Abstract:
The construction industry has a number of commonly used routes to procure new buildings, each of which has varying levels of success dependent upon project objectives and organisational structure. Generally these procurement routes can be classified as separated, integrated and management types (Masterman, 1992). In line with manufacturing industry, current trends in construction procurement are moving towards the concept of a more integrated approach utilising such concepts as strategic partnering and concurrent engineering.

The research being conducted seeks to identify the most appropriate organisational structure for the underpinning of the design and construction process. This research also examines the decision and communication patterns between project inception and completion. The research is based around a sample of 20 case study projects, consisting of a range of project types and sizes. The primary research method was the use of structured interviews conducted by research staff based at the two universities taking part. Ultimately this paper seeks to identify the linkages between project organisational design and procurement routes, and thereby present a series of criteria upon which a choice of an appropriate organisational design can be made.

Keywords: Procurement routes, organisational structure, selection criteria

1.0 Introduction
Anecdotal evidence in conjunction with some recent research (Ribeiro, 1998, Bresnen and Marshall, 1998) would tend to suggest that significant changes in the way in which the construction industry operates are taking place. ‘Client power’, ‘project partnering’, ‘concurrent engineering’ and ‘lean construction’ are regularly used to describe the ‘new’ ways in which construction processes should be considered by such luminaries as Sir Michael Latham (1994) and more recently Sir John Egan (1998) and their adherents.

However these reports have been criticised as being of primary relevance to regular spend clients and associated project participants (Barlow and Cohen, 1996; Contract journal, 1998), and indeed
the change towards a more ‘harmonious’ working environment has more to do with commercial realities than a genuine desire to form lasting partnerships. It is clear however, that the combination of changing economic environment and organisational ethos are playing a major role in redefining the way in which project participants work together. It is therefore appropriate to investigate the design of project organizational structures whilst taking these changes into account.

For example current investigations into alternative project organisational structures include a study carried out by the Tavistock Institute (1997) on behalf of the Department of the Environment, Transport and Regions (DETR) into the use of ‘work cluster’ arrangements in order to ‘Build Down Barriers’ in the construction process. These changes, together with the influence that the top UK clients have over the construction process is therefore, it is suggested leading to a 'paradigm shift' whereby the academic researcher can examine project organizational structures in a 'new light'.

With this in mind, academics from the Universities of Strathclyde and Glasgow Caledonian (funded through the EPSRC) have recently teamed up to look at ways in which the total building procurement process can be improved through the linking of the embedded organisational structures to client objectives and therefore selecting the most appropriate procurement route. This paper seeks to present an overview of the research methods adopted and a review of the preliminary findings thus far. The paper concludes with a summary of the possible linkages between organisational design and procurement, and the future of the research project.

2.0 Project Organisational Structures

It would appear to be a truism that the organisational structure inherent in a project will have a tremendous influence on the overall success of the project. The linkage between procurement systems has already been identified through the work of Mohsini and Davidson (1991), who have published numerous papers discussing the impact of procurement decisions on project structures (Mohsini and Davidson, 1991; Mohsini et al, 1995). Indeed, they suggest that:

‘Selecting a procurement route strategy is tantamount to deciding how the building process is to be structured, and is therefore the most fundamental decision to be made by the [client]’

The failure to design a project structure is seen as an inherent weakness of the construction industry, an industry commonly perceived to have low margins and high risk attached to it (Moore and Moore, 1997). In the future, it is contended, there will have to be a significant improvement in the systematic design and operation of project structures in order to meet the performance improvements demanded from such influential figures as Latham (1994) and Egan (1998). Conversely, other authors imply that it is not possible to devote sufficient time to the design of organisational structures prior to the commencement of a project since there is insufficient lead in time to allow it. Furthermore it is contended that often project participants are involved in more than one project simultaneously, and therefore loyalties to individual client’s projects are divided (McClellan, 1994).

Whether or not it is possible to devote sufficient time at the outset of a project to design a complete organisational structure, it would appear that there are a number of factors which effect organisational structure and therefore project success. These factors are discussed in the following sections.
2.1 Client Power

The influence that regular spend clients are having over the industry, and therefore the project process, can be seen through the views expressed by the Construction Round Table (CRT) and the Construction Clients’ Forum (CCF). The CRT, for example, identify inefficient management practices as a major cause of problems (Contract Journal, 1998):

‘Among the issues identified by [the CRT] as in need of urgent attention are getting better site supervisors, stripping out some [layers] of management and improving the quality of leadership and management within contracting firms’

This contention would appear to echo findings from the recent research by Barlow (1996) who examined the degree to which partnering may alter the decision making process regarding organisational design. Moreover he observed that:

‘In some instances there has been an explicit attempt to reform a company’s organisational structure to produce cross functional teams (e.g. Simons Construction, contractors to Natwest Bank and Safeway.)’

