Selecting a suitable procurement method for a building project

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Selecting a suitable procurement method for a building project

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ABSTRACT

Building procurement has become a fashionable term with industry practitioners and researchers. It determines the overall framework and structure of responsibilities and authorities for participants within the building process. It is a key factor contributing to overall client satisfaction and project success. The selection of the most appropriate procurement method is consequently critical for both clients and project participants, and is becoming an important and contemporary issue with the building industry. The problem, nevertheless, lies in the fact that there has been limited empirical research in this field of study. Postal questionnaire surveys of 41 clients, 34 contractors and 35 consultants were carried out, and were used to obtain experiences and attitudes to a variety of procurement methods and the criteria used for selection. The findings indicate that a simple set of the criteria is generally adequate and sufficient for procurement path selection and that there is a reasonable consensus on their appropriate weighting for each path. Moreover, it is shown that similar clients generally do not have similar procurement needs but nevertheless only one procurement method, that of novation, best satisfies the needs of those involved in the study.

Keywords: procurement selection, novation, criteria weights, client needs, utility rating.

INTRODUCTION

A project may be regarded as successful if the building is delivered at the right time, at the appropriate price and quality standards, and provides the client with a high level of satisfaction (e.g. Naoum and Langford, 1988). One important influence on this, identified in the Banwell and Emerson reports of the 1960s, is the

type of procurement method implemented. These have proliferated in recent years and their characteristics have become a major field of study in their own right (e.g. Turner, 1990; Franks, 1990; Nahapiet and Nahapiet, 1985). One result of this is a consensus that there is one procurement method that is in some sense 'better' than all others for *an individual project* but that no one procurement method is likely to be better than others for *any project*. Several studies have considered how this 'best' individual procurement method may be identified (e.g. NEDO, 1983) by reference to a set of project characteristics, attributes or criteria. The most advanced of these are those of Skitmore and Marsden (1988) and Singh (1990) who propose a procedure involving weighting factors and priority rating for project attributes such as speed, certainty, flexibility, quality, complexity, risk avoidance and responsibility, price competition and disputes/arbitration. For this procedure to be of practical use it is necessary to first fix the weighting factors which relate these attributes to individual procurement methods independent of individual projects.

One problem with this however is that the factor weights cannot be obtained easily by objective means and have to be elicited from practitioners in the field, who have found difficulty in reaching a consensus on such matters (Hamilton, 1987). A further problem is that the client priority ratings have to be established for each project. This can be further exacerbated for clients who may not have the necessary experience even to produce an adequate brief. Nahapiet and Nahapiet (1985) however found the main factors affecting choice of procurement method to be the characteristics of the client as well as the project characteristics and requirements, suggesting that similar clients with similar project requirements may have similar and consistent priority ratings.

THE SURVEY

A postal questionnaire survey of 34 contractors and 35 consultants was conducted to establish if a reasonable consensus existed on *factor weightings*, while a similar postal questionnaire survey was conducted with a sample of 41 clients to establish if a reasonable consensus existed amongst subgroups of clients on *priority ratings* for similar types of projects. Attitudes and experiences to a variety of procurement methods and criteria used for selection were derived from the questionnaires. The results of the research indicate that, for the samples involved, a reasonable consensus did exist for the factor weightings but not for priority ratings. A further and very surprising result was that, having applied the established factor weights and the individual project priority weightings to individual projects, the predicted procurement system was in all cases that of novation, a derivative of the design and build system, followed by the traditional system - generally the

reverse of the actual choice made.

ALTERNATIVE APPROACHES TO PROCUREMENT SELECTION

Numerous techniques exist for the selection of procurement method. The choice of procurement system is now so wide and projects are becoming so complex, that the selection process needs to be carried out in a disciplined and objective manner within the framework of the clients' overall *strategic project objectives*. Nevertheless, the major difficulties associated with procurement selection include:

- no single person, or knowledgable 'czar', has been found who is familiar with all the primary procurement methods (Hamilton, 1987);
- no consensus has been found between 'experts' which easily systemises procurement selection; and
- no mutually exclusive sets of criteria uniquely and completely determine the appropriate procurement method for a specific project (Ireland, 1985).

