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Published in:
Construction Management and Economics

DOI:
10.1080/01446190110045770

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Recommended citation(APA):
Drew, D. S., Ho, L. C. Y., & Skitmore, M. (2001). Analysing a consultant's competitiveness in two-envelope fee tendering. *Construction Management and Economics*, *19*(5), 503-510. https://doi.org/10.1080/01446190110045770

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ANALYSING A CONSULTANT'S COMPETITIVENESS IN TWO ENVELOPE FEE TENDERING

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19 December 2000
(Version 3)

This is an Accepted Manuscript of an article published in Sep 2001 by Taylor & Francis in Construction Management and Economics, available online: https://doi.org/10.1080/01446190110045770

ANALYSING A CONSULTANT'S COMPETITIVENESS IN TWO ENVELOPE FEE TENDERING

ABSTRACT

A method for analysing the competitiveness of a consultant's two-envelope fee tendering history is proposed and illustrated in an application to one of Hong Kong's larger quantity surveying practices. Separate measures for determining consultants' fee, quality score and overall competitiveness are considered to accommodate the special nature of the Hong Kong system which makes cross-auction comparisons impossible. Maximum fee competitiveness is assumed to be the lowest submitted tender fee while maximum quality score competitiveness is taken to be the highest quality score attained by a competing consultant. Fees and quality score are then expressed as separate competitiveness ratios relative to these maximums and aggregated for determining overall competitiveness.

In analysing bidding performance it was found that this consultant's fee, quality score and overall competitiveness are all above the competitor average. These competitiveness measures reveal large differences in variability between quality score and fees with quality score variability being considerably lower. Such a large imbalance in competitiveness variability effectively discounts quality and promotes the influence of the fee since

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competitiveness ratio differences between fees are much larger than the competitiveness ratio differences between quality scores.

Keywords: bidding, competitiveness, consultant, fee, quality, tendering

INTRODUCTION

In several countries, competitive fee tendering is gaining popularity in the construction industry as a mechanism for allocating work to consultants such as architects, engineers and surveyors. For example, Hoxley (1998) concluded that competitive fee tendering is the most popular method of appointing quantity surveyors in the UK while in Hong Kong 89% of quantity surveying consultancy work is allocated in this way (Drew *et al*, 2000). Most consultancy contracts are awarded on the basis of price and quality since it is recognised that a quality service cannot be obtained if just the lowest tender is accepted (The Consultant Quantity Surveyors Association, 1992).

In order to compete effectively, it is important for consultants to regularly analyse their tendering performance in terms of competitiveness. In addition to having an appreciation of their overall competitiveness consultants need to regularly analyse their fee and quality score competitiveness to compare the competitiveness effect of their fee levels and quality scores in securing work. This is a situation similar to construction bidding research in general, where it has long been considered practical to improve tendering performance by

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studying one's own results in relation to the winning tender which is, without exception, assumed to be the lowest tender submitted (eg., Beeston, 1983). It is worth noting that this is despite the fact that the lowest tender may, on occasion, consist of a cover price, be misconceived or contain errors.

Analysing the competitiveness in terms of both price and quality of consultants has special difficulties in drawing conclusions over a series of tenders. In particular the two-envelope system adopted by the Hong Kong SAR Government makes comparison between auctions virtually impossible. This paper suggests a means of overcoming these problems. This is illustrated through the analysis of the tendering performance of one of Hong Kong's larger quantity surveying consultants in terms of (1) fee competitiveness, (2) quality score competitiveness and (3) overall competitiveness. Using a modified price-quality aggregation formulation, the consultant's competitiveness performance is compared with that of (1) the average competitor and (2) the lowest tenderer. This highlights the potential use of the method in providing useful reference points for the consultant in making future decisions on whether to lower (or increase) fees and / or aim for a higher (or lower) quality score. Also highlighted is the large difference in variability between price and quality scores.