2.2 Organisational Culture

Organisational culture can be seen to impinge on project performance on a number of levels. Clearly the communication structure, the roles and responsibilities and at a very basic level the simple interaction of people can all be affected through the organisational culture. Culture in this context includes a whole basket of ‘soft systems’ attributes such as values, beliefs, tenets, organisational history etc. This in turn has led to an increasing emphasis on the value of the so-called ‘soft skills’ to an organisation, i.e. interpersonal skills, client focus (Building Journal, 1997).

The impact of cultural issues in an organisation, is addressed by Jennings and Kenley (1996), who suggest that the systemic qualities of project organisations can only become increasingly important because of the inherently social role of integrating specialist organisations within projects. Moreover, without recognition of these social needs, the assurance of a project organisation’s performance will become increasingly unreliable. Newcombe (1997) identified the negative consequences that power and politics can have on projects and the need for a ‘positive culture’ within the project process. He contended that this is more likely to be present in procurement paths that encourage empowerment and participation (such as construction management) than those that engender fragmentation and confrontation (the traditional system).

Furthermore the power that the clients have to influence the project structure and the prevailing culture of the organisation can be seen in a recent initiative by the supermarket chain Tesco, known as ‘Building the Future’ (Building Journal, 1997).

‘Tesco dumped its traditional approach to tendering every project. We needed to establish continuity. We wanted contractors to become an extension of Tesco, and to understand us culturally.’

One of the most notable projects that managed to demonstrate a ‘positive culture’ during construction is that of the Broadgate development in London (Building Journal, 1998). The project,
that was managed by Bovis and Schal, fostered a project-wide cultural openness. It also featured many innovative management practices and others adapted from Japanese approaches, including:-

- Induction meetings to explain scope and aim of project to trade contractors and off-site manufacturers
- Daily 7.30am ‘toolbox’ meetings between managers and tradesmen - an idea taken from Japan.
- Active supply chain integration
- Subcontractors flown to US for training

The organisational culture engendered during the first stage of the Broadgate development has now being used as a benchmark within the industry. Due to its obvious success, it is also anticipated that the culture will be used as an integrating influence on future phases of the Broadgate development.

### 2.3 Team Building and Integration of Project Participants

The use of teams is often mentioned as being the key to successful industrial production, whether in the context of manufacturing or construction. There does appear to be a level debate as to what a team consists of, but possibly one of the most complete definitions would be that offered by Lettice (1994):

’A team is a group which shares, and says it shares, a common purpose, aim or objective - in so doing understanding that it requires the contribution of all its parts in order to achieve the required results.’

However, frequently a construction ‘team’ purely consists of a series of functions that are represented in the site meetings that attempt to co-ordinate operations on the project. In essence, this sort of team is not really an integrated team sharing a common purpose, since each function tends to be trying to look after its own interests frequently to the detriment of the project as a whole. In short there is no alignment of goals or a common purpose in operations.

The need to align the goals of the temporary multi-organisation (TMO) represented by the project ‘team’ from work of Cherns and Bryant (1984) are said to be possible through team building exercises. Rolstad has examined the benefits of such team building activities during project start up, noting that the challenge is to create the right organisation and organisational ‘spirit’ to face the considerable challenges of a project (Loosemore, 1996). Ribeiro also points to the importance of the initial definition of roles and responsibilities on a project. Specifically, Ribeiro indicates the value of procedure manuals that provide orientation and guidelines for participants, which define and regulate the relationship between participants for the duration of the project. Conversely Gray and Suchocki (1996) suggest that existing techniques aimed at developing teamworking are inappropriate to construction, citing case study findings that participants were inadequately introduced to their role in the project.

It would seem to be apparent, therefore, that in order to be able to effectively run a project team, there has to be a significant amount of preparatory planning to establish the definitive roles and responsibilities of the participants. This implies that there is an increasing amount of structure and management control required - effectively a dictatorial approach. However, we are beginning to see
evidence pointing towards project management being less centralised and more ‘organic’ in nature. Shirazi et al (1996) note that the temporary nature of the project team tends towards a less bureaucratic and more decentralised structure than would be predicted using conventional organisational theory. Sidwell (1990) proposes that project have a distinct lifecycle, which constantly evolves over time from organic to mechanistic to bureaucratic. It would therefore seem apparent from the disparity of research findings that there is a significant amount of disagreement as to the nature of best practice in defining the roles and responsibilities of the team members, and even whether or not there are definitive roles for project participants.

