CHOOSING CONCESSIONAIRES IN BOT-TYPE PROJECTS

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Creative procurement strategies are required to bridge the ever-increasing gaps between public infrastructure needs and available public funding. Private sector involvement in public infrastructure development projects is increasingly encouraged. BOT-type procurement is becoming popular in such Private Public Partnerships (P/P P) in general. However, various special BOT-type procurement protocols are not yet 'proven', and are still being tried and tested. Many countries are still at the lower ends of their learning curves. A critical contributor to the success of a BOT-type project is the selection of the most suitable private sector proposal (tender), i.e. in choosing the 'right' concessionaire, who would provide the 'best' overall deal throughout the whole procurement process from Building, through Operation, to Transfer. Evolving practices in such selection exercises are compared across countries. Particular strengths of successful practices, including those from general contractor selection, are identified as a first step towards formulating a 'best practice' core methodology for these critical multi-criteria selection exercises. An indicative conceptual model is developed to illustrate this proposed core methodology in general. This incorporates a basic flowchart to demonstrate linkages to the different stages. The envisaged decision support system is intended to help public clients to improve concessionaire selection for BOT-type projects.

Key words: BOT, concessionaire selection, decision support system, public private partnership, procurement, tender evaluation

INTRODUCTION

A radical re-alignment of risks between project participants is a fundamental facet of the new procurement paradigm of BOT. Compared with contractors in traditionally procured projects, BOT concessionaires assume far more and deeper risks. These can be broadly classified into: 'project risks' comprising development, design, construction, operation, finance and revenue generation risks; and 'global risks' comprising political, legal, commercial and environmental risks (Garvey 1997). Selection of an appropriate concessionaire is thus crucial for the success of a BOT project, hence the need for benchmarking the good selection practices. For this purpose, a literature review of concessionaire selection priorities in BOT projects was supplemented by a review of contractor selection practices in traditional projects. This was supported by case studies, interviews/ correspondence with experts/ experienced practitioners in diverse public 'client' organisations. It was mainly the lack of experience in BOT-type projects, coupled with extensive experience in traditional contractor selection that prompted such additional comparisons. The objective was to extract elements of good practice from the latter that were relevant to the former, and to supplement the limited knowledge-base of BOT-type projects. Criteria commonly used for prequalifying contractors/ concessionaires, new developments in contractor selection, critical success factors (CSFs) and distinctive wining elements (DWEs) of

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BOT tenders, and current BOT tender evaluation techniques are identified and analyzed. A basic conceptual model for improved concessionaire selection is presented.

CONVENTIONAL CONTRACTOR SELECTION PROCESS

Public procurers have the same goal – the acquisition of a project at a reasonable cost, to a reasonable quality, within a reasonable time, with reasonable security and little inconvenience. To achieve this goal, the tendering system (whether negotiated, limited/local, or open competitive tendering) is used in order to choose the most suitable contractor. Pre-tender prequalification is a common practice adopted by many public clients.

Prequalification

The aim of prequalification is to evaluate a large number of contractors, based on their overall capability of undertaking a client's specific scope of work in general or a specific project in particular. Qualified contractors are then registered in a particular list, such as a standing list, approved list, project list or *ad hoc* list. Multiple criteria, which are usually consistent across most procurers, are used to prequalify contractors. Generally, these criteria can be grouped into five packages, namely, general, financial, technical, managerial, and 'safety, health and environment' aspects (Hatush and Skitmore 1997), as developed and illustrated for this paper in Figure 1. Public clients differ in their emphasis on these criteria due to the scope of their works, the specific needs of a particular project, or strategies employed. Investigation shows that financial strength is the most important criterion, while there is little awareness of the importance of the safety criteria (Hatush and Skitmore 1997).

Both 'static' and 'dynamic' modes of prequalification have been identified (Palaneeswaran and Kumaraswamy 1999). In static prequalification, contractors are classified or grouped into different levels or categories. For example, in Hong Kong, prequalified contractors for public works are listed in one or more of the categories of buildings, port works, site formation, waterworks, roads and drainage. Within each categories, contractors are further divided into Group A, B, or C according to the value of contracts for which they are eligible to tender. The resources and capabilities of contractors are periodically reviewed by public clients to maintain, suspend, or adjust (demote to a lower grade or upgrade) their categorisation. One shortcoming of the static approach is that all contractors within a specific qualification category are considered the same, which means, for example, there is no discrimination between a contractor within a given category who has marginally failed to be qualified for a higher level and another contractor who has only barely attained the present level.