However, despite the difficulties associated with procurement selection, researchers have attempted to derive simple approaches sometimes ignoring these difficulties. NEDO (1985) relates the characteristics of the most popular procurement methods used to a list of nine client priorities or needs. This technique, whilst useful as a guide in terms of eliminating unsuitable procurement methods from the available alternatives, is insufficiently sophisticated to enable a final decision to be taken as to the method appropriate for a building project (Masterman, 1992). Franks (1990) uses a rating system based on the ability of each procurement systems to meet seven common satisfying criteria. A scale of 1 to 5 is used, where 1 is the minimum and 5 is the maximum. Masterman (1992) states that the use of this technique in determining clients' needs is valid, but it is flawed with subjectivity.

Skitmore and Marsden (1988) and Singh (1990) used the multi-attribute approach, which is a technique applied to measure the objectivity to the subjective areas. Both studies adapted the procurement path decision chart from NEDO (1985) to aid the decision-making process. Bennett and Grice (1990) have undertaken similar work. Furthermore, Skitmore and Marsden (1988) applied concordance analysis and discriminant analysis to their theoretical framework. Concordance analysis is used to measure the consistency of experts' ranking for each procurement against a set predetermined criterion. Discriminant analysis examined data collected under a set of criteria which are characteristics on which the various procurement methods are

expected to differ. Thus, procurement paths could be discriminated against for decision-making purposes. Skitmore and Marsden (1988) found from their exploratory work that the multi-attribute approach gave similar results to those using discriminant analysis.

A cognitive perspective to procurement selection was proposed by Liu (1994). Organisational behaviour is modelled as an Act-to-Outcome process. The Act-to-Product and Product-to-Outcome paths are the project realisation stage and post-occupancy stage of the building procurement process, respectively. Liu (1994) states that organisational behaviour is governed by organisational goals and project goals affect the Act-to-Outcome process. A number of moderators such as ability, task complexity and situational constraints affect this goal-performance relationship, thus affecting the Act-to-Product and Product-to-Outcome processes. It is suggested by Liu (1994) that in selecting an appropriate procurement method, the decision maker should take into account the effect of these moderators using conjoint analysis (a technique used to model a decision makers judgment profile).

The procurement module of the '*ELSIE*' expert system computer package (Brandon *et al*., 1988) provides the recommendations on the most appropriate procurement method via a software program. A series of questions relating to the timing, quality, design cost parameters and other characteristics of the project are posed by the program. On evaluation of the information, recommendations are given by means of a list of the most appropriate methods, ranked in order of suitability, together with an indication of the extent to which the various methods will satisfy the client requirements.

The approaches for procurement selection range from simple (Franks 1990) to highly complex (Skitmore and Marsden, 1988; Liu, 1994). However, it is important that method selection is done logically, systematically and in a disciplined manner by the client's principal adviser. Each technique has been briefly explained. The techniques and methodology proposed by Skitmore and Marsden (1988) and Singh (1990) were adopted for the purpose of this research because of their underlying conceptual framework.

THE PROCUREMENT SYSTEM

A common leitmotiv of the construction industry is the misunderstanding of the definition of a procurement system. Too often the terms 'contractual arrangement' and 'procurement system' are considered to be synonymous. A procurement system can be defined as an *organisational system that assigns specific*

responsibilities and authorities to people and organisations, and defines the relationships of the various elements in the construction of a project. Procurement systems can be categorised as follows:

- traditional (design-tender-construct) methods;
- design and construct methods; or
- management methods.

