Conflict analysis in construction project management.

Paul Duncan Gardiner

CONFLICT ANALYSIS
IN
CONSTRUCTION PROJECT MANAGEMENT

ABSTRACT

This thesis concerns the management of conflict in construction projects. Theories of conflict and their outworking in practice are reviewed, with examples from the research data integrated where appropriate. A preliminary investigation of construction activities was carried out in collaboration with a series of construction clients, in which data collected formed the basis of a methodology that uses a process of hierarchical decomposition to classify and render the data suitable for subsequent analysis. In the main investigation, the relationship between the impact of conflict on construction projects and project management strategy is addressed, drawing on examples of conflict collected in semi-structured interviews with participants in nineteen construction projects. Conflict analysis, enhanced by a validation review with the interviewees, pointed to the existence of potentially damaging conflict embedded in all construction projects. The analysis also led to the identification of seven statistical associations and to the formulation of nineteen recommendations to construction clients. A questionnaire-based quantitative survey among independent organisations showed a positive response to the recommendations made. A cyclical model, derived from the research methodology, is outlined to enable project organisations to improve their project management strategy from project to project.

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Appendices

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ABBREVIATIONS

BPF	British Property Federation
BS	British Standard
CIOB	Chartered Institute of Building
CIRIA	Construction Industry Research and Information Association
CPO	Client project organisation
CS	Client system
DES	Department of Education and Science
DLO	Direct Labour Organisation
ICE	Institution of Civil Engineers
ISO	International Standardisation Organisation
JCT	Joint Contracts Tribunal
LRC	Linear responsibility charting
NEDC	National Economic Development Commission
PM	Project management
PO	Project organisation
PSC	Project subcommittee
QMS	Quality management system
QS	Quality system
SCMP	Speciality chemicals manufacturing plant
SERC	Science and Engineering Research Council
TREND	Transformed relationships evolved from network data
UFC	University Funding Council
UMIST	University of Manchester Institute of Science and Technology

CHAPTER 1
INTRODUCTION

Management research in the construction industry has tended to focus on topics such as industry performance, site productivity, contractual procedure, organisation design, computers in construction, and more recently the application of expert systems, and quality systems. The role of conflict and change in construction has received scant attention (with the exception of the very specific field of contract litigation) yet in all organisations there are individuals and groups competing for influence or resources, differences of opinion and values, and conflicts of priorities and goals (Handy, 1983). It is noted that although the term 'conflict' is frequently used in the context of a single firm, many of the associated concepts and ideas are directly transferable to construction project environments which have, in turn, been described as temporary multi-organisations (Cherns and Bryant, 1984).

The importance of conflict and change in construction projects should not be understated; Handy affirms that: "... the resolution of differences or potential differences takes up the largest single chunk of managerial time and energy, and is not always well done at the end of it all". Research in construction management has so far failed to address the subject head on, although it has been an important sub-theme for many years. For example, the socio-technical work carried out by the Tavistock Institute of Human Relations which focused attention on the relationship between the social, technical and administrative functions in construction organisations and brought to light some examples of conflict in the industry (Higgin and Jessop, 1965; Crichton, 1966). The Construction Management Unit of Brunel University (now transferred to Bath University) have reported on the extent to which personality differences between architects and construction managers can lead to or away from conflict. It has also been proposed (Cherns and Bryant, 1984) that many of the problems concerning design changes, delays and difficulties during the construction phase have their origins in unresolved conflicts within the client organisation which remained unresolved when the decision to build was taken, and are exacerbated by too early an insistence on an oversimplified client representative function. The importance of conflict was recently highlighted at the First International Construction Management Conference, UMIST, where the conference theme was 'Construction Conflict Management and Resolution' (Fenn and Gameson, 1992).

An understanding of conflict and change in construction projects is more important now than ever before given the differentiation that exists in today's project

organisations in which the integration and coordination of the different groups within a project can be difficult. It is important to recognise that, to some extent, conflict between groups in organisations is inevitable (Bowditch and Buono, 1990) and that there is a need to acknowledge and plan ahead for project conflicts; to admit openly that change, for whatever reason, is always likely and to control it honestly (Cornick, 1991). Armed with an understanding of project conflict and change it should be possible to reduce the occurrence and limit the damage caused by dysfunctional conflict and at the same time provide conditions which encourage 'controlled' functional conflict and change of benefit to the client. Conflict can be constructive or destructive; and neither the occurrence nor the outcomes of conflict are completely and rigidly determined by objective circumstances. The course of conflict is open to influence even under the most unfavourable objective circumstances (Deutsch, 1969).

This thesis examines the nature of conflict and its importance to construction project management today within a methodological framework developed during the research. Chapter 1 continues with a brief consideration of construction as a project process, and then introduces the business aspects of construction projects: organisation, control, and administration. The chapter concludes with a brief synopsis of the construction clients studied during the current research. Chapters 2 and 3 represent a detailed review of earlier studies and interpretations of conflict both generally and with specific reference to project management. These chapters are integrated with supporting evidence from the research data. Chapter 4 presents the initial methodology and findings of some preliminary research interviews. A description of the main research methodology, incorporating the lessons learned from the preliminary investigation, is developed in Chapter 5.

Chapter 6, the longest chapter, presents a structured account and analysis of the research data. This chapter is illustrated with many examples of empirical evidence from the case study interviews and highlights the most important implications from these findings. Chapter 7 describes a questionnaire-based survey carried out to test the validity of the classification system used to process the research data. A list of the most important statistical associations derived from the data and nineteen recommendations made to the construction clients studied are presented in Chapter 8, followed in Chapter 9 by a description of a strategy development model suitable for use by most organisations regularly involved in project activities. Finally, the contribution of the research to industry and academia is discussed in Chapter 10, together with suggestions for further research.

1.1 Construction as a Process

Construction is a process in that it has a start point and an end point, and there is input and transformation of resources between the two. Project management serves to manage this process, or rather to manage the sum of all the subprocesses that together constitute the construction project. It is convenient when considering project execution to divide the process into its component subprocesses, partly because the nature of the individual subprocesses varies so significantly, but also because in practice it is common to assign particular project personnel or groups responsibility for individual subprocesses. Figure 1.1 shows a typical (simplified) model of the construction process in diagrammatic form.

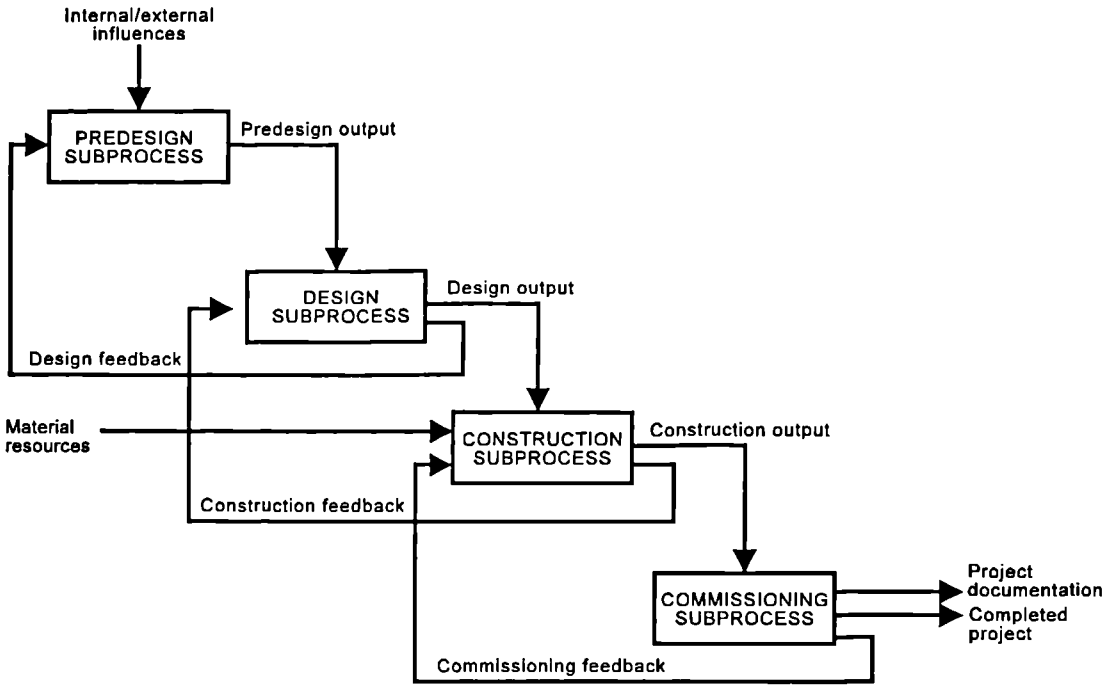


Figure 1.1 Simplified model of the construction process

Any process which involves a multitude of activities, some occurring serially, others in parallel, provides ample opportunity for conflict to arise. Conflicts can occur within single processes or subprocesses, such as design or site investigation, or between processes, such as marketing and design (important for developers), or design and construction. Change takes place to remedy conflict. The nature of a change will depend upon the severity, in cost and time terms, of the conflict. Usually, the longer it takes to discover a conflict in a process, the greater the cost of the remedy. Conflict in the context of the construction process is similar to the concept of nonconformity in quality terms. Oliver (1990) has interpreted BS 5750, Part 1, Clause 4.13 *Control of*

nonconforming product as covering (in design) faulty calculations, inaccurate drawings, incomplete specifications, etc., and (in construction) inaccurate foundation material, inaccurate shuttering for concrete, incorrect positioning of holding-down bolts, nonconforming cement, steel reinforcement, etc. Design control procedures should ensure that nonconforming design work is recognised and changed before it is utilised. Change in this sense includes the 'do nothing' solution which is not to ignore a conflict, but to recognise its presence and approve 'doing nothing' as the best course of action under the circumstances. The key points in the process are: (i) early recognition of conflict within and between subprocesses; and (ii) the mechanism to enact a rapid and appropriate response.

1.2 Organisation

Models of project organisations attempt to show relationships between people and/or groups involved in construction projects. They differ in the way they deal with time and contractual obligations. Some of them try to capture the changing state of a project organisation with time, others cram together all the relationships during a project into a single diagram.

Relationships vary depending upon the mode of procurement; many models depict a particular style or method of procurement. This is typified by the Chartered Institute of Building models (CIOB, 1982) which represent in turn the traditional method of construction, design and construct, management contracting, nonexecutive and executive project management. Walker (1989) describes a variety of different forms of project organisation that can be established. He identifies *two* types of client: (i) no construction expertise, and (ii) in-house expertise available; *three* types of design team: (i) conventional organisation, (ii) nonexecutive project management, and (iii) executive project management; and *seven* methods of appointing a contractor: (i) selective competitive tender, (ii) two-stage competitive tender, (iii) competitive serial tender, (iv) negotiated tender, (v) management contract, (vi) separate trade contracts, and (vii) design and build; giving a total of forty-two possible combinations.

However, the above models still only represent a subset of the project organisations which may be found. This is because they are pitched at a fairly low organisational level and therefore cannot take into account all of the available permutations. An alternative is to use a model based on a higher organisational level, such as the model proposed here, which focuses on the relationships between the separate component organisations as defined below:

Client system (CS). This term includes all the organisations which satisfy one or more of the following criteria: (i) has the authority to approve expenditure on the project; (ii) has the authority to approve the form the project has to take and/or its timing; (iii) will be the owner of the project; (iv) will be a major tenant or user; (v) will administer or manage the project upon completion (Walker, 1989).

Project Organisation (PO). The temporary multi-organisation established for the limited and finite purpose of bringing the project into being from inception to completion, and which consists of parts of several separate and diverse organisations drawn from the project participants (including the client system), and whose members will eventually disperse, going back to their own organisations or on to some new project (Cherns and Bryant, 1984).

Client Project Organisation (CPO). The intersection of project organisation and client system; that part of the client system designated or assumed as having project responsibility.

Project management (PM). A subset of the PO whose responsibility includes one or more of the following management functions: boundary control, monitoring and maintenance activities (in connection with the activities of the project organisation), project recommendation and/or approval powers (Walker, 1989).

Examples of how these organisations relate to one another are given in Figure 1.2. Figure 1.2 (a) is typical of the majority of projects. The role of project management is shared between the client and other members of the project organisation. In Figure 1.2 (b) the project management function is contained entirely within the client organisation; this is typical of property developers. The situation in Figure 1.2 (c) is less usual; here, the project organisation is a subset of the client system. This arrangement might apply to the housing development arm of a construction firm.

The potential for conflict is always present in construction projects. Generally, organisational conflicts may originate in one person, or in one group in which case they are called *intra*personal, or *intra*group conflicts. Or they may reflect incompatible actions of two or more persons, or groups in which case they are called *inter*personal, or *inter*group. The characteristics and culture of a project organisation are important in determining: (i) the relative frequency of conflicts; (ii) the ability of an organisation to resolve conflicts; (iii) the likelihood of achieving a productive or dysfunctional outcome.

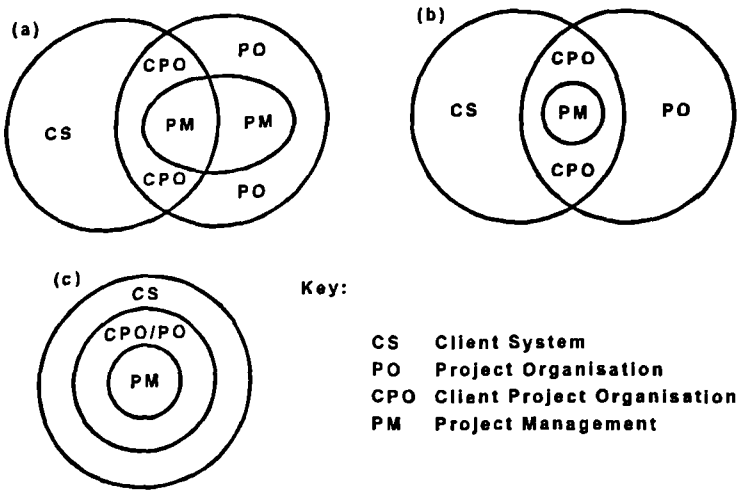


Figure 1.2 Venn diagrams of example project organisations

1.3 Control

The following description of control draws upon the concept of quality control; however, the reader is reminded that this is only one of many perspectives of management control. Quality assurance is currently a very fashionable term in the construction industry. It is now possible for clients to use only BS 5750 third party assessed and registered firms during all stages of a construction project, and the choice of such firms is increasing all the time. Clients of large projects can have individual project sites assessed and registered for the duration of the project. Quality management consultancies are available to advise and serve the client (not without cost, of course).

Quality is often defined as conformance to requirements. In this sense a quality management system provides a method of working which constantly checks each operation or activity against identified requirements, highlighting modifications and changes that need to be carried out to continue meeting and to meet more closely those requirements. The presence of a quality management system (QMS) in the project organisations may help to secure the benefits of conflict for a client and also control and regulate changes. As a client turns its attention to the introduction of a QMS, some of the issues surrounding conflict and change are brought to light and dealt with. A manager in one of the organisations studied commented: "A result of introducing BS 5750 is that project control has had to be applied in cases where before it was very much up to the project manager; project control has been given a higher profile."

Construction projects involve a number of organisations, disciplines, skills, and people of widely ranging experience and background. This can lead to communication problems. For instance consider the subprocess of design. A design programme should clarify what the client needs to provide by way of definition, and what other contributions he can make to the design process. Similarly, for the designer, clarification of the role of the client can save misunderstanding and possibly time. Unfortunately, many clients, particularly those who only rarely enter the construction

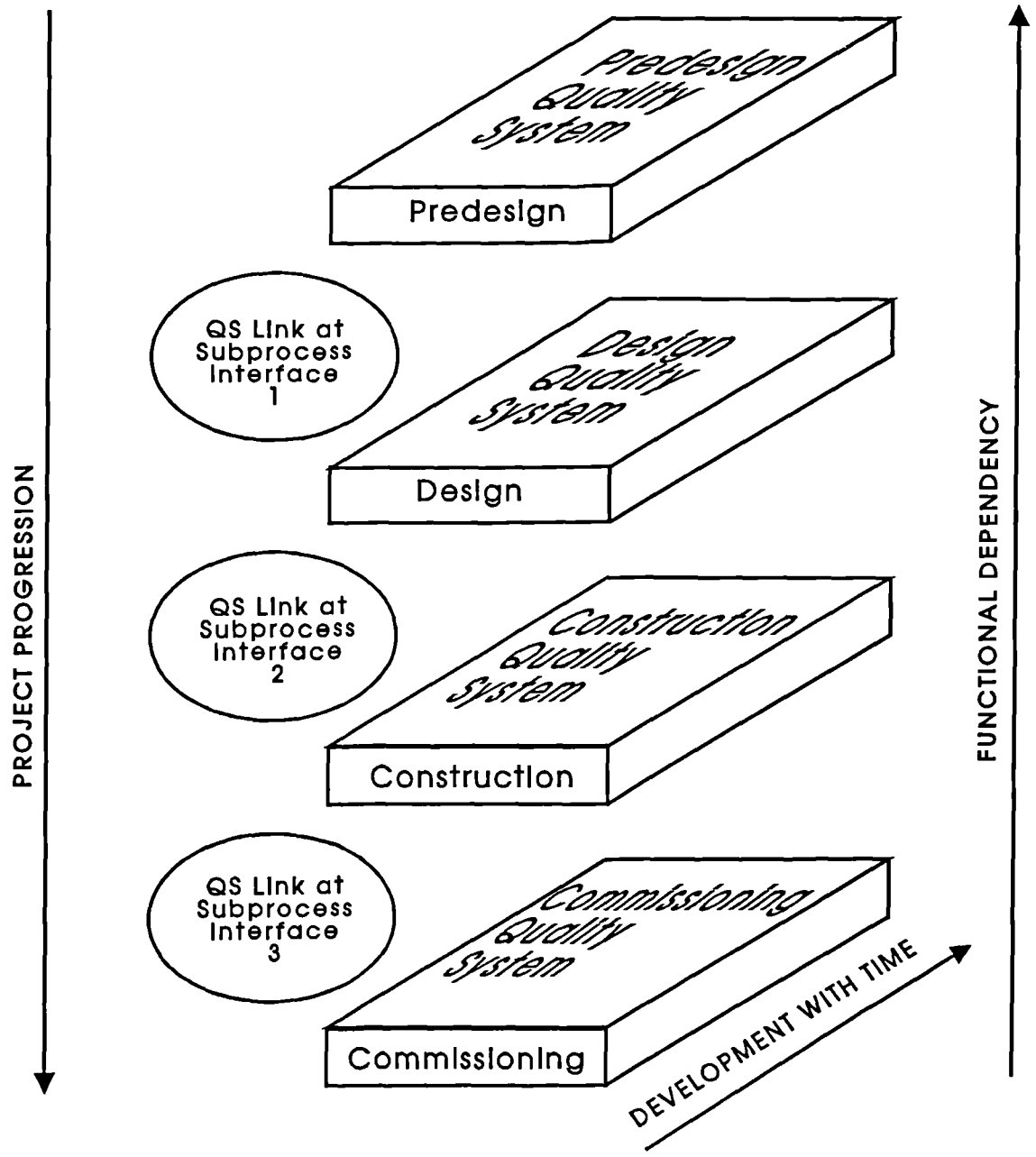


Figure 1.3 Project quality model

market, find it difficult to articulate their requirements in a form which enables the designer to devise an optimum solution. As a result misunderstandings occur which can have a damaging influence on the quality of the project and which cannot be corrected or compensated for at a later stage (Ashford, 1989).

Figure 1.1 shows the main subprocesses in a project. Each subprocess (normally involving two or more organisations) and the interfaces between them need to be managed and controlled. This task is made particularly difficult because project organisations are formed from parts of many separate organisations and it is unrealistic to expect a quality management system to embody more than one organisation; because of administration difficulties, conflicting objectives, and differing organisational structures. However, in the event of each organisation operating its own quality management system, part of each of these separate quality systems would inevitably overlap at subprocess and organisational interfaces. Figure 1.3 illustrates the subprocesses in a project in the form of a project quality model. The overlap required by the individual contributors' quality management systems, including the contribution, if any, required by the client is represented by Figure 1.4.

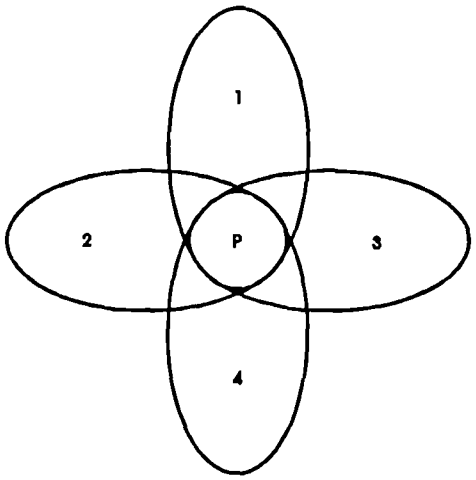


Figure 1.4 Overlapping quality systems in a construction project

The concept of global project control has been represented in practice, to some extent, by bringing together the 'quality plan' of each project participant; sometimes collectively referred to as a 'project quality plan' (Cornick, 1991). Although this concept still remains the exception to the rule, the research presented here suggests

that one of its key features, a review and audit of project procedures, can be readily applied to the development of project management strategy. This idea is developed further in Chapters 6 and 9.

1.4 Administration

The term administration is used throughout this work to mean general and contract administration. Since most clients are generally interested in acquiring only a specific type of constructed facility, they should be aware of the common industrial practices and contractual arrangements suitable to the types of construction pertinent to them. Some clients require periodic acquisition of new facilities and/or rehabilitation of existing facilities. Others procure a constructed facility only once in a long while and may not be so conversant with the various contractual alternatives (Hendrickson and Au, 1989). One project manager[1] interviewed commented that: "There are something like 137 different standard conditions of contract; it is difficult for a client to keep up with the advantages and disadvantages of each one."

It is common practice with experienced clients to use a set of contract condition modifications that go out with invitations to tender. These amendments specify things that the client wants included and the manner in which they would like them. The lay client is generally stuck with the standard conditions although the consulting engineer, or architect, may suggest a few amendments from his experience.

There has been a substantial amount of work done by others on the selection of appropriate contracts to use (e.g. Skitmore and Marsden, 1988) and the procedure for construction contract claims (e.g. Kim and Adams, 1989). Contracts normally include a few nominal procedures for resolving disputes and manifest conflict between the contracting parties. However, they rarely include detailed provisions or information regarding the prevention of conflict, nor are they applicable to situations relating to the internal affairs of the separate companies involved.

1.5 Construction Clients

The preliminary investigation reported in Chapter 4 benefited from the help and cooperation of six client organisations. A seventh organisation, Client D, was also contacted during the main investigation. A summary of all of the client organisations

[1]Unless stated otherwise, the term project manager is used throughout this text to denote any individual performing some or all of the activities normally associated with project management in the context in which it occurs.

are given below; in addition to this details of each case project studied in the main investigation can be found in Appendix A.

1.5.1 Client A

Client A is a large industrial developer predominantly involved in the design and construction of speculative industrial and office buildings, ranging from economy factory units to prestigious bespoke developments. The company carries out its own market analysis and targets areas where there is the greatest demand for their services. They are involved in all the stages of building construction from land identification and purchase, through to sale or leasing of the completed property. Larger developments also require the provision of access roads and landscaping. A significant amount of their activities focus on assisted areas, where the development costs are subsidised by the government.

1.5.2 Client B

Client B is one of the largest housing associations in the North East of England. They have had over forty years experience of providing residential accommodation, and their projects incorporate a wide range of schemes, including housing for disabled persons. Over the past few years Client B has been standardising its range of dwellings in order to increase the efficiency of its maintenance services. The company liaises with local councils for the purchase of land, often in part exchange for a percentage of the nomination rights of tenants. The provision of access roads and landscaping are also requirements of most of their housing schemes.

1.5.3 Client C

Client C is a well known university with an established reputation as a centre of academic learning. The university has buildings both within the confines of its city and also nearby on a separate site. Construction is taught within the engineering departments, however, real construction is organised by the Department of Estates and Buildings. Funding for development is from a variety of sources including the University Funding Council (UFC), and various trusts and private financial institutions. The process of building requires the cooperation and integration of many individuals and committees, not least of all the University Treasurer. Substantial information was gathered about the project management procedures of Client C; these were prepared into a set of 'Example Project Control Procedures' (Gardiner, 1991).

1.5.4 Client D

Client D is a one-off client formed by an association between a number of private sponsors funding a project promoted by the Department of Education and Science. The project studied was a new City Technical College.

1.5.5 Client E

Client E is the engineering arm of a multinational chemical and pharmaceutical group. They are involved mainly in process engineering projects frequently in excess of £5 million. The company operates a project management support unit to service a wide range of construction and engineering departments.

1.5.6 Client F

Client F is a recently privatised water company. Their construction activities include the upkeep and development of water and sewerage systems, pumping stations, and sewerage works. A large proportion of their work can be classified as civil engineering.

1.5.7 Client G

Client G is a city council responsible for many small works and a number of larger works including housing schemes, recreation centres and sites of historic interest. There are several divisions within Client G which are all ultimately responsible to the council; for example, the planning, technical, and operations divisions. These three divisions are involved in construction activities on behalf of the council. All construction work goes out to tender, however, 95% of projects are won by their own operations division. Contractual arrangements are less stringent in this environment, since each division is employed by the council.

CHAPTER 2
THEORY OF CONFLICT

2.1 Introduction

General theories of conflict can be applied in many different and diverse situations, including the study of relationships between nations, businesses, non-commercial organisations, and project organisations. Conflict is a social phenomenon between social units such as individuals, groups, and organisations. Although the literature supports numerous definitions of conflict, none of these successfully embodies all its facets. The following definitions are typical:

1. Disagreement: emotional tension resulting from incompatible inner needs or drives: war, battle: collision: the opposition of persons or forces that gives rise to the dramatic action in a drama or fiction. (Webster's Dictionary, 1971)

2. Any perceived divergence of interests between groups or individuals, or lack of adjustment between an individual or group and the requirements of the job or the circumstances in which it is to be performed. (McGivering, 1983)

3. Conflict exists when two or more people or groups within the organisation wish to carry out actions which are mutually inconsistent. (Nicholson, 1970)

4. Conflict exists when there is a difference between two or more subgroups in their cognitive frameworks or value systems; and an organisationally relevant interdependence perceived by one or more of these subgroups. (Ephron, 1961)

5. Conflict is one of three forms of difference the other two being competition and argument. (Handy, 1983, p. 214)

6. Conflict is an 'interactive state' manifested in disagreement, differences, or incompatibility, within or between individuals or groups. (Rahim, 1985)

In practical terms, defining the existence of conflict is academic; its existence is largely self evident (Phillips, 1985). On the other hand, knowledge about the causes of conflict is of great practical interest. Practitioners of project management can use their knowledge about the causes of conflict when designing a project organisation to minimise the occurrence of the damaging forms of conflict. They can also prepare contingency measures in advance for conflicts which cannot be avoided entirely. Finally, and perhaps more importantly, an innovative project manager can use his or her knowledge of the causes of conflict to engineer-in small amounts of creative conflict into the project development process. This chapter is intended to familiarise the reader with acknowledged theories that address in turn, causes of conflict,

classifying conflict, and responses to conflict. A detailed treatment of conflict in construction is dealt with in Chapter 3.