Dynamic prequalification is a more recent approach, which recognizes (a) that no two contractors are the same, and (b) that even the same contractor's performance potential will vary with time. Different rating techniques are therefore used to 'dynamically' shortlist and compare contractors at specific times. Various ratings (such as aggregate rating, maximum rating, current bid capacity, project rating, work class rating, maximum capacity rating and ability factor) are used to determine the resources and capability of contractors in terms of, for example, type of projects and/or maximum dollar value of work that can be bid for by a particular contractor at a given time.

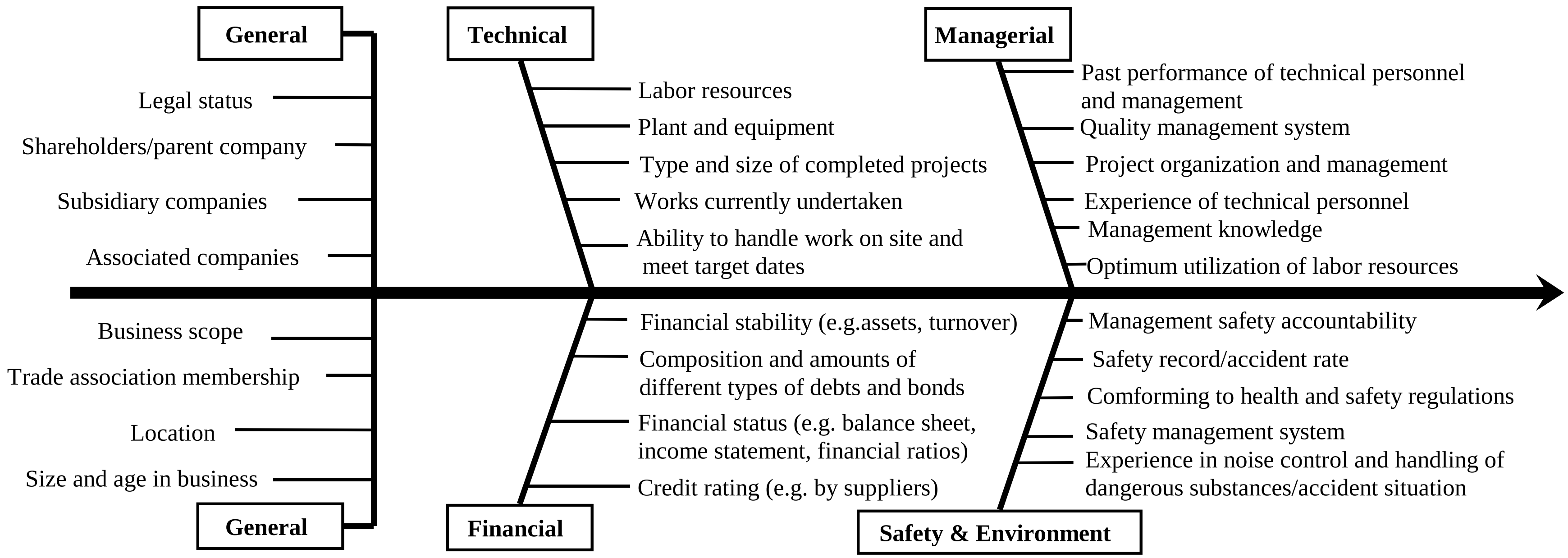

Figure 1: Common criteria packages for contractor prequalification

Tender evaluation

When a contractor passes the prequalification test, it is eligible to tender for works of a client. The tender evaluation stage follows tender submissions by prequalified and/or shortlisted contractors. A multitude of criteria, which reflect a client's objectives and the particularity of the project, should be identified and refined to facilitate selection of the suitable contractor. However, these aspects are often neglected and the lowest bid price is usually the most important or even the sole criterion against which the 'most suitable' contractor is selected (Hatush and Skitmore 1997; Wong *et al.* 1999).

