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Criteria for contractor selection

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This paper is concerned with identifying universal criteria for prequalification and bid evaluation, and the means by which different emphases can be accommodated to suit the requirements of clients and projects. The information, assessment and evaluation strategies currently used by procurers for screening contractors are considered, and the results are reported of an extensive literature review and a Delphic interview study with a small select sample of construction professionals with extensive experience in prequalification and bid evaluation processes. The findings indicate that the most common criteria considered by procurers during the prequalification and bid process are those pertaining to financial soundness, technical ability, management capability, and the health and safety performance of contractors.

Keywords: Prequalification, bid evaluation, information, criteria assessment.

Introduction

In reporting a recent survey of current procurement practice, Hatush (1996) concludes that all types of arrangement comprise five common process elements, or subsystems. These are *project packaging*, *invitation*, *prequalification*, *shortlisting* and *bid evaluation*. For each of these subsystems there are a variety of actual and possible alternatives available – different types of project packages, invitational forms, prequalification systems, shortlisting methods and bid evaluation procedures – which offer clients differing combinations of expertise, risk, flexibility and costs (Nahapiet and Nahapiet, 1985). This raises a major question. For a given project, is there some ‘best’ combination of subsystem alternatives, or does *any* such combination produce roughly the same outcome? In theory, the answer lies in the opportunity costs involved: would the extra benefits of using a better system have outweighed the extra costs in finding (or designing) and implementing it? Unfortunately, if the alternative system is new to the procurer, it is only possible for the procurer to know such costs *after* rather than *before* the system is chosen, and even then only if accurate records are kept. In response to these difficulties, the approach in practice is to make some subjective assessment but, as Holt *et al.* (1993) have found, subjective

approaches in these areas do not necessarily serve the best interests of the construction owner. Another problem is that procurers may not be fully aware of all the options available. This seems certainly to be the case in the public sector, where, according to the Latham Report (NJCC, 1994):

[there is] no means of ensuring that all housing associations, trust hospitals, grant maintained schools, private Government agencies, utilities companies, etc., are aware of the best current practice and changes in construction industry.

One solution is for procurers to share experiences and data so that good *estimates* of likely costs and benefits can be made. It is not common practice for procurers to share experiences and data in this field, however, even in the public sector (Hatush 1996). Latham (1996) reported a lack of communication between the procurers, a feature that is symptomatic of the construction industry as a whole.¹ The reasons for this are not known, but it seems reasonable to assume that the isolated and ad hoc development of systems by procurers has resulted in the lack of a common basis for comparison. While it cannot be shown to be sufficient (i.e. the existence of a common basis for comparison will result in the sharing of experiences and data between procurers²), it is highly likely

to be a necessary precursor to such sharing (or at least will reduce the opportunity costs of sharing). Furthermore, even if such a sharing still fails to take place, for commercial reasons for instance, the existence of a common basis for comparison would at least allow research to take place on an experimental basis.

Is a common basis for comparison possible? The signs are favourable. All procurers have the same goals. All want a project more or less at a reasonable cost, to a reasonable quality, within a reasonable time and with reasonable security (Masterman, 1994; Bent, 1984; Curtis *et al.*, 1991). The tendering system aims to achieve this goal by ensuring the simultaneous selection of an appropriate contractor to deliver the project, the mechanism for delivery, the price to pay and the legal framework. The only difference then between procurers is in the strategic choice of subsystems components. It is expected therefore that the *criteria* involved will be consistent across all procurers, with only the *emphasis* changing between procurers and projects according to the strategies employed (Russell and Skibniewski, 1988).

In this paper, we are concerned with identifying such universal criteria for *prequalification and bid evaluation* and the means by which different emphases can be accommodated to suit the requirements of clients and projects. The information, assessment and evaluation strategies currently used by procurers for screening contractors are considered, and the results are reported of an extensive literature review and a Delphic interview study with a small select sample of construction professionals who have an extensive experience in prequalification and bid evaluation processes. The findings indicate that the most common criteria considered by procurers during the prequalification and bid process are those pertaining to financial soundness, technical ability, management capability, and the health and safety performance of contractors.

Literature review

The contractor selection process comprises five common process elements, or subsystems, for all types of procurement arrangement. These are *project pack-*

aging, invitation, prequalification, shortlisting and bid evaluation (Hatush and Skitmore, 1996). Prequalification is a *pre-tender* process used to investigate and assess the capabilities of contractors to carry out a contract satisfactorily if it is awarded to them, and has been examined by several researchers (e.g. Hunt *et al.*, 1966; Helmer and Taylor, 1977; Russell and Skibniewski, 1987, 88; Merna and Smith, 1990; Ng, 1992; Holt *et al.*, 1994; Potter and Sanvido 1994). It provides a client with a *standing list* of potential contractors to invite to tender for similar types of project on a regular basis, or just a *project list* of contractors to be invited to tender for a specific project. Bid evaluation, on the other hand, involves similar processes but occurs at the *post-tender* stage, and involves the consideration of the bid amount in addition to the contractors' capabilities.

Contractor prequalification and bid evaluation are therefore decision-making processes that occur within the overall procurement strategy. They involve the development and consideration of a wide range of necessary and sufficient decision criteria as well as the participation of many decision-making parties (Russell and Skibniewski, 1988). However, despite a huge increase in the complexity of projects and clients' needs in the last two decades, together with an associated increase in alternative forms of project delivery system, the methods of quantification and assessment of criteria for prequalification and bid evaluation have hardly changed.

The review of the literature revealed the existence of various criteria, types of information and methods of assessment.

Prequalification and bid evaluation criteria

Prequalification and bid evaluation procedures are currently used in many countries, and involve many different types of criterion to evaluate the overall suitability of contractors. These are said to include:

1. general, technical, managerial and financial criteria (Hunt *et al.*, 1966);
2. financial stability, managerial capability and organizational strength, technical expertise and experience of comparable construction (Merna and Smith, 1990);

¹ The Banwell Report (Banwell, 1964) observed that the construction industry does not appear to move forward with the same speed and purpose of its active members, which are lively and full of new ideas. In Banwell's view, this is due to the fact that the various sections of the industry have long acted independently of each other. As a result, the Banwell committee considered the most urgent problem confronting the construction industry to be the necessity to think and act as a whole. In fact, there is widespread agreement that even the Simon Report (1944), the report by Sir Harold Emmerson (1962) and the Banwell Report themselves have resulted

in little action or implementation of their proposals. This is a situation in need of attention and "unless an effective communication network is established . . . more and more cases of bad practice will come to light" (NJCC, 1994).