THE TWO ENVELOPE METHOD

The Construction Industry Council (1998) list five basic methods of consultant selection in which price is considered in the decision process. These are (1) the two envelope method,

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(2) the cost weighted method, (3) the budget method, (4) design competition with prices and (5) price negotiation. The two-envelope method is endorsed by organisations such as the Construction Industry Council who have actively promoted its development (Construction Industry Council, 1994), and is the most popular method in awarding contracts to consultants in the UK (Connaughton, 1994) and Hong Kong. Essentially competing consultants are required to submit two envelopes; one envelope containing the fee (usually a lump sum) and the other containing information about quality such as:

- practice or company related information (e.g. total number of professionally qualified employees, number of years the practice or company has been in business, practice or company turnover, largest contract handled by the company over the past five years)
- project organisation (e.g. how the proposed work is to be shared amongst the project personnel)
- project personnel (e.g. identity, qualifications and number of years of relevant experience)
- project execution (e.g. programme of work showing frequency of site meetings etc)

The quality envelope of each competitor is opened first and each quality criterion is marked out of 100. Each quality criterion is weighted according to the project requirements and a weighted mark is produced for each quality criterion. This is then aggregated to produce a total quality mark out of 100.

After producing a total quality mark for each competitor, the second envelope containing the price is then opened. A price mark is then determined for each competitor. The total quality

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mark and price mark are then aggregated according to the client's formulation to allow the consultant to be selected. These are compared below.

The Hong Kong SAR Government formulation

In determining which consultant to award the contract, competing consultants are ranked according to their technical (quality) points score and compared on a pair-wise basis. The example given in the Hong Kong SAR Government's handbook (Hong Kong Government 1993) on appointment of consultants reads:

The first ranked firm is compared with the second ranked firm as follows:

Consultant	Technical Points	Total Fee ($m)	Technical Comparison	Fee Comparison
A	82	5.43	(82-76)/76	(5.43-5.14)/5.14
B	76	5.14	=7.89%	=5.64%

A is 7.89% technically better than B but 5.64% less advantageous than B on fee. Weighting technical advantage at 0.7 and fee advantage at 0.3 gives a weighted technical advantage of A over B of 0.7 x 7.89% = 5.52% and a weighted fee disadvantage of A compared with B of 0.3% x 5.64% = 1.69%. The difference 5.52%-1.69% is greater than zero so A is therefore the winner (the reverse would be true in the case of a negative difference).

The winner is then compared with the third ranked firm in a similar manner:

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Consultant	Technical Points	Total Fee ($m)	Technical Comparison	Fee Comparison
A	82	5.43	(82-69)/69	(5.43-4.42)/4.42
C	69	4.42	= 18.84%	=22.85%

In this case, A is 18.84% technically better than C but 22.85% less advantageous than C on fee. The weighted technical advantage of A over C is: 0.7 x 18.84% = 13.19%. The weighted fee disadvantage of A compared with C is: 0.3 x 22.85% = 6.86%. Once again A, with a positive difference, is the overall winner.

The implied model is therefore is that the overall competitiveness percentage

$$C_H = 100\{W_q(q_a-q_b)/q_b - W_f(f_a - f_b)/f_b\} \qquad (1)$$

where

W_q = predetermined weighting for quality score

q_a = Consultant A's quality score

q_b = Consultant B's quality score

W_f = predetermined weighting for fees

f_a = Consultant A's fee

f_b = Consultant B's fee

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A positive C_H value indicates that the consultant with the higher quality score wins while a negative percentage difference indicates that the consultant with the lower fee is the wins. ***A major disadvantage, however, in using this approach is that an overall comparison of consultants is not possible since the numerators and denominators change according to the pair-wise combination of consultants being compared.***

Other formulations

Connaughton (1994) has summarised a variety of price-quality aggregation formulations. These are described as either by simple weightings or by prior weightings. The simple weightings approach includes three alternative models (Connaughton, 1994: Appendix J):

$$C_1 = 100f/q \qquad (2)$$

where

f = consultant's fee

q = consultant's quality score

The consultant with lowest C_1 value winning the contract.

$$C_2 = f_{min}q/q_{f_{min}} - f \qquad (3)$$

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where

f_{min} = lowest fee

$q_{f_{min}}$ = quality score of consultant with lowest fee

The consultants with negative C_2 values are eliminated and the process repeated with the remaining consultants until all but one is eliminated.

$$C_3 = q/q_{max} + f_{min}/f \quad (4)$$

The consultant with the highest C_3 value winning the contract.

The prior weighting of quality score and price is as follows:

$$C_4 = W_q q/q_{max} + W_f f_{min}/f \quad (5)$$

The consultant with the highest C_4 value winning the contract.

