INFLUENCES OF THE CLIENT, DESIGNER AND PROCUREMENT METHODS ON PROJECT PERFORMANCE

S.G. Naoum, School of Construction Economics and Management, South Bank University

F.H. Mustapha, Department of Civil Eng. and Building, University of Glamorgan, Pontypridd

KEY WORDS

Building team, procurement method, project performance

Summary

This paper presents some findings of a research project on investigating the influence of the building team on project performance. The paper has several assumptions which form the basis for the discussion of the research framework. Foremost, is the assumption that, the procurement method selected for the project effects project performance but not by itself is the only determinate. Characteristics of the building team ie. the client, designer and the contractor can significantly influence the outcome of the project. Data from 69 case studies were collected to validate this assumption and it was found that, experience of the building team with the building process has significantly influenced the time and cost overruns, as well as the quality standard of the project. On the other hand, pre-construction time and unit cost were more associated with whether the client had selected a management or a traditional form of contract. With regard to speed of construction, this research did not provide enough evidence to conclude that alternative procurement methods can directly shorten the construction time. Construction time was more influenced by the building type and the method of construction.

Introduction

One of the features of the construction industry is its fragmented nature in that design is separated from construction. This places a great dependence on the competence of the building team in setting up the building process and bringing the work to successful completion. The term 'building team' describes those contributors of the building process including the client, designer and the contractor which are brought together to design and build a given project.

Project performance is understood to be the 'level of success' achieved when the project is completed. De Wit (1986) considered a project as an complete success if the building meets the technical performance specifications and/or mission to be performed.

Moreover, if there is a high level of satisfaction concerning the project outcome among: key people in the parent organization, key people in the project team, and key users or clientele of the project effort.

Each member of the building team has some criteria for success which differ from one another (Naoum (1989), Sidwell (1984), Sanvido (1992)). The client may regard the project as successful if the building is completed as scheduled; within budget and quality standard; as well as achieving a good return on the capital invested with a marketable building. For the professionals some criteria for success can be: satisfied client; quality architectural product; meet design fee and profit goal; professional staff fulfilment; meet project budget and schedule; marketable product/ process; minimal construction problems; no liability or claims; socially accepted and well-defined scope of work (De wit). On the other hand, the main contractor may also regard conflict free projects as a success to secure future work with the client and to satisfy the shareholders. Contractor's criteria for measuring success: meet schedule; profit; under budget; quality specification met or exceeded; no claims; safety; client satisfaction.

Such aspirations are commendable but there are, of course, difficulties which mitigate their achievements many of which reside in areas associated with the problem of procurement method. The emergence of a diversity of building
procurement methods has come into being in early 1970’s to overcome the problem of fragmentation, centering upon modified contractual arrangements or organizational forms. Naoum (1989) has critically examined the relationship between the building team and procurement method and their effect on project performance. Two types of contractual arrangements were chosen to represent the procurement method namely, management and traditional contracting. Project performance was measured objectively by calculating the pre-construction time, build time, total time, speed of construction, unit cost, time and cost overrun. Project performance was also measured subjectively by evaluating the level of satisfaction achieved when the building is completed.

The purpose of this paper is to first, identify the characteristics of the client and that of the designer which found to have a significant influence on variables of project performance. Second, it shows whether the selected procurement method had the same or different influence on project performance when compared with characteristics of the building team.

Research methodology

In order to achieve the research objectives, data collection took the form of two pilot studies and a main study. The first pilot study was conducted after a review of the literature had been undertaken, took the form of interviews with nine Construction managers, ten clients and four architects. List of names and addresses were collected from personal contacts, Building Trade Journal, Building Magazine and Employer Confederation. The objective of the first pilot study was to validate the form and content of the research model in order to design a theoretical framework for the definition and ordering of the project data.

The research model identified and studied the interrelationship between 24 variables and discussed them under six main headings, These are, 1) Client characteristics; 2) Designer characteristics; 3) Project characteristics; 4) Contract procedure, 5) Procurement method; 6) Project performance.

The second pilot study was conducted after designing the research model, took the form of interview questionnaire which was identical to the main study questionnaire except it included a small sample of subjects (10 respondent firms). The purpose of the second pilot study was to provide a dry run of a large experiment so to redesign the main study from what the author learnt from the pilot study. For example, the standard of invitation to subjects was ineffective, some questions were ambiguous and certain data were not accessible or confidential.