2.2 Causes of Conflict

Conflicts are often symptoms of a more fundamental problem or underlying source of conflict. For Pondy (1967) these pre-conditions of conflict constitute the first of five categories in his classification system of conflict (see Section 2.3). He uses the term *latent conflict* to encapsulate the idea that due to certain antecedent conditions conflict 'should' occur. In many cases the conditions that constitute latent conflict reflect factors originating outside the particular relationship under consideration (Walton and Dutton, 1969). This, I would argue, is particularly poignant for project organisations which by their very nature are subject to a variety of competing influences and forces outside the transient boundary of the project organisation. It is also clear that in any given situation more than one condition of conflict may be present at the same time, thereby increasing the likelihood that a latent conflict will develop into a real conflict. The causes of conflict discussed in this section cover the majority of situations likely to arise in organisational environments; many of the descriptions have been augmented with illustrative data from the research interviews. Finally, it is noted that there is a small degree of overlap between some descriptions; however, this merely reflects the difficulty of classifying the causes of conflict.

2.2.1 Task interdependency

Task interdependency is the extent to which two social units depend upon each other for assistance, information, or compliance in order to perform their respective tasks (Walton and Dutton, 1969). Interdependency provides a fundamental incentive for collaboration between organisation subgroups but if the level or quality of the collaboration is inadequate then this opportunity can quickly degenerate into conflict.

The entire structure of a project organisation is based on multiple interdependencies. Hundreds, sometimes thousands, of tasks have to be undertaken by different subgroups to achieve the finished product. These tasks are interdependent as frequently one task cannot be commenced until another has been completed or unless another task is undertaken in parallel (Walker, 1989, p. 93). Thompson (1967, p. 51) distinguishes three types of interdependency: pooled, sequential, and reciprocal, all of which operate in construction projects.

Pooled interdependency is the simplest of the three and refers to the effect that any one contribution can have on the final outcome of a project. For example, poor workmanship in the brick work may not affect the individual activities of any other contributor, but the performance of the other contributors will be tainted indirectly by association with the project as a whole.

Sequential interdependence shows itself well in assembly type operations in which successive activities are dependent on their predecessors. This is well illustrated using an example from Client G in which the steelwork subcontractor did not align the steel work to the correct tolerance which caused problems for the cladding subcontractor when he came to fit the cladding panels. The result was a dispute between the two subcontractors, that also involved the client, caused by a lack of collaboration between these two sequentially interdependent subcontractors.

Finally, reciprocal interdependence occurs when there are many parallel or linked inputs to achieve one output, often with a recursive or iterative element between contributions. The briefing stage of a project is typical of reciprocal interdependency, where several parties are contributing information, and each piece of information relates to others in the same process. The final output i.e. the finished brief, is the combined effort of all the contributors; any deficiency from one of the contributors will have serious consequences for the other contributors later in the project. For example, if the client changes the scope of the project during the main stage of the project, this will require new design information, and possibly some demolition of construction work already carried out in accordance with the original brief and design.

The effect of task interdependency during overload conditions is uncertain (Walton and Dutton, 1969). Overload conditions may intensify the problem of scarce resources, typically time, space, and money in a project, leading to bargaining, increased tension, frustration and aggression. There would also be less time available for social interactions that would enable subgroups to contain a conflict. On the other hand, it may place a premium on mutual assistance. The aspect of social interaction can be an important arbiter during projects as suggested by a quote from one project manager of Client E:

> We had a night out before the shut-down to which many were invited, including our own works and the construction team. It helped people get to know each other. Delays following shut-down would have been in the region of £0.25 million per day. There was a bit of goodwill too . . . some charity money was raised during some safety campaigns we had. It helps to create

> local goodwill and general goodwill around the team and keeps people thinking about safety.

In construction projects the actual outcome under overload conditions would depend on factors including the resourcefulness of the project manager to develop and maintain a common organisational goal and team spirit as in the example above.

2.2.2 Asymmetrical dependency

Dependency can also be one sided or asymmetric when one social unit is more dependent than another. Dalton (1959) describes this cause of conflict with reference to a staff group responsible for understanding the problems of line groups. To do this the staff group had to get alongside them, promote their ideas, and generally justify the existence of the line groups. None of these tasks, however, were reciprocal requirements for the line groups. Conflict can easily occur in these circumstances because one unit has little incentive to coordinate its own activities with the other. In a construction project subcontractors are frequently quoted by designers and project managers alike as the main cause of cost and time overruns. The following quote from an interview with the architect-project manager of a project for Client C is an exemplar of asymmetrical dependency:

> There were a number of problems thrown up by the subcontractors involved . . . Subcontractors in any building project can make or break the success of the thing, especially with regard to contractual programme.

The project manager is dependent on the subcontractors to fit their contributions into his programme. But it is an asymmetrical dependency in which there is little if any dependency of the subcontractors upon the project manager, at least in their own eyes.

If members of the construction process were asked if they were interdependent, they would undoubtedly agree, but this is not something that would be at the forefront of their minds if the question were not asked. This lack of recognition of interdependency begins with the education of members of the construction process. Each discipline is educated in relative isolation from the others (Walker. 1989).

2.2.3 Organisational differentiation

Differentiation is a term originally of biological origin meaning the modification of body parts for the performance of particular functions. It is now widely applied to organisations; thus, organisational differentiation is the modification of the subunits of

an organisation for the performance of particular organisational functions. Litwak (1961) draws attention to the differences between uniform tasks and non-uniform tasks and suggests that this leads to differentiation. Uniform tasks require a tall, ordered, bureaucratic type of organisation characterised by impersonality of relations, emphasis on hierarchical authority, separation of policy and administration, and a heavy emphasis on general rules and specialisation. Whereas non-uniform tasks require a human centred organisation with the opposite properties: flat, unhierarchical structure, team work, problem solving groups, integration of authority between functions, and a shared understanding of roles and responsibilities.

In practice, most large or complex organisations including project organisations have to deal with both uniform and non-uniform tasks, and therefore must combine these contradictory forms of social relations into an effective model. The existence of polar requirements in organisations and the differentiation that frequently follows is, according to Litwak (1961), a distinct source of organisational conflict.

Six years on from Litwak, Lawrence and Lorsch (1967) argued that where each unit performed a different type of task and coped with a different segment of the environment, then these units would differentiate by developing significant internal differences. Typically, there would be differences:

> (a) in the level of structuralisation; that is tightness of rules, narrowness of span of supervisory control, frequency of performance appraisals, and in the cognitive orientation of their members;
>
> (b) toward the environment, such as emphasis on life cycle costing, market opportunities, costs of raw materials and processing;
>
> (c) toward time, such as length of planning time horizon, importance of time management; and
>
> (d) toward other people, such as, openness and permissiveness of interpersonal relationships.

Lawrence and Lorsch (1967) went on to suggest that there is an optimum degree of differentiation for every organisational subunit defined largely by the degree of uncertainty in its environment; and that over-differentiation or under-differentiation can be a cause of conflict, although they admit that highly differentiated organisations have

greater potential for conflict. This is particularly relevant in construction projects where the number and types of organisations typically involved mean that over-differentiation is a perennial problem. Differentiation and its counterpart integration are discussed at some length with respect to construction projects by Walker (1989, p. 91) and (Newcombe et al, 1990).

2.2.4 Values, interests, objectives

The term 'values' refers to feelings about what is desirable. The Cyert and March (1963) definition of an organisation is one of a coalition of individuals, some of them organised into subcoalitions. Basic to the idea of a coalition is the expectation that the individual participants in the organisation may have substantially different individual goals. There is an obvious potential for internal goal conflict inherent in a coalition of diverse individuals and groups. Value differences embodied in the goals and subgoals of organisations can give rise to a conflict of interest among subgroups (Ephron, 1961).

Many organisations, including those brought together for the duration of a construction project, are composed of and influenced by a diverse range of participants with competing as well as common organisational and personal interests (Rico, 1964). In building projects, for example, the architect may be looking towards future design awards, rather than only the client's needs; or the main contractor may put in an unrealistically low bid to secure a contract during a period of recession. Interests are themselves based on values which may or may not have direct organisational relevance; if such interests are shared by persons collectively located at some point in the authority structure, then a potential for inter-group conflict exists. The challenge for project managers is to optimise the sum of all participant interests to obtain 'the balanced best interests of all'.

2.2.5 Organisational similarity

The opposite of differentiation is similarity. Organisational similarities may serve as sources of conflict as well as attraction. The reason for this is that increasing similarity provides greater potential for interaction, and that increased interaction leads to an increased risk of conflict. This is the argument postulated by Simmel (1955) who noted that low similarity often leads to interaction on a restricted basis, whereas the more that is shared in common, the greater the potential grounds for conflict. In relationships based on a limited degree of similarity, the spread of conflict is constrained by the

narrow scope of the relationship. In relationships of high similarity, conflict can readily generalise to other areas. Similarity has also been viewed as a source of interorganisational conflict (Barth, 1963; White, 1968). The greater the similarity of two resource-limited competitors, the less likely it is that a single environment can support both of them in equilibrium, and the more likely that one will attempt to dominate or eliminate the other. However, a continuing relationship between two similar organisations also represents a series of mutual decisions to invest resources in maintaining the relationship (Hannan and Freeman, 1977; White, 1974). This environment is typical of joint project ventures. In it, shared investments of time, personnel, and funds may serve as common incentives both to avoid conflicts and to resolve those that do develop (Molnar and Rogers, 1979).

2.2.6 Cognition, semantics, communication obstacles

Cognition encompasses the areas of perception and knowledge, and therefore includes information gathered from past experience and organised into knowledge, beliefs, assumptions, and expectations about the future. Together these constitute a frame of reference within which perception and action take place. Under certain conditions, cognitive differences among subgroups are likely to give rise to misunderstandings and disagreements that may develop into some form of conflict (Ephron, 1961). Pondy (1967) referred to this as the 'semantic model' in which conflict is said to result from the parties' misunderstanding of each others' true position. Semantic difficulties are almost always a problem in construction projects, particularly between the client system and other members of the project organisation. Semantic differences impede communications essential for cooperation. It is argued that conflict derived from the semantic model can be resolved by improving communications between the parties. However, if the parties' true positions *are* in opposition, then more open communications may only exacerbate this kind of conflict (Pondy, 1969).

Strauss (1964) observed that differences in the training of purchasing agents and engineers contributed to conflict in their relationship. In this case their respective training provided each group with a particular cognitive framework within which to operate. In most organisations, common experience eventually reduces communication barriers and provides common referents. However, construction projects are often performed to tight programmes by a unique and temporary coalition of subgroups and individuals described by Cherns and Bryant (1984) as a temporary multiorganisation. Consequently they are unlikely to have their cognitive differences resolved by common experience alone. Construction projects are strewn with examples which exemplify

Miller's proposal that the less units know about each other's job, the less collaboration occurs and that this lack of knowledge can lead to unreasonable interunit demands through ignorance (Miller, 1959; Walton and Dutton, 1969).

The following extract which relates to a university extension by Client C serves to illustrate:

> There was poor communication within the project organisation which led to variations in terms of the scope of the work which the contractor would do, and the scope which would be taken on by the university. There is a university rule book which supposedly sets out precisely what the university will provide, like black boards, notice boards etc., and what will be provided by the contractor. I don't think we ironed out that area sufficiently. We ended up with the contractor doing a lot more in terms of fitting out than we anticipated. It gave the contractor a way in for claims for extensions, which led to an overrun on the contract and an overspend on the budget.

2.2.7 Performance criteria and rewards

The reward system designed by management can serve either to sharpen or to blunt divisive effect (Walton and Dutton, 1969). The more the evaluations and rewards of higher management emphasise the separate performance of each department rather than their combined performance, the more conflict will occur. Client A found themselves in conflict with a main contractor when the use of a performance related reward failed to keep a project on programme:

> We asked the architects to cut some lights out to make a saving; subsequently we put them back in. The electrical subcontractor was asked, through the main contractor, to get a price for them which they did. The price was much higher than in the original tender. We agreed to pay the enhanced fee *providing* the job was done on time. It wasn't, so we said, quite rightly in my eyes, no extra fee. There is an argument still going on about that.

2.2.8 Tension

In an organisation anxieties may result from inconsistent demands from the organisation, identity crises, or from extra-organisational pressures. Individuals need to vent these anxieties in order to maintain internal equilibrium (Pondy, 1967). This is certainly true within project organisations and these tensions can partly be vented though the social interaction already discussed in the context of task interdependencies, but also through a suitable formal and informal communication system. The project manager typically holds monthly or fortnightly design meetings,

for members of the design team, and site meetings for the construction team. Other possibilities include team briefing or orientation meetings at which all groups, including foremen are represented. Informal unminuted meetings are also finding a role in project management. The architect of a City Technical College explains the use of an project orientation exercise:

> We ran a day and a half orientation exercise before it even went to site. The project manager, his leading foremen, and the quantity surveyors and everyone else were invited to attend. We wanted everyone to know what we were trying to build, and what its purpose was. They were told about the national curriculum, they were told about methods of teaching, they were told about the concept of activity rooms and how the children would use these. The result was they had a very clear view, not just of the bricks and mortar, but of the purpose of the building and why the timetable was so tight.

In direct contrast to this approach is the marked degree of tension experience by members of Client E due to uncertainty surrounding recent internal reorganisation:

> My team was not clear about what their responsibilities and duties were. We functioned by instinct rather than following any guide-lines. We had to develop our roles as best we could. There was no job remit, I wasn't very happy about that; I told our construction boss. He still hasn't fully defined what our responsibilities are but experience will probably make things clear. Perhaps we were not involved early enough. When things are set up for you to inherit you feel less than happy about that because you haven't been involved. You haven't had a lot of say, you feel you are not 100% committed.

2.2.9 Personal skills and traits

Walton and Dutton (1969) report that certain personality attributes, such as high authoritarianism, high dogmatism, and low self esteem can increase conflict. Their thesis is that most interunit relationships are mixed-motive situations, which require high behavioural flexibility to be managed optimally. Therefore, a person with a narrower range of behavioural skills is less likely to integrate differences within interunit relationships. He may engage in bargaining to the exclusion of collaborative and integrative problem solving; he may simply withdraw or become passive. Dalton (1959) and Thompson (1960) found that personal dissimilarities such as background, values, education, age and social patterns, also lowered the probability of interpersonal rapport between social units, and that this in turn decreased the amount of integration between respective units.

Personal satisfaction with the internal climate of a social unit decreases the likelihood that a member will initiate interunit conflict. It is therefore in the interests of the project

manager to manufacture a climate of cooperation, common objectives, and team spirit. Seiler (1963) observed that in one firm, constructive handling of interdepartmental differences occurred in part because the members of each department derived social satisfaction from their work associates, had high job interest and good opportunities for promotions, and were not in conflict with each other.

Project organisations are frequently formed from individuals who have been assigned without the prior knowledge of the project manager. The client rarely engages in any formal human resource management; selection is normally carried out only at the group and subgroup level by competitive tender or negotiation. This can often lead to unnecessary frustration, aggravation, and ultimately damaging conflict. The following quote from Client E demonstrates this point:

> There was quite a lot of conflict with their site manager. He was a bit belligerent, he knew best and he couldn't be told anything about construction or how to do things because he had done it all. It never got out of hand but it got a bit heated at times. . . it never really got that we couldn't work with each other; we managed to iron problems out. He was just difficult to deal with at times because he would shoot off at a tangent.

2.2.10 The bureaucratic, political or coercion model

This model describes authority-structure conflict, appropriate for the analysis of conflict along the vertical dimension of a hierarchy and essentially about problems of control such as when one party either seeks to exercise control over some activity that another party regards as his own province or seeks to insulate itself from such control (Pondy, 1967).

A discussion of class conflict by Dahrendorf (1959) explains conflict and social change with reference to the following aspects of societies: the structuring of interests, the dissensus of values, and the coercion of some by others. Dahrendorf explains conflict and change as a direct consequence of the universal existence of mutually exclusive structured interests and group interests generated by authority structures in organisations. Authority is viewed as a 'zero sum' concept, that is, in any structure characterised by authority relations there are two aggregates of individuals, one of which possesses authority to the extent that the other is deprived of it. All those who in any way share in the exercise of authority in a given association, regardless of their place in the hierarchical system, are deemed to be on the 'plus-side' of authority, while those excluded are on the 'minus-side'. Consequently, there are two 'quasi-groups' in

these organisations, one of domination and one of subjection. Those who dominate share an interest in maintaining their positions, i.e., in maintaining the status quo of authority relations; those who are subjected share an interest in modifying this situation.

Ephron (1961) agrees that authority can be treated as a zero sum concept, but also describes it as an entity ranging along a continuum from the lowest to the highest rank in a hierarchy. In other words, interests are themselves based on values which may or may not have direct organisational relevance. If such interests are shared by persons collectively located at some point in the authority structure, then a potential for intergroup conflict exists. As an example of project conflict within the bureaucratic or coercion model consider a professional member of staff from engineering in conflict with a senior member of the project board because he does not have sufficient autonomy or authority, to implement values such as high safety factors. To the engineer these values derive their legitimacy primarily from the wider professional community; however, management values within the client/owner organisation, such as a rapid rate of return on investment, constitute a real barrier.

2.2.11 Bargaining model of conflict

The bargaining model is concerned with interest groups in competition for scarce resources such as physical space, equipment, manpower, operating funds, capital funds, central staff resources, and centralised services. If project organisation member firms are involved with several projects at the same time, then competition for scarce resources will lead to a decrease in problem solving and coordination between competing groups (Walton and Dutton, 1969). Cherns and Bryant (1984) describe this type of conflict in the context of a complex client in which projects between departments compete for funding.

Competitive tendering is an important example of the use of competition for scarce resources. Early forms of tendering used open tendering; a practice which led to many recommendations for change in the annals of construction history (Walker, 1989, p. 25). Competing firms are now usually subject to an initial preselection of four to six contenders by a member of the design team or the project manager. Nevertheless, the cautious client remains the wisest client. There are many newer and alternative ways to bring together the project organisation most of which attempt to remove the negative elements of the open tender bargaining process (Gray and Flanagan, 1989).

2.2.12 Systems model of conflict

The systems model of conflict is concerned with lateral conflicts or conflicts among persons at the same hierarchical level. It is essentially about problems of coordination, such as when two parties who must cooperate on some joint activity are unable to reach a consensus on concerted action (Pondy, 1967).

It is the nature of project organisations that there are many relationships on the same hierarchical level; typically there exist a network of complex informal and contractual relationships between groups and individuals. The diversity of construction project organisations has long been recognised as a cause for concern (Crichton, 1966; Higgin and Jessop, 1965). Recent authors have emphasised a systems view of construction organisations (Walker, 1989; Newcombe et al, 1990). The systems approach reinforces the effect of differentiation and also of sentience, that is, the commitment and loyalty an individual has to his own organisation and profession (Walker, 1989, p. 91). Thus, architects will tend to exhibit sentient loyalty to their practice and professional association. This may in turn influence their behaviour within the project organisation. At a local level, problems and conflicts within the systems model are generally resolved through procedures established at the start of a project such as the design team meeting, the site meeting, consultations of the users with the project architect, or some other specially convened assembly arranged by the project manager.

2.2.13 Summary

In general the causes of project conflict are related to the characteristics of the organisation and the individuals therein. Construction project organisations have been described as temporary multiorganisations characterised by their complexity and diversity (Cherns and Bryant, 1984). They can involve many interdependent groups and subgroups, including those where the dependency is asymmetrical. Organisational differentiation between groups is the result of a long history and tradition of functional separation in the construction industry. This often leads to conflict due to differences in the values and objectives of the individual participants. Organisational similarity, which can also lead to conflict, has enabled the creation of several super projects based on national and international joint ventures and consortia.

A further consequence of the diversity within project organisations is the cognitive differences between interdependent parties, leading to communication difficulties and misunderstandings. The use of rewards to increase productivity and maintain a tight

programme can sometimes contribute to conflict. The personal skills and traits of those in key positions is an important factor in the management of conflict. Potential for tension in project organisations is often taken for granted despite many advances and innovative ideas in the shape and form of the project organisation. However, the open tender bargain is practically extinct. The bureaucratic hierarchy is out, in theory at least, but the alternative forms are frequently not as flat nor as open as intended. Political considerations within the project organisation remain a source of conflict, particularly within the domain of the organisationally complex client. Bargaining over capital funds is a daily reality for project managers in a multiproject environment. A new age has emerged within project theory which has embraced the concept of the biological system. In this theory the project manager is both the composer and the conductor; responsible for designing the organisation structure and integrating the resultant diversity of social units into an efficient and effective functioning whole, all the time sensitive to the causes and effects of conflict.

2.3 Classification of Conflict

Commensurate with the difficulty of defining conflict precisely is the task of trying to classify it explicitly. There are many attributes to conflict and classification can take into account any number of these. Pondy (1967) described five categories of conflict. In practice these often appear as sequential stages of conflict; however, as Pondy has pointed out, every stage does not necessarily occur in a particular conflict episode. The first stage, latent conflict, is about the causes of conflict and has already been discussed at some length in Section 2.2. This section deals with the next three categories in Pondy's classification system which take into account strategic differences in the level of severity of conflict. These stages are termed perceived, felt and manifest conflict. The fifth and final stage, conflict aftermath, deals with responses to conflict and will be discussed in Section 2.4.

An alternative approach to the classification of conflict can be conducted by making a comparison of certain bipolar properties. A discussion of the following comparative properties of conflict is included in this section: (i) functional-dysfunctional, (ii) frictional-strategic, (iii) organised-unorganised, and (iv) structural-operating.

2.3.1 Perceived conflict

Perceived conflict takes hold when the cognitive state of at least some of the members of an organisation begins to perceive or become aware of a conflict situation but

neither party is upset about it. In some cases the conditions of conflict may exist in a relationship without any of the participants perceiving conflict.

There are two important mechanisms that limit the perception of conflict: the suppression mechanism (personal) and the attention-focus mechanism (organisational). Individuals faced with conflicts that are only mildly threatening tend to deal with these by blocking their awareness of them. This is particularly true when the social unit provides an individual with personal satisfaction (see Section 2.2.9). The blocking mechanism is quite likely to happen in construction projects since the project organisation, and consequently the conflict, is temporary in nature. Organisations are characteristically faced with more conflicts than can be dealt with given available time and capacities. Under these circumstances the normal reaction is to focus attention on only a few of these which tend to be the conflicts for which procedural or routine solutions are available. For instance, rules governing conflicts involving ownership of risk, delay, and additional cost are often laid down in conditions of contract, although disputes do still arise. For organisations successfully to confront the less programmed conflicts, it is frequently necessary to set up separate subunits specifically to deal with them. This should be carried out by project personnel with management responsibilities; see also Section 2.2.8.

2.3.2 Felt conflict

Perceived conflict which grieves the parties involved, but which neither would normally do anything about is called felt conflict. Stress and tension are usual outcomes of felt conflict. There is an important distinction between perceiving conflict and *feeling* conflict, namely the affective state of the individuals involved at which point they begin to suffer stress, tension, hostility, or anxiety as a direct result of a developing conflict. For instance, *A* may be aware that *A* and *B* are in serious disagreement over some policy, but it may not make *A* tense or anxious, and it may have no effect whatsoever on *A*'s affection towards *B*. This was probably the case for much of the time with the conflict between the project manager of Client E and the belligerent site manager reported in Section 2.2.9:

> At the end of the day we knew his intentions were to get the job built. I got on all right with the guy; it never really got that we couldn't work with each other.

2.3.3 Manifest conflict

Manifest conflict involves openly aggressive behaviours ranging from mild passive resistance through sabotage to actual physical conflict. It is that behaviour which, in the mind of the actor, frustrates the goals of at least some of the other participants. In other words, a member of the organisation is said to engage in conflict if he consciously blocks another member's goal achievement. He may engage in such behaviour *deliberately* to frustrate another, or he may do so in spite of the fact that he frustrates another. The following question becomes important: 'Under what conditions will a party to a relationship *knowingly* frustrate another party to the relationship?' Suppose *A* unknowingly blocks *B*'s goals. This is not manifest conflict. But suppose *B* informs *A* that he perceives *A*'s behaviour to be causing conflict; if *A* then acknowledges the message and *persists* in the behaviour it is an instance of manifest conflict.

If a conflict is strategic in the pursuit of subunit goals, then manifest conflict is likely. In a construction project any of the participants can initiate conflict if they allow their own organisation's goals and priorities to take precedence over those of the project. Once conflict breaks out on some specific issue, it frequently widens and the initial specific conflict precipitates more general and more personal conflicts which had previously been suppressed in the interests of preserving stability in a relationship. Each episode or encounter leaves an aftermath that affects the course of succeeding conflict episodes.

2.3.4 Functional-dysfunctional conflict

The effect of conflict is a highly subjective measure according to which party's point of view is taken. Conflict can arise in many organisational contexts: interpersonal, interorganisational, intraorganisational, and intrapersonal (Deutsch, 1969). A conflict may have direct and indirect participants; two social units may experience conflict, the result of which may indirectly affect other groups. For example, a conflict initially between an architect and a contractor, may result in a project change which affects the function of the building. This change may reduce the profit margin of the contractor but increase the short term utility of the building for the client. From the contractors point of view the conflict is clearly dysfunctional. The architect may regard the conflict as functional, and the client may take either view depending on his particular set of values at the time; short term or long term utility.

A certain level of conflict in an organisation is not only inevitable but desirable, for conflict is both a cause and an effect of change (McGivering, 1983). The classification of conflict as either functional or dysfunctional depends on the value systems used as described by Pondy (1967):

> It has become fashionable to say that conflict may be either functional or dysfunctional and is not necessarily either one. What this palliative leaves implicit is that the effects of conflict must be evaluated relative to some set of values. The argument with those who seek uniformly to abolish conflict is not so much with their *a priori* assertion that conflict is undesirable, as it is with their failure to make explicit the value system on which their assertion rests.

2.3.5 Frictional-strategic conflict

In a later review of conflict Pondy (1969) distinguishes between relatively minor conflicts and frictions within a stable organisation structure that do not alter the organisation structure; and conflict that is deliberately created to force the organisation to reallocate authority, resources, or functional responsibilities.

In frictional conflict the pattern of authority relations and the allocation of resources and functional responsibilities do not change as a result of the conflict. Strategic conflict, however, is often the only means by which weak members of an organisation can force powerful members to relinquish some control (Pondy, 1969).

In project management, strategic conflict is usually reserved to the larger projects like the Channel Tunnel, most construction projects being too short-lived to allow strategic conflict to take place. However, there are always exceptions to the rule as the following extract from Client D shows:

> The original proposal from the DES was to refurbish a school. This would have resulted in seven to ten level changes . . . it was Mickey Mouse all over the place. The sponsors threatened to pull out until, at the last minute, the DES said: 'You can build a new school but you only get the same budget'. So we scrapped the scheme that had been proposed and proceeded with what was initially called a design and build contract but was in fact a merger of two different contracts: a management contract and a design and build contract.

2.3.6 Organised-unorganised conflict

McGivering (1983) distinguishes between organised and unorganised conflict:

> Organised conflict is normally expressed by positive action on a personal or group basis through recognised procedures or practices whilst unorganised conflict tends to be haphazard and personal, being expressed through negative action such as vague grumbles and dissatisfactions, poor time keeping and indiscipline or withdrawals from the situation by apathy, absenteeism or labour turnover.

