

# THE SELECTION OF SUBCONTRACTORS: IS PRICE THE MAJOR FACTOR?

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The philosophy of 'lowest price wins' in the selection of subcontractors often leads to problems with quality of work and claims for further costs. Since Latham (1994), many models have offered selection methods that take account of a wide range of quality criteria as well as price. A review of existing literature and models enables a list of selection criteria to be drawn up and a survey ascertains which selection criteria are considered most important and whether opinions change when faced with different types of project. The results of the questionnaire are analysed through the use of Simple Relative Indexes, Spearman's Rank Correlation Coefficient tests and a number of T-tests. It is established that price is no longer considered the only important factor in subcontractor selection, and that health and safety, past performance, and insurance cover are considered equally important and, in some scenarios, more important than price.

Keywords: price, quality, selection, subcontractor.

## BACKGROUND

Sir Michael Latham (1994) and Sir John Egan (1998) highlighted the problems in the Construction Industry caused by the 'lowest price wins' philosophy. Selecting subcontractors on a basis of lowest price often results in claims for extensions of time, claims for additional fees, less trust between the parties, less investment in training and development, higher capital costs of construction and operation, and a reduced quality in workmanship (Cox and Townsend, 1998). Also, firms offering the lowest tender often provide a lower standard in terms of the consideration of design alternatives as well as being resistant to changes requested by clients.

Since 1994, many models and guides have offered selection methods that take account of a wide range of quality criteria as well as price. However, the question remains as to whether construction companies are following the guidance, or whether they are still operating on the 'lowest price wins' principle? In this research we: -

- Review existing models for subcontractor selection in order to identify the factors which are considered most important.
- Test whether price is still considered to be the most important selection factor.
- Test the relative importance of selection criteria between different project scenarios (for example between high value / low value work packages)

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## LITERATURE REVIEW

In his report 'Constructing the Team', Latham (1994) recognized that subcontractors should be selected not only on the basis of price, but that quality should also be considered a vital factor within the selection criteria.

The Further Education Funding Council (1997) and the RICS (1996) also both recognized that the selection of subcontractors should be based on value for money, fitness for purpose, and delivery and availability as well as price. Selection may even be split into commercial, technical and functional categories. This suggests that different project scenarios (e.g. high value / low value packages) may carry different levels of importance for the selection criteria.

The 'Code of Practice for the Selection of Subcontractors' (CIB 1997) recommended that tenders should be assessed and accepted with regard to quality as well as price. An extensive list of criteria should be taken into account for compiling the tender list, including quality of work, performance record, overall competence, health and safety record, financial stability, appropriate insurance cover, size and resources, technical and organizational ability and the ability to innovate. Relative importance should be placed on quality and price, using weightings that may differ for different project scenarios (for example there may be a greater weighting on past performance or reputation for specialist packages such as M&E, than there would be for non specialist packages such as cleaning).

Jackson-Robbins (1998), on behalf of CIRIA, published a selection method to help identify who offers the best value to the client on a project, assessed by a weighted score. Weightings are applied to a range of selection criteria, which may differ for each area of works, for example criteria for groundwork subcontractors may differ to say a carpet fitting subcontractor and hence the importance of the weightings may differ, as may the weightings for projects of different size/ cost.

Fong and Choi (1999), and Shiau *et al.* (2005), recognizing that there should be a trade off between cost, time and quality in the final selection, developed a model using the Analytical Hierarchy Process (AHP), which seeks to improve the objectivity of the selection process. They established a list of eight criteria being tender price, financial capability, past experience, past performance, resources, current workload, past relationships and safety performance. The model works by catering for individual project characteristics and uses a hierarchy to prioritize the importance of each criterion. Cheung *et al.* (2001) also developed a selection model using multi attribute technology, as well as the AHP. However the AHP does have its limitations due to the fact that it can only be applied in hierarchal situations.