RECENT DEVELOPMENTS IN CONTRACTOR SELECTION

There is a growing recognition of the need for a systematic and objective approach to contractor selection. Contractor selection based on a mere lowest bid price criterion is justifiable only if it can be assumed that the same scope and quantities of works will be done equally well, fast, and safely by different contractors. Such assumptions have often led to disasters. The sole lowest price criterion is regarded by Latham (1994) as a crude and unsatisfactory measure for awarding contracts and measuring project success. Kumaraswamy and Walker (1999) discuss some dangers inherent in the selection of the lowest price tenderer.

Creative tender evaluation approaches have been explored and expanded by different public clients, along with the new proliferation of procurement routes such as Design-Build contracts, BOT-type schemes and other public private partnerships (P/P Ps), such as PFI in the UK. Two examples are as follows:

Cost/time value approach

There are two kinds of cost/time value approaches in practice, which can be called 'A + B bidding' and 'A – B bidding'. In A + B bidding, the proposal submitted by each tenderer is required to incorporate two packages: cost (part A), i.e. bid price in dollars for all contracted works, and contract time in days. The contract time is converted to a cost to the client (part B), for example, based on 'opportunity' cost to road users. Thus, a straightforward comparison can be made on a consolidated price criterion, A + B in dollars (Herbsman, 1995). The A + B bidding approach has been adopted by Departments of Transportation in Maryland, Missouri and North Carolina (American Association of State Highway and Transportation Officials (1998).

In A – B bidding, the bidder is required to submit a proposal containing a part A (bid price in dollars for all contracted works) and a part B (converted dollar value for the time difference in years between the proposed warranty period of the bidder and the minimum required warranty period of the client. Maryland Department of Transportation, USA have used this scheme for some bridge cleaning and painting projects. The client sets credit per year by dividing the estimated repainting cost of the bridge by the length of the warranty period. If bids tie, the bid with the longest overall performance warranty will be the winning bidder (Russell *et al.* 1999).

Average bid approach

The average bid method encourages reasonable bids. The highest and lowest bids are rejected. Contracts are awarded to the contractor whose tender price is closest to the average of all the remaining bids, as was used in some projects in Italy and Taiwan. This method precludes the dangers of awarding a contract to a tenderer who either mistakenly or deliberately submits an unrealistically low bid. The system may also be modified to reject tenders that fall outside a certain band (say, 15 percent on either side of a client's estimate (Ioannou 1993; Kumaraswamy and Walker 1999).

CONCESSIONAIRE SELECTION FOR BOT PROJECTS

Uniqueness of the concessionaire

By syndicating of financing, design, construction and operation in one consortium, BOT-type schemes provide an excellent vehicle to reverse the over-fragmentation of functions that has previously led to divergent (if not confrontational) agendas of the multiple participants in a project procured through a traditional route. While nominally proceeding just a couple of 'steps' beyond the Turnkey mode i.e., by adding two functions (of finance and operation), BOT in reality 'leaps ahead' in terms of philosophy (and potential benefits), indicating a significant shift in the procurement paradigm. But, BOT is admittedly not always possible nor advisable on all infrastructure projects.

Prequalification

It is apparent that a concessionaire is usually a consortium formed for a particular project, and it has no track record. What makes things more complicated in concessionaire selection is that the concessionaire has more commitments than a mere contractor. It is responsible for financing, design, long-term operation and maintenance as well as construction. Therefore, the competence of the concessionaire is dependent on the resources and capabilities as well as the partnering skills of its various constituent partners (e.g. shareholders, designer, contractor and operator/ maintainer) and its proposed financiers, lenders, suppliers, etc.

The previously discussed five criteria packages for contractor prequalification (also as shown in Figure 1) are still applicable to consortia prequalification for BOT projects. However, appropriate adjustments should be made to reflect (a) revised risk allocations in BOT-type projects in general and (b) the uniqueness of each specific concession. In prequalification, the resources and capabilities of the partners in a consortium should be considered with different weights assigned to each partner, based on their roles in the consortium and taking into consideration the particular priorities of a BOT project.