However, subclassifications of these systems continue to proliferate within the Australian industry (Fig. 1). Novation and design and manage methods are some examples. It is common for procurement systems, contract forms and price determination mechanisms to be regarded as the same thing or inexorably related (Fellows, 1993).

Procurement systems have become increasingly flexible. Fellows (1993) suggests that the interchange that exists between such systems has made it essential to distinguish the procurement system from the formal subsystem. It is further suggested by Fellows that the subsystem may be used interchangeably to enable the procurement system to be tuned to the clients' circumstances and requirements. A primary issue that is often raised within the construction industry relates to what clients want in order to be satisfied with their buildings and the means by which those buildings have been procured. It is important to evaluate the clients' criteria, their importance and then seek performance to match the criteria. All clients require their buildings on time, within budget and of the highest quality. However, some clients stress that certain criteria are more important than others. The author acknowledges that there are numerous derivatives to each method. However, those which have been categorised are considered to be the *most popular* methods at the time of evaluation.

METHODOLOGY

An examination of the literature revealed that insufficient empirical research had been undertaken in selecting a procurement system for the building process. The research attempted to conduct an empirical study, using a similar methodology to that of Skitmore and Marsden (1988) and Singh (1990). Both suggest a method of identifying an appropriate form of procurement method by deriving a set of principal client requirements and weighting them accordingly. This procedure was adopted to investigate the principal criterion of clients. Weightings were obtained from clients and inserted into a decision chart juxtaposed with weightings of 'experts' for each of the listed procurement methods, thus indicating the appropriate form of

procurement method for the client.

Selection of Procurement Methods

The most commonly used procurement methods in Australia are (based on Ireland (1982)):

- single lump sum contracts and full documentation;
- provisional or partial quantities;
- cost reimbursement;
- package deals/turnkey;
- construction management;
- management contracting; and
- project management.

Project management was excluded as it was considered that a project manager could be applied to any procurement method. In other words, to dispel a common misconception, project management is not a procurement method (Bennett, 1986, p. 5). The term merely means that the client has employed an agent to assist in undertaking a supervisory and coordination role within the project. To the above list were added *novation, design and manage, and contractors design and build*.

Selection of Criteria

The following criteria were used to examine client requirements and 'experts' preferences for the performance of each procurement method. NEDO (1985), Skitmore and Marsden (1988) and Singh (1990) suggest employing the following criteria to establish a profile of the clients' requirements:

- speed (during both design and construction);
- certainty (price and the stipulated time and knowledge of how much the client has to pay at each period during the construction phase);
- flexibility in accommodating design changes;
- quality (contractors' reputation, aesthetics and confidence in design);
- complexity (client may specify particular subcontractor, or buildability analysis);

- risk allocation/avoidance;
- responsibility (completion of program, price, product quality, design and construction);
- price competition (covering such issues as value for money, maintenance costs and competitive tendering); and
- disputes and arbitration.

Multi-attribute Utility Analysis

Multi-attribute utility analysis is a methodology which can be used as a tool to measure objectivity in an otherwise subjective area of management (Fellows *et al.,* 1983). As a procurement system is the overall managerial approach by which a client commissions and obtains a building, the multi-attribute approach was considered to be the foremost technique appropriate for examining the criteria of clients and the preferences of experts' weights for each method in the most objective way. By indicating the relative utility of each client requirement and procurement method against a numerical scale, it is possible to obtain a set of utility factors. Clients were invited to give a rating to the above criteria for the latest building project they had procured. Quantity surveyors, architects, project managers and contracting organisations gave ratings for the above criteria against each procurement method listed herein. Each procurement method and client criterion was scored on a scale of 10 to 110 to avoid any possible imbalances due to occurrence of zeros (Fellows and Langford, 1980).