Definitions and measurements of the research variables are reviewed in the CIOB occasional paper no. 45. The following is an example of how the 'unit cost' was defined and measured. Unit cost was defined by the cost of building divided by square metre of gross floor area (square metre). All project tender and final account data were first indexed using BCIS tender price indexes. The method for measuring cost performance was similar to the BCIS cost comparison. After grouping the projects, the mean cost/sqm for each group was calculated and the range of cost where 60% of the project falls into. Projects fall above the top 60% range were considered highly expensive, within the range were average and below the bottom 60% range were cheap. Assume a project cost £900/sqm and 60% of the total projects, for that particular group are with a cost range of £380-£700sqm. The identified project at £900/sqm would be considered as expensive.

The case study data was collected and analysed between 1987 and 1989. In all, 69 projects were studied, 39 were management contracts and 30 traditional contracts. Different statistical methods were used to analyse results of the main study, depending on the type of data to be analysed and the hypothesis to be tested. The central hypothesis of the research was "Project performance is a function of the client and designer's characteristics as well as the procurement method selected for the project." In the main, three tests were applied, namely, Spearman's Rho Coefficient, Chi-square test and Pearson's Correlation Coefficient.

Research findings

The Client

Centre to the main study are several assumptions and ideas from the pilot study. First, the client was considered a subsystem of the building process which consists of a group of people who decided to build a particular project. Three types of clients were identified, these were: 1) an "on-going" clients who built continuously and were
classified as highly experienced clients, such as M&S, Boots PLC, BAA etc. 2) an "on-off" clients who built a number of projects in the past, say 2-3, and were classified as moderately experienced, 3) "one-off" clients who built only one project in the past and were classified as inexperienced clients. These differences of experience in the client sub-system were regarded as an important variable in the building process and can critically influence project performance.

Second, the client can be either a speculative developer (publicly or privately funded) or a purpose built client who commissions buildings for their own use. The research focuses on the client characteristics derives from the believe that the above factors (ie. client experience and type) will generate different inputs which will consequently influence project performance. Relationships between performance measures and client characteristics are given in Table 1.

---

## Performance level indicators

<table>
<thead>
<tr>
<th>Research variables</th>
<th>Design Time</th>
<th>Build Time</th>
<th>Total Time</th>
<th>Speed A/W</th>
<th>Unit Cost</th>
<th>Time Over</th>
<th>Cost Over</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CLIENT CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client Type</td>
<td>-</td>
<td>P&lt;.05</td>
<td>-</td>
<td>-</td>
<td>P&lt;.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Client experience</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Client Business</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

---

Table 1 Significant level between performance measures and client characteristics

The chi-square indicated that experienced clients were more satisfied than others in respect to time and cost because they had larger organization and employed higher level of in-house professional expertise which led to better control of time and cost. Moreover, experienced clients were in a better position to judge project success than those moderately and inexperienced ones. Table 1 also shows that variables of building time, unit cost and the satisfaction on quality differ between public and private clients. Public sector contracts were constructed more slowly than those for private sector clients (significant at P<0.05) and that public sector clients were less satisfied with the quality of the building produced. These results correspond closely with Rowlinson's study on industrial design and build projects (1989). It also confirms Hillebrant's (1985) argument in that, the traditional approach did not always obtained value for money when time and cost are considered together but time is often insufficiently weighted in decisions of many public-sector clients. On the other hand, the private sector is often more concerned with construction time, particularly for industrial buildings, and may place more emphasis on certainty of cost than on lowest cost. Thus private clients impose more pressure on the contractor and on the professionals to ensure getting the building built within the estimated period.

### The Designer

The architect is considered the leader of the building team and the advisor of the client organization and it is expected that different designer's characteristics will influence the selection of the building team and consequently project performance. The architect experience has a great influence on the quality level throughout the building process (Griffith, 1987). Quality through design may be lacking because of inexperienced architect not giving due appreciation to the practicalities of work, poorly devised operational sequences, and unfamiliarity with the skills
available and construction materials to be used. The correlation coefficient of performance measures and the designers' characteristics studied are given in Table 2.

<table>
<thead>
<tr>
<th>Performance level indicators</th>
<th>Research variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design</td>
</tr>
<tr>
<td></td>
<td>Time</td>
</tr>
</tbody>
</table>

**DESIGNER CHARACTERISTICS**

| Designer experience | P<.05-   | P<.025  |       | P<.025  |
| Design source       | P<.01    | P<.025  |       |         |

**Table 2** Significant level between performance measures and designer characteristics

The survey result showed that higher degree of designers experience resulted in corresponding higher performance in several performance measures. Pre-construction time, the higher certainty and higher degree of client satisfaction on time and quality were all found significant in relation to the designer experience. The result also showed that higher degree of in-house expertise input resulted in higher performance with respect to speed of construction.