2.4 Organisational Communications

It is fundamental to the success of the process of construction that communication networks are set in place which allow the complex organisation to operate and it is argued that recent changes in the industry have resulted in greater difficulty in defining these networks. It may also be argued that traditional procurement methods, the limited amount of sub-contracting and relatively unsophisticated construction technology allowed networks and communication patterns to evolve in the past. This is no longer the case. Provisional attempts to tackle the problem of the separation of design and construction resulted in such developments as D&B and partnering. However, these techniques are not appropriate to all projects and indeed carry with them the complication that despite their take up they remain relatively recent developments which consequently have not had sufficient history to allow consistent and recognised patterns of communication to evolve. There remains a need to define the elements and structure of communication networks which are transferable across the full range of project types.

Long term economic pressure on the construction industry together with greater performance demands of clients has resulted in an increasing range of types of building procurement system, each characterised by differing roles, responsibilities and communication patterns among the participants. These procurement systems may be classified as: separate and co-operative systems (e.g. traditional open tendering and negotiated contracts); integrated procurement management systems (e.g. design and build) and management oriented procurement systems (e.g. management contracting and construction management).

3.0 Research Methodology and Methods Employed

The EPSRC grant proposal that facilitated this research originally anticipated a methodological approach geared towards a hypothetico-deductive methodology (Hoare, 1996), utilising a cast study based approach. Specifically it was to be an exercise in hypothesis testing. However, it became apparent that such an approach would be entirely inadequate to fulfill the requirement of the project.

The researchers’ brief was to examine communication and decision processes. It is generally accepted that the nature of construction is a dynamic process which takes place over time, with a fluid organisation evolving to requirement in order to absorb significant alterations in initial project conditions and objectives to complete its commission. This in turn creates a communication and decision process that evolves over time to match external and internal environments of the project. Since the system under observation has multiple variables (power, interaction, personality, conflicts, etc etc) to examine, which are dynamic in a number of dimensions, it was considered to be inappropriate to attempt to utilise a positivistic approach to the research. Inevitably, it would not have been possible to monitor all variables continuously so as to capture the complexity of
communication and decision making processes. Therefore it was decided to adopt a research framework using an interpretive paradigm. This facilitated the inclusion of contextual information into analysis of what was being seen, so as to better explain the social interaction processes under observation.

The initial starting point for this research was the assumption that each procurement route could be differentiated by conducting an analysis of the communication patterns within a case study project. It was further hypothesised that the decision making and authority structures that are derived from a communication network could be used to categorise a project organisational structure. Following an extensive literature survey at the outset of this research project, a number of possible techniques were seen to be available to conduct such analysis. From these techniques, two were selected as being of significant value to the study; firstly, the communication model used by Loosemore (1996), secondly the Communication Project Assessment Tool (COMPASS) (Tucker et al, 1997).

3.1 Communication Network Analysis
The primary method of identifying and categorising the communications taking place in the case study projects selected was a slightly modified version of the communication model developed by Loosemore (1996) who used this technique with great success in charting management crises in projects. This involved issuing diaries to project staff as a means of establishing the communication network within each project, with the results expected to show different patterns across the various procurement routes. The diary was intended to record the key details of the communication, specifically the date, contact type, decision type, communication medium and subject of the communication. It was never intended that these diaries chart all communications however, only those which led to a key decision being made in the running of project. By analysing the communications of a project using such an approach, it was anticipated that as full a picture as possible could be portrayed of the communication patterns and thus the organisational structure of each project.

3.2 Communication Project Assessment Tool (COMPASS)
Research conducted in the University of Texas at the Construction Industry Institute (CII) by Tucker et al (1997) produced a diagnostic tool intended for measuring the effectiveness of project team communication. Their research produced evidence which showed a positive correlation between communication effectiveness and project success. The Communication Project Assessment Tool (COMPASS) is designed to measure six ‘critical communication variables. These variables being accuracy, timeliness, completeness, understanding, barriers to communication and procedures. Utilising the software developed at CII provides an objective measure of the relative performance of different projects with regard to these critical communication variables. It is intended that this should give an assessment of the communications effectiveness highlighted from the use of the network analysis approach described in 3.1.

3.3 Use of Research Tools
Since the primary method of research was the use of a questionnaire, it was decided that the most effective method of data generation would be from the use of semi-structured interviews. The outline format is as follows; firstly, a preliminary contact was made (usually via either contractor or management contractor). Once agreement to participate is given by all other project participants, a preliminary interview was conducted using the COMPASS questionnaire in order to describe
current communication effectiveness. This preliminary data has been retained for further quantitative analysis. Subsequent visits were then arranged with each of the principal project participants, specifically the client, architect, quantity surveyor, contractor, management/construction manager and engineer. During these subsequent interviews, the communication diary was used as a catalyst to elicit the scenario surrounding each major decision.