The Procedure for Weighting Criteria

The procedure adopted for obtaining client priority weightings for each criteria is as follows (Singh, 1990):

(1) Client weights the relative importance of each variable indicated on the Procurement Path Chart on a scale of 1 to 20.
(2) Rationalised priority ratings are calculated (by dividing each of the priority ratings by the sum of all the ratings) and then entered into the decision chart. The sum of the rationalised priority ratings should always be equal to 1.
(3) Each rationalised priority rating is taken in turn and multiplied by each of the utility factors; the results will then be entered into the appropriate columns.
(4) The totals of each of the results columns, under each procurement method, are calculated and ranked in

descending order. The most appropriate procurement method will have the highest total result.

Concordance Analysis

Skitmore and Marsden (1988) used concordance analysis to measure the consistency of the experts who weighted the criteria from the rankings obtained. This technique was used to examine the consistency of the clients' weightings for each client type. The coefficient of concordance (W) (Kendall and Babington-Smith, 1939) was used to see if the rankings of the experts and clients' weighting for each criterion agreed with one another. This statistical technique measures the rank correlation for a number of rankings. The measure for the coefficient of concordance is defined by:

$$W = 12\ S_W/m^2\ (n^3 - n)$$

where S_W equals the sum of the squares of the deviations of the total of the ranks assigned to each individual from $m(n)/2$. The quantity $m(n + 1)/2$ is the average value of the totals of the ranks, and hence S_W is the sum of squares of deviations from the mean. W varies from 0 to 1; 0 represents no community of preference, and 1 represents perfect agreement. Applying Kendall and Babington-Smith's definition of the coefficient of concordance to this study, it was applied in the following way: where m is the number of observers, n is the number of procurement categories, and S_W is the sum of the ranks for each procurement method is found, and the deviation of each sum from the average is then calculated.

The sums of the ratings for each procurement path, when added together should be equal to $0.5\ mn\ (n + 1)$.

DATA COLLECTION

Clients

Questionnaires were mailed to 100 selected clients throughout Australia (with the exception of the Northern Territory). Clients were given over one month to reply to the questionnaire. Initially only 20 clients returned their questionnaires, therefore a further 50 questionnaires were mailed to clients. These clients were given two weeks to answer the questionnaire resulting in a total of 41 being eventually received, of which approximately 25% were property and development companies, 25% investors, 30% occupiers, and 20%

local and central government authorities (including 7% from local authorities). These results indicate an even spread of clients. Once the deadline date for the return of the questionnaires had passed, those clients who had replied to the questionnaires were contacted and interviewed via the telephone. All 41 clients cooperated in the follow-up interview.

Contractors

Questionnaires were mailed randomly initially to the building divisions of 50 selected contracting organisations throughout Australia, and followed up with a telephone call. Thirty-eight replied to the questionnaire, weighting the design and construct options with utility weightings. Contractors stated that contractors' design and build and package deals were becoming increasingly popular forms of delivery systems. Contractors were asked why they believed this to be the case. Thirty-four contracting organisations stated that they believed it was to do with clients wanting to allocate risk and advocate all responsibility to the party who was going to construct the building. It was also suggested that clients desired a guaranteed maximum price before construction commences on site.

Consultants

Questionnaires were mailed to 100 selected consultants throughout Australia. Consultants were given over one month to reply to the questionnaire. Only 10 questionnaires were returned within the time allocated. Each consultant was then telephoned to establish why they had not returned the questionnaire. As a result of the telephone calls, a further 10 questionnaires were returned. Questionnaires were also mailed to another 50 consultants throughout Australia who were given one month to return the questionnaire. Fifteen questionnaires were returned, bringing the total sample size to 35.

FINDINGS

Data from the questionnaires was extracted to derive weightings of utility factors. The utility weightings of the contractor respondents were, however, found to have a bias toward design and construct methods of procurement system and therefore have been excluded from the analysis. The remaining weightings were then examined to determine whether or not the respondents gave similar weights for the same criterion for differing project types.