Unorganised conflict is associated with low morale, whilst organised conflict is related to high morale. It is reasonable to postulate that a relationship exists between functional-dysfunctional conflict and organised-unorganised conflict. Organised conflict allows individuals to express conflicting and contrasting ideas within a safe and accepted environment. This encourages individuals to increase their feeling of ownership of a project, leading to higher morale and greater commitment to the project; an outcome likely to be regarded by most as functional. Similarly, disorganised conflict tends to be unpredictable, self-centred and capable of quickly escalating into serious manifest conflict if left unchecked; clear signs of a dysfunctional outcome.

2.3.7 Structural-operating conflict

Structural conflict involves the rules that govern a relationship. They are conflicts over matters of principle (Coser, 1956). Walton (1972) described structural conflict as disputes over the basic identities claimed by interacting organisations. According to Horowitz (1963), structural conflict grows out of attempts to establish or define a relationship and reflects a basic disagreement over the legitimate prerogatives and fundamental structure of each organisation's responsibilities. The many new and alternative forms of contract in construction demonstrate a long standing structural conflict between member firms of project organisations. Many of the newer methods seek to integrate the traditionally separate functions of design and construction. Specialist and trade subcontractors now in particular have to make significant design contributions in their projects (Gray and Flanagan, 1989).

Operating conflict, on the other hand, occurs over interpretation and application of rules in relationships. They are conflicts over matters presupposing adherence to the same basic principle (Coser, 1956). Operating conflicts occur when one organisation disputes the position of another over some point but does not seek to change the other's ultimate control over the matter. Operating conflict may occur within a pre-established or patterned set of relationships; it predominately occurs over the coordination of operating procedures and activities (Walton, 1972). In the construction industry operating conflicts are frequently concerned with contractual disputes leading to conciliation, arbitration, or litigation.

2.3.8 Summary

The classification systems for conflict described here demonstrate the wide scope and application of the term conflict in construction projects. Although common sense is often sufficient to alert project managers to some of the conflicts in organisations, a theoretical understanding of the properties of conflict and a knowledge of the frameworks within which they operate can provide a manager with advance warning of conflicts brewing on the horizon. It can make him or her wise to the relationship between certain forms of organisational design and subsequent conflict, and provides a facility for gauging the severity of conflict from its earliest point of detection.

2.4 Response to Conflict

The response to, and outcome of, conflict may or may not involve change. Indeed, there may be no 'active' response but there will be an outcome, even if it is sustained conflict. If a conflict is actually resolved then this can lead to greater satisfaction among the participants; if a conflict is not resolved then what appears to be a satisfactory resolution may only be a reversion to one of the prior levels of conflict.

Most conflict resolution programmes are applied to the interfaces between perceived, felt and manifest conflict. These programmes aim to prevent conflicts which have reached the level of awareness or affect from erupting into serious noncooperative behaviour. According to Pondy (1967), the availability of appropriate and effective administrative devices is a major factor in determining whether conflict becomes manifest. These devices may be inherent in the structure of the organisation in which case they constitute a forum for organised conflict or they may be induced by the project manager to deal with unorganised conflicts as they materialise. This point is reinforced by Phillips (1985) who describes several conflict intervention techniques appropriate for projects, in which not only the device itself is important but perhaps more importantly the severity of a conflict before the device is activated and resolution attempted. Rahim (1985) states that intervention may be needed if there is too little or too much conflict and/or the organisational members are not handling a conflict effectively.

Mechanisms for resolving lateral conflicts among the parties to a functional relationship are relatively undeveloped (Pondy, 1967) yet these are probably the most common sources of organisational conflict in construction projects. In the case of a

disruptive or potentially disruptive conflict, control and regulation is often the best short-term solution. However, regulation in this sense recognises and legitimises the conflict and therefore may perpetuate it. Control can sometimes take the form of a 'buffer' put in to diffuse damaging peaks from felt and manifest conflict. For instance, giving sole responsibility to a person to act as a single point of contact for the client may limit the damage caused by a difficult user-architect relationship, without losing the potential for valuable project input from the user concerned.

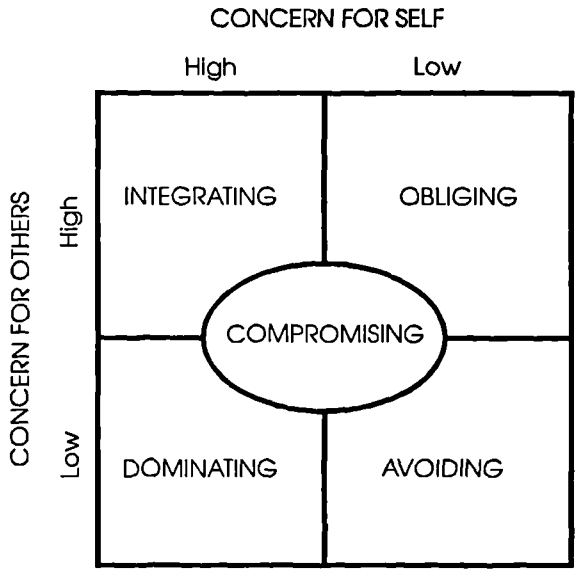


Figure 2.1: Styles of handling interpersonal conflict (Rahim, 1985)

In a conflict situation participants can react in a number of ways (Pondy, 1967). They can:

(a) withdraw, from the relationship or the organisation;

(b) alter the existing set of relationships;

(c) change their values and behaviour within the context of existing relationships.

These themes have been developed by Rahim (1985) with reference to the management grid of Blake and Mouton (1964) into five styles of handling interpersonal conflict, Figure 2.1. The key to this conceptualisation is the differentiation of response into two dimensions: concern for self and concern for others. The most appropriate style depends upon the situation involved. In general, integrating, and to some extent compromising, styles are appropriate for dealing with strategic issues. The remaining styles can be used to deal with tactical or day-to-day problems.

2.5 Chapter Summary

This chapter has looked at causes of conflict, how to classify conflict, and responses to conflict within an organisational context; it represents a fairly comprehensive review of the literature. Many of the theoretical constructs have been substantially fleshed out using examples of data from this research.

The next chapter focuses on literature in the field of project management and seeks to uncover the efforts of other researchers who have sought to apply a theory of conflict to project environments.

CHAPTER 3
CONFLICT IN PROJECT MANAGEMENT

3.1 Introduction

Studies of conflict applied to the management and control of projects often give rise to a series of observations reported as recommendations to project managers. Such recommendations are usually a mixture of common sense and good advice, but on their own they rarely enable organisations to deal with the individual nature of many conflict situations. Taken on board they provide a framework for helping to manage and influence the occurrence of conflict in general terms, but fall short of providing managers with a tool for addressing localised conflict phenomena occurring regularly in their own organisation, or with the capability to develop their own unique strategy on conflict management from project to project.

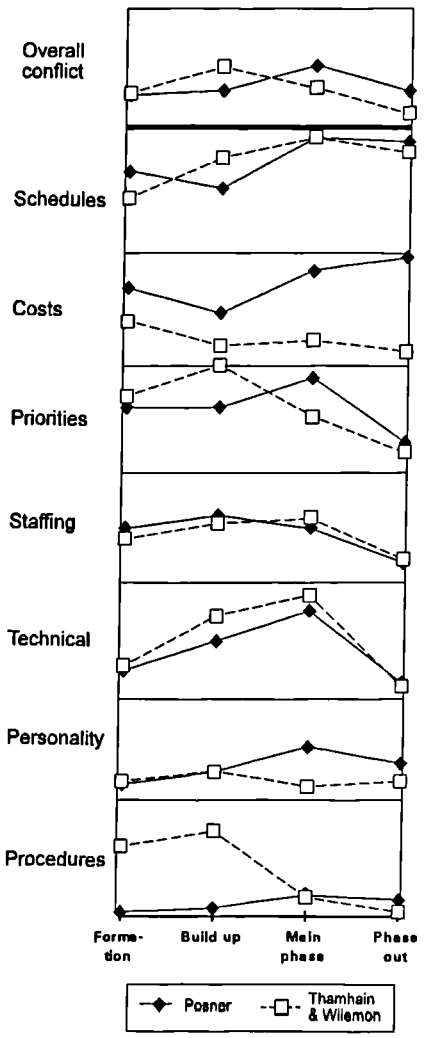


Figure 3.1 A comparison of two studies of conflict intensity

Posner (1986) collected data from 287 project managers during a nationwide series of seminars, and concluded that the intensity of conflict was relatively substantial over the entire project life cycle. His work strongly reflects an earlier study of conflict by Thamhain and Wilemon (1975a); adopting the same breakdown of project stages and addressing the same issues of conflict. A comparison of the results of the two studies is given in Figure 3.1. Since the method used to calculate conflict intensity was different in each case the graphs have been drawn to a scale of relative intensity on the y-axis that preserves the shape of the original graphs. Conflict intensity is considered in seven separate categories, namely: (i) project schedules, (ii) cost, (iii) priorities, (iv) staffing, (v) technical opinions, (vi) personality, and (vii) administrative procedures. Each graph examines conflict intensity during four project stages: (1) formation (briefing), (2) build-up (design), (3) main program phase (construction), and (4) phase out (commissioning), where

the terms in brackets refer to the equivalent stages in construction projects.

The graphs in Figure 3.1 show some striking similarities, such as the intensity of conflict experienced in staffing and technical issues, and some notable differences, such as in costs and procedures. Both studies suggest that disagreements over schedules result in the most intense conflict situations during a project life cycle, particularly in the second half of the life cycle. The research described in this thesis does not suggest any evidence to discredit this observation, although it should be pointed out that a different classification structure has been used (described in Chapter 5). Evidence of conflict in scheduling was obtained in the construction and commissioning stages which seems to fit well with the results of Posner (1986) and Thamhain and Wilemon (1975a). Two examples relating to Clients A and C respectively serve to illustrate:

> The contract period was totally unrealistic at sixteen weeks initially; it lasted about 40 weeks in total.

> Their [the contractor] other failing if they had one was that they underestimated the amount of time required for services installation and commissioning.

Posner (1986) explains the reduced level of conflict for administrative procedures as being due to the 'institutionalisation of project management as an organisational form' over the last ten years; and the increased level of conflict over cost issues as a result of a shift from cost-plus contracts to fixed fee contracts on the one hand and an increased level of international competition on the other. However, Thamhain and Wilemon (1975a) do show some surprise at the relatively low ranking of cost as a cause of conflict in their study and emphasised that this was:

> by no means indicative of the importance of cost performance to the overall rating of a project manager. During discussions with top management, it was repeatedly emphasised that cost performance is one of the key evaluation measures in judging the performance of project managers.

A further point of interest reported by Thamhain and Wilemon (1975a) was the disruptive effect of even small differences in personality:

> Project managers emphasised that personality conflicts are particularly difficult to handle. Even apparently small and infrequent personality conflicts might be more disruptive and detrimental to overall programme effectiveness than intense conflicts over nonpersonal issues, which can often be handled on a more rational basis.

Views on conflict from practitioners of project management include Richter (1978), Phillips (1985) and Kezsbom (1989). The most poignant of these is Phillips, a conflict interventionist, who considers the benefits and risks associated with conflict and, in particular, the way in which the impact caused by a conflict depends on when it occurs and the time lag between its initial development and intervention by a project manager. His approach is forthright and practical. For example, he considers that 'conflict is not so difficult to understand that one needs a two-pound, three-ring binder to help identify it', and that the causes of conflict are often so 'obvious and mundane as to be embarrassing'. A practical approach is also offered by Richter (1978), a senior systems analyst, who looks at problem solving techniques in project management. Perhaps not surprisingly he considers that 'the prevention of conflict requires the systems approach which creates order when a situation tends to disorder'. Kezsbom (1989) treats conflict from the points of view of Posner (1986) and Thamhain and Wilemon (1975a) incorporating their findings into a summary of project management best practice.

More recently, Langford et al (1992) looked at the occurrence of conflict at contract interfaces, for example, between the main contractor and his domestic subcontractors. They suggest that project managers should be able to anticipate zones of conflict between the various contractual parties. This view is consistent with Thamhain and Wilemon (1975a), and Posner (1986) whose research efforts focused on potential sources of conflict and when they are likely to be experienced by project managers in general; the hypothesis being that this knowledge should enable project managers to deal more effectively with these 'inevitable' conflicts. Dodd and Langford (1990) discovered several conflicts in a 'construction management' case study, all of which related to the comparative responsibilities of the subcontractor in a management contract, where the contractual relationship is with the client, rather than a traditional contract, where the contract is with the main contractor. Conflict was more pronounced in those subcontractors who may be described as 'traditional', whereas 'specialist' subcontractors showed a more positive approach to the demands of this changing role.

Cleland (1968) describes the certainty of conflict in projects as 'the deliberate conflict which exists because project management requires creation of a management philosophy that formalises the crossing of organisational lines to accomplish project goals'. This is a conflict between the priorities of the project manager and those of the functional department manager. In Cleland's opinion, a project is a series of activities

requiring specialist input from many sources, either departmental or extraorganisational. Each contributing organisation has its own goals and priorities, including the project manager. Therefore, according to Cleland, an important function of the project manager is 'to achieve harmony of activity among organisational elements with conflicting objectives', for which 'the desire to negotiate is essential'.

A study by Barker et al (1988) into the characteristics of effective and ineffective project managers revealed that some project managers relied heavily on the 'ineffective combination of competitive and avoiding approaches to conflict' which led them to pose the following three questions for future research (the various approaches or styles referred to are discussed more fully in the next section):

(1) Can we find ways to select project managers whose natural tendencies emphasise confirming and cooperative approaches?

(2) Can we find ways to modify the attitudes, behaviours, and skills of project managers who over use the competitive and avoiding approaches to conflict?

(3) Are there ways for an existing project team to facilitate the changeover from neutral or negative conflict approaches to a more positive combination of confirming and cooperative approaches?

The very same questions have also been raised during the research presented in this thesis which attempts to go beyond general theories of conflict applied to project management, valuable though they are, and to look at conflict processes from the point of view of individual organisations and project managers. The whole process of dealing with areas of conflict is taken in this research to include the individual manager as well as the organisation and other considerations. A discussion of these ideas are presented in Chapter 6 and a system of self analysis is proposed for individual project managers to perform on their own projects as they are completed. This is formalised in Chapter 9 as a generic model of strategy development.

3.2 Styles of Handling Conflict

Many of the current authors in the field focus their attention on conflict handling techniques for project managers. Kezsbom (1989), for example, describes eight recommendations for improving project manager effectiveness and minimising conflict. These relate to communication, leadership, an understanding of the cause of conflicts, alternative styles of handling conflict, motivation of staff, and project planning.

The earlier work of Thamhain and Wilemon (1975a) considers the following five methods for resolving conflict, adapted from Blake and Mouton (1964): withdrawal, smoothing, compromising, forcing, and confrontation. These modes have been reinterpreted by others including Rahim (1985) resulting in five specific styles of handling interpersonal conflict: (1) integrating - high concern for self and others, (2) obliging - low concern for self and high concern for others, (3) dominating - high concern for self and low concern for others, (4) avoiding - low concern for self and others, and (5) compromising - intermediate in concern for self and others.

A further study involving the engineering group of a large utility in Western Canada was carried out by Barker et al (1988). This study, questionnaire driven, focused on the approach of effective and ineffective project managers. It was distilled from 135 project engineers with experience in a matrix style project organisation overlain on a predominantly functional organisation. The researchers examined four conflict handling styles, similar to those suggested by Blake and Mouton (1964) and Rahim (1985):

(1) Cooperative - emphasis upon mutual goals, orientation toward joint benefit, understanding everyone's views, and incorporation of several positions to form a solution good for all.

(2) Confirming - conveys that the other person is accepted as effective, avoids insults and blaming.

(3) Competitive - assumes that the conflict is a win-lose struggle, attempts to make the other conform to his or her views, forceful presentation and coercion.

(4) Avoiding - tries to maintain harmony and smooth over differences, avoids expressing frustration and anger.

Using this conceptualisation, the damaging effects of conflict are much more likely to occur when a project manager adopts a competitive style of trying to win conflicts; and the constructive effects will predominate when the project manager establishes a win-win atmosphere by confirming the competences of team members (Barker et al, 1988).

A pictorial representation of the various conceptualisations, in chronological sequence, is shown in Figure 3.2. Similarities in meaning are shown by the letters A, B, C, D, and E as appropriate.

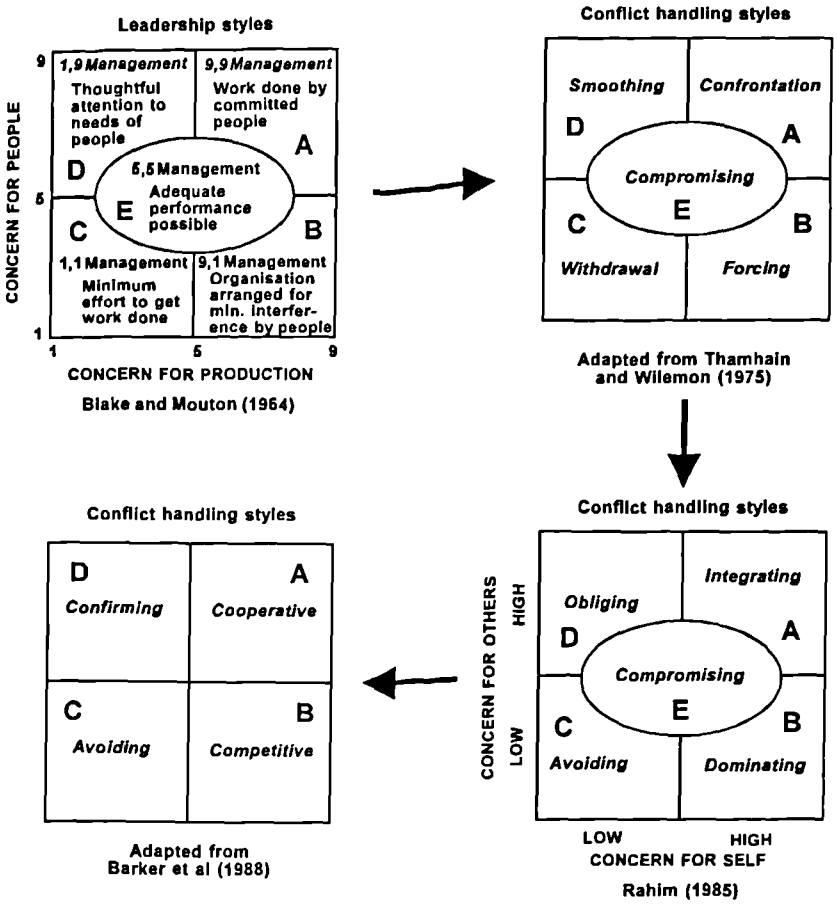


Figure 3.2 Conceptualisations of conflict handling styles

3.3 Functional-Dysfunctional Aspects of Conflict

The term 'functional-dysfunctional' is a comparative property of conflict and has already been referred to in Section 2.3.4. A discourse on the constructive effects of conflict is given by Singh and Vlatas (1991) who state that 'certain forms of conflict, such as disagreement and dissension, can be very constructive for project organisations as a whole', and that 'managers should view conflict situations as active resources of an organisation and use the opposing ideas expressed as control mechanisms to verify, modify, and improve decision processes'. They conclude that 'a minimal level of conflict is desirable for maintaining a healthy organisational environment', and state that, 'conflict must be stimulated if too little of it exists and destimulated if too much of it is present'. This is analogous to the recommendations of Lawrence and Lorsch (1967) concerning differentiation (see section 2.2.3). In terms of exercising control over conflict Singh and Vlatas emphasise: (i) the use of an integrating conflict-handling style, (ii) creating and maintaining a team building, problem solving environment, and (iii) the use of situational leadership skills. Dodd and Langford (1990) regard tension between individuals as a positive force and

suggest that 'engineering out' potential conflict between individuals by manipulative selection procedures is not a viable option for project managers. This point is discussed further in Section 6.7.1.

Other authors such as Kezsbom (1989) and Posner (1986) also allude to the functional aspects of conflict. Kezsbom boldly affirms in her opening synopsis that:

> Since conflict is inevitable, our goal is not to eliminate it, but to view it as an essential, healthy, and productive characteristic of project work. If managed properly, conflict can enhance team productivity, stimulate innovation, and assure a quality product. By encouraging rather than suppressing the expression of conflicting opinions and ideas, managers can create a reservoir of alternatives from which a solution may eventually evolve.

Posner, on the other hand tends to follow the style of Thamhain and Wilemon in which conflict management is largely taken to mean getting rid of conflict as soon as it appears, to avoid serious damage to project objectives; but then in his concluding paragraph, he tentatively mentions the alternative view that:

> ... conflict is not bad, a view more prevalent a decade ago, but is a dynamic process. Indeed, conflict may be viewed as creating the energy necessary to deal with more uncertain situations, rapidly changing technologies, turbulent economic conditions, and increased competitive forces.

Earlier contributions to project management literature make no direct mention of the potential benefits of conflict, although Richter (1978) describes in some detail several group discussion and creative problem solving techniques which he concludes: 'Can be used for the good of the project and the company'. However, in his final sentence he talks about 'overcoming' rather than 'using' conflict to achieve project goals.

In the social and behavioural sciences, ideas about the functionality of conflict were beginning to form by 1967. Pondy (1967) acknowledged that, 'most frequently the study of conflict has been motivated by a desire to resolve it and to minimise its deleterious effects', but that exceptions are now coming to light. He states:

> Conflict is not necessarily bad or good, but must be evaluated in terms of its individual and organisational functions and dysfunctions. In general, conflict generates pressures to reduce conflict, but chronic conflict persists and is endured under certain circumstances, and consciously created and managed by the politically astute administrator (Pondy, 1967).

Pondy makes no explicit mention of project managers, the concept of the project manager was only just beginning to emerge at that time, but clearly his reference to the politically astute administrator, would encompass the modern day project manager. It appears that there has effectively been a time lag of about 20 years in transferring the notion of a functional conflict from the social science arena to that of engineering management.

The consensus of more recent papers is that conflict can be beneficial to projects as well as dysfunctional. An analogy would be that pain is a feeling beneficial to people. Without it there would be no way of knowing when to withdraw the hand from a hot object to avoid damage to the body. Conflict is the pain experienced by project managers during projects. It is a useful guide, which is best explored and experienced during its infancy, before serious damage results. A second medical analogy would be with live vaccines, where a small insignificant infection, can alert the body to manufacture specific antibodies to combat a serious disease. In the same way a little conflict early on can correct many misunderstandings between participating groups and individuals and at the same time may serve to induce new and novel ideas.

3.4 Conflict Intervention

Conflict can occur at any stage in a project. However, the frequency of conflicts tends to increase to a maximum towards the end of the main project phase, and then decrease during phase out (Thamhain and Wilemon, 1975a; Posner, 1986). This observation is not surprising since the number of active interunit relationships also tends to increase and decrease in the same way. Without people there would be no conflict! Many of the project conflicts described in the literature are the visible signs of latent conflicts that exist because of the confrontational nature of project organisations. It is not surprising therefore that several researchers have acknowledged the importance of the early project stages as the most appropriate environment for managing conflict.

The importance of managing conflict at the beginning of a project is a view supported by the experiences of Client D and consistent with other sources (Phillips, 1985; Thamhain and Wilemon, 1975b). In the case of Client D, the architect carried out a project orientation exercise lasting a day and a half. The effect of this was invaluable. The meetings had been arranged before the project went to site. The people invited included the project manager, his leading foremen, the quantity surveyors and several other project personnel. Full attendance was achieved. The purpose of the exercise

was to ensure that all project personnel understood the nature of the project and the background behind many of the briefing and design decisions that had already taken place. This included details of the National Curriculum, modern methods of teaching, and children's activities. The group were given a very clear view, not just of the bricks and mortar, but of the purpose of the building, why the timetable was so tight, and what they were being asked to achieve. The project manager and others said that it gave them a major insight into what they were doing.

Phillips (1985) reports a similar experience involving an architect-engineering firm. The terminology he uses is 'team building session'. In his project there was initial reluctance to proceed with the team building exercise from the other participants until the architect-engineering firm agreed to foot the bill. At the end of the day the result was very similar and all agreed that the session had been 'good management practice'.

Further confirmation of the importance of managing conflict at an early stage is given by Thamhain and Wilemon (1975b). Their data identified three areas in which project managers perceive that the intensity of conflict is likely to increase. Two of these three areas fall into the formative and early programme phases of projects. The first concerns the understanding of project objectives among project members; the second is similar, and concerns the improper understanding of project mission, organisation, and roles of team members. The confusion over objectives was particularly directed to specific 'work packages' within a project. One project manager they interviewed put it like this:

> Everyone usually understands the objectives of the project in terms of cost, performance, and schedule. When you break the project down into the various subsystems or work packages, problems can develop in making certain that those who support you really understand their objectives and how they relate to the overall project.

This cause of conflict, together with role ambiguity, which can cause frustration among those supporting a project, tends to occur most frequently during the formative and early stages of projects, when most of the project planning takes place.

The reason that these early management exercises are so effective is because the potential for project conflict is present right from the start, before any work commences. A project orientation exercise is a management tool which can kindle many otherwise hidden potential conflicts, classified by Pondy (1967) as latent conflicts, bringing them into a carefully controlled environment where they become perceived conflicts, and where they can be resolved before they progress to their more

serious forms of affect (such as felt and manifest conflict). These exercises encourage the early forms of conflict, with an emphasis on friendly exchange and win-win resolution outcomes. Thamhain and Wilemon (1975b) acknowledge that conflict over objectives may lead to open exchange which clarifies objectives and project details but fail to emphasise the importance of team building exercises, such as the orientation exercise in the case of Client D.

The importance of recognising conflict early in projects is mentioned by Phillips (1985). He describes six project management tools and techniques addressing the occurrence of conflict but warns that: 'Each tool becomes more difficult to apply and less likely to succeed as a conflict is allowed to unfold.'

The six points of entry described by Phillips (1985) are: (1) Early team building exercises, (ii) dealing with boredom games, (iii) dealing with remembered history, group conflict, and consolidating the opposition, (iv) third party conflict intervention (reconciliation and arbitration), (v) litigation, and (vi) evaluation.

In a project studied by Dodd and Langford (1990), the importance of creating compatible teams to generate effective teamwork was clearly demonstrated. The client convened informal weekly meetings which served as a non-threatening source of team building, information exchange. This was particularly welcomed by many specialist trade contractors at the start of their project input. Problems were shared between trade contractors and management contractor. No minutes were taken. This approach is similar to the early orientation exercise of Client D, but adapted to suit the requirements of a management contract procurement method.

Dodd and Langford (1990) also noticed that conflict developed with respect to the precise definition of responsibilities at the boundaries of work packages. There was uncertainty on behalf of trade contractors. Consequently, they recommended an improved organisational structure in terms of (i) tightening up the contractual definitions, (ii) clarifying areas of responsibility, and developing teams geared to resolving any problems that still occur, with a fixed price for conflict resolution chargeable to the trade contractor.

3.5 Feedback and Debriefing

Once a project is completed project evaluations can be invaluable for participating organisations; debriefing can be a constructive exercise in which participants are

encouraged to learn from project problems and conflicts by 'failing forwards'. Few clients carry out formal debriefing exercises to tease out faulty procedures and introduce new ideas into their project management practices. Most clients agree how useful such exercises could be, but generally project managers have other projects baying for their attention, and on projects where there is much to learn, the temptation is to sweep the memories, and their association with the project, under the carpet and 'hope' that the same sequence of events will not recur.