Cheng and Li (2004) developed a method which made use of multi-criteria decision making in the selection process and discovered that for complicated decision problems, the Analytical Network Process (ANP) allows interdependent influences to be specified in the model. Fong and Choi (1999) and Cheng and Li (2004), both came up with the conclusion that tender price is the dominant factor in the selection process (within the Hong Kong construction industry).

Research from Wong *et al.* (2000), Okoroh and Torrance (1999), and Egemen and Mohamed (2005), offer extremely detailed lists of factors which should be considered when selecting a subcontractor/ main contractor.

Research from Waara and Brochner (2006) found that reliance on non price criteria is increasing slightly from previous years. However from their analysis of 386 bidding

documents (reflecting practice in Swedish municipalities) in 2003, they found that there was a significant pattern of a 70% price weight combined with 30% non price criteria, indicating that times are changing slightly, but that there is still a very significant amount of selections being based on price.

All subcontractors will not be suitable for all jobs (Ramus *et al.*, 2006). A company may be suited to work on a particular size of project or within a price range, suggesting that there may be a change in the perceived level of importance for certain selection criteria between different project scenarios. Contractors should aim to select subcontractors who are financially stable, for whom the scale of the job is neither too big or small, who have a reputation for good quality workmanship and have a good record of industrial relations. Selecting a subcontractor with the lowest price may militate against these factors being incorporated in the selection process.

## CONCLUSION FROM LITERATURE REVIEW

The majority of evidence suggests that price is the dominant factor in the selection process, being closely followed by past performance and financial capability. These are basically the factors affecting the triple constraints of cost, time and performance which are directly related to profit.

From reviewing the works of these different authors mentioned above, a list of criteria has been compiled, which can be used as a basis to test the theory that subcontractors are mainly selected on the basis of price and that the importance put on selection will differ when faced with different project scenarios. The criteria selected will be the eight used in the research by Fong and Choi (1999), Cheng and Li (2004), and Shiau *et al.* (2005), and six more from the research of CIB (1997), Wong *et al.* (2000), Okoroh and Torrance (1999), and Egemen and Mohamed (2005):-

1. Price
2. Past performance
3. Health and safety record
4. Financial capability
5. Current workload
6. Reputation
7. Past relationships
8. Resources (both physical and human)
9. Technical/ managerial capability
10. Number of years the firm has been working in the market
11. References
12. Location of firm
13. Experiences firm has of similar projects
14. Appropriate insurance cover

These fourteen criteria will be used as a basis to test the theory that subcontractors are mainly selected on a basis of price.

## METHODOLOGY

A questionnaire survey was conducted to find out the attitudes of main contractors towards the significance of tender price in the selection of subcontractors, and also to find out if their attitudes change when faced with five different project scenarios, as follows.

1. In General
  1. Specialist Packages (i.e. M&E, lifts etc.)
  2. Non-specialist Packages (i.e carpet fitting, tiling, cleaning etc.)
  3. Packages Low in Value (i.e. below £1k)
  4. Packages High in Value (i.e. over £100k)

140 questionnaires were distributed to contractors within a region of England. Only larger companies were included in the sample as these were deemed to have the most experience when selecting subcontractors. 43 responses were obtained, representing a response rate of 31%.

The Relative Index (RI) ranking technique is used to rank in order of importance the criteria used by contractors in the selection of subcontractors, based on the different project scenarios. Once the RI were established for each situation, further analysis of the data was undertaken by the use of a Spearman’s Rank Correlation Co-efficient test to illustrate whether there was any significant difference in the ranking of the selection criteria between different situations/ project scenarios. T-tests are also used to show if there was any significant difference between the different selection factors.

### SIMPLE RELATIVE INDEX AND RANKING OF DATA

The results of the Relative Index (RI) technique and the rank ordering based on the RI values for each of the five project scenarios are listed in Table 1 below.