In competitive tendering for a BOT project, the prequalification process is mainly aimed to reduce a number of interested consortia to a shortlist of three or four, each consisting of reputable and experienced contractors, operators and bankers. This ensures that unsuccessful bidders do not incur unnecessary tendering costs, which are much higher than those for similar projects through other procurement routes. Apart from additional commercial evaluations, a much longer time horizon and complicated contractual and financial relationships need to be assessed. For example, tender costs for PFI projects range from 0.48% to 0.62% of the total project costs, as compared to 0.18% to 0.32% for Design & Build projects, and 0.04% to 0.15% for traditional projects (Kumaraswamy and Zhang, in print). This means that tendering costs for PFI projects can be much higher than those for traditional projects.

Tender evaluation techniques

Simple scoring system: Maximum points are assigned to each predetermined selection criterion, against which alternative proposals are evaluated, and a score is then allocated to each proposal for each criterion. The score for each criterion may range from 0 to the maximum allocated points for that criterion. The proposal with the highest total score is considered to be the best overall proposal. This scoring system has been used in highway projects in USA. Levy (1996) compares such evaluation practices in toll road projects in different states in USA.

Multi-attribute analysis: This technique takes into consideration the major (or all) attributes of each alternative. The multiple attributes of a BOT project proposal would be based on various evaluation (criteria) packages (general, financial, technical, managerial, legal, environmental). Of course, each of these packages in turn include many subsets of attributes. According to the relative importance of the criteria, varying weights are assigned to each main criteria package; and based on their relative importance, maximum available points or weights are given to each sub-criterion within a specific main criteria package. Each proposal is then evaluated and scores are given against each sub-criterion. The proposal with the highest final total weighted score will be chosen for the concession. This method was used in China for its Laibin B BOT power station, where there were five main evaluation packages: electricity tariff (60%), financial proposal (24%), technical proposal (8%), and OMT (operation, maintenance and transfer) proposal (8%).

Kepner-Tregoe decision analysis technique: Major elements of the Kepner-Tregoe decision analysis technique (Kepner and Tregoe 1981) include decision stages of formulating a ‘decision statement’, identifying and weighting decision objectives (in terms of MUST and WANT criteria), generating alternatives, evaluation of alternatives against the MUST and WANT criteria and selection of the most suitable alternative. The decision statement provides the focus for the following steps and sets limits in the selection. The MUST and WANT criteria help to identify specific requirements of the decision. Each MUST and WANT criterion could also be subdivided into its own set of sub-criteria.

The MUST criteria are mandatory, functioning as a screen to eliminate failure-prone alternatives. After screening through the MUST criteria, the remaining alternatives will be judged on their relative performance against WANT criteria. The WANT criteria give the evaluator a comparative picture of the remaining alternatives. The most important WANT criterion would be allocated a highest weight, say, of 10. All other criteria would then be weighed against the first, from 10 (equally important) down to a possible 1 (not important). The WANT criteria should also be examined for potential dangers inherent in too many high/low weight criteria, too many criteria, unfairly or unrealistically ‘loaded criteria’, e.g. those that guarantee a smooth passage for a certain alternative at the expense of all others.

Tiong and Alum (1997a) propose the use of the Kepner-Tregoe decision analysis technique for evaluating BOT proposals and identify some MUST and WANT criteria in such general scenarios. Lloyd (1996) confirms that this technique was used for evaluating BOT proposals for tunnels in Hong Kong.