It is interesting to note that Dodd and Langford (1990) list as one of the major implications of their research the provision of feedback into the project organisation. They recommended putting,

> structures into the project organisation which, without robbing an organisation of its flexibility, [would] show an understanding of the potential problems and [provide] a distribution of resources designed to alleviate them before they have a chance to appear [as damaging conflict]. The administrative systems and client meetings [in the project studied] showed an inherent level of structure that allowed all the necessary changes to occur within a controlled environment.

Cleland (1968) talks about an environment of trust, integrity, and willingness, as prerequisites for entering into and resolving inevitable conflict. The project manager must therefore build an environment for open and free expression in which the project-functional feedback is meaningful and real, and in which the climate necessary for innovation is provided. This is the very kind of environment aimed for in the orientation exercise, and weekly client meetings already mentioned.

In describing the last of his conflict intervention points Phillips (1985) postulates that:

> the most relevant and vital training tool a company has is its project successes and mistakes. . . There is no better way for project managers to learn about conflict than from those who shed the blood and wear the scars of its costs.

In particular he observes that:

> very few companies have any such mechanism for reviewing project successes or failures. Typically, company management 'remembers' only those project managers whose projects went sour. And they are branded, often for the rest of their careers.

This thesis advances, in Chapter 9, a basic model for project organisations to generate, distribute, and utilise feedback on organisational and behavioural issues. The potential importance of such a model is strengthened by the interest bestowed upon it by several of the firms who have collaborated with the research.

3.6 Chapter Summary

The chapter shows several perspectives of conflict within project environments. A striking similarity between the work of Posner (1986) and Thamhain and Wilemon (1975a) provided convincing evidence of the extent and relative occurrence of conflict in projects. Langford et al (1992) looked critically at the interface between the main contractor and his domestic subcontractors and suggested that certain conflicts are 'inevitable' and therefore should be planned for in advance. A number of commentators drew attention to different styles of handling organisational conflict. For project managers, the integrative style is required more frequently than the others. The notion of functional (or useful) conflict was emphasised with reference to the work of Singh and Vlatas (1991) and others; while conflict intervention was discussed as a tool for project managers in cases of dysfunctional conflict. Finally, the importance of feedback at the end of a project (or major project stage) has been considered together with the notion of 'failing forwards' as a learning concept that can help project participants derive some positive benefit from otherwise dysfunctional conflict experiences.

CHAPTER 4
PRELIMINARY INVESTIGATION

4.1 Introduction

The main aim of the preliminary investigation was to establish a rigorous methodology for collecting, classifying and analysing project information relating to conflict and its effects. During this phase contact was established with six organisations all professional clients of construction activities; these have already been introduced in Section 1.5. Interviews were conducted with up to three senior project managers from each of these organisations. From this work, a methodology was developed which uses a process of hierarchical decomposition for classifying the data and rendering it suitable for subsequent analysis. The methodology is described in detail in Chapter 5. The results presented here lend weight to the hypothesis that the creative management of conflict and change can benefit construction industry clients. The majority of the results presented here have already been published (Gardiner and Simmons, 1992).

4.2 Developing a Methodology

In this study, a total of nineteen interviews took place over an eight month period, i.e. between October 1990 and May 1991. The objectives and methods used during these interviews gradually changed as the focus of the research became clear. Early interviews were concerned with collecting information to determine project control procedures of clients; later interviews became increasingly focused on the phenomena of conflict and change. Preliminary interviews were largely unstructured and consequently tended to generate information about a client's organisation in general and about subjects or 'pet topics' which the respondent knew very well. The methodology developed here underpinned the research methodology described in Chapter 5. The method adopted followed the following pattern.

4.2.1 Establishing contact

Telephone contact was made with potential respondents to discuss briefly the purpose of the interview and to set up a meeting. This was confirmed in writing. It was occasionally necessary to send on a summary of the research objectives before respondents would agree to a meeting.

4.2.2 Visiting company to carry out interview

This could take a morning, an afternoon or sometimes all day depending upon the location of the company. The duration of an interview was normally between 1-2 hours. Unstructured interviews began with an exchange of pleasantries, a brief statement of the purpose of the visit and the objectives of the research followed by a long discourse from the respondent with occasional interjections from the interviewer if the subject began to veer too far off course. More structured interviews followed a similar line with the proviso that a set of written questions was at hand which the interviewer could refer to and read out if necessary. The approach was inductive in nature with questions ready only as an aide-mémoire or 'topic guide'. Fully structured interviews consisting of a series of questions to be answered one at a time with a mixture of yes/no answers were not carried out.

4.2.3 Transcribing interview material

Transcriptions were prepared with the help of a Sanyo transcriber and associated foot control and ear phones. Standard C90 tapes were used throughout the research. The process of transcribing usually took between one to three days depending upon the length of the interview and the spoken style of the respondent. For instance, interviews which comprised of short complete sentences were easily transcribed. However, long rambling comments with many side-tracking subclauses, took much longer. It was important to retain the intended sense of respondents during transcription; spoken English does not always convey the same meaning in the written form, a fact which had to be taken into account later when quoting directly from transcripts (see also Riley, 1990). In most cases, direct word-for-word transcription was carried out. Occasionally, if a significant proportion of the interview material was unsuitable or irrelevant then it was edited out during transcribing. This saved on processing time later, but produced an incomplete transcription, and was carried out infrequently. The reuse of recorded audio-cassettes was put into practice after the first ten had been recorded and transcribed. This practice was stopped following the loss of part of two computer files for which hard copies and back-up files had not yet been obtained.

4.2.4 Processing the transcription

Several commercial software packages, such as the Ethnograph, are available to process information derived from interviews. However, it was decided that a simpler

and cheaper alternative to these could be developed to meet the requirements of the research. This was achieved using the SmartWare[1] project processing language, which enabled items of data to be quickly earmarked, extracted and coded for subsequent analysis. Data items were marked within transcripts by enclosure between two star (*) symbols. By executing the programme developed these were then located and stored in a separate file. Each item of data was then assigned seven attributes to be employed later as a basis for comparison and analysis. The attributes used were: (1) reference code, including company name, transcript filename, and the page and paragraph where the information occurred, (2) subject (from conflict, and change), (3) context (from process output, organisation, quality and control, and contracts), (4) parties involved (from client system, project organisation, client project organisation, and project management), (5) subprocess (from inception, briefing, design, and construction), (6) project name, where applicable, and (7) comment. The attributes 2, 3, 4 and 5 could be given more than one descriptor. For instance, an item may be classified by subject as belonging to the set of data items containing both conflict and change.

The data were extracted from their respective transcripts and marshalled together with their attributes in a single data file. This file could be interrogated by a second programme. For example, all data items with the attributes 'subject=change', 'context=process output', and 'subprocess=design or construction' could be quickly accessed and stored as a separate file ready for analysis. A listing of the text processing programmes are given in Appendix B together with an example of the output obtained.

4.3 Client Attitude and Philosophy

While client organisations recognised the inevitability of change and had developed some measures to control it, conflict was less frequently considered and was often seen as a negative phenomenon, one which clients were not keen to associate with their own projects. Despite this, upon questioning, most client project managers recognised the value of challenging existing norms and expectations (Bowditch and Buono, 1990).

Some distinction was generally made between design changes and scope changes. For example, in the case of Client E a project begins with a particular client-business intent which is turned into an engineering intent. If the client-business then wishes to make a change because of a fundamental misunderstanding about what was required, or new information makes the original assumptions invalid, this is regarded as a change in scope. A scope change is a fundamental change to the intent (or brief) of a project, a

[1] Registered trademark of Innovative Software Inc.

design change, however, does not alter the intent of the project. Design changes are sometimes provided for by way of contingencies included in the project scope. Consider, for example, a decision about whether to use one pump or two in an installation. The client may not have had sufficient information at the time the original project scope was produced to make a final decision. Nevertheless, an informed choice was needed. If it turned out later that the wrong choice had been made, a design change and not a scope change would be required. Of course, not all design changes can be anticipated in this way.

Clients from different market sectors in construction view project change differently. For example, Client E regards change as an acceptable part of project management and control. The volatility of the market place demands that change must be allowed in order that the technical quality of the end product reflects the current market. Other clients avoid change so far as it is possible but nevertheless acknowledge its inevitability in many projects. However, the project users and operators of some clients, particularly Client C in this study, preferred to regard the ability to effect change as a normal and acceptable facility regardless of the stage a project had reached. Explanations concerning the difficulty of making changes given to this group seemed to provide some of them with the impression that those in charge, such as the client project manager and the architect or engineer, are merely being obstructive.

In organisational terms significant planned change takes place during the life of a project both with respect to the nature of the relationships between, and the responsibilities of, the parties concerned. For regular or professional clients, such as those studied here, organisational change also gradually evolves from project to project. Clients generally agreed that these changes should also be reflected in documented project procedures which are ideally updated to incorporate new knowledge and experience as they arise.

4.4 Analysis and Discussion of Data

130 data entries were collected from sixteen recorded interviews across six client organisations. A wide range of types of conflict and situations involving change were identified. Figure 4.1 shows the distribution of conflict and change across the categories: process output, organisation, quality/control, and contracts. The category having the greatest number of conflicts is *organisation* (42 occurrences) of which 11 also include change. This is closely followed by *quality/control* (39 occurrences of conflict), the only category having more occurrences of change than conflict.

Contracts has the fewest number of data, a total of only 12 entries, compared to 68 for *quality and control*, 51 for *organisation* and 22 for *process output*.

Figure 4.2 shows the distribution of conflict and change across the subprocesses of a construction project. Project design has the most occurrences of conflict and change, 53 and 47 respectively. There are 25 occurrences of conflict in briefing and 30 in construction. Inception and tendering have only 7 and 10 respectively. To reiterate, the preliminary investigation was primarily intended to develop research methodology and data handling techniques and therefore no attempt was made to eliminate the risk of these figures being biased by the individuals spoken to in the different organisations. This type of bias is taken into account in the main investigation.

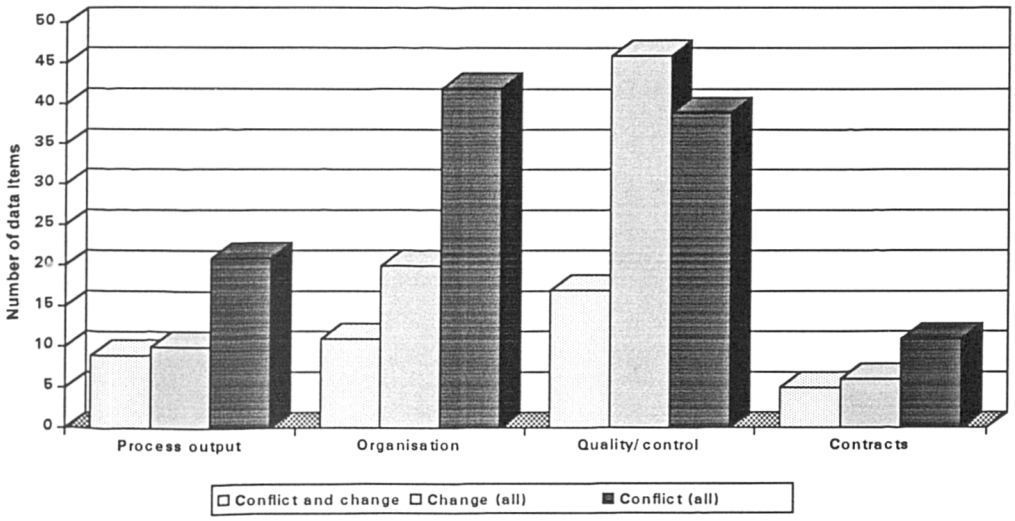


Figure 4.1 Distribution of preliminary data across business categories

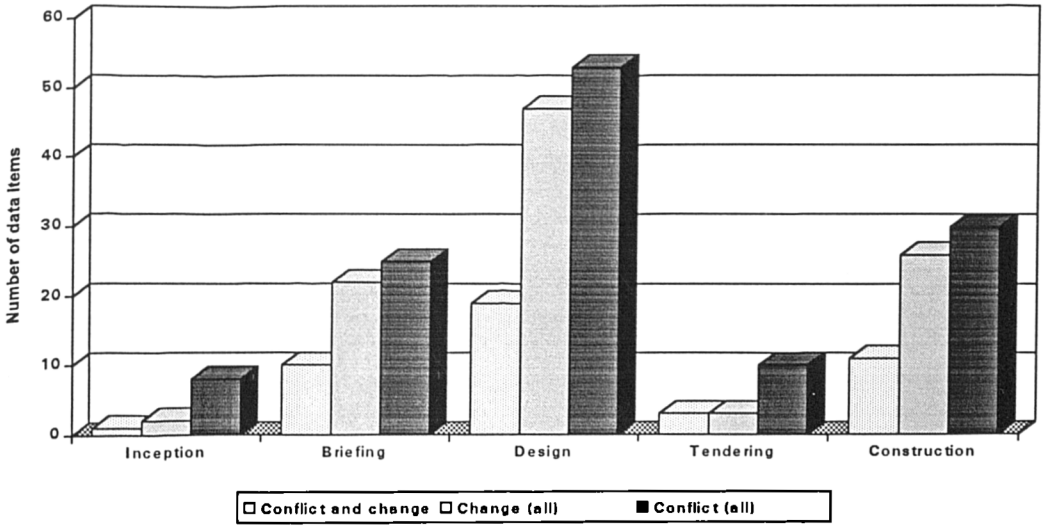


Figure 4.2 Distribution of preliminary data across construction subprocesses

It is hypothesised that conflicts originating during inception, briefing or design, should be identified early in the life of a project because of a reverse order dependency between construction subprocesses (see Figure 1.3). From the client's point of view, the success of construction depends to a large extent upon the success of the design, which depends upon the quality of the brief, which in turn depends upon the inception process and the reasons behind the decision to build. A latent conflict originating at inception, perhaps between the concept architect, a user representative and the client's projects officer, which leads to a change once the construction subprocess is under way, is likely to have serious implications of cost and time. Table 4.1 shows the distribution of conflict and change for the subprocesses briefing, design, and construction, within the *process output* category illustrated in Figure 4.1. Process output consists of the various outputs from the different stages of construction which then become inputs for the next stage on.

	Conflict	Change	Conflict & change
Briefing	2	1	1
Design	17	7	6
Construction	8	5	4

Table 4.1 Distribution of preliminary data classified as process output

There are only two items of data within the briefing sub-category of process output. It can be seen that 6 (or 35%) of the conflicts which occurred during design led to a change and 4 (or 50%) of those for construction also led to change. It is perhaps surprising that such a high proportion of conflicts leading to change should occur in the construction phase, when the cost of change is probably at its highest. However, the preliminary investigation does not contain sufficient data to draw specific conclusions from this analysis. Nevertheless, it does suggest areas of interest for further study.

Many situations were identified involving conflict and/or change. A selection of these are listed in Table 4.2. Committees were one type of situation in which conflict occurred. In the case of Client E projects are headed by a steering group or committee; a typical committee comprising representatives from the works, the business, a project manager from engineering, and also a business engineering manager. The project

Inception/Briefing/Tendering
Poor briefing procedure and coordination of information
Client and/or users lack experience
Failure to get consensus from users
User committees: low recognition and lack of authority
Design
Design error
Design omission
Design not meeting specification
Difficulty getting written approval from users
Poor interpretation of drawings by client
Construction/Operation
Construction: failure to meet design
Site: poor quality of work
Cost overrun
Running late
Operational faults
Project Management/Other
Internal politics regarding planning and approval
Lack of internal agreement between users and client project manager
By-passing a 'single' point of contact
Conflict of loyalty (e.g. clerk of works)
Poor change control: not taking into account the nature of a change
Poor change control: not taking into account percentage project completion
Failure to maintain interfaces to serve the client
Use/misuse of a quality system
Over elaborate contract condition modifications

Table 4.2 Typical causes of conflict and change identified during the preliminary investigation

manager is the link into the design team. Any problems get fed back to the steering group on a regular basis. The steering group has an overseeing role; it would decide if a scope change was needed. It provides an environment to help detect latent conflicts and which encourages the open expression of perceived and felt conflicts across interfacial boundaries. The process of conflict detection, expression and resolution

within a controlled environment benefits the client. There are many technical interfaces in connection with Client E. One of the roles of project control is to ensure that interfaces between the various groups involved are serving the client. Well maintained interfaces behave as open channels and enable the client to locate and benefit from conflict between the various parties at the earliest opportunity. Conflict which originates during the inception, briefing, or early design subprocess, but which is not discovered until the final subprocesses of a project may still benefit the client, but with a significant cost and time penalty.

However, not all conflict in committees is beneficial. Consider, for example, the case of Client C in which, until recently there was a tendency to create project subcommittees (PSC's) to support a project during its design and construction subprocesses. The purpose of a PSC is to provide a balanced and representative client voice to interact with the lead designer and the client project manager, and to provide the right environment to enable perceived and felt conflict to be brought into the open and resolved (and in this respect the PSC is similar to the project steering group of Client E). Most projects proceed satisfactorily and are regarded as successful by users and University alike. However, in one particular project (a new academic building) this was not the outcome obtained. There was some difficulty integrating the 'non-construction wise' user-members of the PSC into the early subprocesses of the project. The concept and importance of design information status was sometimes unclear. This led to intergroup conflict between some of the users and the project management team during the later subprocesses of the project.

In general, large or complex clients create project committees in order to develop a balanced brief and to bring to light and resolve potential conflicts at an early stage. The value to the client of a committee style environment depends upon having good integration within the committee. A poorly structured committee consisting of largely uninterested parties is unlikely to command authority or respect from the other members of the project organisation.

Change also occurs in many different situations. What is important here is the control of change. A system which allowed anybody to change anything would be catastrophic. Similarly, a system which prevented the consideration of any changes could result in a building quite unsuitable for its client, or even the discontinuation of a project. Changes themselves are not usually a problem. Most problems arise when there is no suitable mechanism or system to recognise required changes and enable them to occur promptly with minimum disruption. The system should also help prevent

unnecessary changes taking place (without creating further conflict between the parties). One of the problems encountered by the users in the PSC mentioned earlier was a resistance to change, even though questions regarding the same changes had been asked earlier, when they could have been more easily accommodated. In Client E one of the purposes of project control is to facilitate planned and controlled change.

4.5 Chapter Summary

The results of the preliminary investigation suggest that the creative management of conflict and change needs to be actively pursued by project managers, and it is no longer sufficient to rely only on a 'common sense' point of view. During the research it was found that both client and construction companies were quite willing to help. Good relationships were established with a small number of clients which served as a strong foundation for the next phase of the research.

The methodology presented here continued to emerge during the research and formed the basis of the methodology used in the main investigation to measure more fully the role and effect of conflict in construction projects. Three lessons, in particular, were learnt during the preliminary investigation:

(i) the value of using semi-structured notes and questions during interviews;

(ii) the need to have manual back-up of one sort or another in case the recording or computing equipment fails;

(iii) the advantage of developing a flexible classification system which is able to continue emerging and being reshaped during the research process, rather than trying to define a rigid system at the start of the process.

CHAPTER 5
METHODOLOGY

5.1 Data Theory

Researchers are continually having to ask each other: "Have you got the facts right? Can we get better data? Can the results be interpreted differently?" (Phillips and Pugh, 1988). When developing a data theory it is important to define the unit of analysis. For example the research described by Bresnen and Haslam (1991) is about construction industry clients in which the client rather than the project or any other variable is the unit of analysis. In the current research the unit of analysis is conflict, conflict in construction projects. The main audience will be construction industry clients. It may be of more interest to some clients than others. Clearly, if all the data were collected from local authorities, the research findings would appeal firstly to local authorities and firms who had made a direct contribution, secondly to other local authorities and firms specialising in local authority work, thirdly to clients who have a significant number of features in common with local authorities, and finally to other firms engaged in construction or construction related activities. Alternatively, if the research were to consider only projects carried out using a certain procurement route, then it would appeal primarily to those clients using the same route. As it is the research has examined a spectrum of client types and construction methods.

Project conflicts have been analysed at a low organisational level. In this case it is less important who the client is, how the project is organised, whether or not a project control or quality system is being used, or which conditions of contract have been adopted. Indeed, it has not been the purpose of this research to recommend best practice in any one of these areas, but rather to identify the circumstances and conditions which exist during a certain type of conflict and the implications thereof.

This chapter briefly considers the techniques of others in the same field, then outlines the techniques used in this research to select case study projects, interview project personnel, and analyse the data obtained. An outline is given of the qualitative and quantitative treatment of the data, including some background to the statistical analysis. The chapter concludes with the view the author has taken on the validity of the findings.

5.2 Research Techniques in Construction Management

The collected experience of earlier researchers served as a useful guide during the selection and development of suitable research techniques and communication protocols. Cherns and Bryant (1984), for example, approached potential clients formally and informally:

> The formal method, sending a standard letter briefly explaining the project and following this up with a phone call to arrange an initial meeting, was far less productive than the informal method of using personal networks and previously established relationships with senior members of client organisations. While little information came from formal approaches, the informal ones netted an interestingly assorted bag of people willing to talk to us. Some had long experience of successive projects, others had stories about only one or two, some were already building, some planning to build. Our 'method' was no more than getting them to talk about their experience and plans.

Fisher (1984) performed a series of interviews involving four construction companies:

> Structured interviews were prepared (Garrett, 1970) with suitable meeting agenda circulated to the staff to be interviewed before the interviews were commenced. An initial interview was conducted with a senior director and also the person nominated by the company as a link person. A total of fifteen people were considered as many as could be interviewed in each company, given time constraints. The structured interviews with each employee were undertaken in 'top down' order and were all recorded on audio-cassette.

And Bresnen and Haslam (1991) used a target sample of 179 construction industry clients for their survey:

> Once cases were selected, a telephone call was made to ascertain who would be best able to act as key informant about the organisation and the specific project. This individual was then sent a letter outlining the research and this was followed up by a telephone call to establish willingness to participate. Once access had been agreed, an interview was arranged and a short pre-interview questionnaire was dispatched to obtain some general information. The interviews were then based on a 40-page structured questionnaire and lasted an average of 1-1.75 hours. The nomenclature and role of those interviewed varied considerably, as might be expected. They included managing directors, project managers, building service managers, property/estates managers and chief architects/engineers.

Each of these approaches has its relative merits. The experience of Cherns and Bryant illustrates the advantage of using existing contacts as a source of information, or as the starting point for developing a wider network of contacts. In the case of Fisher, initial

links with a senior director and contact person provided sufficient motivation for the cooperation of up to fifteen additional personnel from each construction company, although the applied nature of the research would have almost certainly helped. Bresnen and Haslam's approach was threefold: select a large list of possible companies, establish the most suitable contact person in each, then negotiate access and cooperation.

5.3 Selection of Construction Clients

The current research involved the intensive study of a handful of client organisations and construction projects rather than the more traditional large scale survey and questionnaire approach. This is consistent with Moser and Kalton (1985) who report that the intensive study of a few case studies tends to "dig deeper" than studies involving the use of standardised, formal methods with large representative samples, although something may be lost in terms of generality.

Client organisations were chosen to represent a broad spectrum of construction activity and also by virtue of their geographical proximity. In all, seven clients collaborated with this programme of research (See Section 1.5). They can be categorised as: (i) an industrial developer (Client A), (ii) a housing association (Client B), (iii) a university (Client C), (iv) a one-off client with private sector funding (Client D), (v) an industrial process engineering company (Client E), (vi) a water company (Client F), and (vii) a local authority (Client G).

5.4 Selection of Projects

The number of projects which could be studied in depth was limited by the time available and the number of suitable projects that were identified by each client. Projects which were put forward as case studies were discussed and selected in consultation with the main contact established during the preliminary investigation within each organisation.

In selecting projects, attention was given to the diminishing ability of project participants to recall information relating to project relationships and activities with time. As time increases beyond the date of completion of a project, information provided by a respondent would probably begin to lose its freshness, clarity, accuracy and reliability. Conversely, the study of on-going projects may not have produced the right information either owing to the existence of 'live' conflicts with unknown

outcomes; a respondent may view a conflict in a different light following project completion. Projects were chosen with completion dates that fell within the three years preceding the main investigation.

To eliminate bias in the selection of projects, that is the selection of only those projects which seemed to be 'worth' studying, a degree of randomisation was incorporated by requesting that clients selected projects using a predetermined project size range and date of completion.

Two to four projects were chosen for use as case studies from each client, except Client D which represented a one-off project. The criteria used for selecting case study projects were as follows. Each project should:

(i) have a preconstruction project budget of between £1 million and £5 million;

(ii) be based in the North East of England; and

(iii) have a practical date of completion (or its equivalent) between 1 October 1988 and 30 September 1991, with a preference for recently completed projects.

A description of the projects used as case studies can be found in Appendix A.

5.5 Interviewing

5.5.1 Conditions for a successful interview

A large portion of the data was gathered during interviews with project participants, both from the client and from other contributing organisations. The following information drawn largely from Moser and Kalton (1985, p.271) was used as a guide in the preparation and execution of interviews. Three conditions for a successful interview are postulated:

> The first condition is the *accessibility* of the required information to the respondent. If the respondent does not have the information he cannot answer the question. This situation may arise because, although he once knew it, he has now forgotten it; or because he has repressed information which involves some emotional stress to him; or because he cannot answer the question in the manner required, that is, he may not think of things in the same way that the question has been framed and so may be unable to answer it in the specified terms of reference.

Many of the interviews carried out involved some areas of personal stress for the respondent. Also since the larger projects spanned over two years from inception to completion respondents did occasionally have problems remembering exactly what had happened.

> The second condition is *cognition,* or understanding by the respondent of what is required of him. Upon entering into an interview the respondent is adopting a particular role, and he needs to know what is expected of him in that role. He must, for example, establish means of sorting out relevant information from that which is irrelevant to the context of the research being undertaken. How completely should he answer, and in what terms of reference should he express his answers. It is part of the interviewer's job to teach the respondent his role, both in his initial explanation of the survey and of what is being asked of the respondent and in the way he treats the answers given by the respondent, in particular by probing for further details when the answer is incomplete or off the point.

This condition often needed individual application. Some respondents were able to grasp the nature of the research and the information being sought quickly, while others had significant difficulty understanding precisely what was required from them.

The third requirement for successful interviews given by Moser and Kalton is *motivation* on the part of the respondent to answer the questions accurately.

> This includes the respondent's initial decision to cooperate and his subsequent decision to continue with the interview. But, more than that, it also includes his motivation to give accurate answers; a seriously distorted answer is no better than no answer at all. It is a part of the interviewer's job to try to reduce the effect of factors tending to decrease the level of motivation such as a desire to get on with other activities, embarrassment at ignorance, dislike of the interview content, fear of the consequences and suspicions about the interviewer. Similarly, it is also the interviewer's job to build up the effect of factors tending to increase motivation such as curiosity, politeness, a feeling of duty, a keenness to help the sponsor of the enquiry and a liking for the interviewer. (Modified)

In practice, motivation tended to wane after about 45 minutes to 1 hour, or if the respondent had been allowed to talk at length upon some side tracking issue, which meant that there was insufficient time left to develop more relevant themes.