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The Construction Industry Council (1994) also recommends separating quality score and fees according to predetermined weightings. Essentially, they advocate that the fee is combined with the quality score as a weighted percentage above the lowest bid i.e.

$$C_5 = qW_q - 100W_f (f - f_{min})/f_{min}) + 100 \quad (6)$$

The consultant with the highest C_5 value winning the contract.

Discussion

As Connaughton (1994) observes, although eqn *(2)* is simple to understand and calculate it does not provide a relative dollar value of the technical quality score. Eqn *(3)* attempts to do this. However, the disadvantages of eqn *(3)* are that each unit of quality score is assumed to have the same monetary value and the quality score baseline varies according to the consultant who submits the lowest fee. Eqns *(4)* and *(5)* appear to be an improvement on eqn *(3)* since quality and fees are assessed separately and according to a constant baseline (i.e. highest quality score and the lowest fee). A problem, however, in assessing quality and fees separately is that the parameter with the greatest variability will influence the outcome in selecting the consultant for contract award. In other words, the more the fees vary relative to quality score the more fees will influence consultant selection and vice versa. The weightings, W_f and W_q, can be used to control this to a limited extent as they have to be fixed in advance by the procurer.

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In addition to eqns *(4)* and *(5)* the unequal variability problem will also most likely occur with eqns *(1)* and *(6)* since fees and quality scores are also assessed separately in these equations. Lam (2000) has shown that the high fee variability and low quality score variability can be so extreme, that even changing the predetermined quality/ fee weightings from as much as 70% / 30% (W_f=0.7 W_q=0.3) to 50%/50% (W_f=0.5 W_q=0.5) has little effect on influencing which consultant is awarded the contract. Consequently, Lam recommends reducing the fee variability by giving all the consultants whose fees are lower or equal to average fee the same score for the fee component of the bid.

Interestingly the Construction Industry Council (1998) comment that once price is introduced, the consultant selection becomes biased in favour of the lowest fee rather than quality (i.e. technical quality score) and it often dominates the objective assessment of the other factors. Therefore they recommend a move away from fee tendering to a negotiation approach in which the scope of services is first agreed and then an appropriate fee negotiated.

The general tender analysis literature was consulted in the search for further models. Here, a recurring theme is the nature of baseline used. Potential baselines include the designer's estimate, contractor's cost estimate and the mean, median or lowest of the tenders entered for a particular contract. Of these, the lowest tender has the advantage that at the time of tendering it represents the maximum level of competitiveness. Thus, by using the lowest tender as a baseline, other tenders can be expressed as a percentage or ratio to this lowest

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tender baseline. Using the maximum value of competitiveness means that all competitiveness values will be on an absolute scale and easier to understand. Also, in comparing percentage and ratio competitiveness measures, Drew and Skitmore (1997) have also shown that the ratio measure is easier to calculate and more adaptable to transformation. This suggests that, in the case of fee competitiveness, a suitable baseline is the lowest fee tendered. For quality competitiveness, the highest possible quality score of 100 could be used. However, it is unlikely that any firm will ever be awarded a perfect quality score of 100. This is, therefore, rejected in favour of the more consistent approach of using the highest attained quality score. Thus, the closer a competing consultant's fee is to the lowest fee, the greater the fee competitiveness and the greater a competing consultant's quality score is to the highest quality score attained by a competing consultant, the greater the quality competitiveness. This leads to a new model where the overall competitiveness of the consultant is found by adding fee competitiveness and quality competitiveness together and expressing the result in either in percentage terms or as a ratio. The competitiveness equation (with predetermined weightings) expressed in percentage terms is as follows:

$$C_6 = 100\{W_q(q_{max}-q)/q + W_f\,(f - f_{min})/f_{min}\} \qquad (7)$$

Lower C_6 values indicate greater competitiveness and vice versa with minimum and maximum competitiveness being constrained respectively between infinity and zero.

In its ratio form this equation can be taken to be that as shown in eqn *(5)*, with higher ratio values indicating greater competitiveness and vice versa. In this case, overall minimum and

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maximum competitiveness is constrained between zero and one respectively. Maximum quality and fee competitiveness are equal to their predetermined weightings. There is, however, an inconsistency in eqn *(5)* in that the highest quality score (i.e. maximum quality competitiveness) is the denominator whereas the lowest fee (i.e. maximum fee competitiveness) is the numerator. This can be overcome by inverting the quality ratio and, in order to make sense of the aggregating, deducting the fee ratio from the quality score ratio i.e.

$$C_7 = W_q\, q_{max}/q - W_f\, f_{min}/f \qquad (8)$$

Lower C_7 values indicating greater competitiveness and vice versa.