Sensitivity analysis: In BOT tender evaluation, the financial proposal is usually assigned a much higher weight compared to other packages. For example, in recent BOT tunnel projects in Hong Kong, financial proposals were allocated a 65% weight, while in the Laibin B power station in Mainland China, financial aspects were given a 84% weight (60% for electricity tariff + 24% for financial proposal). Therefore, more diligence should be exercised in analyzing financial aspects in BOT tender evaluation. Sensitivity analysis is recognized as a useful analytical procedure for evaluating financial investments. While this technique cannot evaluate risk per se, it can identify those variables that contribute most to overall investment riskiness, and points the decision maker to where efforts should be directed to effectively control risks. It can also direct attention to critical components of the estimates which require special/ extra forecasting efforts because of their potentially significant impact on the decision, for example, where it is identified that a small error in estimating such components may make the net present value negative or depress the internal rate of return below the desired rate. Sensitivity analysis usually requires no additional information. This method can also represent the analysis in diagrammatic form, highlighting variables that have the greatest influence on project return and inviting special efforts to keep them within the specified limits. The possibilities of errors in various components can be combined to derive an overall effect on the financial feasibility of the project (Lumby 1988). The most important variable considered from a sensitivity perspective is inflation, while other variables included revenues, construction/ refurbishment costs, interest rates, debt/equity ratio, offtake, operation costs, construction time, and project life. Sensitivity analysis is usually conducted within the range ± 20%, while it sometimes goes as high as 30% for high-risk variables (Woodward, 1995).

'Success factors' and 'winning elements'
It is also useful to identify factors that lead to success of BOT-type projects in order to incorporate them in criteria for predicting success in future projects of a similar nature. Research into, and discussions about critical success factors in BOT infrastructure projects have been previously conducted, for example, by Berry (1991), Tiong (1996), Tam (1995), Morledge and Owen (1997) and Gupta and Narasimham (1998). Tiong and Alum (1997b) have identified distinctive elements of winning proposals in competitive BOT tendering. Common factors consolidated from the review of such literature review were supplemented by interviews and correspondence/ discussion with different types of practitioners in the present study. It is concluded that innovative and proven technology, effective and credible financial package, minimum guarantees by and maximum benefits to the public client are the most critical success factors that are commonly identified.

CONCEPTUAL MODEL FOR CONCESSIONAIRE SELECTION

Success levels of BOT-type projects depend to a great degree on the capability of the concessionaire, hence the need for a more structured selection framework. The literature review, interviews, correspondence and discussions indicated that the Kepner-Tregoe technique was potentially most suitable for concessionaire selection, if properly adapted, taking into consideration BOT characteristics, client objectives and project attributes. Recent advances in

contractor selection practices should be incorporated, but also including typical success factors and winning elements in BOT-type projects. Decision support tools including knowledge-based (expert) systems should be mobilized at each stage, where knowledge-bases are steadily developed by extracting the available experiential knowledge on 'better' (if not the 'best') BOT practices. Meanwhile, brainstorming and group decision methods will help in formulating a realistic 'decision statement' and in identifying MUST and WANT criteria. Utility theory, fuzzy sets theory,

Moody's precedence charts (Moody 1983) and pair-wise comparison techniques will help to weight the WANT criteria and to judge alternative tender proposals against these weighted WANT criteria. These techniques should be supplemented by sensitivity analysis against key variables, value engineering to improve benefit/cost profiles of potential technical solutions, resource and construction program optimisation and multi-attribute decision making techniques including fuzzy logic where useful, to finally select the most suitable concessionaire. An indicative conceptual concessionaire selection model is developed as in Figure 2.