The significant relationship between designers and project performance appeared to result from the fact that a resourceful and knowledgeable professional team ensured that client's requirement brief is thorough, properly implemented and monitored. Moreover, some highly experienced professionals have kept the client constantly informed of the well-being and progress of his project; such that any deviation or problem can be dealt with quickly and effectively to achieve higher level of client satisfaction and a smooth going project.

It was therefore concluded that inadequate communication of the initial brief and design requirements can create uncertainty in the interaction between the designer and contractor, if not clearly presented, misunderstandings in code of practice and regulations will undoubtedly hinder the understanding of the genuine requirements of the project. These effects of architect's experience upon quality and subsequently project performance should not be underestimated and some form of a systematic effort to co-ordinate the management information system need to be introduced to the traditional system in order to help overcoming the problem.

**Procurement Method**

After the client with the architect establishes his needs and priorities, and identify the characteristics of the project and the procedure for selecting the contractor, they will then decide on a suitable method to procure the project. This is the process in most building procurement, except for project management and some management contracts where the contractor is appointed at the very early stages. It has been argued that early involvement of the contractor will provide integration and thus be an important variable in organizations and could afford a measure by which to differentiate between procurement methods. The research intention was to utilize variables of the building process as a base for comparing two methods, management and traditional contracting. Traditional contracting is the method of procuring a building in which independent professional (i.e. architects, engineers, quantity surveyors) are employed by the client to complete the designed work. The client enters a separate contract with a building contractor to construct the designed building. Management contracting is the method of carrying out a construction project by which a contractor is appointed at the pre-construction stage and paid on a fee basis, to manage and deliver the project. The fee comprises a percentage for profit and fixed overheads. All construction
work is carried out by subcontractors, selected and appointed in consultation with the client and his professional advisors. Table 3 gives result of correlation between performance measures and procurement method adopted. In particular, six performance measures were found to be highly associated with the method of procurement, these were, pre-construction time, total time, unit cost, time overrun, cost overrun and client satisfaction on time.

Management contracting has contributed to fast completion due to time saving by overlapping design and construction. This permitted a start to be made on construction work while the design of later stages was continued. However, this research did not provide enough evidence to conclude that management contracting can shorten the construction time nor speeding up construction. According to Nahapiet and Nahapiet (8), quickly constructed projects were those where the client made a substantial investment appointing a project manager / controller acting on his behalf on site. Additionally the author's research found that fast construction techniques developed during the pre-construction stage, were valuable in saving time. For example, a project cost £10.0 million and took 50 weeks to build used a steel frame superstructure technique. Sizeable overlaps between design and construction were achieved and all 765 tons of steel were erected in only eight weeks. This emphasized the point that early constructability input can yield substantial savings in simplifying and standardizing design as well as increasing construction efficiency and reducing programme schedules.

<table>
<thead>
<tr>
<th>Performance level indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research variables</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Design</td>
</tr>
<tr>
<td>Time</td>
</tr>
</tbody>
</table>

**PROCUREMENT METHOD**

<table>
<thead>
<tr>
<th>Management/Traditional</th>
<th>P&lt;.01</th>
<th>-</th>
<th>P&lt;.05</th>
<th>-</th>
<th>P&lt;.01</th>
<th>P&lt;.025</th>
<th>P&lt;.025</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>on time</td>
<td>on cost</td>
<td>on quality</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management/Traditional</th>
<th>P&lt;.025</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
</table>

Table 3 Significant level between performance measures and procurement method

Under this argument, Tatum (1987) has studied constructability improvement during conceptual planning, using information from 15 projects in U.S. Tatum confirmed that constructability, (ie. management design-construction integration), is related to three key issues: developing the project plan, laying out the site, and selecting major construction methods. Based on the projects studied, he found that early involvement of the contractor can benefit from the use of advanced construction methods and more efficient construction operations. On the other hand, Barnes and Partners (1984) have argued that buildability advice may not be a sustainable argument in favour of MC. It assumes that management contractors will go on telling designers about buildability in perpetuity, designers having learnt nothing by the experience and always needing to be told the same things. If training of designers was to include enough about buildability and this knowledge were kept up to date, needing to acquire it from the management contractor could not be sustained as a major plank in the MC platform.

In reviewing the literature, there seem to be a disparity in opinions and findings about whether MC can help minimizing costs. Ward et al (1991) believe that cost can be reduced by producing a good design and by staged competitive tendering. The author's research, however, found that the mean unit cost of traditional contracts is lower than that of management contracts, but this difference seems to be marginally marked on small size projects rather than medium and large ones.