5.5.2 Interview technique

During the data collection phase, the researcher was the only interviewer for all eighteen case studies. This was preferred to employing professional survey companies

or part-time interviewers on grounds of cost, and the probing nature of the research, particularly during the preliminary investigation. Many texts on interview technique stress that the form of the interview opening is crucial to win the confidence of those who are less than willing to cooperate. Barriers to cooperation can arise because the time may be inconvenient, the subject may be one the respondent is not prepared to talk about, or the respondent may be antagonistic towards interviews in general. Therefore, it is during this period that the interviewer's attitude counts most. The following techniques were applied during interviews (Moser and Kalton, 1985; Riley, 1990):

1. Communicate gratitude and explain purpose

   'The interviewer should recognise that the call is an encroachment upon people's time, although one which many do not resent.' With this in mind, the reason for the interview was always carefully explained to respondents both in terms of why the research was being carried out and who would benefit from it. These explanations were kept relatively brief and excessive diffidence or apologies avoided.

2. Confidentiality

   'Show that you have taken problems of confidentiality and your informants' interests seriously.' It was always spelled out that answers and comments recorded during an interview would be treated confidentially. Occasionally, it was felt necessary to explain how the sample of construction clients had been selected, and to intimate that lack of cooperation would make the research less representative.

3. Probing technique

   'Probing is one of the most challenging aspects of an interviewer's work, and requires a good deal of skill. The importance of probing should not be underrated: by intelligent and neutral probing the interviewer can make the respondent feel at ease about the information he is revealing, can ensure complete and meaningful data and can make the interview flow interestingly.' Several devices were used to help encourage the release of information from respondents. For example, allowing a brief 'expectant' pause to develop often helped, indicating that something more was required, providing the pause did not become too long. Sometimes encouragement was offered in the form of expressions such as 'Uh-huh,' 'That's interesting' or 'I see' or a simple

supplementary question, such as 'How do you mean?' or 'Can you tell me more about that?'. Moser and Kalton (1985) also suggest repeating part of the respondent's answer in a questioning manner but go on to play down attempting to summarise a respondent's answer as some respondents would tend to accept the summary, whether it truly reflected their position or not.

4. Length of interview

   The length of interviews needs to be monitored carefully so as not to jeopardise further interviews with the same person, or with colleagues of the respondent. Interview lengths were generally agreed with individual personnel at an early stage. Occasionally, the respondent made an entire morning or afternoon available for the interview. In other cases half an hour (including interruptions) was the best a respondent could offer. It is advisable to know in advance how much time is available for an interview; this allows the most pertinent points to be covered in good time.

5.6 Methodology in Practice

5.6.1 Preliminary investigation

The methodology used during the preliminary investigation has already been described in Section 4.2. A major objective of the preliminary investigation was to help formulate a rigorous methodology to apply during the main investigation.

5.6.2 Main investigation

As already suggested, the main data collection process was based upon the experiences and skills developed during the shorter preliminary investigation. Care was given to provide a coherent structure to the operation within well defined aims and objectives; and attention was paid to the limited period of time available (approximately three months). This helped to determine the scope of the investigation in terms of the number and type of client organisations approached and the number of projects studied.

Many of the techniques used for collecting, handling and processing the data were taken directly from the preliminary investigation. Procedures were explored concerning the handling of sensitive information with a view to gaining the confidence of the organisations involved. Assurance was given that information volunteered would not

risk being misused. The possibility of establishing one year research contracts between the University of Durham and client organisations was considered as a means of strengthening the client-researcher relationship and gaining confidence. This resulted in additional financial support of £1000, from Client F, although formal contracts were not drawn up.

About half of the data was collected during interviews over the telephone. This was a development from the preliminary investigation in order to save time. The other interviews were carried out face-to-face. All thirty interviews, including those made by telephone, were recorded on audio-cassette, and subsequently transcribed. A network of project personnel was set up for most of the nineteen projects detailing respondents' address, telephone number, project activities, etc. This ensured rapid referencing and communication between researcher and respondents.

A wide range of personnel were contacted, from senior members of the client organisation, through to the lowest hierarchical level of user of the finished product. Although it was not possible to interview every person held in the personnel network, these networks were utilised later during the validation exercise.

The data collected was developed if necessary through further contact with the original respondent and by carrying out interviews with additional personnel. The outcomes of each conflict were explored as far as possible, including the extent to which they were functional or dysfunctional? An interview guide and questionnaire were prepared; copies of these are included in Appendix B.

5.7 Data Processing

The collection and reduction of the research data formed a five tiered hierarchy consisting of: (i) *raw data*: tapes of recorded interviews, documentation, letters, etc.; (ii) *transcribed interviews*; (iii) *primary processing*: locating and marking all conflict and strategic data; (iv) *secondary processing*: cross checking of information, and coding-up data items as (a) latent conflict, (b) other conflict, or (c) strategy; and (v) *tertiary processing*: classification into detailed data types, conflict analysis and strategy review.

The programmes developed during the preliminary investigation for coding the transcribed data were not used. This was for three reasons. Firstly, by the end of the transcribing process, transcript files had been created on different word processing

packages. This came about as a few people helped with transcribing; some transcripts were even typed and not on disc at all. Secondly, during the processing of the first few transcripts a very effective manual method of processing the data emerged. Thirdly, the finite volume of material being processed meant that it was feasible to manipulate the transcripts effectively by hand, something which could not have been done if there had been significantly more transcripts.

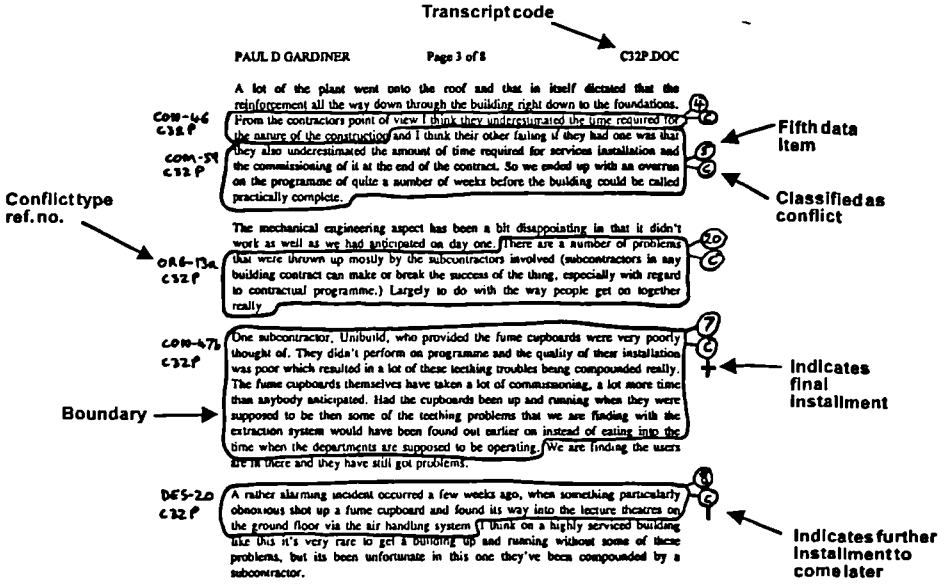


Figure 5.1 Fully coded sample of transcript text

Transcripts were labelled using a device such as 'C32', 'F11', or 'G22', where the letter indicates the construction client, the first digit indicates the case study project, and the second digit defines the number of the interview being carried out for that project. Figure 5.1 shows a fully coded sample of transcript text (with names changes) taken from a transcript labelled 'C32': the second interview of the third case study project promoted by Client C.

Individual data items were marked using a boundary of ink drawn around sections of text which fell into one of the three categories: latent conflict (L), other conflict (C), or strategy (S). Each marked section was then given a code to provide the following information at a glance:

(i) the data category it belonged to: L, C, or S;

(ii) an identification number within the transcript; and

(iii) whether the marked text represented part or all of the episode described.

The data codes were entered near to the text to which they related, encircled in ink and joined to the text boundary with a line. In the interviews it was noticed that respondents would occasionally refer back to a conflict episode which they had previously described and add some new piece of information to it, either directly or indirectly while describing some other incident. In these cases the same identification number was used to describe the new information. However, when studying a particular conflict or strategy in a transcript it was necessary to be able to locate all references to it quickly. A simple graphical device helped do this. It took the form of a small vertical mark attached to the base of the circle surrounding the alphanumeric data code. The final piece of text describing an episode was given an additional horizontal mark forming a small cross below the alphanumeric code. Every conflict episode was uniquely defined by combining the code for the transcript and the conflict episode; conflict episodes were easily and quickly located by storing transcripts in code order.

These codes were then used to assist classifying the data into specific conflict and strategy data types; a process that took several months to complete. The information on the left of the text in Figure 5.1 shows the data type reference number under which each piece of marked text has been classified. Thus '13a' refers to a particular data type in the 'organisation' category, in this case defined as, 'There was at least one person who did not get on well with others'. This information can be checked by referring to Table D.1, in Appendix D.

5.8 Qualitative Analysis

Data analysis began almost immediately after the first interview, continued throughout the data collection period reaching a peak after the final interviews had been transcribed. Valuable supporting information was often gathered during interviews from the general attitude and demeanour of the respondent. It was sometimes possible to pick out certain themes which weighed heavy on the mind of the respondent. In one case the respondent's company was undergoing restructuring. Job security was uncertain and the authority and responsibility of the project manger was changing. These were difficult times and this theme threaded its way throughout the interview. Other useful information included the number of interruptions, whether or not the respondent reflected for a moment before answering, and whether his approach was hurried.

After the first few respondents had been interviewed a number of themes began to emerge from the data. Certain areas in which damaging conflict would occur came into sharper focus, or aspects of management which were missing or performed ineffectively began to show themselves. An example here would be the reference of respondents to the unsuitability of some member in the project team. This raised the whole issue of how to select the project team members.

As familiarity with the transcripts grew it was possible to construct and express relationships concerning conflict, the construction process, and the form and structure of project organisations. Qualitative methods of analysis referred to included those described in texts such as Miles and Huberman (1984), and Riley (1990). It was also instructive to examine the output of other researchers who had employed a similar methodology. The technique of integrating data within the body of the report text itself while developing logical arguments was examined. The two texts used for this purpose were Scott et al (1992) and Marchington et al (1992).

5.9 Quantitative Analysis

Preparing the data for quantitative analysis required the classification of each datum into a suitably structured classification system; see Figure 5.2. At level one there are two categories: construction subprocesses and business categories. The first of these, construction subprocesses, decomposes into the four main stages of a construction project: (i) predesign, (ii) design, (iii) construction, and (iv) commissioning. It is acknowledged that more recent methods of procurement often involve significant overlap between some of these stages, notably design and construction. However, personal judgement was used to assign a data item to the construction project stage it most closely described. The second division at level one decomposes into: (i) organisation, (ii) control, and (iii) administration. Altogether there are seven categories in level two of the classification structure. The third level divides each category in its parent level into smaller manageable topics and themes. Finally, the data are assigned to a specific data type or description and grouped as latent conflict, conflict, or strategy, representing levels four and five respectively.

Two statistical methods were used in the quantitative analysis. The first involved a selection of summary statistics, including histograms, mean and range values. These have been applied to the data as a whole in Chapter 6, and to individual clients in Chapter 8. The second statistical test performed was the chi-squared test of association. Initial studies were carried out using Minitab (Ryan et al, 1976) which

identified many potential associations. However, because of the low frequencies in the contingency tables a more reliable method was needed. This was accomplished using Table 38: 'The test of significance in a 2 x 2 contingency table containing small frequencies' which can be found in *Biometrika Tables for Statisticians. Volume 1* (Pearson and Hartley, 1966, pp. 71-78 and 212-217). A discussion of low frequency 2 x 2 contingency tables in general is provided by Upton (1982) and Yates (1984).

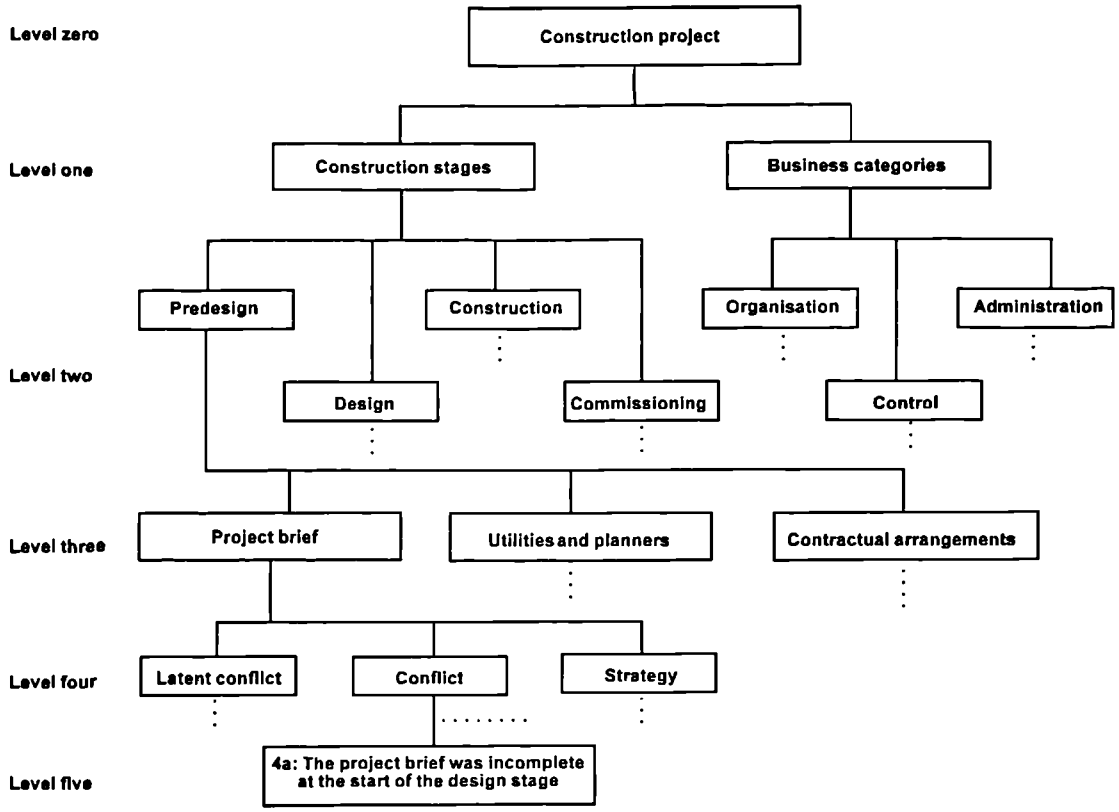


Figure 5.2 Data classification structure

5.9.1 Contingency tables

For each condition of conflict, a project can be categorised as having either 'experienced' or 'not experienced' conflict due to this condition. In some cases a particular cause of conflict may be associated with a second cause of conflict. By comparing conditions of conflict in this way some significant associations between causes of conflict have been determined. These are reported in detail in Chapter 6 and summarised in Chapter 8. Using the chi-squared test of association pairs of conflict conditions were compared against each other in the form of a two-way or contingency table. Such a table tests the independence of or association between different sets of observations (Chatfield, 1983, p. 151). An alternative way of describing this kind of association is to say that the presence of one condition of conflict is contingent on the presence of another.

In this case the null, H_0, and alternative, H_1, hypotheses are

H_0: The conditions or reasons for conflict are independent.

H_1: The conditions or reasons for conflict are associated.

Each pair of conflict conditions are assumed to be independent unless the significance resulting from the test of association provides sufficient evidence to reject the null hypothesis.

Using the Biometrika Statistical tables a number of statistically significant associations were found. Associations with a level of significance of 5% or less were taken to represent reasonable evidence for rejecting the null hypothesis. An example of a contingency table is shown below in Table 6.2.

Contingency table showing a significant association at the 2.5% level of significance		Reason for conflict: One or more design aspects failed to meet stated or expected requirements	
		No. of projects in which conflict occurred	No. of projects in which conflict did not occur
Reason for conflict: Some design information was late in coming or difficult to obtain	No. of projects in which conflict occurred	11	4
	No. of projects in which conflict did not occur	0	4

Table 5.1 Contingency table

5.10 Validation

Following the main investigation, a short questionnaire and survey was conducted to test the researcher's initial interpretation of the interview data and to enhance the research data. This exercise is discussed separately in Chapter 7. It also served as a learning opportunity in the design and use of survey questionnaires that augured well during a final quantitative check on the recommendations made in Chapter 8; a practice recommended by Riley (1990). See Section 8.4 for the results of this check.

CHAPTER 6
CONFLICT AND STRATEGY ANALYSIS

6.1 Introduction

This chapter contains an analysis and discussion of the conflict and strategy data collected during the research. Following the introduction, Section 6.2 shows how the data is divided among the seven research categories defined in Chapter 5: predesign, design, construction, commissioning, organisation, control, and administration. A comparison is made between interview data collected over the phone and that collected face-to-face. Throughout the chapter, the three classes of data, namely latent conflict, conflict, and strategy, are distinguished from each other as appropriate. The reader is reminded of their meaning:

Latent conflict data	Describes conditions that often lead to conflict but which did not do so on this occasion.
Conflict data	Describes conflicts that occurred in case study projects.
Strategy data	Describes elements of project management strategy identified as useful for managing conflict.

The latent conflict data were treated separately to avoid unsubstantiated generalisations or hearsay that might otherwise have biased the data; see Chapter 2 for a detailed discussion of latent conflict. Sections 6.3 to 6.9 analyse the data separately for each of the seven categories previously mentioned. These sections represent self-contained and integrated units that draw upon the research data and selected literature to present a reasoned argument of emergent issues and strategic implications. Subsections are used to group similar types of data; these are displayed in tables containing a description of the data type, and the number of data in each class: latent conflict, conflict, and strategy. Some descriptions contain data in more than one class; for example description 4a in Table 6.2, defined as 'the project brief was incomplete at the start of the design stage', has data in all three classes. Strategy data in this sense describes measures useful in the management of a particular type of conflict. When strategy data occurs without any associated latent conflict or conflict data, as in the case of description 82 in Table 6.3, it refers to a more general aspect of strategy relevant to that section. The final column in the data tables shows the number of respondents who referred to a particular conflict in the validation survey but not during

the interview survey. The reader is referred to Chapter 7 for more information about the validation survey.

Construction organisations and clients, particularly those that have collaborated with the research, are encouraged to consider the issues discussed in this chapter; perhaps with a view to making strategically significant changes to their own project management strategy. Unfortunately, it is beyond the scope of this research to prepare detailed proposals for each construction client that has taken part, however, a concise set of recommendations is presented in Chapter 8. These recommendations also serve as a summary of the chapter providing a quick or initial overview to the reader.

6.2 Description of the Data

6.2.1 General characteristics

The research investigation yielded a total of 283 coded data extracted from thirty interviews and processed in the manner described in Chapter 5. Eight per cent of the data were classified as latent conflict, sixty-eight per cent as conflict, and the remaining twenty-four per cent as strategy, as shown in Figure 6.1. The validation survey yielded a further 293 conflict data which are used in this chapter to support some of the arguments and interpretations made. However, the validation data are not included in the statistics presented in this section which describes only the data collected during the main investigation. However, they are included in the client graphs of Chapter 8 which form part of the recommendations to construction industry clients (see Figures 8.3 to 8.10).

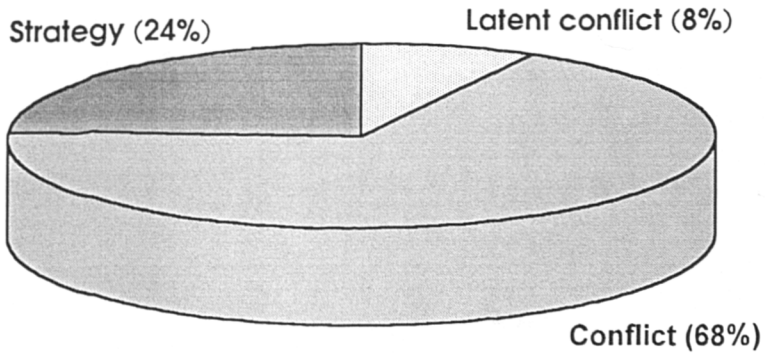


Figure 6.1 Distribution of data as latent conflict, conflict, and strategy

Interview transcripts yielded a varying number of data depending on the length of the interview, the person being interviewed and whether the interview was carried out over the phone or face-to-face. To help compare transcripts as sources of data, a

quantitative measure of 'data richness' can be defined as the average number of data per thousand words of transcript. Values of data richness varied between 0.19 and 6.00 with a mean of 2.60 and a standard deviation of 1.59. The largest number of data

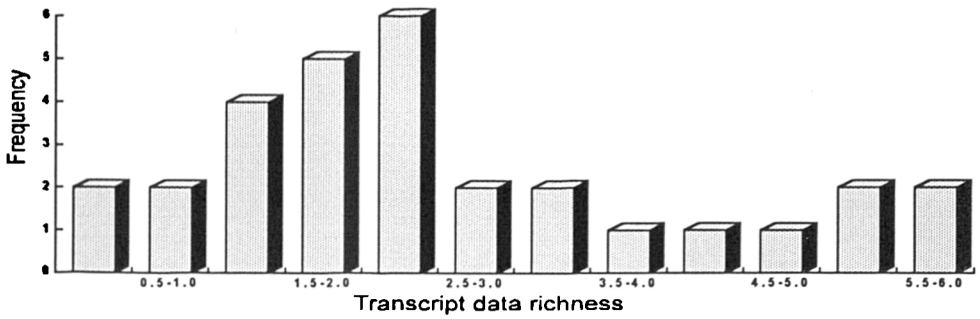


Figure 6.2 Frequency distribution of data richness values

found in a single transcript was 26. This transcript, E21M, had a length of 5320 words giving a value for data richness of 4.89. Figure 6.2 shows the frequency distribution of data richness for the case study interview transcripts. The distribution is skewed to the right (positively skewed); values of data richness for all the case study transcripts are given in Table 6.1.

Trans-cript code	Length in words	No of data items	Data richness
A41M*	1000	6	6.00
A11M	2300	13	5.65
C32P	3500	19	5.43
C33M**	1900	10	5.26
E21M	5320	26	4.89
B11P	2700	12	4.44
B21P	1887	7	3.71
E11M	2763	9	3.26
C43M	2900	9	3.10
B31P	3000	9	3.00
G12P	2300	6	2.61
D11M	7400	18	2.43
F11P	2700	6	2.22
F32P	4500	10	2.22
G13P	900	2	2.22
G22M	10400	23	2.21
A21M	4100	9	2.20
A31M	5000	10	2.00
E12M	6700	13	1.94
C11M	2600	5	1.90
C31P	1575	3	1.82
E31M	1100	2	1.79
G14P	5575	10	1.36
F23P	2200	3	1.30
F22P	6900	9	1.22
F21P	4900	6	1.18
C21M	5100	6	0.99
F31P	2025	2	0.86
G21P	14200	12	0.43
G11P	2300	1	0.19

* Interview guide with annotated notes by respondent.
** Hand written notes prepared after the interview.

Table 6.1 Data richness values of case study interview transcripts

The small rise in frequency at the upper levels of data richness in Figure 6.2 can be explained as follows. In two of these cases taped interview transcripts were unavailable; A41M, is not a transcript in the conventional sense, but is a collection of comments prepared by the respondent in advance. This was used in place of a transcript because several days after the interview it was discovered that the tape recorder had failed to operate. Transcript C33M is also peculiar in that this respondent did not want the interview recorded on tape; notes were taken and written up shortly after the interview. These two interview scripts will tend to introduce bias towards high values of data richness.

Further variation in data richness occurred because some of the interviews were carried out across the telephone; others face to face with the respondent. Of the top ten transcripts for data richness, discounting the two exceptions described above, half were carried out using the telephone. However, at the other end of the scale, eight out of the ten interviews having the lowest data richness values were carried out on the telephone. This suggests that collecting data from face-to-face interviews will on average yield a richer set of data than data collected by conducting interviews over the phone.

6.2.2 Process oriented data

The method used to classify the data was described in detail in Chapter 5. Just over half of the data (51.3%) were process oriented, and were classified as: predesign, design, construction, and commissioning. Figures 6.3 and 6.4 show the distribution of process oriented data. Figure 6.3 considers conflict data only, while Figure 6.4 considers latent conflict, conflict, and strategy data for comparison. It can be seen from Figure 6.3 that the design and construction stages contain the most occurrences of conflict. However, this does not necessarily imply that the underlying cause or origin of these conflicts is also located here.

6.2.3 Business oriented data

The remaining 48.7% of the data were business oriented. These were classified as: organisation, control, and administration, as shown in Figures 6.5 and 6.6. Figure 6.5 illustrates the importance of both project control and organisation as areas of conflict over that of project administration.