**Table 1:** Simple Relative Indexes and Rank ordering of selection factors.

Different Scenarios →	In General		Specialist		Non-Specialist		Less than 1k		Over 100k		Total Average	
	RI	Rank	RI	Rank	RI	Rank	RI	Rank	RI	Rank	RI	Rank
Health and Safety Record	0.870	1	0.874	2	0.837	1	0.805	1	0.884	1	0.854	1
Past Performance of subcontractor	0.860	2	0.879	1	0.740	5	0.563	8	0.849	3	0.778	4
Price	0.847	3	0.798	6.5	0.826	2	0.667	4	0.821	5	0.792	3
Appropriate Insurance Cover	0.844	4	0.865	3	0.800	3	0.751	2	0.870	2	0.826	2
Resources	0.802	5	0.814	4	0.751	4	0.677	3	0.812	6	0.771	5
Financial Capability (of subcontractor)	0.784	6.5	0.807	5	0.712	7	0.544	10	0.833	4	0.736	6
Past Relationships with subcontractor	0.784	6.5	0.777	8	0.728	6	0.616	7	0.756	8	0.732	7
Current Workload (of subcontractor)	0.742	8	0.735	11	0.709	8	0.623	6	0.760	7	0.714	8
Reputation (of subcontractor)	0.737	9	0.760	9	0.665	9	0.560	9	0.740	9	0.692	9
Technical/ Managerial Capability	0.702	10	0.798	6.5	0.626	10.5	0.509	11	0.728	10	0.673	10
Experiences of similar projects	0.679	11	0.751	10	0.626	10.5	0.500	12	0.721	11	0.655	11
References	0.565	12	0.626	13	0.525	13	0.467	13	0.614	12.5	0.559	12
Years firm has been doing work in the market	0.551	13	0.633	12	0.528	14	0.442	14	0.614	12.5	0.554	13
Location of subcontractor	0.500	14	0.440	14	0.567	12	0.647	5	0.488	14	0.528	14
Average Relative Index	0.733		0.754		0.689		0.598		0.749		0.705	

Taking the overall average from five scenarios, the top six factors, in descending order are health and safety, insurance cover, price, past performance, resources and financial capability. This indicates that price is not the most important factor, however the significance of this needs testing, as there is only 0.062 difference between health and safety ranked first and price ranked third.

A pattern is also evident towards the lower end of the scale. It is evident that the location of the subcontractor is ranked lowest in all cases except for packages less than £1k in value where it ranks 5. This can be expected, as if a contractor is letting a package for say £500, then for obvious reasons, they are unlikely to consider a subcontractor who is located a long distance away.

There were a few rankings which differed considerably between the different scenarios. Firstly past performance ranked high (i.e. top 5) for all scenarios except for packages less than £1k (ranked 8). Again this is logical as contractors will be willing to take more risks for packages low in value, than for say specialist packages (rank 1) and packages high in value (rank 3) where the whole outcome of the project may be at stake.

The criteria of price received its lowest ranking for specialist packages, reflecting the necessity for the most competent firms to be selected in these cases, with less regard for price. Similarly, with packages high in value, more importance is attached to insurance cover and past performance than price.

Packages low in value received the lowest average RI (0.598) followed by non-specialist packages (0.689) indicating that contractors put less emphasis on the selection factors for these two scenarios suggesting they are willing to take more risks and that they consider them less important.

### SPEARMAN’S RANK CORRELATION CO-EFFICIENT (SRCC)

An SRCC test was carried out to test whether there is any significant difference in the ranking of selection factors between the different project scenarios. The results are highlighted in Table 2.

**Table 2:** SRCC test for the five different project scenarios.

Project Scenarios	In general	Specialist	Non-specialist	Less than £1k	Over £100k
In general	1.000	-	-	-	-
Specialist	0.901 ***	1.000	-	-	-
Non-specialist	0.958 ***	0.827 ***	1.000	-	-
Less than £1k	0.678 **	0.520 *	0.823 ***	1.000	-
Over £100k	0.956 ***	0.905 ***	0.914 ***	0.652 **	1.000
* Correlation significant at 5% level (one-tailed)					
** Correlation significant at 1% level (one-tailed)					
*** Correlation significant at 0.5% level (one-tailed)					

For the results to be significant, then the 5% level is the minimum that can be accepted. It can be seen from Table 2 that all of the results are significant at the 5% level, with the majority being significant at the 0.5% level and 1% level. Therefore it can be concluded that there is no significant difference in the ranking of the selection factors between the different project scenarios.