4.0 Current Status of Research
At the time of writing, 8 projects are under investigation which include a range of size, type and procurement route. Further contacts are being pursued in order to be able to widen the study towards the proposed 20 case studies. Preliminary indications are that, based on the investigative methods selected, it will be extremely difficult to be able to effectively track and analyse communication paths between the main project participants on all twenty projects.

4.1 Evolving Research Techniques
Using the first two case study projects visited as ‘pilot’ studies in themselves, several issues were raised as to the effectiveness of the selected research tools. The first realisation was that the COMPASS tool was very useful in developing quantitative data with which to assess the relative effectiveness of communications between project participants. Furthermore COMPASS seemed to be useful as a method of building research relationships.

There was also an immediate realisation that the communication network analysis technique would not be practical within the bounds of the study. Put simply, none of the project participants interviewed were willing to devote the necessary time to filling in the communication diaries. Indeed one contractor commented:

‘We were asked to fill out something similar by [head office] as part of a communication audit. We wouldn’t do it for [them] do you seriously expect me to do it for you?’

Consequently it was proposed that the diary, instead of being used to review all communications, would be adapted and used as a tool for charting just those communications that led to major decisions. Having started to use the diary for this purpose, it was discovered that the major decision points that research was attempting to monitor were embedded in a ‘story’. This also seemed to reinforce some of the anecdotal observations elicited during interviews using the COMPASS questionnaire. Usually these ‘stories’, around which decisions were made, were actually the reason why a decision had to be made at all. Therefore essentially there was a re-emphasis of the research away from the monitoring of the ‘what’ of a decision - i.e. the simple mechanics of how a decision was made - to the ‘why’ of that decision - why was a decision necessary at all.

It began to be recognised that these stories surrounding decision points were relevant to the structures of the organisations involved. Consequently, it was decided that these stories should be recorded and classified according to typologies in order to compare and contrast procurement routes in the case study projects. The ‘story-telling’ sessions (semi-structured interviews) conducted to date have revealed a copious amount of anecdotal evidence falling into a number of typologies which in turn can be either project enhancing or project detrimental. Furthermore, these typologies may also be divided into those which are project generated or externally generated.
Typology | Project Detrimental (frequency) | Project Enhancing (frequency)
--- | --- | ---
Roles and Responsibilities | (1) ⬤ ⬤ | ⬤ ⬤ ⬤ (15)
Location of team members | (2) ⬤ | ⬤ (16)
Selection of team members | (3) ⬤ | ⬤ (17)
Continuity of team membership | (4) ⬤ ⬤ | (18)
Communication issues | (5) ⬤ ⬤ ⬤ ⬤ ⬤ ⬤ | (19)
Design / detailing issues | (6) ⬤ ⬤ ⬤ ⬤ ⬤ ⬤ ⬤ ⬤ ⬤ ⬤ ⬤ | ⬤ (20)
Organisational politics | (7) ⬤ | (21)
Supplychain management | (8) ⬤ ⬤ ⬤ | ⬤ ⬤ (22)
Subpackage integration | (9) ⬤ ⬤ ⬤ | (23)

Table 1: Project generated typologies

Tables (1) and (2) indicate the frequency with which each of the typologies were seen to appear during the analysis of the interviews conducted. It is important at this point to highlight the fact that none of the typologies had been hypothesised prior to the conduct of the research. All of the typologies have been derived from analysing the transcripts of the interviews so far undertaken. It is intended to return to each of the interviewees to corroborate the accuracy of the typology allocations.

Typology | Project Detrimental (instances) | Project Enhancing (instances)
--- | --- | ---
Project location | (10) ⬤ | ⬤ (24)
Historical trade loyaties | (11) ⬤ | (25)
Macro-economic pressures | (12) ⬤ ⬤ | (26)
Planning control issues | (13) ⬤ | (27)
Client Internal Issues | (14) | (28)

Table 2: Non-project generated typologies

5.0 Conclusions

Although the research presented here is at formulative stage and will no doubt have to be refined, a number of interesting issues are already beginning to present themselves. Firstly, it appears that as the research is developing it will begin to be possible to define a ‘footprint’ of the frequency of each typology for the various projects researched. This will permit straight forward comparison and contrast between the effectiveness of the various procurement routes used within the case study projects.

Secondly, the typologies provide a important conduit to gain entry into the workings of the organisational structure within each project. It is envisaged that this will provide a useful additional tool to identify the key issues of organisational structure, both in terms of the structure present and in terms of the structure that is absent. It is intended that the typologies can, and most likely will, be grouped so as to represent project structures. It is hoped to circumnavigate some of the existing problems with regard to describing construction project organisations using existing concepts from the management texts. This may well provide a basis for a new paradigm with which to analyse construction project organisational structures.
REFERENCES