Contractors and consultants indicated the procurement methods used by percentage value of work commissioned for the years 1993 and 1994 (Table 1). It can be clearly seen that the percentage values differ significantly for both contractor design and build and traditional lump sum methods, although it can be concluded that the procurement methods indicated were dominant within the marketplace in the period of analysis. Furthermore, it is shown that design and build derivatives generally predominate. Barclay (1994) also supports these findings.

Clients

The most common form of arrangement used by the client respondents is the traditional lump sum and documentation (56%), with novation the next most popular system (18%), and the management system of design, manage and construct the least used (3%). Seventy-four per cent of clients procured their development less than one year previously. Clients were classified into either investors, property and development companies, local and central government authority or occupiers (Turner, 1990). Clients weighted each criterion using the scale indicated in the questionnaire. Each client type was classified in terms of their experience of market and technical knowledge of the construction industry (Table 2). The time period as to when they had completed their last building project was used as the basis for verifying clients and their perceived satisfaction or dissatisfaction with the form of procurement method actually implemented. The classification of clients' market and technical knowledge of the construction environment is as follows:

- good knowledge of both technical and market factors;
- good technical knowledge but limited or no market knowledge;
- limited or no technical knowledge but a firm understanding of market factors; and
- limited or no knowledge of both technical and market factors.

The classification of buildings types which clients procured are as follows:

- residential;
- commercial;
- recreational;
- administration and civic;
- industrial;

- hospital;
- educational; and
- other.

Each client's weights were ranked in order of preference. The mean weights of each client type were calculated along with the corresponding mean rank (Table 3). The coefficient of concordance (*W*) (Kendall and Babington-Smith, 1939) was calculated for each client type to establish a consistency in rankings for the predetermined parameters (Table 4). The results indicate that there is no consistency with the weightings for the utility factors. Therefore, it can be concluded that different clients have different needs. The coefficient (*W*) for local and central government authorities is marginally below the significance level of 0.70, thus indicating that with a larger sample a relationship between selection criteria preferences and the client may become evident.

Clients indicated their satisfaction with the procurement method adopted are shown in Table 5. Seventy per cent of clients who were satisfied with the procurement of their buildings implemented a design and build system, whereas the remaining 30% implemented a traditional system. Moreover, it was found that clients had all used an independent project manager as their representative and principal adviser. Clients were questioned on the factors that contributed to their satisfaction. The following fundamental factors were identified:

- completion of the project on time and to budget;
- completion to the desired technical specification and quality;
- teamwork and commitment from all participants;
- ability of participants to understand the goals and objectives of the project;
- effective communication both formally and informally between participants; and
- an independent project manager.

Those clients who were dissatisfied with their procurement method were those who had implemented construction management and traditional lump sum methods (Table 6). Completion of the building within a stipulated time period was a fundamental reason clients implemented a construction management method. This led to other prominent criteria being neglected, thus other priorities of the client were not evaluated in a holistic manner. Moreover, an independent project manager was not used by these clients. The following

fundamental factors were identified as contributing to clients' dissatisfaction:

- project not completed on time nor to budget;
- project not completed to the desired technical specification and quality;
- lack of feedback from participants to the project's performance;
- lack of involvement throughout the project;
- poor coordination and communication between participants;
- conflicting advise from consultants; and
- no project manager to act as an integrating device between participants.

From the results obtained, it is evident that there are particular factors which contribute to client satisfaction and these should be considered prior to the selection of a procurement method. In summary, the factors contributing to satisfaction are somewhat similar to Masterman and Gameson's (1994) 'client needs', viz.:

- a need to be kept informed and actively involved at all stages of the project;
- a need for certainty of final cost;
- a need for certainty of the day of completion;
- a need to achieve value for money; and
- a need to obtain the lowest price.