Reviewing the levels of correlation shown in Table 2, it can be seen that there is very strong positive correlation between selecting subcontractors in general and selecting them for specialist packages (0.901), non-specialist packages (0.958), and packages over 100k in value (0.956), indicating little change in priority between the ranks for the selection factors between the ‘in general’ and the remaining project scenarios.

Specialist packages and packages less than 1k in value contained the least correlation (0.520) followed by packages less than 1k and over 100k (0.652). This indicates a lesser relationship, which is likely to be due to the fact that more critical tasks (i.e.

specialist and over 100k packages) will be deemed to be more important than non-specialist and packages low in value, hence the contrast in opinion. This can be seen as the opposite to specialist packages against high in value, and non specialist packages against low in value. Although there is not as strong a correlation between these scenarios, it must be noted that both relationships were deemed significant at the 5% and 1% levels respectively indicating that they are still ranked similarly.

### T-TEST ANALYSIS

T-tests are performed to test if the differences between the selection factors are significant at the 5% level. Table 3 shows the results of the t-tests for the ‘in general’ scenario.

**Table 3.** T-test between selection factors for the in General Project Scenario.

Rank	Selectio Factors ??	Health and Safety Record	Past Performance of subcontractor	Price	Appropriate insurance cover	Resources	Financial Capability	Past Relationships	Current Workload	Reputation	Technical/ Managerial capability	Experiences of similar projects	References	Years in the Market	Location
1	Health and Safety Record	1.000	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Past Performance of subcontractor	0.765	1.000	-	-	-	-	-	-	-	-	-	-	-	-
3	Price	0.442	0.561	1.000	-	-	-	-	-	-	-	-	-	-	-
4	Appropriate insurance cover	0.448	0.564	0.932	1.000	-	-	-	-	-	-	-	-	-	-
5	Resources	0.037	0.027	0.079	0.152	1.000	-	-	-	-	-	-	-	-	-
6.5	Financial Capability			0.014	0.040	0.491	1.000	-	-	-	-	-	-	-	-
6.5	Past Relationships					0.507	1.000	1.000	-	-	-	-	-	-	-
8	Current Workload					0.028	0.126	0.140	1.000	-	-	-	-	-	-
9	Reputation						0.062	0.075	0.851	1.000	-	-	-	-	-
10	Technical/ Managerial capability						0.010	0.012	0.203	0.228	1.000	-	-	-	-
11	Experiences of similar projects								0.035	0.035	0.480	1.000	-	-	-
12	References										0.001	0.480	1.000	-	-
13	Years in the Market											0.000	0.719	1.000	-
14	Location												0.103	0.158	1.000

Health and safety ranks first amongst the selection factors. However, from the results of the t-test it can be seen that although it ranked top, there is no significant difference between the ranking of health and safety, past performance, price or insurance cover and that it is only when rank 5 ‘resources’ is reached that a significant difference occurs. Therefore we can conclude that there is no significant difference between health and safety, past performance, price and insurance cover as the top selection factors for the ‘in general’ scenario when tested at the 5% level.

Similar t-tests for the other project scenarios produce the following results.

For specialist packages, there is no significant difference between past performance, health and safety and insurance cover. This differs to the ‘in general’ scenario in the fact that price is not considered as one of the most important selection factors, as there is deemed to be a significant difference between past performance (rank 1) and price (rank 6.5). As discussed previously, this indicates that for such specialist packages (i.e. M&E) contractors are more concerned about selecting a subcontractor who is certain to be capable of carrying out the work and are less concerned by costs.