² According to Latham (1994, p. 50), both the DoE and the DoT ask applicants to submit similar documents. Most local authorities and other public sector clients also keep separate lists. Such duplication of effort, it is argued, is wasteful of money and adds costs to the clients because of the resource implications of maintaining separate lists.

3. relevance of experience, size of firm and safety record (Moselhi and Martinelli, 1990).

To this Dennis (1993) adds the criterion of previous prequalification. A review of prequalification records, he maintains, should satisfy both the engineer and the client, in that each bidder should have:

1. the financial strength to sustain the cash flows likely to arise during the project; experience of projects of a similar nature;
2. competence and plant capacity to complete the project within the constraints imposed by the contract;
3. technical capability (including human resources) sufficient to satisfy the requirements of the contract;
4. a complete understanding of similar project scopes and ability to absorb subsequent changes;
5. the facilities (testing, quality control, etc.) necessary to endorse assurance of quality;
6. the ability to comply in all respects with health and safety regulations.

Criteria may vary in emphasis according to the characteristics of the project. For planning and tendering the parallel runway for Kingsford Smith Airport, for example, where a design and build contract was the method assigned for the project delivery, several criteria were investigated for selecting a suitable contractor for the job (Herbert and Biggart, 1993). These were:

1. management capability (project management structure, human resources and quality management);
2. delivery capability and experience (proposed construction methods and plant ownership, current and completed contracts);
3. relationships (industrial relations, occupational health and safety, and claims and dispute history);
4. financial status (based on an investigation of measures such as net assets, earnings and several financial ratios including debt to equity, current ratio and ability to carry construction losses).

Another case is a contract auction for a multistorey office building, estimated at US\$10.4 million for construction and US\$1.57 million per year for the operation, where Moselhi and Martinelli (1990), in consultation with industry, found the selection criteria considered for bid evaluation to be:

1. bid amount;
2. annual life cycle cost;
3. number of years in business/bid amount;

4. volume business/bid amount;
5. financial credit/bid amount;
6. previous performance;
7. project management organization;
8. technical expertise;
9. time of execution;
10. relation with subcontractors.

In yet another case (Diekmann, 1981), where there was the problem of selecting a contractor for a hybrid unit/price cost-plus contract, higher-level criteria were proposed, comprising cost exposure, company stability, quality of produce, and management capability, each of which were then broken down into second, third, and (in some cases) fourth levels of subcriteria.

The criteria are also used in the process of short-listing: i.e. where the number of applicants for prequalification is so great that the number of contractors has to be reduced to a shortlist. Here Merna and Smith (1990) found that the type and size of contract together with regional and physical location were used as criteria in addition to the quality and quantity of technical and managerial expertise available.

Information

It is necessary to collect and analyse information in order to quantify objectively the criteria for prequalification and bid evaluation. This information includes that relating to (Hunt *et al.*, 1966):

1. the contractor's permanent place of business;
2. adequacy of plant and equipment to do the work properly and expeditiously;
3. suitability of financial capability to meet obligations required by the work;
4. appropriateness of technical ability and experience;
5. performance of work of the same general type and on a scale not less than 50% of the amount of the proposed contract;
6. the frequency of previous failures to perform contracts properly or fail to complete them on time;
7. the current position of the contractor to perform the contract well;
8. the contractor's relationship with subcontractors, or employees.

The assessment of contractors who have previously prequalified can, of course, be assisted by reference to previous prequalification records.

In total, the information used for the assessment of criteria for prequalification and bid evaluation falls into five groups: general information that is used mainly for administrative purposes, financial information,

technical information, managerial information and safety information.

General information

This concerns the administrative information relating to contractors wishing to be considered for inclusion in clients' standing lists. There is very little literature on this subject. Ng (1992) has mentioned only the name of the contractor in his list for gathering data about each contractor for the prequalification process. Seeley (1986), referring to Haswell and Da Silva (1982), covers more information about the contractors, including the legal status of the company, particulars of holding, subsidiary or associated companies, membership of trade association and names of directors, while Holt *et al.* (1994) found litigation tendency, size, age, and image of the contractor to be popular information collected from contractors, although ranking 24, 27, 29 and 31 in importance among the 31 variables in his study.

Financial information

This involves financial statements and other information to check on the financial exposure of the company for both domestic and overseas contracts. Financial status is most often assessed by ratio analysis, examination of bank references, credit reference and turnover history (Holt *et al.*, 1994). Financial stability, on the other hand, requires the consideration of credit ratings, bank arrangements, bonding capacity and financial statements (Russell *et al.*, 1992). Furthermore, studies by Severson *et al.* (1993, 1994) on predicting the likelihood of experiencing a claim, investigated trends in contractor financial data in the form of the assets, liabilities and stockholders' equity portion of the contractor's balance sheet, together with the contractor's income statement.

Technical information

This is concerned principally with the current commitment of the contractor's labour and plant resources, ability to handle the type, quality and size of work, and the ability to perform on site. 'Past experience', which includes the type and size of projects completed, is the technical information most used (Holt *et al.*, 1994), and is assessed by visits to existing sites and by meetings to discuss, in general terms, the nature of the construction work, the programme dates and the client's requirements.

Managerial information

Managerial organization and expertise are considered by identifying the contractor's managerial approach to risk, contract strategy, claims and variations. Here Ng (1992) has listed four sources of managerial information:

1. management and organization of work;
2. resources;
3. coordination-control-response;
4. documentation.

Helmer and Taylor (1977) have classified these management variables into three fundamental areas:

1. planning (management perspective, qualification of key management personnel, use of planning tools);
2. organization (integration of activities, communication, human relations);
3. controlling (control system, adaptability, risk assessment, subcontract management).

Finally, Diekmann (1981) has grouped the management source of information into site organization, project manager, corporate management, experienced procurement, project control, and historical performance.