A study by Walker (1994) of the Australian construction industry, found that experienced or sophisticated clients are more likely to achieve a successful project outcome. However, from this research the key factor contributing to project success was not necessarily the experience of the client, but their ability to recognise the role and function of an independant project management organisation which acted as a focal point for project participants. Masterman and Gameson (1994, pp. 81-84) have identified the desire of the client to be involved and informed about the project, referring to studies of client needs by Bennett and Flanagan (1983) and Hewitt (1985) which found that clients needed active involvement and to be kept informed. The lack of involvement by the client was identified as a factor contributing to their dissatisfaction. This factor was common amongst clients who classified themselves as having a good knowledge of both technical and market factors and those with limited or no knowledge of the industry. Masterman (1994), in a detailed study of the basis upon which clients select a procurement method, found that the need of the client to be involved and informed of the final cost and certainty of completion were amongst the first of their priorities when

selecting a procurement route. It is concluded from this research, nevertheless, that the priorities identified by Masterman (1994) are not consistent with the findings identified herein. It was found that clients do not have similar needs in their procurement objectives. The factors identified by Masterman (1994) were, however, considered in hindsight by the client when they were dissatisfied with the procurement process. Gameson (1992, pp. 203-207) has shown that construction professionals tend to take a dominant and diagnostic role in the relationship with inexperienced clients, but that role becomes less supportive and less influential when dealing with experienced clients. Consultants may agree on the fundamental objectives of time, cost and quality but will place emphasis on the performance standards which affect their own expertise. This was found to be the case with dissatisfied clients who had implemented a procurement system on the advise of their consultants rather than an independent project manager who could take a holistic approach of the clients' strategic project objectives.

Consultants

Thirty-five consultants completed and returned the questionnaires. Of these, 14% were architects, 57% project managers and 29% quantity surveyors. The *most popular* method of procurement for the whole sample of respondents was found to be traditional lump sum (42%), followed by novation (34%), contractor design and build (16%), and turnkey and package deals (8%). All consultants thought that the reasons for the popular forms were (1) client wants to reduce the amount of risk they are willing to take due to the prevailing economic climate, (2) clients' main priority is cost and certainty in times of recession, and (3) clients require lump sum before construction commences. The *least popular* method of procurement for these respondents were found to be (1) management method - design, manage and construct, (2) management method - management contracting, (3) traditional method - cost reimbursement, and (4) traditional method - provisional quantities. All consultants considered systems (2), (3) and (4)to be not popular within the marketplace with 90% stating that method (1) was unpopular.

The architects and quantity surveyors subsamples principally weighted the traditional method of procurement with the higher utility preferences (except in the case of cost reimbursement form), whereas the project managers subsample tended to show no preference toward any particular system; their approach to weighting each parameter against each procurement method tended to be impartial (i.e. show no favouritism). There was no doubt architects' and quantity surveyors' priority weightings favoured traditional lump sum and traditional lump sum with provisional quantities.

The mean values of the consultants' utility weightings for each criteria against each procurement method are shown in Table 7. The results indicate that method A (traditional lump sum) provides the best quality (mean weighting 100.00) and best price competition (mean weighting 94.50), method E (turnkey and package deals) is the most certain (mean weighting 100.00), best for risk allocation/avoidance (mean weighting 109.70) and best for responsibility (mean weighting 95.60), method F (novation) is the best for avoiding arbitration and disputes (mean weighting 95.60) and method G (construction management) is the speediest (mean weighting 90.50), most flexible (mean weighting 95.60) and best for complexity (mean weighting 105.0). The smallest coefficient of concordance was 0.61 (for arbitration and disputes) and this was taken to indicate the existence of a reasonable consensus on the value of the weightings (Table 8).

PROCUREMENT PATH DECISION CHART

A Procurement Path Decision Chart (Skitmore and Marsden, 1988) was produced for each client respondent using the mean utility values of the consultants' weights from Table 7 juxtaposed with the clients' criteria weightings. An example is shown in Fig. 2. Each procurement method was ranked, with the highest result being ranked 1. Method F in this example, with a total weighting of 84.59, represents the 'appropriate' form of procurement method. A total of 41 charts were produced in this way - one for each client respondent - and in every case the appropriate form of procurement system is the design and construct novation form, with the traditional lump sum and documentation form ranked as the second choice, irrespective of the type of client or building involved.