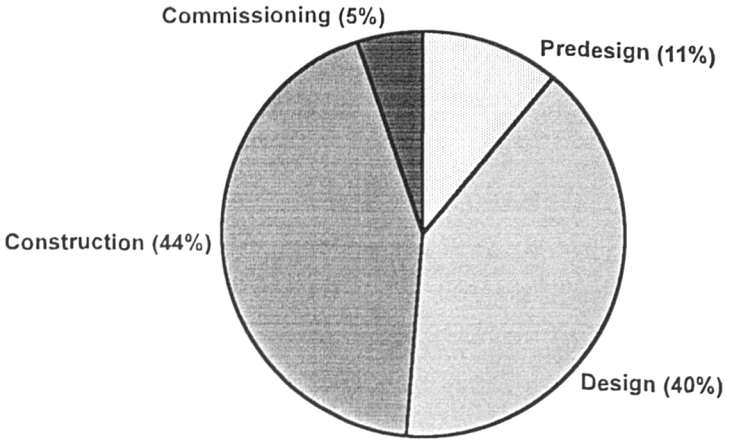


Figure 6.3 Distribution of process oriented data: conflict only

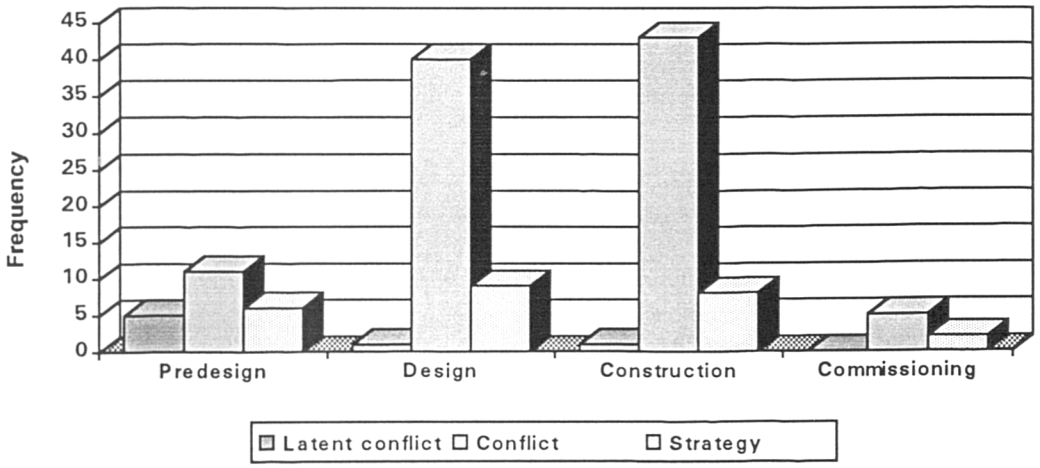


Figure 6.4 Distribution of process oriented data: all classes

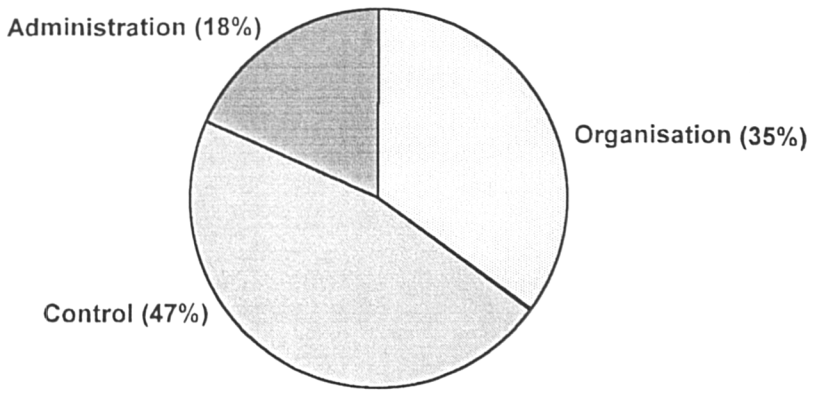


Figure 6.5 Distribution of business oriented data: conflict only

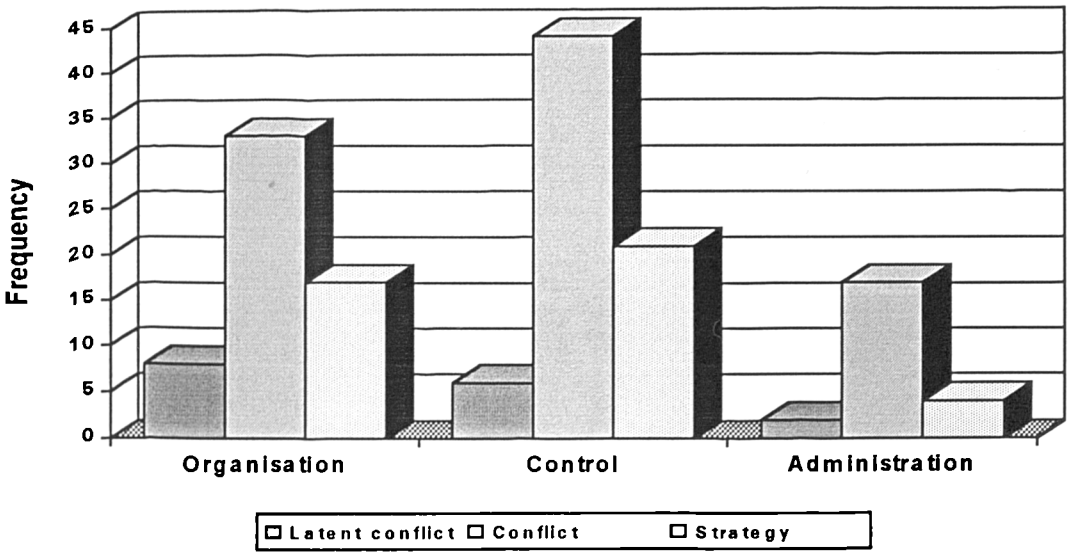


Figure 6.6 Distribution of business oriented data: all classes

6.3 Predesign

6.3.1 Project brief

Three types of conflict have been grouped in the 'project brief' subsection of predesign as shown in Table 6.2. During the research interviews, the difficulty of obtaining a complete and accurate brief at the start of a project was frequently mentioned, even though most of the companies consulted may be regarded as experienced clients of the construction industry. In one case, Client D, the initial brief contained numerous flaws and was immediately rejected by the design team. This type of conflict, arising from the appraisal of a client's brief, was also identified as a source of conflict by six additional respondents during the validation survey.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
8	Appraisal of client's initial brief revealed one or more potential design or construction problems	-	1	-	6
4a	The project brief was incomplete at the start of the design stage	2	2	1	2
4b	The project brief was not a true representation of the client's needs at the start of the design stage	-	2	-	1

[1] Shows number of additional conflict data collected during validation survey.

Table 6.2 Predesign data: project brief

The importance of the project brief is further emphasised by a statistical analysis of the data that indicates a significant association at the 5% level of confidence between conflict occurring in the briefing process and conflict due to internal management problems in one or more of the project organisations. This may be a reflection on the ability of a project organisation, such as a main contractor, to accommodate late changes of information into their programme, since a poorly developed brief can lead to requests for change late in the project life cycle. The importance of the brief in a project life cycle is portrayed by the following quote from one of the research interviews:

> If you don't research your brief properly and get the brief correct, you're never going to get the design right; no matter how good a design it may be. (G22M)

A poor brief may represent latent conflict that can develop into dysfunctional manifest conflict in the design and construction stages. However, the process of preparing a brief is far from straight forward:

> He [the client] only really starts to think seriously about what it is he wants out of a project in detail when you're close to giving it to him. (F31P)

> It wasn't set down early enough exactly what was required [comment from a design engineer on the same project regarding a pumping control system]. (F32P)

> We were well into the project before it became clear what the users wanted [comment from an architect regarding complex lecture theatre benches]. (C32P)

In one case, the client's brief continued to evolve during the construction stage thanks to an architect taking the lead and exerting a strong influence. The following relates to the function of a lecture room in the basement:

> It changed from a simple room to a fairly complicated lecture theatre with acoustics and all the problems that went with it. There wasn't a laid down brief for the basement, there wasn't really a clear concept of how they wanted to use that space, whereas upstairs they knew exactly how they wanted it. Downstairs the impetus came from us and the design team with much consultation. (C32P)

In this example a good relationship between the architect and the client helped to maintain a constructive dialogue between the participants. This is unlikely to happen in projects suffering persistent or ongoing organisational conflict.

Kelly et al (1992) discuss the problems surrounding the briefing process. They point out that clients often underestimate the importance of the briefing process and consequently these clients tend to appoint representatives having low status in the client's organisation to oversee a project. This can have serious repercussions on the availability, flow and interpretation of information between client organisation and design team, resulting in a series of conflicts becoming increasingly severe and more difficult to manage. An inadequate briefing process can lead to situations such as this one described by a design engineer from Client F:

> It is always difficult to know exactly what they [operations] want and that's where we sometimes have problems. For example, we've put these pumps in but I don't think they will ever get used now. Operations wanted them from the beginning of the job, but I think they would agree now that it was probably a waste of money putting them in. (F11P)

6.3.2 Utilities and planners

In two of the case studies, a building project and a civil engineering project, the role of utility and planning agencies was clearly underlined as a feature of project management strategy: see Table 6.3.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
82	Early liaison with utility/planning agencies	-	-	2	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.3 Predesign data: utilities and planners

This is particularly important when the design contains controversial or unusual features that may generate conflict. The following relates to Client F:

> If these people [agencies and planners] know what you are doing in advance, know that they can have an input, know that you will be sympathetic to their problems, know that you will do what you say you are going to do, then they will have confidence in you. What most people in these agencies dislike is finding out the day before that someone is going to come and dig a hole in the road adjacent to their works; or when someone says they are going to do one

> thing, comes in and does something completely different. That's when you start to get nasty letters. (F23P)

Conflict analysis has revealed that it is important to try and pre-empt problems with planners and similar officials. By communicating early with planning officials, building inspectors, parish councils, etc., before making a submission, it is possible to work through conflicts of interests and gain their agreement before detailed design work. An unexpected refusal at a planning meeting can cause significant delay, extra cost, and interpersonal conflict, particularly if it is over a minor detail. The architect of Client G suggests that designers should:

> Say to these people, particularly planners: 'Look, I'm preparing this design, I intend to submit it for a planning application next month, say, but I'm working on the design at present. I have some freehand sketches; will you have a look now in case there is anything controversial that you don't like.' By doing this you get their first thoughts on the design. They may look at the design and say: 'We don't like this, we don't like that, could you alter this, have you thought about the design from this angle?' Then, hopefully, the design is in full agreement with the planners by the time you make the planning submission and will therefore pass through the administration period without any problems. (G22M)

The consequences of failing to involve the local authority during the early project stages, and fostering good relationships with planners and other agency officials is brought to light in more detail later on in Section 6.4.3.

6.3.3 Contractual arrangements

Conflict connected to contractual arrangements can arise for a variety of reasons, ranging from the large number of contractual links that normally exist between project organisations and the client, and differences between lines of contract and lines of communication: see Table 6.4.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
15	Contractual arrangements were initially unclear or unsuited to the project	3	5	-	-
34	Contractors/designers enthusiasm for non-traditional method	-	-	2	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.4 Predesign data: contractual arrangements

Several clients were keen to reduce the number of lines of contractual responsibility between them and other project organisations; unnecessary contractual links tended to be regarded as harbingers of conflict, a trademark of the 'old way' of doing things. Contracts such as design and build, or management contracts for larger projects, were often used for this reason; though it was pointed out by one client that, 'the use of design and build contracts does not reduce on-site problems' but rather, 'makes things more clear cut when [conflict] does arise, since the contractor alone is responsible'.

The theory behind the trend away from traditional contracts involves significant organisational differences between the use of traditional contracts and newer styles of contract; differences that reflect the importance of teamwork in a project. Briefly, an effective team culture is more difficult to achieve in a hierarchical structure than a flat structure, particularly a temporary hierarchical structure. The use of design and build contracts means that there is only one relationship between the client and the project organisation, ostensibly at least.

There are, however, limitations to the use of design and build contracts. On more ambitious projects, a suitable tenderer may not be found due to a smaller choice of architects employed by these firms; with traditionally arranged contracts the market can be trawled until a suitable architect is found. Without a suitable architect to lead the contractor's design input, a project may gradually succumb to increasingly dysfunctional conflict. An alternative is to use a 'develop and build' type of contract in which a substantial part of the design is done before appointing a contractor. However, this was not a suitable option in the case of Client D, since speed of design and construction were essential.

The use of newer and alternative contractual arrangements may reduce dysfunctional conflict for some clients; however, it can cause minor conflict initially with project managers, particularly if they are not party to the selection of these arrangements. In the case of one client, Client E, an increasing incidence of management contracts as opposed to separate contracts managed internally for each part of the project was a precursor to organisational change and mild intraorganisational conflict. One project manager from Client F, disinclined to change, considered their old method, in which he was responsible for managing the various separate contracts, as the most appropriate method since it had 'evolved over the years by trial and error'.

On the other hand, in certain circumstances alternative arrangements can have unexpected benefits that complement the normal reasons for employing them, as experienced by Client C:

> The construction scene at the moment is in recession; we are highly sought after. They [a main contractor] were doing a similar scheme elsewhere but were getting a bit messed around there, they had lost enthusiasm, so they targeted this one as a show piece to show what could be done. They were very eager to demonstrate that management contracts can be done at a good price, which it certainly was. It is a much less adversarial method; you've no main contractor looking after his back all the time. Rather, you've got somebody who is effectively on the design team, who has put his name on the line, the price and the programme. I would be tempted to try again. (C21M)

In projects where large pieces of capital equipment are required that have long lead times, the client may go ahead and order these before a main contractor has been appointed. Statistical analysis reveals an association at the 2.5% level between conflict due to contractual arrangements and conflict in the procurement of equipment and materials. This practice led to a number of problems in a project carried out by Client E in which a large management contractor was used but most of the equipment was supplied by the client. The project manager reports:

> It wasn't the right thing to do; it was set up from day one almost with contractor conflict. Getting vendor information is notoriously difficult. The contractor had to approach the vendor through us. There were many conflicts between our designers and their designers. (E21M)

6.3.4 Summary of strategic implications

The data suggests that latent conflict in a brief that is not addressed during the briefing process will in many cases to lead to perceived, felt or manifest conflict in the design or construction stages. This is not unexpected since it is a well-known axiom of project management that the possibility of influencing project outcomes diminishes rapidly beyond the briefing process. This relationship, illustrated in Figure 6.7, is consistent with the findings of the research.

There is substantial evidence both from this research and elsewhere (Kelly et al, 1992; Cornick, 1991) that project and client organisations need to improve the effectiveness of the briefing process. This applies to firms acting on behalf of one-off or irregular clients and to larger more experienced clients. Models put forward by Kelly et al and Cornick are predominantly for application by firms involved in building projects as

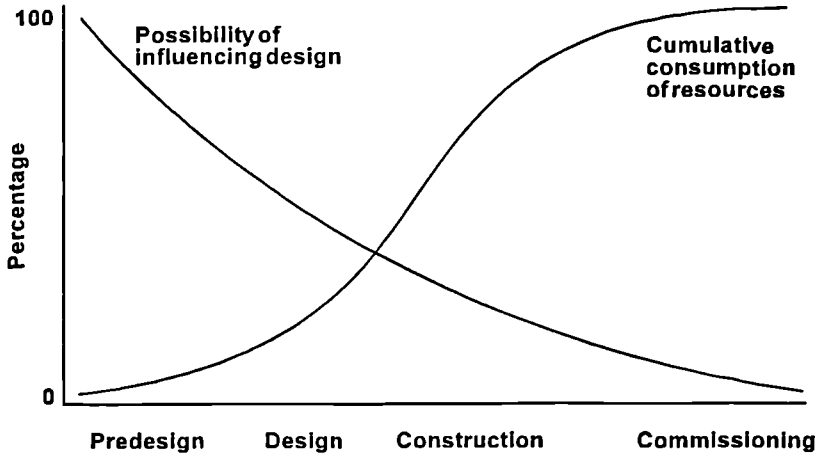


Figure 6.7 Graph showing the relationship between design flexibility and consumption of resources (adapted from Austen and Neale, 1984)

opposed to civil engineering projects. However, the conflict analysis model presented as a result of this research, and described in detail in Chapter 9, is a suitable starting point for developing an improved briefing process by all clients and project organisations. The following example highlights the type of conflict that is typical in briefing communication:

> Most people struggle to design something that isn't there. The skill of the design profession should be to see and interpret what isn't there. We found that we couldn't ask them [users] to lay a room out. It wasn't in their vocabulary. One or two could cope but it tended to be rather woolly. We prepared proposals that we then amended and polished with their help. We had to go through this cycle twice or even three times to get out exactly what furniture was required. It took a great deal of time with staff going through every room explaining what was in it and how it worked to get a clear picture of what they were really looking for as opposed to how they could make the best use of what they saw. It was a very long, very, very hard process because you found yourself repeating things time and time again. (D11M)

Without this kind of care and attention to the problems of communicating with people from very different backgrounds, it is unlikely that the briefing process will ever fully reflect the needs of the user. In this case the effort put in by the architect paid off.

6.4 Design

6.4.1 Client-design interface

Perhaps one of the most challenging tasks involved in managing a project is creating and managing optimum communication channels between participants and flows of

information during project stages, particularly during the more dynamic periods between stages where two stages may run in parallel for a time, such as design and construction. The dangers of failing to perform a thorough briefing process were outlined above, but this is just the first hurdle; conflicts can also surface during the design stage. Not only conflict between participants involved in design, but also conflict involving operators, users, and construction firms, as shown in Table 6.5. One design engineer from Client F aware of this problem said:

> We never liaise as much as we should with operations. They probably think they don't find out what we're doing in some aspects of the job until it's too late. That's when distrust sets in. (F11P)

Distrust is a form of latent conflict that left unchecked can lead to serious misunderstandings and manifest conflict. In the above example there is evidence of a weak communication link between the design team and the operational staff, at a time when an atmosphere of trust should be fostered. In view of the number of decisions that take place during design it would be impossible and impractical to attempt to involve a works representative in every instance. Each organisation needs to apply a strategy suitable to their own circumstances. Deficiencies in the current system of an organisation could be highlighted by performing a conflict and strategy analysis exercise as described in Chapter 9.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
21b	Users or operators were not adequately involved in the design process	-	1	1	4
42	Users or operators lacked the ability to interpret design layouts or to contribute effectively to the design process	-	2	-	-
51	There was disagreement over some aspect of design between the client and a member of the design team	-	3	-	7

[1] Shows number of additional conflict data collected during validation survey.

Table 6.5 Design data: client-design interface

On the other hand latent conflict between designers and operators can be put to good use at the right time. For example, in chemical and process engineering projects where safety is a critical factor the knowledge and experience of a works representative can be indispensable. This is reflected in a process known as 'hazard and operability study', or 'hazop study' for short, carried out by Client E on almost every project. Within the

hazop study the operations people can have their say, and this often throws up one or two practical points that conflict with the design as it stands rendering it safer or more fail-safe.

Despite the value of creating a designer-user interface such an exercise should not be performed without careful consideration of the risks involved. A designer sitting down with user or works representatives to discuss the most recent design developments in a project can in itself be a source of further conflict. Interpreting a design drawing requires entirely different skills than developing a brief. To lead a designer-user conflict to a constructive conclusion the project manager must be confident that when the user nods his or her head, this constitutes proactive approval of a design and not disguised ignorance:

> The main problem I found [department user representative], even having done some of this before, was interpreting technical drawings. You can't do it without plenty of guidance; it's easy to miss things and so on ... I find it very difficult to read services drawings in between floor surfaces. They are excruciatingly complex to the uninitiated, and therefore I was taking a lot on trust, which turns out to be quite satisfactory in this case. (C34M)

The approach of architects varies widely in this respect as observed by Cory Dixon (1978, p. 76)

> All architects are different and all therefore work in different ways - some have the 'open end involvement' approach in which they want the client not only to know what they are doing but also what they are thinking and why they are thinking it, and hardly dream of drawing a line on paper without asking if it is the right line in the right place. Whilst at the opposite end of the spectrum is the 'secretive' architect who covers up all his doodles every time an outsider enters the office, apparently so that his masterpiece can burst upon the world without the danger of anyone knowing what he is up to.

The architect who does not take the pains to ensure that his audience is able to interpret what he sees, is laying the same seeds of latent conflict as the architect or designer who forces through his completed design allowing only a transient glance from the affected parties, the users and operators. In project management there is often a need to bring together and integrate more than one agenda: the architect pursuing, protecting and defending his latest creative design features versus the practical and functional demands of the user that may conflict with these. It is the acting project manager's responsibility to ensure that a system is followed that enables users to comment effectively on design issues when asked to do so. A designer may be only too pleased to have his own way regarding some feature that he has designed-in and

values. It follows from this that there is a potential conflict of responsibility in projects where the lead designer is also the acting project manager.

There were three specific examples in the data where conflict occurred over some aspect of the design, and seven more were added to this number from the validation survey. The following examples show a reluctance and general unwillingness by designers to back down from their own judgements and ideas:

> I felt that the timber porches hadn't worked out as well as we had wanted. The architect defended them since he designed them. *However, I still felt and I still feel that the porches on the houses were a mistake.* When you look at them on a drawing they look better. They cost more than brick porches to build, even the contractor thought we were being foolish, although they had no strong objections. I was stuck in the middle [as project manager] ... Our new house types are no longer using that style of porch. (B31P)

> Design faults were incorporated into the building *against my will and advice.* (C33M)

The second of these examples is a biting comment from a departmental representative of a new university building. The user had voiced his concerns about the relative location of a fume extraction outlet and the corresponding air handling system inlets on the roof of the building. He pointed out that in his opinion the outlet and inlets were positioned too close together and that the design would tend to allow reintrainment of exhaust fumes. His comments, which conflicted with the design proposal, were rejected as incorrect and assurance was given by the engineer that the design accorded with standard practice and met the relevant British Standards. Nevertheless, shortly after practical completion of the building, an incident did occur in which a small amount of a particularly pungent gas escaped from an experiment. The gas was efficiently channelled into the fume extraction system leaving no trace of gas in the laboratory. However, within a few minutes the gas, which is identical to the substance used to render natural gas detectable by smell, could be detected throughout the new building.

This type of conflict can arise for two main reasons. Firstly, designers, like any other professional, will be inclined to defend their own professional judgement, particularly against non-professionals in their field; and secondly, as the design progresses many of the parties involved will be relieved at the progress being made (at long last) and will be disinclined to allow any further causes of delay. It is precisely at this time that the acting project manager and client representative, must be sensitive to the criticisms of

users and operatives, 'not get carried away by the atmosphere that has been built up, and retain their critical faculties' (Dixon, 1978).

6.4.2 The design team

Relationships within design teams and between design team members and the project manager were mostly good, but there were a number of minor conflicts as indicated by Table 6.6. Most large construction projects operate a system of design team meetings with minutes taken on a regular basis. These meetings give the various parties a chance to 'moan and groan' about each other and helps to create a team spirit, each person trying to make sure that he is pleasing the rest. There is often a set pattern in which each member has a progress report to give on their aspect of the project.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
5	Members of the design team found it difficult to finalise some aspects of design	-	5	1	3
84	Design firm operated at a distance of over one hours drive from the construction site	-	2	1	2
40	Use of in-house designer or engineer	-	-	1	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.6 Design data: the design team

The maintenance of team spirit, particularly between construction teams and design teams, is hindered if designers fail to frequent the construction site, and are reluctant to visit the site to assist in problem solving. This was a particular cause of conflict in two projects:

> Distance was a serious problem. If you have got a two and a half hour journey between you and the design engineer, then you have to try and describe the problem over the phone or by fax to get a sensible solution. It often took weeks to get answers to technical queries. (E31M)

The importance of a close physical environment between key personnel is an important factor in information systems development. Kharbanda and Stallworthy (1990, p. 99) report that, 'the effectiveness of a team is drastically reduced once its members are physically separated'. The above example provides evidence to suggest that this argument holds true for construction projects as well.

Statistical analysis of the data suggests that conflict in the design team can be associated with: (i) conflict due to poor communication between participants, (ii) conflict caused by design information arriving late, (iii) conflict arising from technical aspects of design (excluding a failure to meet expected or stated requirements), and (iv) conflict caused by special design considerations for disabled persons.

The importance of communication has been mentioned several times already and can be approached in a number of ways. Perhaps the most appropriate method, and the one espoused by recent authors (Walker, 1989; Newcombe et al, 1990), is the application of systems theory. Walker in particular applies systems theory to the 'analysis and design of project management structures' (Walker, 1989, p. 210). He evaluates the use of two techniques, namely *transformed relationships evolved from network data* (TREND) and *linear responsibility charting* (LRC), as project organisation design tools. LRC is then further developed to reflect the needs and characteristics of construction project management. However, the technique is not widely used, and perhaps needs to be simplified for practical purposes.

The late arrival of design information is a widespread cause of conflict, and one for which little formal control is exercised. The risk of design delay is usually borne by the client, who pays the price of project delay and the cost of settling contractor claims. It is suggested that the cost of bearing this risk should be more evenly distributed between the parties, particularly to design firms when they are the source of this type of conflict.

6.4.3 Local authorities

The research data has revealed a series conflicts between design team members and local authority staff, Table 6.7. This is particularly significant given the delay that can result due to the requirements of local authorities and other agencies not being met, as outlined above in Section 6.3.2. Many of the conflicts with local authorities indicate a lack of coordination within and between local authority departments. There is a genuine difficulty in some cases of gaining a consensus from the individuals involved:

> We rarely have problems that are difficult to resolve; except perhaps with local authorities. They tend to be renowned for playing up internally. They might have an engineer saying one thing, a planner saying another thing and we're caught in the middle. (B11P)

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
36	Problems were encountered when dealing with a local authority department	-	10	1	3

[1] Shows number of additional conflict data collected during validation survey.

Table 6.7 Design data: local authorities

One particular project, carried out by Client F, highlights this type of conflict well:

> Most of the people you consult with, such as the gas board or highway engineers, are professionals who say, 'Right, work is going to go ahead, lets make the best deal, let's work together and be mutually supportive'; but there were people who did seem to make a meal of it, specifically the local authority planners. They seemed to have an unlimited supply of people and time to get involved in many different issues. I did feel at one time that maybe I was getting paranoid, that they were almost baiting me, trying to make the job as difficult as possible . . . *These people didn't seem to want to operate as a team with you.* Probably got different aims. It was difficult to get them to pull in the same direction as us. (F23P)

Another example outlines how poor coordination between departments within a County Council caused conflict in a project being carried out by a neighbouring City Council

> The biggest argument we have got is that there seems to be a total lack of cooperation at the County Council between the different departments ... We have virtually been forced into constructing a footpath that will be surplus to requirements as soon as they come and hack it up to create a lay-by. (G21P)

6.4.4 Technical aspects

Table 6.8 shows the seven types of conflict classified as technical aspects of design. Of these the most frequently occurring conflict concerned the failure of certain design aspects to meet stated or expected requirements. A total of nine conflict data were collected initially and an extra seven were added to this number from the validation survey. From the statistical analysis a significant association at the 2.5% level was obtained between conflict caused by design aspects failing in this way and conflict caused by the remaining six technical aspects in this category when grouped together.

Another association, perhaps of more importance, is that between conflict caused by a failure of design aspects to meet stated or expected requirements and design

information arriving late. There is an element of intuition within this association. One explanation is that designers under pressure to produce working drawings that are already late, may in their haste allow poor judgement to come into play. Where an excessive amount of energy has been expended in resolving problems of design information arriving late, there is less time and personal energy resource left for checking other normal, less critical elements of the project; thus widening the margin for error in other areas of the project's design. As might be expected this association applies to both building and non-building projects. In reality the likelihood of an association will depend on the frequency that design information is late, whether it is a one off occurrence or recurs throughout the project, and the degree of lateness involved. In a project by Client B, the problem centred around missing design information regarding a live sewer. Two projects of Client E are included in this association, the first involved a large piece of equipment that caused many problems throughout the project, both regarding lateness of design information and performance of the equipment design; and the second involved a project where consistently late design information was coupled with an excessive number of technical queries from the mechanical contractor. Finally, a project by Client F involved two seemingly unconnected incidents; the size of a pumping chamber and the level of a river weir. However, at a level of significance of 2.5% there is a convincing association between these two causes of conflict.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
20	One or more design aspects failed to meet stated or expected requirements	-	9	-	7
3a	Certain design regulations hindered the design process	1	1	-	3
3b	The design brief failed to take account of one or more regulations	-	1	-	1
30	Resolving design conflict on similar/repeat projects	-	-	2	-
86	Some problems occurred due to the use of high-tech equipment or design aids during the project	-	2	1	3
38	Additional design effort was used to satisfy design requirements for disabled persons	-	3	-	1
37	Putting in extra services or supplies to safeguard future requirements	-	-	1	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.8 Design data: technical aspects of design

Conflict caused by technologically advanced equipment was also associated with conflict over late design information, at the 5% level of confidence. Again there is an intuitive link between these types of conflict. Recent or complex technology is always a risk until it becomes standard or at least well tried, tested, and accepted by an industry. Conflict caused by late design information is intuitively more likely to lead to conflict later in the project when the project involves technologically advanced equipment. In one project by Client E the design team used a new advanced design tool but they were unable to deliver design drawings on schedule to the mechanical contractor.

6.4.5 Summary of strategic implications

The importance of conflict has been demonstrated in four areas of design: client-design interface, the design team, local authorities, and technical aspects of design. The effect of physical separation between project members has been brought to attention and is an area which might be considered by project managers prior to the selection and appointment of the design team.

Some of the issues identified relate to the difficulty of integrating project contributions from individuals whose main allegiance is with their parent organisation and not the project organisation. The parent organisation offers greater stability and security; its systems and methods are known and used by the individuals concerned and are therefore preferred. The role of those acting in a project management capacity is to recognise these inherent differences or latent conflicts and to integrate the project organisation with the chosen project participants and their incumbent parent organisations. This is a task that begins before the appointment of the participating organisations and is discussed in more detail in Sections 6.7.1 and 6.7.2.

A pronounced example is provided by the relationships shown between project organisations and local authorities in which the outlook and philosophy of members of these two organisations are often very contradictory. In one of the examples given, a project organisation had to deal with conflict caused by excessive attention to detail by one local authority; and in another case, an impenetrable barrier seemed to exist between internal departments within a local authority preventing communication and coordination. These issues are related to the high degree of differentiation that exists between clients, agencies and project organisations.