Safety information

Samelson *et al.* and Samelson and Levitt (1981, 1982) has focused on construction cost reduction by means of accident cost control through owner selection of safe contractors. A survey of construction site safety in Honduras (Jaselskis and Suazo, 1994) indicated a substantial lack of awareness of the importance of safety at all levels of the construction industry. Questions on experience modification rating (EMR) and the Occupational Safety and Housing Administration (OSHA) incidence rate can, however, generate the required information about the safety performance of the contractors.

Assessment and evaluation

Assessment

The information relating to the criteria can be assessed in various ways. Moore (1985), for example, has proposed a quantitative system for selecting contractors for fast track projects in which an evaluation team initially visits the contractor's home office to collect the required information and assign preliminary scores to the criteria used. Table 1 shows how this is done. A maximum point value is assigned for each aspect of construction project execution. These values are then weighted according to their relative importance on the overall project delivery strategy. When a category is made up of subcategories, the weighted value scores of the subcategories are added to calculate the total value for the category. To avoid individual biases, it is recommended that a minimum of three evaluators is required for each scoring activity.

Table 1 Relative importance of project execution factors

Maximum points	Category or criteria
5	Craftsmen availability
5	Training or skill level of craftsmen
	Supervision:
	80% interviews and reference checks on 8–10 key people
25	10% foreman quality and training
	10% foreman availability
10	Productivity improvement programme
25	Systems and procedures:
	Cost, schedule, material control, personnel, accounting, subcontracts, purchasing, safety
5	Field organization, work rules, work policies
3	Safety record
2	Geographical experience
3	Experience with the specific type of facility
5	Quality control
2	Home office support
2	Executive involvement - leadership
5	Small tools and construction equipment (condition and procedures)
3	Engineering coordination
100	

Source: Moore (1985)

Holt *et al.* (1993) have proposed a modification of the present system (prequalify/select) with quantifiable indices. This comprises a three-stage process requiring the calculation of what is called a P1 scale index to investigate the more general areas surrounding potential tenderers. A P2 scale index is calculated for the second stage to assess the contractor further in the light of specific factors. Finally a P3 scale index is calculated to compare the bid prices of the invited tenderers.

Evaluation

The term 'evaluation' is used to denote the procedure for the strategic assessment of tender bids submitted by prequalified contractors. It is said that the strategy used for bid evaluation should reflect the client's objectives (Hardy, 1978). These, according to Herbsman and Ellis (1992), amount to the 'major' criteria of cost, time and quality as measured by the bid amount, time of execution and quality of previous work respectively. This implies that the winning bid is fully responsive to the contract in addition to the bidder's being sufficiently well qualified to undertake the contract (Hardy, 1978). In addition, Herbsman and Ellis (1992) have also proposed further project-specific criteria, including safety, durability, security and maintenance.

The UK public sector of civil engineering, however, is thought to follow the concepts outlined in guidance notes of the Institution of Civil Engineers (1983) and the NJCC 1983, 1985, and 1989 Codes for building, which are concerned with the justification of the lowest priced bid (Merna and Smith, 1990). The exception is Ellis and Herbsman (1991) who found, from a 16-case study, that timely completion was a significant factor in the selection of the successful tenderer.

Another procedure for bid evaluation in use in the UK public sector is that by clients who require a tender submission of only an initial lump sum price without a pre-qualifying process. These clients sometimes request further information from tenderers for a more detailed evaluation of the three lowest bids (Merna and Smith, 1987). In this case, clients request a complete package of information from tenderers checked initially for qualification, alternatives and errors in the tenders before proceeding to a more detailed technical, financial or contractual evaluation to identify the winning bidder.

Any bid evaluation practice that goes beyond that of selection of lowest bidder is currently largely subjective (Merna and Smith, 1990). More objective methods have been proposed by Moselhi and Martinelli (1990) and Diekmann (1981) by means of multi-attribute utility techniques for combining the bid price and contractor selection criteria. The evaluation of bids by multi-attribute methods can encounter some difficulties when comparing different criteria measured on different scales, and various ways have been suggested for combining criterion values into a single scale. Hardy's (1978) criterion, for example, is the bid that maximizes the return on the client's investment. Thus he proposes that bidders should submit a schedule of the payments they expect to fall due to them during the contract. Both the client and contractor may use this to determine the present value of bids. Ellis and Herbsman (1991), on the other hand, propose a time/cost approach to determine the winning bidder in highway construction contracts by which a road user cost is applied to the contract time proposed by each bidder. Therefore in this case it is suggested that the criteria to be considered are bid prices and contract time (the road user cost being applied to the contract time). By converting the contract time to a cost to the client, a straightforward comparison can be made on a single criterion. Finally, Holt *et al.* (1993) combine their P2 and P3 scores into a simple index by assigning a 60% weighting for the P3 score (representing the bid price) and a 40% weighting to the P2 score (representing the scores of the information collected).

Conclusions

The conclusion from these disparate studies is that

Table 2 Types of firm interviewed

Interview date	Position	Type of firm	Sector
13 January 1994	Select list coordinator	Technical and consultancy division (client representative)	Direct works Civil and building engineering
14 January 1994	Office administrator	City architect department	Building engineering
19 January 1994	Practice manager	Architect division	Building engineering
21 January 1994	Quantity surveyor	Technical and consultancy division (area office)	Building engineering
22 January 1994	Architect engineer and owner representatives	Consultant	Building
24 January 1994	Chief assistant engineer	Civil engineering division	Civil engineering
26 January 1994	Chief engineer	Architect department, landscape division	Building
8 February 1994	Director of accountants	Finance department	Building, civil and direct engineering works
10 February 1994	Health and safety officer	Health and safety section	Building, civil, and direct engineering works
24 February 1994	Architect engineer and owner representatives	Consultant	Building

there is no consensus as yet on a common set of criteria for contractor selection. Several recurrent factors emerge, however. The lowest bid is clearly the most dominant criterion, as this involves no subjective judgement, and satisfies most of the requirements of public accountability. Most sources mention the need to consider financial and technical criteria, on the grounds that contractors have to have a minimal level of resources to complete the work. On the whole, the quality of resources and managerial capability seem to be secondary issues.