Although eqn *(8)* is consistent in that both maximum quality competitiveness and maximum fee competitiveness are numerators it suffers from a disadvantage that consultants' overall competitiveness becomes distorted when compared to eqn *(5)*. For example, suppose Consultant D submits a fee of $4.62 million and obtains a quality score of 73. With a C_4 of 0.910, Consultant D is more competitive than Consultant B who achieved a C_4 of 0.906. Now compare this with eqn *(8)*. With a C_7 of 0.499, Consultant D is less competitive than Consultant B who achieved an C_7 of 0.497.

Table 1 summarises the results obtained in using all 8 equations together with Lam's (2000) method (eqn *(9)*). In making comparisons, the following observations are made:

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- In analysing competitiveness, it is vital that consultants' competitiveness reflects, as closely as possible, the aggregation method used by clients since this forms the basis on which the contracts are awarded.
- Although the fee and quality competitiveness ratios are not consistently measured in eqn *(5)*, there is at least some evidence in the literature to suggest that some clients aggregate quality and fee ratios based on eqn *(5)*.
- There appears to be no evidence in the literature of client's using eqn *(8)*.
- Eqn *(5)* also has the advantages over eqn *(8)* that it is easier to understand (since there are no deductions) and maximum competitiveness is fixed at unity (rather than varying according to the difference between the predetermined weightings).

For these reasons, eqn *(5)* is used in the analysis in preference to eqn *(8)*.

COMPETITIVENESS RELATIVE TO THE LOWEST TENDERER AND THE AVERAGE COMPETITOR

A consultant's (1) fee competitiveness, (2) quality competitiveness and (3) overall competitiveness can each be determined and compared against the fee, quality and overall competitiveness of the lowest tenderer and the average competitor.

The competitiveness of the lowest tenderer can simply be found by substituting the consultant's tender fee and consultant's quality score for that of the lowest tenderer. The

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average competitor is the average of all the competitors' fees and quality scores. The average competitor concept is particularly useful where the data sample is relatively small and /or the identities of the competitors are unknown (Park and Chapin, 1992).

A consultant's competitiveness, the lowest tenderer competitiveness and average competitor competitiveness can then each be averaged over a series of competitions. Competitiveness variability can be gauged from the resultant standard deviations and coefficient of variations.

DATA SET

The data sample is from one of Hong Kong's larger quantity surveying practices and comprises competitive fee tendering feedback information relating to 17 Hong Kong SAR Government quantity surveying consultant fee contracts tendered for between December 1995 to June 1999. All of the competing consultants have been assigned a code to preserve anonymity. The quantity surveying firm whose bidding performance has been analysed is coded 16.

ANALYSIS

Firm 16's bidding performance is first introduced by identifying the number of competing consultants, Firm 16's ranking and number of successes. Firm 16's quality, fee and overall

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competitiveness (measured in accordance with eqn *(5)*) is then analysed and compared to that of the average tenderer and lowest tenderer.

Number of competing consultants, Firm 16's ranking and number of successes

Table 2 shows the number of competing consultants being fixed at 3 for 13 contracts and 7 for the remaining 4 contracts. Firm 16 was successful in securing 6 of the 17 contracts (even though for two contracts this consultant was ranked second). Based the number of competing consultants and number of competitions the average success rate is 4.92 (i.e. 13/3 + 4/7). Firm 16's tendering performance in terms of success is therefore above average.

Firm 16's quality competitiveness

Table 3 shows Firm 16's quality competitiveness ranging between 0.700 (maximum competitiveness) and 0.642. By counting the number of 0.700 scores it can be seen that Firm 16 obtained the highest quality score in five of the seventeen competitions. Overall, Firm 16's average quality competitiveness of 0.683 is above the competitor average of 0.678. Further evidence of Firm 16's competitiveness being better than the competitor average can be seen by considering difference between the two variables. It can be seen that in only five of the seventeen competitions was Firm 16's quality competitiveness below the competitor average. This is indicated by a negative difference. Interestingly four of the five

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occurrences were in the earlier years before 1997. It would seem, therefore, that Firm 16's quality scores have, on average, improved slightly faster than their competitors.