Despite the apparent difficulties faced by project organisations and those responsible for managing them, there is some evidence in the data that the more damaging conflicts can be lessened and even eradicated when a client is engaged in a series of similar projects. This was certainly true for a City Council, Client G, building their third new sports complex:

> One of the advantages of this project was that the city has built several sports centres in the past, and the design team hasn't changed and apparently the project architects haven't changed, so problems that were brought up in the past were already resolved for this project.

Standardisation of design and construction methods across the construction industry is still some way off, except for certain client types, but it is certainly an important concept for the future and already happening in other areas of mainstream manufacturing. The idea has been underlined in the launch documents of the recent SERC initiative 'Innovative Manufacturing' (SERC, 1993). It is hoped that the current research will form a foundation for new work to be carried out under the aegis of the 'Innovative Manufacturing' initiative (see Chapter 10 for more information on proposals for future work).

6.5 Construction

There is a statistical association at a level of 5% between conflict caused in the construction stage and conflict arising from the administration of projects. This probably reflects a relationship between conflict during construction and resulting contractual disputes. The use of contracts in construction is universal. However, it is their very presence, argues Clegg (1992), that causes conflict in the construction stage:

> Members of the site organisation are oriented to the contractual documents less as a blueprint, however fallible, and more as an opportunity in the occasion of site meetings for re-negotiating to their advantage what they understand the contract to mean. Contracts, as any set of rules, can never provide for their own interpretation.

The data pertaining to the construction stage have been divided into five groups: interpersonal aspects, procurement, programming, performance and workmanship, and risk and uncertainty.

6.5.1 Interpersonal aspects

The four conflict data in Table 6.9 from the interview survey are complemented by a further seventeen additional data from the validation survey, suggesting that this is a

relatively more important type of conflict that at first anticipated. One of the main types of conflict in this group concerns disagreement over cost issues between quantity surveyors. This is not unusual and draws attention to the many variations that frequently occur during a construction project. To reduce this type of conflict the project manager could enforce the recommended practice (Wills, 1991, p. 51) of agreeing the price of variations at the time they occur. This avoids the accumulation of Architect's Instructions that need to be priced by the quantity surveyors pending final account.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
48	Differences of opinion over some design aspects existed between a contractor and a member of the design team	-	2	-	7
44	Several differences of opinion existed between the client's and the contractor's quantity surveyors	-	2	-	10
81	Performing a briefing orientation exercise	-	-	1	-
55	User involvement during fitting out	-	-	1	-
89	Use of in-house works department	-	-	2	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.9 Construction data: interpersonal aspects

Alternatively, conflict may exist between designer and contractor. This can be caused by a failure on behalf of the designer to issue finished drawings on time, or due to inconsistencies between the design and construction method. This latter point is often referred to as buildability or constructability, and is a measure of how well a design takes into consideration the methods and materials of construction to help rather than hinder the contractor. In design and build, and management contracts, there is good opportunity for construction experience to be brought to bear on the design. However, in more traditionally arranged contracts, this concept is more difficult to apply since there is no main contractor during the formative stages of design. The following account from Client F illustrates this point:

> The contractor will always come up with alternatives, either because they are cheaper, or they might take less time or construction effort . . . I think the majority of changes that the contractor put forward we didn't accept. For example, in one case the contractor was required to drive a pipe jacket underneath a road using steel pipes. The sewer was going to be threaded through that pipe jacket. The contractor wanted to use concrete pipes because

> it was a cheaper alternative; but by the time we had looked at the consequences of using flexible jointed pipe we had to turn him down because of the disruption it would cause, or could cause, the other services that we were jacking underneath. (F22P)

Many projects suffer from this type of conflict in which the design is so advanced before a contractor can comment on it, that when he does so it is too late for the designer or project manager to take all but very minor changes on board. There is a case for developing and encouraging the type of relationship found in management contracts in which the contractor can be present as a professional member of the design team during much of the design stage (NEDC, 1983, p. 4). There is a parallel here with the type of alliance often established between large manufacturing companies and their suppliers in which the relationships between designers and suppliers are recognised and nurtured from a very early stage.

It is difficult to unite the diverse members of the project organisation, including designers and site foremen, into a team having a common goal and shared determination to achieve that goal. A team briefing or briefing orientation exercise can help to get the best for the project from conflicting ideas and opinions, and avoid, to a large extent the wasted time and money caused by conflict in later project stages that stem from latent conflict present from the project start. Client D in particular made good use of this approach:

> Everyone knew what direction we were going in. We ran a day and a half orientation exercise before it even went to site to which the project manager, his leading foremen, the quantity surveyors, and everyone else was invited to; and which everyone attended. The result was they knew what we were trying to build and what its purpose was. They were told about the national curriculum, the way of teaching and about the concept of activity rooms and how the children would use them; so they had a very clear view, not just of the bricks and mortar, but of the purpose and why the timetable was so tight. The project manager and the others reckoned that it gave them a major insight into the project and just what it was they were trying to do. Right from day one they knew what they were doing, and that does give a purpose to many of the project personnel, particularly to the people that supervise the site operations. (D11M)

6.5.2 Procurement

It is not uncommon on projects where material is required in large quantities, or where successive projects will require the same material, for the client to negotiate preferential rates with a supplier over a fixed time. However, the data would suggest that caution is advisable since client supplied items can generate damaging conflict for

client and contractors alike, overshadowing the initial advantages sought. This applies also to equipment purchased before a contract by the client due to long lead times. The conflict data related to procurement is shown in Table 6.10.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
90	The client supplied some equipment or material	1	2	-	3
87	Some materials or equipment had long lead times or phased deliveries	-	2	-	3
91	Procurement of some equipment or material was restricted to only one or two suppliers	-	2	-	4

[1] Shows number of additional conflict data collected during validation survey.

Table 6.10 Construction data: procurement

Conflict is centred around two particular aspects, firstly the complexity of a major piece of equipment supplied to Client E for a management contractor not yet appointed, and secondly two projects by Client F in which certain items could only be supplied by a very small number of suppliers. In the first case involving Client E, conflict developed between the contractor, the supplier and the client over the issue of design information relating to the equipment concerned. On the second issue, there was a problem over the delivery of a large diameter pipe during the project. There is generally less risk for the client if the contractor is made responsible for negotiating directly with a supplier, however this must be weighed against the counter argument of preferential rates that can be obtained on repeat orders. A project manager for Client F commented:

> Where the construction contractor supplies the materials, that is a neater arrangement, because you just need one big stick to hit the one guy, and then it's up to him how big a stick he needs to hit his various subcontractors. In the water industry the reasons for supplying material ourselves are partly historical. We do it for two reasons. One, it's probably cheaper, or potentially cheaper, albeit more risky. It's cheaper because he can maybe maintain larger volume orders with the relatively scarce suppliers of pipework materials, and can maybe buy his materials at preferential rates. It's like the sort of bulk buying philosophy. The downside is the greater risk - if you don't get the materials in time, you've got to pay the guy who wants to install them for twiddling his thumbs.

Finally on procurement, a statistical association was present at a 5% level between conflict caused over procurement and conflict connected to process control. This association is discussed in Section 6.8.2.

6.5.3 Programming

Research data on construction programming focused on scaffolding requirements, insufficient design resources during construction, and contract periods that were either too short to maintain or required additional resources to achieve. The data are shown in Table 6.11.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
88	Meeting the scaffolding requirements of all the construction teams caused some problems	-	1	1	2
41	During construction, insufficient design resources were allocated to process design changes promptly	-	1	1	3
46	The initial contract period was too short or required additional resources to achieve	-	3	-	4
54	Use of standardised design or construction methods	-	-	1	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.11 Construction data: programming

An association at the 2.5% level is indicated from the data between construction programming and organisation selection. Construction programming requires good integration of the different participants and is therefore highly dependent on the skill of the project manager and on the ability of the various participants to plan their work effectively. This requires adequate resources and management ability by each contributor to coordinate their own work within the broader sense of the project programme as a whole.

In the context of design firms allocating insufficient design resources during construction, the principal designer for a project of Client C confided that:

> It is the responsibility of the design team during the contract to produce information by the required time. There was probably some anxiety in areas where that information wasn't as forthcoming as maybe it should have been. I think most designers, if they were being honest would admit to that . . . I think with any job in any design office you like to have at least 90% of the work done by the start of the contract. Consequently you are working through the contract period with a much reduced team, and if a problem arises that requires major resources then it is sometimes difficult to procure that because

> it has been allocated elsewhere; plus you also like to use people familiar with the contract. (C32P)

Although this was the only explicit example of this type of conflict from the data, three further projects were identified as having the same conflict from the validation exercise.

Conflict over the allotted construction periods caused conflict in a number of instances. Contract periods can be stipulated at the time of going to tender by the client, or they can be suggested by the main contractor. Conflict arises when there are serious difficulties from unforeseen circumstances (discussed in Section 6.5.5) and a lack of management ability or performance capability from one of the construction organisations. Consider a report from the project manager of Client A:

> The contract period was totally unrealistic at 16 weeks initially. It lasted about 40 weeks in total, and the contractor . . . it became fairly apparent that he wasn't really a capable contractor. We had backed the wrong horse; the consultant had to virtually lead them by the hand. They made numerous 'foul-ups'. They were very good at the planning, drawing out networks and all the rest of it, but on the site, terrible . . . And we found out afterwards that this was the biggest contract by far that they had ever won. (A31M)

It is perhaps not surprising to find a statistical association between conflict due to construction programming and that due to the selection of project participants. The issue of selecting project participants is discussed at some length in Section 6.7.1. A strategy often employed by more experienced clients to combat conflict in this area is the development and use of standardised design and construction methods:

> We like to see ourselves at the forefront of housing development. We are going more along the road of using our standardised (not standard) house types. We know that we can build them on time and cost, which is very important now because there is no Housing Association grant to bail us out of problems. We are using this approach more and more . . . The small number of contractors with whom we are happy to work with know what to expect and know what we are expecting of them in terms of cost and so on. (B31P)

6.5.4 Performance and workmanship

The importance of performance and workmanship as sources of conflict is indicated by the relatively large number of data items pertaining to it: 17 from the transcribed interviews and a further 48 from the validation survey, see Table 6.12. This is clearly an area in which many clients and other project organisations could focus their attention to improve performance.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
47a	There were instances of poor performance regarding methods of working, keeping to programme or delivery date by				
	... a main contractor	-	1	1	9
47b	... a subcontractor	-	7	-	9
47c	... a supplier	-	3	-	9
18	One or more errors occurred during construction (not attributable to design errors)	-	1	-	12
49	There were some examples of substandard workmanship or quality during construction or at hand over	-	5	-	9

[1] Shows number of additional conflict data collected during validation survey.

Table 6.12 Construction data: performance and workmanship

The data refer to all aspects of construction firms involved. A division of these firms into main, subcontractor and supplier categories is made for comparative purposes. Although the subcontractor is way out in front followed by suppliers as causes of conflict in this area, this does not augur well for the main contractor, who frequently has management and contractual responsibilities to fulfil regarding suppliers and subcontractors. The following two examples are typical:

> The main conflict as mentioned was between [us as client] and [a management contractor]. Initially, much of it was to do with planning information. Their construction guy didn't come up with the goods by way of planning information that we wanted. He seemed to think that planners were a waste of time, he could do it all himself. I think good planners are worth their weight in gold. (E21M)

> We asked the architects to cut some lights out to make a saving; then we subsequently put them back in. We asked the electrical contractor through the main contractor to get a price for them; they more than doubled the initial price. We then said, 'Right, we'll pay the enhanced fee for getting them done on time, providing the job is done on time'. However, they didn't complete on time so we said, quite rightly in my eyes, no extra fee. There is an argument going on about that. I remember being there with the contracts manager when this was all being discussed and agreed. He is denying that it was ever said. Although this is a fairly minor dispute, it will probably have far reaching effects. It will leave a shadow over our relationship in the future. (A11M)

In the statistical analysis of the data, there were associations at the 5% level between conflict over 'performance and workmanship' and 'contractual disputes', and between 'performance of suppliers' and 'internal management problems of one or more project organisations'. The first association involving contractual disputes is intuitive and reflects the example of the electrical contractor failing to complete the extra works in time mentioned above. The second association is also consistent with expectations, since poor internal management can reflect badly upon a firm's ability to perform well. It is less clear why this association was not also evident for the main contractor and subcontractors, as well as for suppliers.

6.5.5 Risk and uncertainty

The items of risk or uncertainty included here and illustrated in Table 6.13, are a small fraction of those that could be included within the terms risk and uncertainty. A large part of this chapter could probably find its way into a full study of project risk and uncertainty. Those that are included here are the ones that do not readily fit into one of the other categories.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
43	There were some unforeseen ground or foundation problems	-	5	-	4
45	One or more project activities were delayed due to inclement weather	-	2	-	8
52	Site security or vandalism was a problem	-	3	-	4

[1] Shows number of additional conflict data collected during validation survey.

Table 6.13 Construction data: risk and uncertainty

The treatment of risk and uncertainty varies in the literature, however, a useful convention is that risk can be quantified by probability, whereas uncertainty refers to those elements of a project that are more difficult to measure objectively and consequently are more difficult to deal with. Contractual documentation often makes some provision regarding the responsibility for certain types of risk, such as unforeseen ground or foundation problems. Indeed, the way in which risk is apportioned will affect the price of tenders received; as the level of risk borne by the contractor increases so the price of the tenders will increase to cover the increased indemnity insurance costs.

The greater the risk borne by a client, the greater the need for contingency measures for cost and time; in cases where the planned contingency element is inadequate, cost cutting exercises are often carried out. These may result in lower grade finishes or fewer features. Conversely, where contingency remains unused near project completion, some clients use the remaining money to satisfy additional 'wants' of users and operators that were not catered for in the initial specification. A description of the methods of handling risk and uncertainty by Client C can be found in Gardiner (1991), and a detailed account of project risk and its management are given in Mason (1989) and Hayes et al (1986).

6.5.6 Summary of strategic implications

The research data within the construction stage are fully consistent with the results of a National Economic Development Council report on the speed of building projects for commerce (NEDC, 1988, p. 75):

> In essence, the factors that caused fast and slow site times reflected the main contractor's ability to control resources and to manage. In this he was helped or hindered by the customer's influence on the project and the conditions created by the buildability of the design and the communication of the design information. It was evident that the level of certainty afforded by the tender documentation had a profound influence on the subsequent progress of the project: it determined the mode in which contractors approached the project objectives and the ambition and sharpness of the programme.

There are two themes that emerge above others for importance; firstly, the age old division and separation between design and construction. There is evidence that this division is in reality a three-fold division including the briefing process as well as design and construction. Early communication between client, designer, and contractor in a project can help towards project success. However, the problem is not merely a logistical one of bringing these parties together early on; it is also an organisational design problem requiring an effective structure and mechanism to ensure the proactive sharing of ideas and to encourage an openness and exchange of opinions without fear of reprisals later in the project. The creation of a safe environment where the client, designer and contractor can interact and express perceived and felt conflict without fear of contractual implications, and in which a common goal and shared priorities can be agreed, is a precursor to project success or, at the very least, to minimised project failure.

Secondly, the selection of project participants according to management ability is essential, and perhaps ought to be a qualifying condition for invitations to tender, both concerning client invitations to main contractors and nominated subcontractors; and further down the line regarding contractor invitations to subcontractors. Without a record of proven management ability, a firm is a potential risk to the success of a project. The development of partnerships with suppliers and subcontractors, as practised by some manufacturing sectors, notably the automotive sector, is a strategy well worth consideration by construction industry firms.

6.6 Commissioning

Conflict in the commissioning stage, see Table 6.14, centred around three main areas: the client finally realising what it was he really needed, the combined effect of several minor problems, and insufficient time. Although the commissioning stage has been assigned only seven data from the interview survey, the importance conflict during the commissioning stage is more clearly depicted following the validation survey which added a further twenty-three data to this stage.

Commissioning is the last of the stages in a construction project, consequently any outstanding problems or conflicts tend to surface at this time. Complex or innovative designs are more susceptible to problems in the commissioning stage, so much so that an attitude of indifference rather than surprise often prevails among project managers:

> The chemists are the only ones in there operating 100% now. The greatest problem from an operational point of view has been the teething problems that you *always get* with a highly serviced building. (C32P)

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
57	Some users or operators requested changes at or near practical completion	-	2	2	8
59	Insufficient time was allocated in the project programme to the commissioning stage	-	1	-	5
58	There were several "teething" problems during the commissioning stage	-	2	-	10

[1] Shows number of additional conflict data collected during validation survey.

Table 6.14 Commissioning data

On one project carried out by Client F two of the faces of a large pump were connected the wrong way round. This resulted in the loss of a day's operation. Nobody knows the reason why this happened. A second example of conflict involving Client F is shown below; it concerns user alterations near practical completion of the project:

> And again at the commissioning stage, there was a period of about two months when the operations department looked at the plant and required modifications to suit their personnel. They tended to be small items such as hand-railing and safety chain re-locating and re-positioning, to provide a safer working environment. One of the problems with operations personnel is that it is sometimes difficult for them to relate the drawings to a physical reality, so they always like to have a look at the plant before it is handed over. (F22P)

Estimating the time required to carry out the commissioning stage is a task which was miscalculated by one contractor:

> I think their [main contractor] other failing if they had one was that they underestimated the amount of time required for services installation and the commissioning of it at the end of the contract. We ended up with an overrun on the programme of quite a number of weeks before the building could be called practically complete. (C32P)

6.6.1 Summary of strategic implications

The above examples typify the problems which occur during the commissioning stage in construction projects. Conflict analysis can be employed by clients and construction companies alike to focus attention on the more important commissioning issues pertaining to their own particular project mix. An excellent exposition on modern commissioning philosophy is given by Lane (1991) who asserts that:

> Commissioning is a process which can take a matter of weeks on a well designed, well constructed plant, but many months on one poorly designed and constructed eating substantially into the end user's financial return . . . It is a false economy to involve commissioning personnel only when construction work is 90% complete.

A good example of involving commissioning personnel at an early stage is provided by Client E:

> The commissioning manager was involved at about the same time as myself [construction manager]. Model reviews took place which he attended; and he commented on the position of vessels, lifting beams, access points, valves etc. He is now the plant manager - a good incentive to get it right. If you know you

are going to run it at a later date you are going to put some effort in at the beginning. (E31M)

6.7 Organisation

6.7.1 Selection of participants

The use of screening criteria in the selection of project participants is now a well established practice for most capital-project clients. It is a subject that is receiving increasing interest from authors and practitioners alike, and has already been referred to in Section 6.5.3 in the form of a statistical association between conflicts to do with construction programming and organisation selection. The research data pertaining to the selection of participants is shown in Table 6.15. This can be further divided into data linked to the selection of organisations (data types 61, 60, 93, and 16) and data linked to the selection of individual project personnel (13a and 13b).

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
61	Using an approved panel of consultants or contractors	-	-	1	-
60	Using regular participants	-	-	4	-
93	At least one participating firm seemed to have internal management problems or insufficient management resources available	-	6	-	6
16	At least one firm was unable to discharge all its obligations satisfactorily	2	7	-	5
13a	There was at least one person who did not get on well with others	1	2	-	4
13b	One or more people in the project team should probably not have been selected for their particular role	-	5	3	3

[1] Shows number of additional conflict data collected during validation survey.

Table 6.15 Organisation data: selection of participants

Experienced clients may use their own cocktail of selection criteria but in most cases these will closely resemble the recommendations of advisory service organisations such as the Construction Industry Information and Research Association (CIRIA, 1983). Their recommendations for consultants (A) and contractors (B) are:

(i) identify suitable firms on the basis of:

Your previous experience and personal knowledge (A, B)
Personal recommendation by other clients (A, B)
Recommendations by other consultants (A, B)
Investigation of projects similar to your own (A)
Client advisory services of professional institutions (A)

(ii) assess for:

Appreciation of your needs (A, B)
Relevant experience and specialist knowledge (A, B)
Management, design and technical skills (A, B)
Availability of staff and resources (A, B)
Personality and rapport (A, B)
Fee levels (A)
Financial stability (B)
Local involvement (A, B)

(iii) to help assessment:

Visit their previous projects (A, B)
Consult their previous clients (A, B)
Consult design/cost consults. with whom they have worked (B)
Talk to staff who would actually work on your project (A, B)

Despite the availability of guidance such as this, the research data suggest that for many projects the process of participant selection is not always carried out satisfactorily. This can be attributed to either a failure to adhere to or carry out effectively all the recommendations contained in such a list, or that the set of criteria are deficient in some way. One important criterion identified by the research and not always carried out well is the checking of a contractor's management ability and existing financial commitments at the time of tendering:

> We got into a difficult situation on this tank. The contractor had done one job elsewhere and made a good job of it, so we chose them for this job; because of their past performance. What wasn't checked at that particular time was the number of projects that they were involved with in other places at the same time . . . what you might call the amount of capital they were involved in. So we got into a situation where they did the initial foundation for the tank, but it didn't particularly suit us; it wasn't within our specification. They had to redo the work twice. At the same time they got into financial difficulties and they have eventually gone out of business. I would now recommend that we cover the contractor's financial commitments on other works to make sure he has no cash flow difficulties; make sure we know what he is committed to already before giving him something else. (E12M)

> There was a problem in our civils contract where we let the contract primarily to a pipe-laying contractor because that was where the majority of the work was . . . He had to sublet his building works for the pumping station to others and that wasn't particularly well managed. There was friction at the site level. (F32P)

A statistical association at the 5% level was identified between conflict caused by firms not discharging all their obligations satisfactorily and conflict caused by contractual problems. This association is not surprising; when a firm does not carry out its contractual obligations, it is reasonable to anticipate administrative conflict involving these contractual issues. This particular association held true for three projects; one building related (site infrastructure only) and two non-building. In the case of the building project the contractor's performance was poor, this led to many problems, and a large number of claims were made by the contractor as a consequence. In a second project, a pipe-laying contractor failed to manage satisfactorily a small element of civils work in the contract. This resulted in claims from the contractor to try and recover his own losses. In the third project there was no clear connection between the two conflicts.

In some cases a firm's inability to manage can be traced back to particular individuals employed by the firm on the project:

> There was an unbelievable amount of rain. Instead of stopping, the contractor just ploughed on. It was terrible and in the end I had to ask the engineer to have a word with him [the contractor's site agent]; but you can't instruct him to stop work because then he comes back at you for preliminaries and all the rest of it, so the engineer suggested to him, 'Don't you think you should stop?' . . . They didn't take the hint for a couple of weeks; it was unbelievable. (A31M)

> We had a few issues with the pumping contractor, but I think they were just struggling a bit with their management initially. I think it's just a question of getting the right person onto the right job; like any organisation if suddenly you're overloaded, because you win a lot of jobs, then you spread yourself a bit thin and hiccups start to occur. At the end of the day they came good. Eventually we got to the right guy at the top, got him by the 'short and curlies', and squeezed a bit; and you know, things went very well from then on. (F31P)

Interpersonal conflict can be very damaging to a construction project:

> There are a number of problems that were thrown up by the subcontractors involved. Subcontractors in any building contract can make or break the

> success of the thing, especially regarding contractual programme. It's largely to do with the way people get on together really. (C32P)

> We had a lot of problems concerning the civil contractor; the site agent had to be removed from the site. The problem was that he lost his temper a couple of times where he shouldn't have lost his temper. (E31M)

The recommendations put forward by CIRIA (1983) are largely concerned with the selection of organisations. Very little advice is provided for the selection of individual team members. The advice that is given includes vague statements such as, 'personality and rapport' and 'talk to staff who would actually work on your project'. Useful though this advice may be, it does not provide the project manager with sufficient information to make reliable judgements about the suitability of individual team members. The impact of an individual's personality on project success is echoed by Payne (1981) who states that, 'personality conflicts can ruin team efforts'. Payne describes the use of an instrument called the Perception and Preference Inventory (PAPI) in a data communications project. The instrument is already used by companies who operate a team working culture, for example, Schlumberger Cambridge Research. An adequate introduction and summary of the use of PAPI is given by Payne (1981):

> The Perception and Preference Inventory (PAPI) is a set of quickly and easily administered paper-and-pencil questionnaires. They allow an individual to specify his needs and describe how he perceives his behaviour in the working environment. The project manager can then relate one individual's needs and roles to those of other individuals, as well as to the requirements of a complex project. After brief training, most managers can learn to administer, score, and interpret results from these questionnaires . . . Although PAPI is not a panacea for management problems, it is a practical aid to forming a team. Experience with management tools like PAPI has demonstrated that the manager of the implementation process can benefit from insight into the drives and goals of the individuals on the team.

Further discussion on the PAPI tool, together with specific case examples, can be found in Payne (1981). This paper and evidence of conflict in the data suggest that interpersonal conflict can be reduced if more attention is given to the selection of individual project members. There were five instances of conflict regarding individuals whose suitability on the project organisation was questioned. The following examples illustrate a range of problems that can result from lack of care during the selection process:

> There were problems with the initial site agent. He could organise but he never actually got out on the site so that what was supposed to be done was never done. He was too cabin-based. (A11M)

> There was conflict with their site manager. He was a bit belligerent; he knew best and couldn't really be told anything about construction or how to do things because he had done it all. It got a bit heated at times. (E21M)

> We were in a position of doing some design checking, but the people doing the checking were not very good; they missed things. Altogether, the group was rather disastrous. It affected adversely the relationships on site ... the [project] cost and quality, and the client's perception of us. (F23P)

> The guy on site from the contractor was obviously totally out of his depth. This was a key element. (A31M)

The importance of selectively screening individual project participants is further emphasised by a statistical association of the data at the 2.5% level between conflicts caused by selecting the 'wrong' people to serve on the project team and conflict caused by the number of design changes made during a project. The intuitive implication of this association is that an excessive number of design changes will be required when the person or team responsible for the design is not appropriately experienced with the task in hand. As expected this association exists between both building and non-building projects. In reality not all design changes are due to deficiencies of the design engineer. New information concerning the client's circumstances can require the design to be changed at a moment's notice, or the project manager may initiate design changes. In two of the projects studied the conflict data concerned with this association were not obviously connected, however, in a third project (F23P) there was a strong association in which the members of the design team were not very well selected for some of their required design tasks, such as the checking of design information.

In the area of human resources management, many organisations pay a great deal of attention to methods of screening the people they recruit to work for them, including the use of PAPI grids and other psychometric tests. It is recommended, following this research, that clients, and those acting on behalf of construction industry clients, take up the responsibility of identifying and administering adequate tools in the selection of project team personnel. Construction projects are frequently multi-million pound ventures and must surely warrant the time and effort to appoint appropriate people to act together as an efficient team during a project's life span. The research data would seem to indicate that there is substantial room for improvement in the present system, which relies largely on chance and unsubstantiated human judgement.