Interview findings

In order to corroborate the findings and views of these earlier studies, an interview survey with a sample of nine people with relevant construction industry experience was undertaken. The list of interviewees, comprising client representatives, was compiled by reference to The Royal Institution of Chartered Surveyors list of the 1993 directory (RICS, 1993) and personal contacts in the north-west of England. The interviews were conducted at the offices of eight different public client representatives and one private client representative, and comprised one civil engineering, three building engineering, one landscape, one financial, one safety and health policy, and two list coordinators. Table 2 lists the types of personnel interviewed and other information on the types of firms that participated in the interview. The interviews ranged from 1 to 2 hours, with each interview being tape-recorded.

In order to make the interviewing more effective and to save the time of the interviewees, the purpose of the interview and the need of the research was communicated to the interviewees before the interview through either: (1) a simple list of questions developed and sent to the interviewees (Appendix 1); or (2) a telephone conversation. The interviews were conducted in an open, semi-structured manner, allowing the respondent to introduce whatever information was felt to be relevant, but with the topics identified from the literature survey being introduced by the interviewer at convenient points.

The interview responses were all found to fall into one of the following three categories:

1. what information is considered *for selecting contractors*;
2. how the information is used to assess the four criteria;
3. the strategies that are employed to evaluate the criteria.

Information considered

Information from contractors

Information is obtained from firms wishing to be included on a standing list of approved contractors or project tendering list, usually via a detailed questionnaire from the client. Firms already included on a standing list must also provide all the information required. The information is always treated as a matter of utmost confidentiality, and is used only in compiling and monitoring approved lists of contractors. The

Table 3 General information about the contractors

Full name and status of company	
Local address	
Telephone number	
Registered office address if different from above	
Date company established	
Company registered number (indicate public, private or cooperative)	
Cooperative companies must comply with ICOM Model rules	
Date when last company accounts were registered and the financial year to which they relate	
Parent company (if applicable)	
Nominal and paid-up share capital	
Managing Director	Name and tel no.
Person dealing with the application on behalf of the company	Name and tel no.
Description of the company/firm's business activities. Please confirm that the objects of the company stated in its memorandum of association cover the purposes for which this list is being compiled	
Sole trader/partnership	
Full names of proprietor or every partner	
Date of formation or commencement of trading	
Person dealing with this application	Name and tel no.
Description of the business activities	
For all firms	
List the names of every director, partner, associates and company secretary	
Have any of the directors, partners or associates been involved in any firm that has been liquidated or gone into receivership? (give details)	
Has any director, partner or associate been employed by the client? Details required	
Is any director, partner or associate a relative of any of client employees?	

information requested from applicants comprises both general and specific information.

Application forms often request information relating to:

1. categories of work offered by the firm;
2. company details;
3. scope of work offered by the firm;
4. technical resources and references;
5. particulars of existing insurances;
6. taxation details;
7. financial information;
8. subcontracting;
9. race relations;
10. plant and equipment;
11. health and safety.

Typical company details required are given in Table 3.

The following is a list of information requested from the contractors by one of the clients:

1. types of work that the firm wishes to, and could, carry out;
2. financial penalties previously levied in respect of failure to perform to the terms of a contract;
3. contracts that the firm has had terminated or employment determined under the terms of contract;

4. contracts not renewed due to failure to perform in accordance with the terms of contract;
5. competence of potential employees (this may include job descriptions, application forms, references, qualifications, inspections of previous work, trial periods before confirmation of employment and personal recommendations;
6. skills, including professional, managerial and technical expertise, that are available to the company, e.g. qualifications and relevant experience;
7. staffing levels in the company, including management, professional/technical, administrative/clerical, manual supervisor;
8. currency of records of employees;
9. names, addresses and details of work carried out recently for public sector clients other than this authority, including supervising officer, contract title, tender price and type of work;
10. contracts carried out for the client in the last 3 years;
11. main plant and equipment owned by the company.

Other information

An initial assessment leads to a reduced number of contractors followed by a detailed investigation

involving requests for information from referees. Clients use different ways of requesting information from the referees, and there are distinct differences in the type of detailed information requested.

The finance personnel interviewed use information collected from mainly two sources of information: (1) the standard business report from Dun & Bradstreet, including payment profile, liquidity and equity; (2) 3 years' published accounts from the contractor, which include balance sheet statement and income statement (profit and loss account). In addition, financial assessments may also include:

1. confirmation that the company is still trading;
2. a statement of turnover since the last set of published accounts;
3. details of any outstanding claims or litigation against the company.

Applicants also have to provide security information in the form of a health and safety policy. This covers the names of personnel responsible for implementation of the policy, number of employees, procedures to convey the safety policies to the employees, procedures for reporting and recording the accidents, first aid provision, and details of prosecutions served on the firm by health and safety executives. Further information includes particulars of existing insurances, taxation, subcontracting and race relations record.

Criteria assessment

Contractors may be rejected at any stage of the prequalification process: i.e. during preliminary screening or after a detailed investigation. For the larger client organizations, the application forms are received by a list coordinator. The provision of incomplete information, or failure to enclose the relevant documents, usually excludes any further assessment of criteria. Valid forms are then passed to different sections and departments for assessment against the selection criteria.

Assessment of general information

Some of the general information is used for administrative purposes, the remainder being used for technical and financial assessment of the contractors. General details of the company, such as the date of establishment, whether a contractor is a cooperative or has a parent company, are usually requested for administrative purposes, although they might be used as an indication of the firm's general status. All those interviewed were found to use subjective judgement in assessing general information.

Assessment against technical criteria

Most of the clients, with minor variations related to the general policy of the client (such as ability to attract local labour), use the same type of information for assessing the technical ability of the contractors.

Eighty per cent of the clients interviewed use dichotomous (yes/no, rejected/accepted) or trichotomous (bad/good/excellent) variables for assessment, with the remaining 20% using a point system (1, 2, 3 . . .). Table 4 shows a points system used by one of the clients interviewed. Another client uses a cardinal system for assessing technical information requested (Table 5). All interviewees use value judgements based on the experience of the assessor and the information available.