Now compare Firm 16's quality competitiveness with that of the lowest tenderer. With identical average scores of 0.683, it can be seen that Firm 16 has managed to at least equal the quality competitiveness ratio score of the lowest tenderer. Again, by comparing the difference between Firm 16's quality competitiveness and that of the lowest competitor, it can be seen that Firm 16 was more competitive than the lowest competitor in nine of seventeen competitions.

Firm 16's fee competitiveness

Turning to fee competitiveness, it can be seen in Table 4 that Firm 16's fee competitiveness ranges between 0.300 (maximum competitiveness) and 0.155. Firm 16 submitted the lowest fee on four occasions and submitted a fee lower than the competitor average on ten occasions. Overall, Firm 16's average fee competitiveness ratio score of 0.250 is slightly better the competitor average of 0.247. However, 0.250 is far below the average fee of the lowest tenderer fee ratio of 0.288. Despite this, Firm 16 did manage to submit a fee lower or equal to that of the lowest tenderer in six competitions.

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Firm 16's overall competitiveness

Table 5 shows Firm 16's overall competitiveness ranging between 1.000 to 0.855. Firm 16's average overall competitiveness is slightly higher than that of the average competitor competitiveness. The difference is 0.008 (or 0.80%). By submitting the lowest fee and obtaining the highest quality score in the same competition, Firm 16 did manage to obtain a maximum overall competitiveness score of 1.00. Firm 16's overall competitiveness is higher than that of the average competitor in ten of the seventeen competitions.

In comparing Firm 16's competitiveness with that of the lowest competitor it can be seen that Firm 16's competitiveness is 0.037 (i.e. 3.7%) below the lowest competitor. The zero difference indicates that Firm 16 was the most competitive consultant on four occasions.

Differences in competitiveness variability

When comparing quality and fee competitiveness in Tables 3 and 4 a particularly striking feature is the large difference in competitiveness variability. In Table 3 it can be seen that the coefficient of variation for Firm 16's and average competitor quality competitiveness is only 2.49 and 2.21 respectively yet the corresponding fee competitiveness values in Table 4 are 18.80 and 19.43. This indicates that fee competitiveness varies some eight times more than quality competitiveness.

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With such an imbalance in variability, there would seem to be little point for Firm 16 (or any of the other consultant firms) attempting to improve their quality scores since competitiveness differences between consultant quality scores are much smaller when compared to that of fees. Therefore, if Firm 16 (or any of the other consultant firms) wishes to make a marked improvement on its competitiveness it appears that the best route under the current system is to lower fees.

CONCLUSIONS

Consultant fee tenders are commonly awarded based on price and quality and this paper describes the development of a method by which a consultant may analyse its tender performance in comparison with competitors. A major disadvantage of the Hong Kong SAR Government's fee tendering system is that the price-quality aggregation formula makes an overall comparison of consultants impossible since the numerators and denominators change according to the pair-wise combination of consultants being compared. This problem is overcome by selection of an alternative formulation in which the maximum competitiveness in each competition is taken to be the lowest submitted fee and highest attained quality score. The consultant's competitiveness in terms of fee and quality is expressed as a ratio relative to these maximums and aggregated. Apart from being simpler to understand and providing uniform basis for overall comparison, this competitiveness measure is more flexible in that additional parameters (e.g. current client workload) can be more easily added to the competitiveness equation, if required.

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A method is then proposed in which the target consultant's performance measured in this way is compared with that of the average competitor and lowest tenderer. This is illustrated by the analysis of real data provided by a major Hong Kong consulting firm. The results of this analysis (based on a sample of 17 contracts) show the firm to be above average not only in terms of success but also according to fee, quality and overall competitiveness. The firm has done particularly well in terms of quality competitiveness. The firm's quality scores also appear to have improved at a slightly faster rate than their competitors.

Although the purpose here is to describe a method for analysing individual performance, one aspect of possible generality arising out of the analysis is the large difference between fees and quality scores in terms of competitiveness variability. The low variability in quality competitiveness, when compared to the fee competitiveness variability, is the result of ratio differences between quality scores being much smaller than the ratio differences between fees. Such a large disparity in variability between fees and quality scores effectively discounts quality and promotes the influence of fee. Whether or not a firm is successful in securing a contract would, therefore, appear to be not so dependent on the quality score attained but on the fees submitted. This is likely to lead to consultants adopting low fee strategies which, in turn, is likely to lead to a gradual deterioration in the quality of service.

