment might be responsible for the variance noted.

Overall, the findings of this study could assist quantity surveyors to prepare more reliable contract price estimates at the pre-contract stage. It would also improve construction-stage cost monitoring and control.

Due to time limitations of the research, an online questionnaire was the only method of data collection. For further study, interviews are recommended to add to the research through more in depth probing of the factors in the context of the New Zealand construction industry.

Additionally, responses were limited to quantity surveyors registered with the New Zealand Institute of Quantity Surveyors (NZIQS). Inputs from other key stakeholders such as project managers, contractors, subcontractors, clients, designers and suppliers, could add to the depth and variety of factors influencing tender price; this is highly recommended in future research.

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