The following are some of the reasons used by clients' representatives for rejecting applications on technical grounds:

1. unsatisfactory work or performance on a contract for the client within the last 5 years;
2. unsatisfactory work or performance on a contract for any other authority or company;
3. no previous experience in the category of work applied for;
4. habitual submission of excessive claims;
5. declined invitations, or no tender submitted on at least three occasions in the previous 12 months;
6. inadequately staffed reception arrangements for telephone at head office;
7. inadequate plant resources;
8. likely to cause additional cost to the client in supervising contracts because of inadequate arrangements for head office or site management;
9. disregard for the conditions of contract or instructions given by, or on behalf of, the supervisor.

Assessment against financial criteria

The detailed measurement and financial analysis of contractors carried out by clients involves the assessment of the contractors' past, present, and anticipated future financial condition. The request form used for the financial assessment of contractors takes the form shown in Figure 1. The objective is to identify any weaknesses in contractors' financial health that could lead to future problems, and to determine any strengths the firm might capitalize upon. Clients or list coordinators pass the completed application forms to their finance departments for financial analysis/assessment.

The financial status of the contractor is used as a criterion to cover aspects such as the financial stability, liquidity and financial capacity to perform the work.

Table 4 The point system used for requesting technical criteria

		Points out of 20
1.	Planning, programming and general progress	
2.	Site organization and supervision	
3.	Quality of workmanship	
4.	Adequacy of labour force and plant	
5.	Responsibility and consideration for the general public	
6.	Responsibility and consideration for the adjoining owners affected by the work	
7.	Signing, lambing off and watching	
8.	Taking of adequate safety precautions on the work	
9.	Willingness to effect remedial works which were required during the defects liability period	
	Interim and final accounts:	
10.	Presentation	
11.	Settlement	
	What was the contractor's attitude with regard to claims?	
12.	Justification	
13.	Documentation	
14.	Settlement	
	Any other comments regarding claims	
15.	Relations with statutory undertakers	
16.	Working relations between members of the referee staff and the staff of the firm including Head Office staff	
	Total score out of 320	
17.	Percentage of work sub-let	
	Details	
18.	Standard of Sub-contractors work: Points out of 20	

20 points = outstanding, 15 points = good, 10 points = satisfactory, 5 points = poor, 0 points = unsatisfactory

Table 5 Technical information requested for cardinal system

1.	Type of work the firm has carried out for the referee	
2.	Value of work the firm has carried out for the referee	
3.	The quality of workmanship was:	Poor/Average/Good
4.	The referee relationships with their management were:	Poor/Average/Good
5.	Their site organization and programming were:	Poor/Average/Good
6.	Compliance with specification was:	Poor/Average/Good
7.	Did the firm have difficulty providing adequate labour?	Yes/No
8.	Was the contract completion date achieved?	Yes/No
9.	Has the firm completed defects to the referee's satisfaction?	Yes/No
10.	Were damages for non-completion ever applied?	Yes/No
11.	Relationship with subcontractors and suppliers generally	Poor/Average/Good
12.	Were nominated subcontractors paid promptly?	Yes/No
13.	Was the final account settled amicably without undue claims?	Yes/No
14.	Did the contractor have a tendency to make excessive claims?	Yes/No
15.	Does the referee consider this firm capable of undertaking the work assigned to him?	Yes/No
16.	Would the referee employ this firm again if the occasion arose?	Yes/No
17.	Any further comments that would be helpful	

FAO Peter Harrington
Finance Department
Town Hall

Date

Please carry out a financial vetting of the following contractor:–

Contractor:

Address Tel:

Contracts Applied For: £

Reg. No.

Information by Finance Department

Company Turnover:

Date of Company Accounts:

Contractors financially suitable for contracts:–

	Please Tick
£0 to £50,000
£50,000 to 100,000
£100,000 to 500,000
over 500,000
The contractor is not financially suitable to work for Bury MBC

Comments
Please return form ASAP TO:
Neil S. Long
Department of Development Services

Figure 1 Financial reference for contractors

Financial status is measured by four decision parameters:

1. *credit status*, which is collected in the form of credit ratings from subcontractors and suppliers (this measures how promptly contractors pay their bills and their reputation among suppliers and subcontractors);
2. *bank status*, which gives an indication of the financial management abilities of the contractors and their relationship with a bank that would enable them, in the event of cash flow difficulties, to obtain the required financing;
3. *bond status*, which measures the capability of the contractors to get a bond for a certain type and size of project;
4. *published accounts report*, which measures the liquidity, efficiency and profitability of the contractor.

Two main *financial statements* are generally used by the finance departments to assess the financial status of a contractor:

1. *Balance sheet*. The balance sheet represents a statement of the financial position of a firm on a given date, including its asset holdings, liabilities, and owner-supplied capital. Assets represent the resources owned by the firm, whereas liabilities and owner's equity indicate how those resources are financed. Table 6 shows an example.
2. *Income statement*. The income statement represents an attempt to measure the net result of a firm's operations over a specified interval, such as one quarter or one year. The income statement is sometimes referred to as a profit and loss statement.

Table 6 Balance sheet of Contractor X

<i>Assets</i>	<i>£</i>	<i>£</i>	<i>£</i>
Current assets:			
Cash		1400	
Accounts receivable		10 000	
Inventories		12 000	
Prepaid expenses		300	
		-----	-----
Total current assets			23 700
Fixed assets:			
Land		2000	
Plant and equipment	12 300		
Less: Accumulated depreciation	7300		
Net plant and equipment		5000	
		-----	-----
Total fixed assets			7000
Total assets			30 700
<i>Liabilities and owner's equity</i>			
Current liabilities			
Accounts payable		3000	
Notes payable		3400	
Accrued salaries, wages		3100	
Current portion of long-term debt		500	
		-----	-----
Total current liabilities			10 000
Long-term liabilities:			
Deferred income taxes		1500	
First mortgage bonds		6000	
Debentures		2900	
		-----	-----
Total long-term liabilities			10 400
Owner's equity:			
Common stock		100	
Additional paid-in capital		2000	
Retained earnings		8200	
		-----	-----
Total owner's equity			10 300
Total liabilities and owner's equity			30 700

Clients use these statements for the purpose of financial ratio analysis for each contractor. These ratios are then compared with the average industry ratios. The average industry ratio is derived from a financial analysis for all firms, which is usually carried out by government or national agency. The financial ratios provide the basis for answering very important questions about the financial standing of the contractor:

1. How liquid is the firm: Liquidity refers to the firm's ability to meet maturing obligations and to convert assets into cash.
2. Is management generating sufficient profits

from the firm's asset? Because the primary purpose for purchasing an asset is to produce profits, the analyst often seeks an indication of the adequacy of the profits being realized.