The positions of ranks for the traditional methods with provisional quantities and the remaining design and construct method, tend to be consistent throughout all the charts (ranks 3 to 5, but on occasions exchange places). Construction management, management contracting, and design and construct occupied ranks 6, 7 and 8, with management contracting predominantly being ranked eighth and the positions of the remaining management methods exchanging ranking positions. The traditional cost reimbursement form was ranked ninth for all the charts.

CONCLUSIONS

It is shown that similar clients do not in general have similar needs in their procurement objectives. This may

of course be due to the different nature of their individual projects - whether the same client has the same needs for different projects is not examined here. There is a consensus, however, that the criteria proposed, and their weights, are themselves appropriate for each procurement method. That the application of these weights in the Procurement Path Decision Charts should result in the same procurement decision is totally unexpected and suggests that a replication of this study is needed. It should be noted, however, that the two most common procurement methods used by the client respondents are the traditional and novation and the Procurement Path Decision Chart found these also to be the most appropriate, albeit in reverse order. The low rankings for construction management, management contracting and cost reimbursement may be due to the intrinsic uncertainty involved in these methods. NEDO (1985) suggests that the management system offers price certainty although, at the time of contract, the exact nature and detail of the of the project are not generally established. In our view, management forms as a derivation of a form of prime cost contract and are thus lacking in price certainty.

The device of a guaranteed maximum price is sometimes offered, but it is only possible to obtain price certainty if the maximum being guaranteed is high enough, in effect to contain a target figure that includes sufficient contingency. A maximum guaranteed price concept is not often possible to obtain before the time when a construction contract needs to be signed. The cost reimbursement form is a system whereby the contractor is paid the actual or prime cost for an indeterminate amount of work and in addition an agreed fee is paid to cover management, overheads and profit. It is possible that this form is not favoured, as the resultant final cost to the client is difficult to determine. As with construction management and management contracting, fees are paid on the actual cost of the work undertaken. Moreover, Barclay (1994) found from his studies that the design, manage and construct form has not been used that extensively within Australia, hence the lower weights and the low overall aggregate rank.

A simple set of criteria have been identified as being generally adequate and sufficient for procurement selection and that there is a reasonable consensus on their appropriate weightings for each path. Moreover, greater involvement and interaction between client and consultants is indicated for a more effective procurement process. It is suggested that participants have to put aside their own objectives by considering the clients *strategic project objectives* in a holistic manner. This can be effectively achieved through the use of a project management organisation which acts as a control mechanism for the client and participants. The results indicate that design and construct options juxtaposed with a project management organisation generally satisfy clients' needs. However, further empirical research is required to test the validity of these

findings if the selection of the most appropriate method is to be identified.

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Table 1. Incidence of use of annual work commissioned of procurement methods for the years 1993 and 1994

Procurement method	Contractors (% by value)	Consultants (% by value)
Contractors' design and build	52	16
Turnkey and package deals	9	8
Novation	26	34
Traditional lump sum	13	42

Table 2. Summary of client classification

Client	Market and technical knowledge	Building type	%
A	Good knowledge of both technical and market factors	Commercial	80
	Good technical knowledge but limited or no market knowledge	Residential	20
B	Good knowledge of both technical and market factors	Residential	30
		Commercial	50
		Recreational	20
C	Good knowledge of both technical and market factors	Other (airports)	18
		Educational	9
	Limited or no technical knowledge but a firm understanding of market factors	Industrial	9
	Limited or no knowledge of both technical and market factors	Commercial	9
		Admin. & Civic	9
	Limited or no technical knowledge but a firm understanding of market factors	Educational	18
	Limited or no knowledge of both technical and market factors	Educational	18
		Hospital	9
D	Good knowledge of both technical and market factors	Hospital	25
		Admin. & Civic	12.5
		Residential	12.5
	Limited or no technical knowledge but a firm understanding of market factors	Educational	25
	Limited or no knowledge of both technical and market factors	Recreational	12.5
		Hospital	12.5

Key: (A) investors; (B) property and development companies; (C) occupiers; (D) local and central government authorities.