The reasons offered by the clients as to why management contracting could be more expensive than some competitive traditional tendering contracts were as follows (Naoum, 1989):-
1. There is a tendency for greater involvement of the professional consultants. The architect and the Q.S. get involved more than they should in some work which is the management contractor's job. This overlapping responsibility can be reflected in higher fees and this can be very noticeable on smaller projects.

2. In an interview with a banker client the organization conducted an internal cost analysis. It was found that under a management contract, the client paid more than the traditional system. Attributable, partly because drawings, and bill of quantities provide a common basis for competitive tenders from the traditional main contractor and partly because of higher costs of preliminaries and paper work. Once again this extra cost can be more influential on small jobs and proportionally less on larger projects.

In addition to the above explanation, it must be stressed however, that this could be very much attributed to the fact that the management contracts had larger building costs, were more complex and had a higher building rate than traditional contracts.

A study for the Department of Health and Social Security (DHSS), by Barnes and partners, who compared the performance of management and traditional contracts based on three projects concluded that, "there is no type of expenditure which exists in the management contracting arrangement which does not exist conventionally. Those types of expenditure which are likely to be larger in management contracting are outweighed by the reduction in cost and risk which can be achieved if the management contractor performs well." Although the two management contracts of the DHSS produced higher final cost, the study team did not conclude that this is attributable to the use of management contracts.

Although there have been some concerns about MC association with risk and uncertainty, the distributions of the author's data for percentage time and cost overrun indicated more likelihood for traditional contracts to overrun on time and on cost than management contracts. The association for time overrun was tested and the difference was found to be highly significant. These results seem to reinforce the view that phasing the construction work into packages, under the MC system, is a valid approach and provide flexible and useful indication of successful project performance. It can be argued, however, whether the estimated time and cost were the correct ones at the outset of the project.

Nahapiet and Nahapiet (1985) suggested that there are two reasons for the overruns on time and on cost, which are not related to any procurement methods, these are:

1. The client may alter his mind and introduce variations. These, even if not substantial, will undoubtable affect performance. One problem is that it is very difficult for the client to find out in advance what the effect of a variation will be. Some experienced clients make substantial allowances in their budgets for cost overruns. Others apply a system where changes can be manipulated without exceeding the budget.

2. There is little incentive under the traditional system for the contractor to deal with the causes of time and cost overruns or to compensate for their effects by, for example, better liaison with the architect's office on provision of drawings and catching up on lost time. At the present time, from the moment a contract is signed the contractor keeps careful record of the evidence on which he is to base his claim for increased cost.

Finally, a study by Mohsini and Davidson (1993) into determinants of performance in the traditional building process, reveals an interesting pattern of aggregation. Using interorganizational conflict among the project's task-organizations as a yardstick, the impact of a number of conflict-inducing organizational variables upon project cost, time and quality was measured and significant determinants at these three levels were identified. Their results indicated that at a threshold level, the aggregate performance in the traditional building process is primarily affected by two factors. First, the sufficiency of the starting information, defined by different things to different participants in the building process. Secondly, the extent of "tasks' interdependence." The study confirmed that the traditional building process without a central integrating mechanism is not suitable for large and complex building projects.

Mohsini and Davidson made some recommendations in an attempt to modify the traditional process. A systematic effort to co-ordinate information management appeared as a prerequisite for successful introduction of innovation and change in the traditional building process. At a practical level, the newer procurement strategies should seek to reduce the negative impact of "task interdependence" upon performance. Finally, the importance of specialists should not be ignored. Thus, a blue-print for innovation and change in the traditional building process, where
information (its quality and availability, along with process aggregation and greater intervention) can lead to improved time, cost and quality performance.

Conclusion

Tables 1, 2 and 3 give the significant relationships found in this research, which shows that project performance is influenced by several variables. Procurement method can be an important variable in affecting project performance but not by its own is the only determinate. The independent variables of client and designer's characteristics also seem to have a great weight in determining project performance, particularly on time overrun. However procurement method as an intervening variable can be a factor assisting in optimizing project performance. For instance, the total timing of the building process can be reduced by appointing a management contractor. The reduction in time is not so much accounted during construction rather it is due an early start on site by overlapping the design and construction. Moreover, it has been stated that the project can be successful and the client can be satisfied even if the project is highly complex, provided the appropriate procurement method was selected to the project and according to the client requirements. In this research, management and traditional contracts were good examples. The management contracting system was employed on higher building costs with higher complexity, and yet a significant number of those projects were found to be completed on time, within estimated budget and the client was satisfied. Similarly, when the traditional contracts were selected to fairly simple buildings and according to the client priorities, these projects were successful and the client was also satisfied.

References