3. How does the firm's management finance its investments: these decisions have a direct impact upon the returns provided to the common stockholders.
4. Are the common stockholders receiving sufficient returns on their investment?

Categories of financial ratios and what each ratio will indicate on the financial standing of the contractor are

Table 7 Summary of financial ratios

Ratio	Formula	Calculation average	Industry	Evaluation
Liquidity ratios				
1. Current ratio	current assets/current liabilities	23 700/10 000 = 2.37	1.7	Satisfactory
2. Quick ratio	(current assets – inventories) current liabilities			
Efficiency ratios				
3. Average collection period	average accounts receivable/ (annual credit sales/360)			
4. Inventory turnover	cost of goods sold/ending inventory			
5. Fixed asset turnover	sales/fixed assets			
6. Total asset turnover	sales/total assets			
Leverage ratios				
7. Debt ratio	total liabilities/total assets	20 400/30 700 = 67%	58.9%	Poor
8. Long-term debt to total capitalization	long-term debt/total capitalization			
9. Times interest earned	net operating income/annual interest expense			
10. Cash flow overall coverage ratio	(NOI + lease expense + depreciation/ interest + lease expense + principal payments)/(1 – tax rates)			
Profitability ratios				
11. Gross profit margin	gross profit/sales			
12. Operating profit margin	net operating income/sales			
13. Net profit margin	net income/sales			
14. Operating income return on investment	net operating income/total assets			
15. Return on total assets	net income/total assets			
16. Return on common equity	net income available to common/ common equity			

provided in financial management standard texts. Table 7 summarizes the different ratios corresponding to the industry norms.

Trend analysis is sometimes performed to determine how different variables have changed over time for contractors. A firm's financial ratios can be compared with two types of standards: (1) industry norms, as the basis for comparison between the financial status of the firm with respect to the average of the industry; and (2) trend comparisons, for the firm itself over a minimum period of three years. An example of trend analysis is shown in Table 8.

Assessment against managerial criteria

These criteria are used to assess elements such as the

1. capability to execute the work in an appropriate manner;
2. existence and application of quality control programmes;
3. ability to coordinate the work;
4. previous performance of the company in projects of similar type and size;

5. percentage of the work previously performed by the company that was completed within budget and on schedule;
6. quality of work achieved in the last projects;
7. quality programmes of the company;
8. managerial approach to risk, especially at a pre-award meeting.

As with the technical criteria, most of the clients interviewed use subjective methods, although a few do use quantitative methods in assessing the information.

Assessment against security criteria

This information is not always taken seriously by clients, and it is rare to find a contractor rejected on this criterion, especially if the contractor is already on a standing list. Several points are checked by the safety officer during the pre-award meeting, however, including company safety policy, method statement, F10 notices used in the UK for contracts over 6 weeks' duration, job flow charts, welfare provisions, electricity regulations, IE ELCB or 110 V transformers, health and safety information charts for employees, accident

Narrative	Year 3	Year 2	Year 1
Date		31/3/91	31/3/90
turnover (£)		2 115 532	1 512 652
Gross profit (£)		234 379	192 962
Trading profit/Operating profit (£)		14 353	4 943
Totals assets less current liabilities (£)		65 392	48 516
Stock and work in progress (£)		2000	4 631
Current assets (£)		524 601	336 953
Current liabilities (£)		516 349	331 122
Current assets less stock and work in progress (£)	0	522 601	332 322
Debtors (£)		271 903	215 572
Creditors (£)		516 349	331 122
Contract size (£)		200 000	200 000
Ratios			
Return on capital employed (%)	ERR	21.95	10.19
Gross profit as a percentage of turnover (%)	ERR	11.08	12.76
Trading profit as a percentage of turnover (%)	ERR	0.68	0.33
Work per £ of capital employed	ERR	32.35	31.18
Current ratio	ERR	101.6	101.76
Quick ratio	ERR	101.21	100.36
Debtors: creditors	ERR	52.66	65.1
Contract size to turnover (%)	ERR	9.45	13.22
Comments			
Ratios			
Turnover			

[illegible]

books, excavations weekly examinations, reports of tests (sites), lifting appliances, weekly inspections and test reports, scaffolding weekly examinations, cranes, eye bolts certificates of test and examination, underground services, and drainage connections. Again, all the information is assessed subjectively.

Criteria evaluation

The strategies for shortlisting contractors for invitation to tender are different from one client to another.

For the *standing list* tendering system some clients select contractors at random from the list for invitation to bid, while most clients select in rotation. Still others use a points system, in which those on the list are invited to tender through an advertisement in the press. In this case, selection is made from those applying who are willing to tender and receive the full package on the basis of a points score, with the highest six scorers given the chance to tender. Table 9 provides an example of this system and the criteria that are considered in selection.

For *project list tendering*, a quantitative system is used in which contractors are invited to tender through an advertisement in the press or by direct invitation. In this case, selection is made from those applying who are willing to tender and receive the full package on the basis of a points score, with the highest five to six scorers given the chance to tender.

At bid evaluation stage, it is the practice of all the respondents to select the contractor tendering the lowest bid irrespective of the technical, financial,

managerial and security information available. Thus the lowest bid is currently used to decide the winner of all contracts, even if the contractors tendering for the contract had received lower assessments compared with the other tenderers for other criteria.

After the winning contractor is identified by the client, final checks and a pre-award meeting are normally carried out to clarify the technical, safety, and risks associated with the construction.