For non-specialist packages health and safety, price and appropriate insurance cover ranked 1-3 respectively, and the results of the t-test show that there is no significant difference between these factors when tested at the 5% level. Therefore for non-specialist packages such as cleaning, or carpet fitting, then the 'lowest price wins' philosophy is a lot more evident. Unlike the 'in general' and 'specialist' scenarios, past performance (rank 5) was found to be of significant difference when compared to health and safety (rank 1) and price (rank 2). Again, this indicates that contractors are willing to take more risks for works of a non-specialist nature, and may indicate that they are willing to try subcontractors who they may have never used before, due to the non-critical nature of non-specialist works.

For packages low in value, health and safety and insurance cover ranked 1 and 2 respectively and from carrying out a t-test at the 5% level, there was found to be no significant difference, indicating that equal weighting should be given to these two factors when selecting a subcontractor to carry out works for packages low in value.

For packages high in value, the four criteria health and safety, insurance, past performance and financial capability all rank as the most important selection factors for packages high in value, and the carrying out of the t-test at the 5% level between these factors show that there is no significant difference between each. Therefore equal weighting should be given to each when selecting a subcontractor to carry out works for packages over £100k in value. There is a significant difference found between health and safety (rank 1) and price (rank 5), indicating again that for packages of such a high value, contractors are less willing to take risks and only want subcontractors who are competent to carry out the works, hence past performance becomes more important, and price becomes less of an issue.

## **SUMMARY AND CONCLUSIONS**

The outcomes of the data analysis suggest that price is not now considered the most vital criterion when it comes to selecting a subcontractor. The results of the relative indexes showed that price did not rank as the top selection factor for any of the five different scenarios. The criteria which received the majority of top rankings were health and safety, closely followed by insurance, price and past performance. However, results from the t-test found that there was no significant difference between price and the selection factors which ranked above it for the 'in general' and 'non-specialist' scenarios. This indicates that although the 'lowest price wins' scenario is still important, there is a shift towards the inclusion of more than just price as the most important selection factor for the above two project scenarios.

This is in contrast to the other three scenarios of 'specialist', 'low in value' and 'high in value' packages where a significant difference occurred between price and the factor which ranked first. In these scenarios there is an even stronger shift away from the 'lowest price wins'.

For each of the five scenarios, it was found that health and safety and appropriate insurance cover were considered to be the top selection factors, and this was reinforced by the results of the t-test which highlighted that there was no significant difference between the two factors for any of the scenarios, meaning an equal weighting might be given to each when selecting subcontractors, regardless of the project scenario. Fong and Choi (1999) found that health and safety ranked lowest out of their eight selected criteria and insurance cover was not even included within their list, in contrast to these findings where contractors are not going to select a

subcontractor who does not have a good health and safety record or appropriate insurance cover.

It appears the industry is becoming more health and safety conscious and the introduction of CPCS cards for operatives using machinery and plant, and CSCS cards for all parties involved to improve health and safety awareness and competence reinforces this finding. There has also been the introduction of NVQs in health and safety for operatives to enable them to further improve their competence. Within a firm, poor safety awareness, precautions and policy can amount to huge costs to main contractors, and may even result in delays. Such harsh consequences can lead to lost clients and damage to a firm's reputation. Contractors are now safety conscious and do not want to be associated with such poor standards, hence the upsurge in emphasis towards health and safety. Moreover, the increase in attention towards insurance cover indicates that contractors are now becoming a lot more cautious and conscious of covering themselves, and that they are less willing to take risks on projects by selecting incompetent subcontractors who may offer cheaper prices. This differs greatly to previous research on the subject where price was often found to be deemed the only criterion on which to base selection.

Past performance also ranked high for the 'in general', 'specialist packages' and 'high in value' scenarios, as did financial capability for the 'high in value' scenario, and results of the t-test found there to be no significance between these factors when compared to the top rated factor for any of the above project scenarios, again meaning that equal weighting might be given to these factors for the above mentioned scenarios.

The results of the Spearman's Rank Correlation Co-efficient test showed that there is no significant difference in the ranking of the selection factors between the different project scenarios.