A possible remedy to promote the influence of the quality component might be to increase the predetermined weighting in favour of quality (as suggested by Connaughton, 1994). Another is to reduce the fee variability by giving all consultants whose fees are lower or

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equal to the average fee the same score for the fee component of the tender (as suggested by Lam 2000). An alternative approach (suggested by the Construction Industry Council, 1998) may be to abandon fee tendering altogether in favour of a negotiation approach in which the scope of services is agreed and then an appropriate fee negotiated.

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			Equation 1 (70/30)				Equation 2			Equation 3		
Consultant Identity	**Quality Mark**	**Fee $M**	**Quality Score**	**Fee Score**	**Total Score**	**Pairwise Winner**	**Multiplier**	**Weighted Fee Bid**	**Rank**	**Weighted Fee**	**Difference**	**Rank**
A	82	5.43	5.52	1.69	3.83	AvB=A	1.220	6.625	3	6.451	1.021	1
B	76	5.14	13.19	6.86	6.33	AvC=A	1.316	6.764	4	5.659	0.519	2
C	69	4.42	8.63	5.26	3.73	AvD=A	1.449	6.405	2	4.420	0	4
D	73	4.62					1.370	6.329	1	4.888	0.268	3

			Equation 4				Equation 5 (70/30)				Equation 6 (70/30)			
Consultant Identity	**Quality Mark**	**Fee $M**	**Quality Score**	**Fee Score**	**Total Score**	**Rank**	**Quality Score**	**Fee Score**	**Total Score**	**Rank**	**Quality Score**	**Fee Score**	**Total Score**	**Rank**
A	82	5.43	1.000	0.814	1.814	3	0.700	0.243	0.943	1	57.40	23.15	80.55	1
B	76	5.14	0.927	0.860	1.787	4	0.651	0.258	0.909	3	53.20	25.11	78.31	3
C	69	4.42	0.841	1.000	1.841	2	0.588	0.300	0.888	4	48.30	30.00	78.30	4
D	73	4.62	0.890	0.957	1.847	1	0.623	0.287	0.910	2	51.10	28.64	79.74	2

			Equation 7 (70/30)				Equation 8 (70/30)				Equation 9 (70/30)			
Consultant Identity	**Quality Mark**	**Fee $M**	**Quality Score**	**Fee Score**	**Total Score**	**Rank**	**Quality Score**	**Fee Score**	**Total Score**	**Rank**	**Quality Score**	**Fee Score**	**Total Score**	**Rank**
A	82	5.43	0	6.86	6.86	1	0.700	0.244	0.456	1	0.700	0.271	0.971	1
B	76	5.14	5.53	4.89	10.42	3	0.755	0.258	0.497	2	0.648	0.286	0.934	2
C	69	4.42	13.19	0	13.19	4	0.832	0.300	0.532	4	0.588	0.300	0.888	4
D	73	4.62	8.63	1.36	9.99	2	0.786	0.287	0.499	3	0.623	0.300	0.923	3

Table 1: Comparison of Price/Quality Aggregation Methods using a Hypothetical Example

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Rec. No.	Tender Qtr	No. of Competing Consultants	Firm 16 Ranking	Successful Consultant Identity Code
1	4Qtr 95	3	3	4
2	3Qtr 96	3	3	18
3	3Qtr 96	3	2	18
4	3Qtr 96	3	3	13
5	4Qtr 96	3	3	17
6	4Qtr 96	3	3	18
7	4Qtr 96	3	1	16
8	1Qtr 97	3	2	13
9	2Qtr 97	3	1	16
10	2Qtr 98	7	2	16
11	2Qtr 98	3	1	16
12	2Qtr 98	7	3	4
13	2Qtr 98	7	2	11
14	3Qtr 98	7	2	13
15	3Qtr 98	3	2	16
16	3Qtr 98	3	2	11
17	2Qtr 99	3	1	16