Discussion

The most notable aspect of this study is the increasing subjectivity in our interviewees' practices in moving from information collection through criteria assessment to final evaluation phases. Although only ten practitioners were interviewed, and all are clear about the information to be collected and the general reasons for its collection, there is some variance on the criteria for which the information was to assess, and complete perversity in the abandonment of the criteria in the bid evaluation phase. The following are the main points drawn from the investigation, and can serve as an indication of the current practice in the construction industry.

- 1. The application forms used to collect information about the contractor differ in structure and in the detailed information requested for most of the clients interviewed.
- 2. Financial soundness is the most important

Table 10 The main source of criteria for contractor prequalification and bid evaluation

Financial soundness	<ul style="list-style-type: none">1. Financial stability2. Credit rating3. Banking arrangements and bonding4. Financial status
Technical ability	<ul style="list-style-type: none">1. Experience2. Plant and equipment3. Personnel4. Ability
Management capability	<ul style="list-style-type: none">1. Past performance and quality2. Project management organization3. Experience of technical personnel4. Management knowledge
Health and safety	<ul style="list-style-type: none">1. Safety2. Experience modification rating (EMR)3. Occupational Safety and Housing Administration (OSHA) Incidence rate4. Management safety accountability
Reputation	<ul style="list-style-type: none">1. Past failures2. Length of time in business3. Past owner/contractor relationship4. Other relationships

Table 11 Measures of financial criteria

Financial stability	Credit rating	Banking arrangements and bonding	Financial status
Current and fixed assets	Subcontractors Suppliers	Short-term borrowing Long-term borrowing Bonds	Balance sheet statement
Liquidity Annual turnover			Income statement

Table 12 Measures of technical criteria

Experience	Plant and equipment	Personnel	Ability
Experience over last five years in construction	Availability of owned construction equipment	Availability of first-level supervisors, and number presently employed	Ability to handle the offered type and size of work
Current and completed contracts	Adequate plant and equipment to do the work properly and expeditiously	Availability of skilled crafts	Ability to perform on site
Past experience on owner's major projects		Expertise in design	Ability to control and organize contracts and efficiently integrate labour resources
Experience and capability of technical field personnel	Small tools and construction equipment	Skills, including professional and technical expertise, that are available to the company, e.g. qualifications and relevant experience	Ability to meet target dates
Complexity of work executed	The testing equipment as quality assurance		
Level of technology			
Types of projects executed in the past five years		Craftsmen availability	
Performed work of the same general type and scale, and ability to absorb subsequent changes		Training or skill level of craftsman	
		Supervision	

criterion considered during the prequalification stage.

3. There is little awareness of the importance of safety criteria, which are treated as of secondary importance. It is enough for the contractor to submit a two-page safety policy to be accepted for a standing or a project list.
4. Attitude towards claims is an essential issue.
5. Ability to complete on time is also an essential criterion considered during the detailed investigation phase.
6. Approach to dealing with third parties (e.g. gas and electricity suppliers) is important for civil engineering works, and relationships with

subcontractors and suppliers are considered important for building and civil engineering works.

7. Different methods are used to assess the information collected.
8. Bid price is the only criterion considered by all clients in the bid evaluation phase.

In fact the distinct impression gained is that of the cart being put before the horse in a situation reminiscent of Buckminster Fuller's *Operating Manual of Spaceship Earth*, where it is conjectured that our major institutional systems were put in place for the amusement of some whimsical, and long since departed, extra terres-

Table 13 Measures of managerial criteriaPast **Table 13** Measures of managerial criteria

Past performance and quality	Project management organization	Experience of technical personnel	Management knowledge
Past performance	Experience in completion of project on schedule	Present workload and capability of contractor key site-management personnel	Scheduling and cost control system and how it is utilized
Quality-control program and quality of work on past projects	Planning, programming and general progress Site organization and supervision	Availability of first-line supervisors	Material control, personnel, accounting, subcontracts, purchasing
Quality assurance certificate	Engineering coordination	Staffing levels in the company including management, professional/technical, administrative/clerical	Level of research and development
Quality level, including aesthetics, confidence in design, and flexibility in accommodating design inputs by the client	Present workload and capability to support the current projects Capability to manage subcontractors.	Executive involvement-leadership	Risk avoidance and responsibility, including client involvement and design liability
Quality of workmanship	Drawing control procedure Capability to perform material control Methods of procurement adopted Certainty, including the reliability of the original price, reliability of the estimated construction time, and knowledge of exactly how much the client has to pay at each period during the construction phase. Field organization, work rules, work policies		Productivity improvement programme Time performance Predicted outturn costs

trial ‘pirates’! While the logic is clearly appropriate – the ‘ends’ of contractor selection justify the ‘means’ of evaluation through criteria development and assessment through information collection – the formal procedures necessary to collect the information seem to have taken on a life of their own at the expense of the more difficult phases of assessment and evaluation, which, in the absence of any formal procedures, appear to take place in a largely subjective and ad hoc manner.

The central issue in this is the criteria to be used in contractor selection. These are determined by the client or project objectives, and determine the infor-

mation needed for their assessment. Although it was not possible to make direct comparisons between criteria used by different clients, because of the often implicit nature of these criteria, we had little difficulty interpreting their actions in terms of the four criteria identified in the literature. This strengthens our belief that, although there is little sharing of knowledge between clients, the similarity of their goals tends to result in the use of similar criteria.

The results of this study indicate that there is some variation in the measures and methods of assessment used. Each client uses a different scale for categorizing

Table 14 Measures of health and safety criteria

Safety	Experience modification rating (EMR)	OSHA incidence rate	Management safety accountability
Experience in handling dangerous substances	Financially rewarding or penalizing employers according to their accident claims	OSHA is the Occupational Safety and Housing Administration.	Who in the organization receives and reviews accident reports, and what is the frequency of distribution of these reports?
Experience in noise control		The OSHA incidence rate is the average numbers of injuries and illness, per 100 man-year for a construction firm	Frequency of safety meetings for field supervisors
Accident book			Compilation of accident records by foremen and superintendents, and the frequency of reporting
Complied in all respects with health and safety regulations			Frequency of project safety inspections, and the degree to which they involve project managers and field superintendents
Health and safety information chart for employees			Use of an accident cost system measuring individual foremen and superintendents as well as project managers
Safety record			
Company safety policy			

the contractors. Furthermore, although clients apply all the criteria to some extent, there is no systematic way of developing and differentiating between methods of assessment.