Twelve years on from the Latham report, it appears that his recommendations are now being heeded, and subcontractors are being selected on a basis that takes account of quality as well as price. This can only be seen as good for the industry, particularly for clients who are likely to receive a higher quality of service, which in turn will have positive implications for contractors. If contractors are offering a higher quality service, then clients are less likely to hesitate in using them again on future projects.

## **REFERENCES**

- Cheng, E. W. L. and Li, H. (2004) 'Contractor Selection Using the Analytic Network Process': *Construction Management and Economics*. 22.(10) pp.1021-1032.
- Cheung, S., Lam, T., Leung, M. and Wan, Y. (2001) 'An Analytical Hierarchy Process Based Procurement Selection Method': *Construction Management and Economics*. 19.(4) pp.427-437.
- CIB Working Group 3. (1997) *Code of Practice for the Selection of Subcontractors*. London: Thomas Telford.
- Cox, A. W. and Townsend, M. (1998) *Strategic Procurement in Construction: Towards Better Practice in the Management of Construction Supply Chains*. London: Thomas Telford.



- Egan, J. (1998) *Re-thinking Construction: the Report of the Construction Task Force to the Deputy Prime Minister, John Prescott, on the Scope for Improving the Quality and Efficiency of UK Construction*. London: Department of the Environment, Transport and the Regions.
- Egemen, M and Mohamed, N. A. (2005) 'Different Approaches of Clients and Consultants to Contractors Qualification and Selection' *Journal of Civil Engineering and Management*. 11.(4) pp267-276.
- Fong, P. S. and Choi, S. K. (2000) 'Final Contractor Selection Using the Analytical Hierarchy Process' *Construction Management and Economics*. 18.(5) pp547-557.
- Greenwood, D. (2001) 'Subcontract Procurement: are Relationships Changing': *Construction Management and Economics*. 19.(1) pp.5-7.
- Jackson-Robbins, A. (1998) *Selecting Contractors by Value*. London: CIRIA Publication.
- Latham, M. (1994) *Constructing the Team: Joint Review of Procurement and Contractual Arrangements in the UK Construction Industry: Final Report/ by Sir Michael Latham*. London: H.M.S.O.
- Luu, T and Sher, W (2005) 'Construction Tender Subcontract Selection Using the Case-based Reasoning' accessed 20th December 2005: available at [www.itcon.org/data/submissions/att/7795.content.00174.doc](http://www.itcon.org/data/submissions/att/7795.content.00174.doc).
- Okoroh, M. I. and Torrance, V. B. (1999) 'A Model for Subcontractor Selection in Refurbishment Projects' *Construction Management and Economics*. 17.(3) pp.315-327.
- Ramus, J., Birchall, S. and Griffiths, P. (2006) *Contract Practice for Surveyors*. 4th ed. Butterworth-Heinemann.
- R.I.C.S. (1996) *The Procurement Guide: A Guide to the Development of an Appropriate Building Procurement Strategy*. London: RICS.
- Shiau, Y., Tsai, T., Wang, W. and Huang, M. (2005) 'Use Questionnaire and AHP Techniques to Develop Subcontractor Selection System' Accessed 4th March 2006: available at [fire.nist.gov/bfrlpubs/build02/PDF/b02143.pdf](http://fire.nist.gov/bfrlpubs/build02/PDF/b02143.pdf).
- The Further Education Funding Council. (1997) *Procurement: A Good Practice Guide*. London: The Stationary Office.
- Waara, F and Brochner, J (2006) 'Price and Nonprice Criteria for Contractor Selection' *Journal of Engineering and Management*. 132(8) pp797-804.
- Wong, C. H., Holt, G. D. and Cooper, P. A. (2000) 'Lowest Price or Value? Investigation of UK Construction Clients Tender Selection Process': *Construction Management and Economics*. 18.(7) pp.767-774.
- Wong, C. H., Holt, G. D. and Harris, P. (2001) 'Multi Criteria Selection or Lowest Price? Investigation of UK Construction Clients Tender Evaluation Preferences': *Engineering Construction and Architectural Management*. (Blackwell Publishing Ltd). 8.(4) pp.257-271.