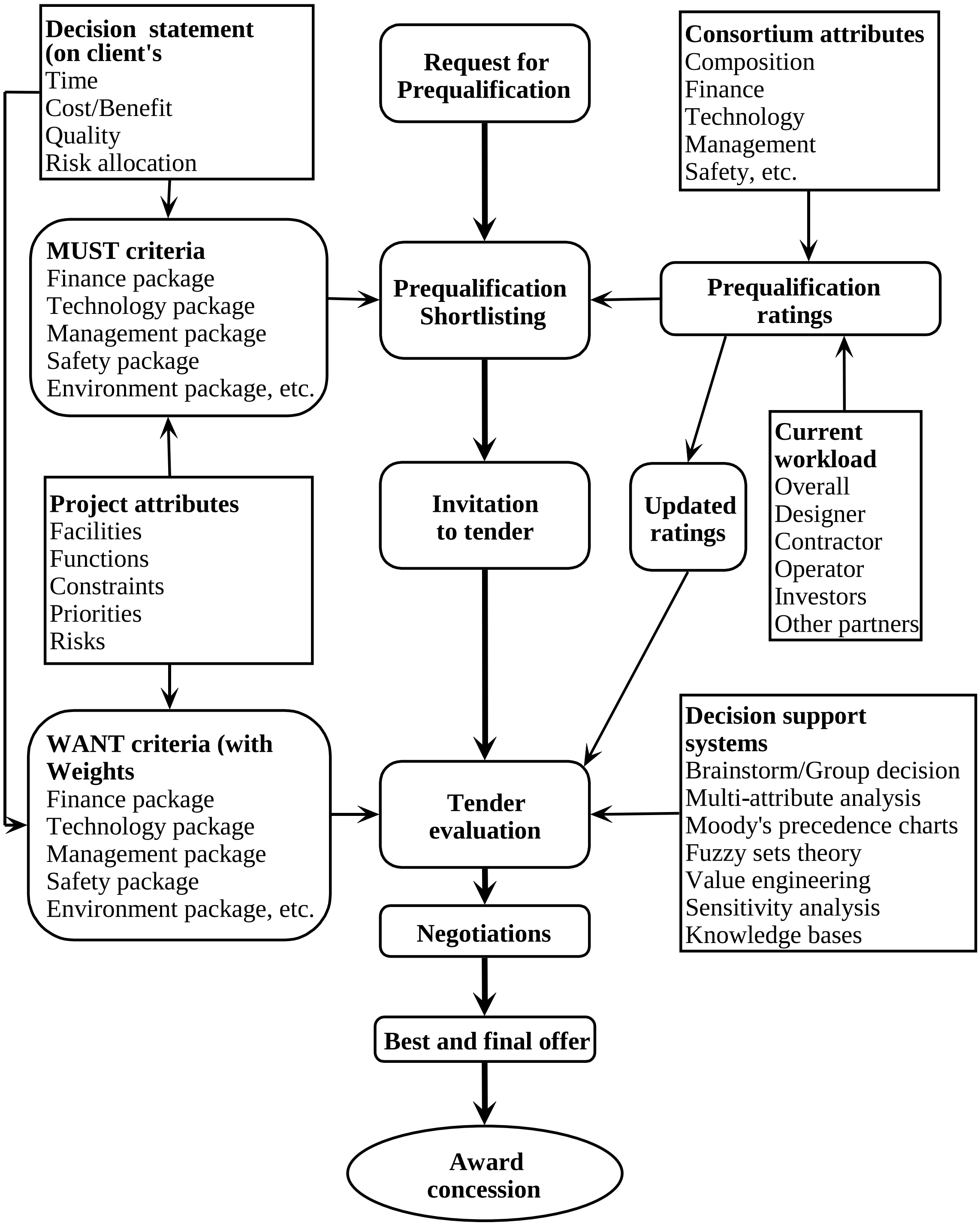

Figure 2: A basic conceptual model for concessionaire selection

CONCLUDING OBSERVATIONS

The 'right' choice of the BOT concessionaire is absolutely crucial to the success of any BOT project, thus making the selection process critical. Relatively limited experience and scattered knowledge on BOT-type projects prompted an examination of lessons learned from similar scenarios elsewhere: the study of recent developments in contractor prequalification and tender evaluation practices provided possible approaches and tools to be adapted for BOT concessionaire selection. Current BOT tender selection practices and evaluation techniques are also analyzed in attempts to identify 'good', 'better' and if possible 'best' selection practices. For example, prequalification exercises should evaluate potential concessionaires against criteria including financial soundness, technical capability, managerial ability, safety/health and environmental records. A conceptual concessionaire selection model is formulated, based on the envisaged selection process and utilising the underlying principle of the Kepner-Tregoe technique, taking into consideration BOT characteristics, client objectives and project attributes, while incorporating other decision support tools as appropriate. The model needs development with, for example, the incorporation of detailed criteria/sub-criteria, attributes and the adaptation and refinement of specific decision support tools. This is planned in the next stage of the ongoing research project. The development of a knowledge-base is expected to proceed in parallel – for incorporation in an envisaged knowledge-based advisory (expert) system that should further assist in the critical concessionaire selection decision after adequate experiential 'knowledge' is assimilated.

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