Also, an important and surprising omission for all those interviewed is that there is no investigation of the contractors' workload outside the client environment at the time of contract awarding.

A common set of criteria

As discussed above, most of the clients involved in the study use the same type of criteria with some variation, but all of them use a mixture of criteria to collect information about the contractors. Also, there was no definite differentiation and classification of these different types, which makes the assessment more difficult. This confirms the findings of the literature surveyed. Thus our small survey, in conjunction with the literature, allow us to summarize the five main criteria currently used, arranged in a way to assess the method of collection for information about contractors, and also for assessment later in the selection of contractors in the prequalification and bid evaluation stages. Table 10 identifies these five main criteria (*financial soundness, technical ability, managerial capa-*

bility, safety, and reputation) along with the information necessary to assess these criteria.

Table 11 summarizes the financial soundness criteria. Table 12 covers the technical criteria and the method of measurement of contractors' technical ability. The technical criteria are divided into four sources of information: experience, plant equipment, personnel, and ability of contractors. The measure of these criteria is shown for each type of source of information: for example, plant and equipment is measured by the availability of owned construction equipment, testing equipment, small tools, etc. Tables 13–15 cover managerial, health and safety, and reputation criteria respectively.

It is important to note that the degree of emphasis and the weights assigned to each criterion are different, and largely depend on the circumstances and specifics of the project as well as on the preferences of the decision makers and their different experiences.

Conclusions

The increasing needs in shorter project periods has led to the use of alternative forms of project delivery system, but the tendering and awarding systems are still largely in their original form. One of the most difficult decisions taken by the client is selection of the con-

Table 15 Measures of contractor reputation criteria

Past failures	Reputation		
	Length of time in business	Past owner/contractor relationship	Other relationships
Past and present experience regarding legal suits or claims	Amount of projects executed in the past five years.	Proximity of contractor's home office to project	Relationships with subcontractors, industrial
Reasons for recent debarment (if any)	Capacity of work	Responsibility and consideration for the client staff and general public	Maximum percentage of subletting
Reasons for failed contract (if any)	Company's stability	Performance of contractor over a number of previous invitations	Relationship with employees
Previous failures to perform contracts properly or to complete them on time	Permanent place of business	Responsibility and consideration for the adjoining owners affected by the work	Relations with statutory undertakers
Financial penalties previously levied in respect of failures to perform to the terms of a contract	Depth of organization	Experience of working with the owner: i.e. understanding of the owner's procedures in meetings and for payments. Public owners are quite different in this respect from private owners	Working relations between members of the referee staff and the staff of the firm, including Head Office staff.
Contracts that the firm has had terminated or employment determined under the terms of contract			Race relations
Contracts not renewed due to failure to perform in accordance with the terms of the contract			Standard of sub-contractors' work
		Local knowledge	
		Responsible attitude towards the work	

tractor, because the inappropriateness of the selected contractor leads to substandard work, delays, disputes, or even bankruptcy.

In order to cope with new developments and invite suitable bidders it is necessary to clarify and develop predetermined selection criteria, to improve and organize the assessment of information relating to these criteria, and to develop methods for evaluating the criteria against the owner's goals in the prequalification and bid evaluation stages of the procurement process. This paper has been concerned with identifying such criteria and the means by which different emphases can be accommodated to suit the requirements of clients and projects. The information, assessment and evaluation strategies currently used by procurers for screening contractors have been consid-

ered, and the results have been reported of an extensive literature review and a Delphic interview study with a small select sample of construction professionals with extensive experience in prequalification and bid evaluation processes. The findings indicate that the most common criteria considered by procurers during the prequalification and bid process are those pertaining to financial soundness, technical ability, management capability, and the health and safety performance of contractors.

Clearly, it is impossible, with a sample of only ten practitioners, to arrive at any firm conclusion with regard to prevailing practice, the consistency of practitioners both in the selection of the lowest bid and in the use of a general approach to tendering, and in the common criteria being used. There is, however, suffi-

cient corroboration with the general literature on the subject to indicate that the model proposed for collecting different types of criteria may well be appropriate in the general field.

The research on which this paper is based, rests on the premise that there is a possible common set of contractor selection criteria. If these criteria are identified and their levels of importance determined, the development of an objective quantitative selection framework could be facilitated. Construction clients may then apply more objective contractor selection methods as a means of identifying the most suitable contractor for a project. This alternative approach could avoid duplication of effort (with a commensurate reduction in individual clients' resource costs) in each devising an idiosyncratic set of criteria, as well as offering an improved prospect of client satisfaction with a project outcome.

In restricting the empirical part of this work to a small select group of procurers, it has been possible to identify key issues that may have been obscured in a larger study. The next stage should now be to conduct a larger and more focused study covering a wider range of clients. In this respect we recommend the use of the common set of criteria identified from this study as a basis for comparison, in terms of both identity and weights, of contractor selection criteria used by different clients in the construction industry. Once this has been realized, there is a real prospect of developing a prescriptive, or even normative, code for selection criteria to provide a consistent, logical, objective and therefore a comparable and communicable basis for useful information exchange between procurers of construction work for more accurate, reliable and efficient decision making.

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Appendix: List of questions discussed during the interview

Questions related prequalification processes and bid evaluation discussed during the interview:

1. The first question will be about the position of the interviewee, the firm and its activities, contractor selection, and involvement in bid evaluation.
2. What are the criteria that are currently considered by the firm during the prequalification process?
3. What is the objective of the client in the prequalification process, and what are the criteria that are considered for special circumstances i.e. projects of large size and value?
4. What criteria are used in bid analysis and evaluation?
5. Which of the criteria considered are more important than others, can you rank order these criteria?
6. What is the current method or methods being used for bid analysis?
7. What type of problems if any, have you experienced during the project execution period caused by the contractor not being capable of carrying out the job within the contract conditions?
8. Do you think the methods used currently for bid analysis are capable of identifying the most suitable and favourite contractor?
9. What other criteria do you think should be included in the prequalification process, and what other methods might be considered better for bid analysis?
10. Do you have any other comments related to the prequalification process and bid evaluation you want to add?