Table 3. Mean weights and ranks of client types

Criteria	A		B		C		D	
	Weight	Rank	Weight	Rank	Weight	Rank	Weight	Rank
Speed	13	6	20	1	14	5	17	4
Certainty	16	4	18	3	15	5	19	2
Flexibility	15	5	12	7	9	8	14	6
Quality	13	6	15	6	17	4	18	4
Complexity	8	8	9	8	10	7	11	8
Responsibility	18	3	17	4	16	4	13	7
Arbitration and dispute	8	8	9	8	17	3	14	6
Price competition	17	4	16	5	19	2	20	1
Risk allocation/ avoidance	18	2	17	4	12	7	13	7

Key: (A) investors; (B) property and development companies; (C) occupiers; (D) local and central government authorities.

Table 4. Coefficients of concordance for clients

Client type	Coefficient of concordance (*W*)
Investors	0.57
Property & development companies	0.27
Occupiers	0.25
Local & central government authorities	0.64

Table 5. Percentage of clients satisfied with their procurement method

Client type	Novation	Design & manage	Contractors design & build	Traditional lump sum
Investors	Ñ	Ñ	Ñ	10
Property & development companies	Ñ	15	15	Ñ
Occupiers	35	5	Ñ	Ñ
Local & central government authorities	Ñ	Ñ	Ñ	20

Table 6. Percentage of clients dissatisfied with their procurement method

Client type	Construction management	Traditional lump sum
Investors	10	28
Property & development companies	5	28
Occupiers	10	Ñ
Local & central government authorities	Ñ	19

Table 7. Mean utility factors of criteria for procurement methods

Criteria	Procurement methods									
	A	B	C	D	E	F	G	H	I	
Speed	52.5	56.5	45.6	76.2	79.6	83.5	90.5	88.6	81.5	
Certainty	88.5	80.6	29.1	90.3	100.0	85.6	55.6	50.2	53.8	
Flexibility	75.6	86.3	65.2	59.6	45.0	73.8	95.6	94.8	85.2	
Quality	100.0	95.6	58.3	60.5	45.5	85.2	73.6	71.2	84.5	
Complexity	80.6	78.5	55.0	75.6	50.0	95.3	105.0	100.0	85.5	
Risk allocation/ avoidance	80.0	70.0	10.0	96.8	109.7	92.5	45.0	40.0	50.0	
Responsibility		88.6	75.2	20.0	92.5	95.6	90.5	36.0	35.8	40.0
Arbitration/ disputes	75.3	65.3	10.0	70.8	83.5	95.6	58.3	55.2	57.6	
Price competition		94.5	76.7	44.7	42.0	40.0	62.5	90.0	90.0	80.0

Key:(A) traditional single lump sum, (B) traditional provisional quantities, (C) traditional cost reimbursement, (D) contractors design and build, (E) turnkey and package deals, (F) novation, (G) construction management, (H) management contracting, (I) design and manage.

Table 8. Coefficients of concordance for consultants

Selection criterion	Coefficient of concordance (*W*)
Speed	0.73
Certainty	0.85
Flexibility	0.99
Price competition	0.65
Risk allocation/avoidance	0.96
Responsibility	0.86
Quality	0.70
Arbitration & disputes	0.61

Complexity 0.94

ÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑÑ

FIGURE CAPTIONS

Figure 1. Categorisation of building procurement systems.

Figure 2. Example of a procurement path decision chart.