Table 2: Firm 16's introductory bid performance information

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Rec. No.	Firm 16 Quality Competitiveness (1)	Average Competitor Quality Competitiveness (2)	Difference (1) – (2)	Lowest Tenderer Quality Competitiveness (3)	Difference (1) – (3)
1	0.700	0.665	0.035	0.674	0.026
2	0.642	0.690	(0.048)	0.680	(0.038)
3	0.672	0.684	(0.012)	0.700	(0.028)
4	0.699	0.691	0.008	0.682	0.017
5	0.690	0.700	(0.009)	0.699	(0.009)
6	0.675	0.697	(0.021)	0.694	(0.018)
7	0.700	0.677	0.023	0.700	0.000
8	0.700	0.686	0.014	0.675	0.025
9	0.700	0.683	0.017	0.700	0.000
10	0.675	0.656	0.019	0.694	(0.020)
11	0.683	0.667	0.016	0.683	0.000
12	0.678	0.659	0.018	0.699	(0.021)
13	0.679	0.659	0.021	0.585	0.094
14	0.674	0.655	0.019	0.693	(0.018)
15	0.700	0.691	0.009	0.698	0.002
16	0.656	0.682	(0.025)	0.663	(0.007)
17	0.685	0.684	0.001	0.685	0.000
Av.	0.683	0.678	0.005	0.683	0.000
S.D.	0.017	0.015	0.021	0.028	0.030
C.V.	2.489	2.212	-	4.100	-

Table 3: Firm 16's quality competitiveness relative to the average competitor and lowest tenderer

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Rec. No.	Firm 16 Fee Competitiveness (1)	Average Competitor Fee Competitiveness (2)	Difference (1) – (2)	Lowest Tenderer Fee Competitiveness (3)	Difference (1) – (3)
1	0.200	0.294	(0.094)	0.288	(0.088)
2	0.223	0.288	(0.065)	0.300	(0.077)
3	0.300	0.287	0.013	0.285	0.015
4	0.219	0.278	(0.059)	0.300	(0.081)
5	0.295	0.293	0.002	0.300	(0.005)
6	0.288	0.291	(0.003)	0.300	(0.012)
7	0.290	0.298	(0.008)	0.290	0.000
8	0.265	0.263	0.002	0.300	(0.035)
9	0.300	0.209	0.091	0.300	0.000
10	0.244	0.201	0.044	0.255	(0.010)
11	0.300	0.234	0.066	0.300	0.000
12	0.219	0.183	0.036	0.219	0.000
13	0.181	0.141	0.040	0.300	(0.119)
14	0.235	0.195	0.040	0.255	(0.020)
15	0.155	0.217	(0.062)	0.300	(0.145)
16	0.239	0.250	(0.011)	0.300	(0.061)
17	0.300	0.272	0.028	0.300	0.000
Av.	0.250	0.247	0.003	0.288	(0.038)
S.D.	0.047	0.048	0.050	0.023	0.048
C.V.	18.80	19.43	-	7.986	-

Table 4: Firm 16's fee competitiveness relative to the average competitor and lowest tenderer

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Rec. No.	Firm 16 Overall Competitiveness (1)	Average Competitor Overall Competitiveness (2)	Difference (1) – (2)	Lowest Tenderer Overall Competitiveness (3)	Difference (1) – (3)
1	0.900	0.959	(0.059)	0.962	(0.062)
2	0.865	0.978	(0.113)	0.980	(0.115)
3	0.972	0.971	0.001	0.985	(0.013)
4	0.918	0.969	(0.051)	0.982	(0.064)
5	0.986	0.993	(0.007)	0.999	(0.013)
6	0.964	0.987	(0.023)	0.994	(0.030)
7	0.990	0.975	0.015	0.990	0.000
8	0.965	0.949	0.016	0.975	(0.010)
9	1.000	0.892	0.108	1.000	0.000
10	0.919	0.857	0.062	0.949	(0.030)
11	0.983	0.901	0.082	0.983	0.000
12	0.897	0.842	0.055	0.918	(0.021)
13	0.860	0.800	0.060	0.885	(0.025)
14	0.909	0.850	0.059	0.948	(0.039)
15	0.855	0.908	(0.053)	0.998	(0.143)
16	0.895	0.932	(0.037)	0.963	(0.068)
17	0.985	0.956	0.029	0.985	0.000
Av.	0.933	0.925	0.008	0.970	(0.037)
S.D.	0.050	0.059	0.059	0.031	0.041
C.V.	5.359	6.378	-	3.196	-

Table 5: Firm 16's overall competitiveness relative to the average competitor and lowest tenderer

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