6.7.2 Relationships

In terms of organisational relationships the single most significant factor identified from the data is distrust between participants, notably between contractor and design team and/or the client:

> There is always a certain level of distrust between contractors and design teams. Design teams and particularly architects tend to assume that the contractors are out there to make a profit and will cut corners and make claims for additional moneys wherever possible. Because of the confrontational nature of traditional contracts and the way that they are let on a competitive basis in this country there will always remain that slight level of distrust. Conversely, the contractor tends to assume that the design team don't know as much about buildability as they think they do, which is probably quite true and therefore mistrusts some of the information he gets. Case in point is a reinforced concrete structure for which all the information to build was in the tender drawings, but when he [the contractor] came to build the thing he found it very, very difficult. This happened [early in the project] when he was laying the foundations and led to further mistrust of the structural engineer. (C32P)

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
95	Significant disagreements arose between two or more participating firms during the project	-	2	1	3
62	Distrust developed on one or more occasions between a contractor and the design team or vice-versa	-	1	5	6
26	Site-office relationships	-	-	1	-
94	Social interaction between participants	-	-	1	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.16 Organisation data: relationships

Table 6.16 shows the data in the category of relationships. In management and design-and-build contracts there is greater potential for the client and the design team to develop a harmonious relationship between the contractor and his team. A harmonious team provides greater opportunity to discuss design, cost and construction problems openly and honestly:

> We had question and answer sessions with the contractor and his architect during the design because the speed of response needed was very, very fast. It was much quicker to set up a whole series of meetings; just keep meeting them and answering any questions rather than set up a heavy paperwork process.

> They [the contractor's team] were very much treated as members of the design team right from the word go; a part of that team. Once the tender was accepted the contractor was involved in the detailed design. He was involved in the sense that he had his own architect, who worked extremely closely with ourselves, although clearly representing the contractor. We would have an interface meeting with the contractor saying, 'We need this; we haven't got that; can you do this or that, etc.' We would have an open dialogue, or he would perhaps come back and say, 'Look this is going to cost an extra £30k. I've got these sums available, if we put in a cheaper hand rail, or we put in less partitioning, or less expensive ceilings this is what it is going to do to the contract sum.' Since the contractor was very open with the design team, we could constantly say between us, 'Look we can afford this by doing this; or we've got money spare here but we haven't got enough money here'. The design proposals that cost the programme were constantly being reviewed and renewed. We are talking about less than every week. (D11M)

Once again the selection of individual team members and a shared awareness of each other's perceptions and preferences in the group are important factors. Interpersonal conflict between members of the design team and contractor would certainly have delayed the project carried out by Client D.

6.7.3 Other organisational aspects

The most important of the other organisational aspects were those that related to role-definition and conflicts of responsibility; see data types 63 and 22 in Table 6.17.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
70	There were significant organisational changes or relocation of personnel as a result of the project	-	2	-	-
63	There was a lack of definition for some project team members or firms regarding their contribution or area of responsibility	-	9	-	4
22	There was a conflict of interest or responsibility for at least one project team member or firm	3	2	-	3
64	Use of "special" consultants	-	-	1	-
27	Use of an in-house construction team led to extra cost which would otherwise have been borne by an external contractor's liability	1	1	-	-
6	There was uncertainty over how much extra works to give to the main contractor	-	1	1	1

[1] Shows number of additional conflict data collected during validation survey.

Table 6.17 Organisation data: other organisational aspects

Without a clear indication of personal and organisational responsibilities, uncertainties and arguments can quickly develop. Delays can set in when there is ambiguity or differences of opinion over who should be responsible for certain aspects of the project. Some of these responsibilities are put down in the contractual documentation, others are assumed to be implicit. However, uncertainties do arise; a failure to define responsibilities can lead to an increased level of personal uncertainty and this in turn can develop into intraorganisational tension and conflict. In Client E, for example, substantial changes are taking place regarding the role of construction managers and internal tensions are running high. The change concerns reducing the responsibility of construction managers for managing the various project contractors by giving that responsibility to a management contractor; a change that is happening with increasing frequency in the larger process engineering firms and which reflects current practice in America. In the case of Client E, the situation is aggravated by a failure on behalf of the client organisation to provide construction managers with a clear description of their new responsibilities.

Conflict also arises when an individual is faced with competing or contradictory work related demands. For example the responsibilities of a designer and a project manager are sometimes in conflict with each other. This can lead to role-conflict when the lead designer is also performing the role of project manager. It is suggested that potential role conflicts be identified early and measures taken to minimise any potential dysfunctional outcomes.

6.7.4 Summary of strategic implications

The data have demonstrated that the selection of project participants is a task which can either make or break a project. It has been recognised as a factor for project success by some clients, such as Client D. The task of selection is made easier in cases where the project manager has had previous experience working with a particular person; he knows what to expect and can gauge his confidence accordingly. The following comment is from the construction manager of a large project involving two management consultants:

> The relationships on the 'wet' end were good. I have worked with BW before so I knew the guy, knew how he worked, I knew a bit of his track record. I had confidence in him really. We got on well together. I also got on with his team; good lads, very approachable. They did what they were told if we had a problem. (E21M)

The importance of personal relationships is also highlighted by a project manager from Client A:

> I think the biggest challenge in project management is handling the people; knowing their strengths and weaknesses. People within the client, the consultants, and the contractor. It can cause all sorts of aggravation if you don't know the people you have got on site. (A21M)

It is noted that this project manager was not concerned about subcontractors:

> Subcontractors are really under the control of the main contractor. They are contracted to him. We have got a contract with one guy. If a contractor can't control their subcontractors that's their problem. (A21M)

This type of familiarity with participants can be developed by clients involved in regular and similar construction projects. Client B, for example, has sought to establish a good relationship with several contractors; they have also substantially standardised their building designs:

> We have what is called an approved panel of consultants and an approved panel of contractors. Any consultant who is commissioned by us is someone who is on our panel and we know we are happy to work with them. We have worked with them in the past. The reason they continue to get commissions is that we know they can interpret our brief. It is the same for the contractors. We often have a long standing relationship with these firms and are confident that they can erect to our instructions and specifications. (B21P)

> There is a very good level of trust. I've worked with that team several times; the same general foreman and the same project controller. We enjoy a good rapport and professional relationship. We know how each other works; there are times when we know how each other thinks. We trust each other to make decisions. (B11P)

Of course it is not always possible to achieve these conditions, particularly when the client lacks previous experience with design teams and contractors. The arduous task of selecting the 'correct' participants begins early in the predesign stage of a project and continues throughout the briefing and tendering stages.

The following account from the architect acting on behalf of Client D is exemplary of this kind of process. The briefing process has been extended to include the assessment and selection of a design-and-build contractor for a fast-track one-off education building. Instances of interpersonal and interorganisational conflict in this project were notably low; only one datum out of twenty-two, or two data out of fifty if the extra conflict data collected during the validation survey are taken into account:

> The quantity surveyor, ourselves, the DES, and the educational advisor in particular all had very strong criteria. We set up a matrix of what we felt were the most important criteria and measured each scheme submitted against those. It was a robust method of measurement. The same criteria had also been included in the tender documentation that went out to the firms invited to tender. For example, if we asked what proportion of your floor area is devoted to x, y, or z, we could measure [quantify] that. They answered various questions as they went. There were also subjective questions to test their understanding of the brief: how well would the building adapt to change in education? How was cross-curricula activity catered for? Was the management of the school dispersed or centralised? What was the ability of the building to extend? What was the ability of the building to alter during the construction stage? We knew that we had gone so fast that we were going to continue designing whilst we were building. These criteria and many others [enabled us to] form a matrix with the submissions received. [Analysis of this matrix revealed that] there was one scheme well in front of the others. This was then taken forward, cleared by the sponsors and the DES, and taken to site very, very quickly. (D11M)

The selection of organisations and individuals to a construction project organisation requires, among other things, the consideration of two important requirements: (i) relevant technical and professional qualifications, and (ii) the ability to perform as part of a team. Traditionally, organisations are invited to tender that can show some indication of their ability to perform in the situation required. They are often firms whose names are on the client's 'approved list' or who have recently gained some recognition in a new area. These checks typically assess a firm's technical and professional qualifications: it entitles or qualifies them to compete for work against other similarly checked firms. The approach is well established for contractors and is becoming common for the selection of design firms too.

Competing firms that have passed successfully through the preselection screening stage must then submit their tender and wait until a decision is made. Traditionally, tender price is the single most important criterion applied once the initial preselection has been made. The argument for doing this is that all the firms invited to tender have been preselected and are assumed to be equally qualified to do the work. The tender competition is merely a mechanism to ensure that the client achieves value for money; and in most cases this is interpreted to mean the lowest priced tender. However, the approach is simplistic and not suitable to apply to a complex situation involving 'temporary multiorganisations' (Cherns and Bryant, 1984) in which the ability to perform in a team is arguably of equal importance to technical capability, above a certain base level of competence. Kharbanda and Stallworthy (1990) write that:

> As we move, in a management context, from individuals to groups, so the strength [of the unit] increases, but so also do the problems. We can get a negative result if two people are antagonistic to one another. On the other hand, if synergy develops, the power of the group grows. There is strength in numbers but also weaknesses. Managers need to know and understand the implications of unconscious or covert factors in human interactions, since they have direct relevance to the workplace.

There is not much evidence of this 'knowledge and understanding' in the formation of the project organisations studied in this research; although, the following three examples do show some signs of a new awareness of the importance of human factors in project organisations:

> We have no foreknowledge of a site agent, but we do have a list of approved contractors. At a pre-contract meeting the contractor will declare who he is going to put on. You can then say you're not happy with that if you have had experiences with that agent. On our design and build contracts we even state that we have the right to say who the agent is, or whom we do not want. Once he is on the job the contractor cannot take him off, or move him about without prior consent. [These conditions] are in our contract amendments in the design and build. This is not the case on the conventional architect-led jobs ... We haven't had to enforce it a terrible lot. The trouble is that agents tend to move about and the contractor will want his best agents on the bigger jobs. (A11M)

> [Comment from a project manager in a design firm.] What we have now is like an internal market. At one time it was hierarchical so that you were given staff by a manager who was responsible for staffing up. Whereas now what we have on the design floor is individuals who are project managers and have budgets. They then go round the various groups bidding for staff. The group manager has the staff but he doesn't actually run the jobs. There is a market effect. If I wanted an engineer, I may go to a particular individual. Of course there are instances where you may not get the people you want, so then you have to structure the job to suit. It may require a bit more briefing, a bit more control, and a bit more checking. (F23P)

A more thorough system of checking was carried out by Client D on the design and build contractors that were considered for tendering:

> We looked for contractors who had a flexible mind. In assessing the scheme we had to look for buildings that were capable of being flexible during their execution. We also assessed the contractors by the team they put forward. We insisted on seeing the team, the actual people running it. We interviewed six or ten contractors. At these interviews we insisted on having the project manager, and one of the site foremen ... and the project manager they would put on the job right from day one. We weren't too interested in their marketing manager; we'd also insisted on their QS, architect and services engineer. We felt right from the word go that the project manager [of the design and build firm] was the key. If he didn't want it to work, it wouldn't work. I can think of three [contractors] that would probably have done it ... The chemistry needs to work

> between the individuals involved. The system has to be there, but if the chemistry is right that will make the system work ... I wouldn't say that we are experts on assessing individuals but you do form your own prejudices and opinions. (D11M)

The data clearly show an increasing concern by clients and their advisers to assemble a team which will function well together; not a team of identical personalities but a team possessing specific skills and complementary personalities. Furthermore, teams that are formed which include members having conflicting personalities can still be managed effectively, providing the project manager is aware of these differences and can work through them with the team members involved (Payne, 1981). The use of psychometric type instruments, such as PAPI or the self-perception inventory by Belbin (1981), in the formation of teams is a positive step which can be carried out by clients and project managers to complement their 'own prejudices and opinions'. It provides a firm foundation to a new understanding of the importance of project teams which seems to be emerging in the construction industry.

A team environment on the site provides people with a sense of identity and ownership with the project. It encourages them to be involved and to contribute beyond the absolute minimum. Good site-office relationships can enable the designer and project manager to take advantage of the collected wisdom and experience of those working on the site, particularly in cases when this is in conflict with a design proposal. In a well formed team environment site-personnel will be more inclined to share their perceived and felt conflicts to try and help the team, rather than to ignore or suppress them until they risk becoming manifest in more serious dysfunctional ways:

> [By visiting site frequently] you get on good talking terms with [the site personnel]; you virtually become one of the lads. You learn things [about the project] from a tradesman and this can help you in the future with detailed presentations. This is better than trying to dictate and lay the law down. Okay, they will always try a short cut and you've got to say, 'No, I'm not accepting that; that's not how I want the finished product to appear'. Once they understand you, they are more than willing to discuss and try to help. Ultimately it's probably their bonus that is affected if they can't get the job to your satisfaction. (G11M)

Another practice that can help cement together frayed nerves and deteriorating relationships is a limited amount of social interaction between participants as described by the project manager of a large and sometime beleaguered process engineering project of Client E:

> We went out two or three times socially with them during the job and at the end of the job as well. We didn't have any aggressive feelings towards them ... [or with] the construction guy. It is all part of doing a good job. There was a bit of goodwill too ... some charity money was raised during the safety campaigns we had. It helps to create local goodwill and general goodwill around the team and keeps people thinking about safety. We had a night out before the shut-down to which many were invited, including works and construction [personnel]; it helped people to get to know each other ... Delays following shut-down would have been around a quarter of a million pounds per day. (E21M)

6.8 Control

The term control can be applied to a variety of activities, including information control, cost control, quality control, boundary control and project control. Generally, control is concerned with identifying and responding to system-significant internal and external environmental factors. Control is largely a management responsibility and in a construction project includes both intragroup and intergroup situations. The means used to effect control, both formal and informal, can be collectively referred to as a control system. These systems vary in complexity depending upon the complexity of the system to be controlled; a system containing many interacting units and subunits is more difficult to control than a simple system containing only a few units. The data described in this section are consistent with the hypothesis that latent conflict in project control increases with increasing organisational diversity and poor management ability within participating organisational units. Section 6.7, above, considered conflict from an organisational point of view, and provided some evidence that projects carried out by teams containing poorly matched participants tend to develop conflict in certain areas of control; a statistical association was discussed (in Section 6.7.1) between conflict caused by selecting the wrong people to join a project team and conflict due to design change control.

6.8.1 Human factors

The data classified as human factors are shown in Table 6.18. The first data type within this category reflects the importance of the client in the construction process; a view that has been spelled out in a number of previous publications (NEDC, 1975; NEDC, 1983; Cherns and Bryant, 1984; NEDC, 1988; Walker, 1989; Bresnen and Haslam, 1991). The point is often made that clients should be proactive during a project, but not to the point of telling the designer how he should design. The designer provides a service to the client; it is the client's brief and not the designer's fancy that a design is trying to fulfil. However, and this is particularly true of building projects, there is

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
21a	The client continued to influence the design process after the briefing stage	-	2	-	7
73	There was sometimes no-one available to make executive decisions from within the client's organisation	-	1	-	1
50	There were one or more confrontations with local residents or land owners	-	6	-	3
1	There were some disagreements between construction staff and users or operators	2	1	-	5
67	Use of hands on project management to avoid problems	-	-	1	-
100	Use of "tension" to keep people on their toes	-	-	1	-
105	Team spirit	-	-	1	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.18 Control data: human factors

frequently a cost trade-off to be made between the aesthetic and functional elements of the brief. A trade-off in which the user tends to favour the functional element and the designer the aesthetic. Two of the interview survey data and seven of the validation survey data fall within this data type, #21a. The following extract from a project manager of Client A provides a good illustration:

> You start off with a fairly sketchy drawing and budget costs; the design develops gradually as the ideas of the designer begin to crystallise. If you are not careful they tend to use their architect's license! They start putting things in that *they* would like to see, not necessarily what *we* would like to see at the end of the day. They want the best building that they could possibly do; but it's important not to overrun on cost. In some cases it becomes purely aesthetic and not functional ... We go through the drawings every couple of weeks and try to make sure that there is nothing in there that is going to shoot the scheme sky high ... One or two things nearly always slip through. (A21M)

An effective client-designer interface requires a willingness to cooperate on behalf of the designer and the provision of clear guidance from the client. Conflict can occur when the client becomes over involved and begins to interfere with the process of design; or when the designer chooses not to comply with the implicit or explicit wishes of the client. A project manager comments:

> You will suggest something to the job architect, he will then have a word with his boss, and it's a matter of: 'Ah! We'll not bother', then you have to go to his boss and tell him ... I would definitely think twice about using the architects again. (A11M)

Surprisingly, in this example it was the project manager who recommended the architect! When questioned about this the project manager replied:

> I have a problem in so far as the architect does not listen. Unfortunately the firm in question are good on ideas. There are other firms easier to work with. A lot would depend which side of the bed I got out of that morning. (A11M)

A second significant area of conflict in this category involved confrontations between project personnel and local residents or land owners. Many projects have an environmental impact on residents living nearby; project control may require a measure of robustness to withstand the objections and criticisms of disenchanted locals. In the case of building projects this often concerns site access roads adjacent to or incorporating local access roads. These issues when dealt with sensitively do not necessarily lead to dysfunctional conflict. A project manager from Client B reports:

> I was on site at least four times a week. Before the start [of the project] we met the self-formed residents' committee with a contractor and explained how the scheme was going to be built; when we were going to start; when it was going to be finished; and the sequence of the building operations. We tried to emphasise to them the number of wagons that would be coming on and off, because the local authority had dictated that we could only use Jesmond Road for delivery of materials. From then on if there were any problems or anybody had complaints, it was directed through myself; and I went out to see them if necessary. (B31P)

However, a practical balance was maintained by one project manager when assessing the concessions to be made in this regard:

> The only other differences of opinion and conflict have been with land owners; people who live nearby who caused us quite a bit of aggravation for very, very minor items. For example, if a fence had been damaged or a heavy vehicle had caused a bit of churning up of a road, which we put right incidentally, we had to go to great lengths ... excessive lengths to sort that out. Because they were obviously our customers we did our best, but we went to excessive lengths to keep them happy. We went as far as they could have possibly made us go - too far in my opinion. That was one of the main conflicts. (F11P)

Another area of conflict that affects control is conflict between construction staff and operators or users. This is particularly important when the project interferes with live

processing plant. Contractors need to be aware of the reason for delaying a project and that an existing process may take priority over the project even if this disrupts the contractor's programme. The next two examples illustrate this conflict:

> What you always have is the safety aspect of the job causing consternation between the works and the contractors, because the contractor sometimes can't see the reason for them not to be going in there and getting the job done. That is why we operate a permit to work system. (E12M)

> The contractor has to be aware that he just can't turn certain valves and switch certain items of plant off, because it may affect our final effluent standard, and cause us to be prosecuted while we are actually upgrading the works; so he has to phase his work in such a way to keep everything going. There's obviously got to be liaison with our operations people all the time. (F11P)

The view of project managers regarding the avoidance of conflict due to the human factor varies, and are typified by the following comments:

> Hands on project management didn't allow problems [due to the way information was communicated, interpreted and acted upon] to develop. (A41M)

> There's got to be a little bit of tension there that can keep people on their toes. If everything was really cool and laid back, nobody would do anything. (F31P)

> The other reason [the project] was a success was team spirit between the people I'd got working with me. It was a good atmosphere. (E31M)

The influence of human factors on the effectiveness of teams is discussed at some length by Kharbanda and Stallworthy (1990). Many of the comments discussed on forming effective teams in Section 6.7 are relevant to this section too.

6.8.2 Information control

Table 6.19 shows the five data types classified in the category information control. Reference has already been made to conflict caused by the late arrival of design information; see Sections 6.4.2 and 6.4.4. Perhaps the most important aspect linking information control and conflict is communication; both the method or process of communicating information, and the accuracy and appropriateness of the information communicated. Communication procedures can be very detailed and formal or can be ad hoc with little or no formal structure. An example of an informal structure is that used by 'huddlers' (Kharbanda and Stallworthy, 1990); people working together

intimately and informally in small groups. It is not intended from this research to establish a definitive communication procedure for project management, but rather to draw attention to the sort of conflicts that can arise in this area. It is recommended that client and project organisations review their own communication procedures within a framework of conflict analysis as described in Chapter 9.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
14	Lack of communication between participants was a cause for concern in some areas of the project	2	12	3	3
65	General confusion over areas or levels of responsibility	-	-	5	-
68	Some design information was late in arriving or difficult to obtain	-	5	-	4
74	Making decisions at 85-95% information level	-	-	1	-
97	Effective use of feedback information	-	-	1	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.19 Control data: information control

Information forms the basis of all decisions. Incorrect information can lead to wrong decisions; missing information to no decision in cases when a decision should have been made. The project data revealed several examples of conflict caused by poor communication. They are summarised below:

1. A contractor's suggestion was accepted by an architect without approval by the client, leading to a number of complaints about doors not shutting correctly. (A11M)

2. Late information from a contractor prevented a consultant from updating his cost forecasts and resulted in a large overspend. (A31M)

3. Landscape vegetation grew too high and caused problems with a local authority; in future the client will inform the local authority of their intentions to use this type of bush and warn them of its potential height. (B21P)

4. Lack of coordination between designer, main contractor and subcontractors caused conflict regarding design details or interdependencies between trades. (B22P) (D11M) (G12P)

> There are always misunderstandings with items of detail. It's usually a problem of communication through to the operative stage. We were going so fast; once a design decision was made, communicating that information by drawings or written instructions to the operative on site was always a problem. We may not be speaking the same language. Wanting a light here or there doesn't mean I want a cable right across the ceiling. It's that kind of understanding. (D11M)

5. Insufficient level of interaction between a user representative and the rest of the users about room layout and services caused problems in finalising room layouts. (C34M)

6. Increased numbers of people in a communication chain due to a shift from internally managed trades to management contracts caused communication uncertainties for a project manager. (E21M)

7. Process conflict between the location of cable trunking and pipework was caused by contractors using different communication methods for design updates; one used drawings another used a physical model of the project that did not incorporate the latest updates. (E31M)

These examples illustrate the importance of a well-designed system of communication in project management. There were no reports of conflict due to too much communication between project participants; on the other hand too much printed information might well cause processing delays and subsequent deterioration of management decisions.

Another aspect of information control is the definition of individual responsibilities. This has already been mentioned in Section 6.7.3. For clients engaged in 'repeat' construction projects, particularly those using design and build contracts, it is often possible to define detailed employer's requirements, 'to the point where it would be very difficult for any misunderstandings to arise' (B31P). On the other hand one project manager advised: 'Never assume anyone will do something automatically'; and a user representative for a new university building commented: 'You realise you have to be absolutely specific about everything'. The data suggests that it is important for project

participants to know their own responsibilities and the responsibilities of others to help ensure that the right information is communicated to the right people, at the right time. Of course this is not a new idea; the British Property Federation System (BPF, 1983) included a very detailed schedule of responsibilities for the Client Representative (or project manager). This amounted to a giant project management checklist. The system has been used successfully, although, it never proved to be very popular. Walker (1989) points out that such a level of detail in a formal agreement could lead to excessive haggling over responsibility for certain items of work and inappropriate attitudes on the part of the client, project manager, and consultants.

Most of the case study projects included regular meetings between design staff and construction staff to realise project communication requirements. Design team meetings often preceded site meetings, so that problems identified during the design team meeting could be talked through with the contractor and any design changes discussed. Ideally, project meetings will reflect the information requirements of the project participants and recognise that the need for meetings waxes and wanes for individual participants throughout the various project stages. The following comment from a user representative of Client C illustrates this well; it is also interesting to note the proactive attitude of this client representative:

> Once the decision to build has been taken, you're set up with contacts and it's up to you how well you handle it. It's a very personal matter. My own technique is to have direct contact with as many people as needed. You can only do that on a daily basis. I set aside, as far as I wasn't teaching, the first hour of every day in the initial stages when much activity was needed. That subsided once construction began and then revved up again like anything as soon as we got to things like provision of instruments, installations and furnishings. (C34M)

The traditional approach of holding monthly site meetings may not suffice. However, this can be complemented by regular site visits and contact between members of the design team, project manager, and site personnel, including the clerk of works. There may also be a need for ad hoc meetings called to resolve manifest conflict requiring immediate attention. It is suggested that the usefulness of project meetings could be greatly enhanced by achieving a balance between the large design and site meetings, in which most project organisations are represented, and the ad hoc meetings created on a need to know basis by a project manager. During design team and site meeting that were attended during a project carried out by Client C, it was noticed that there was a tendency members to remain quiet unless defending their own position. Minutes formally recorded can become the ammunition of clients to resolve (in their favour)

future contractor claims. The nature of the process is adversarial and reflects the contractual basis of projects. It is suggested that less formal meetings could be used to help generate goal-oriented, as opposed to self-oriented, ideas and to encourage progress reporting, problem solving, and conflict analysis in a more constructive team environment, rather than one of rivalry.

6.8.3 Process control

The conflict and strategy types identified from the data are shown in Table 6.20.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
2	One or more changes were made to the original scope of the project	1	5	1	4
17	Several design changes were made during the project	1	5	1	7
12	One or more discussions took place to interpret stated or expected standards of quality	-	1	-	10
10	Site quality inspections resulted in some construction work being condemned	-	1	1	7
71	The project budget was initially fixed during the predesign stage	-	2	-	2
98	Formal approval was required from the client to increase the project expenditure	-	1	-	3
104	Faster pace for enhanced fee	-	-	1	-
96	Hazard and operability studies	-	-	1	-
69	Use of standard project control sheets	-	-	2	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.20 Control data: process control

Many of the projects studied suffered conflict due to changes of scope or design. Scope and design change are important features of project management. Scope changes are generally defined as changes instigated by the client and which alter some aspect of the brief as initially developed. Scope changes may have a small or large impact on the design and construction of the project. Design changes, on the other hand, are generally instigated by the design team and do not normally result in any alteration of the client's brief. There are many reasons why projects change in scope and design. Some of these have been described in previous sections of this chapter;

changes in scope revolve around the complex organisational relationships and relatively long time scale involved in the construction process. One of the problems faced by a client in specifying a project brief is the uncertainty of future events and circumstances. A project brief reflects a mixture of current circumstances and expected future requirements; the larger the element of risk and uncertainty the greater the potential for change and conflict, and the greater the need for a method of controlling that change.

In general, issues concerning change are probably best addressed during the predesign stage at the time contractual arrangements are decided. Then the client, the designer, and occasionally the contractor can plan the design and construction stages together and allow for potential change at various stages of the project. Client D, for example, used a design-and-build approach on a project that would normally be carried out using the traditional method. The design and build approach included elements of risk for the client, but allowed a greater degree of flexibility for scope and design changes during the project. This was a key factor given the relatively short time and limited resources available. Other clients use design and build as a low risk approach, since there is only one point of contact between them and the entire project organisation. These clients tend to have very detailed, well tested employer's requirements which serve to minimise conflict due to uncertainty between client and contractor; the requirements are so tight that there is 'little' room for design error. This strategy is employed by Client B and suits their policy of increasing the standardisation of design and construction methods:

> [Comment from a designer employed by Client B.] We have standard hand-over sheets for example, where any snagging lists are recorded on standard sheets and handed over to the contractor for action. Everybody had a record of what was going on. The client has plenty of paper work in the system which if implemented correctly, keeps everybody informed and helps to maintain high standards. (B11P)

A major change in a client's circumstances may lead to project failure, unless the project can accommodate some or all of these new circumstances. However, the efficiency and productivity of a project are generally adversely affected by scope and design changes. It is important that these changes are controlled during a project. For the purpose of conflict analysis it is useful to distinguish between changes of scope that are (i) anticipated and provided for in the predesign stage because of known levels of risk and/or uncertainty, (ii) not anticipated nor provided for during predesign but still caused by risk and/or uncertainty, and (iii) not anticipated nor provided for and not due to risk or uncertainty but caused by deficiencies in predesign output that could have

been avoided. There is a progression from (i) to (iii) in terms of the ability to influence these changes by means of project management strategy. The following example from Client F falls into category (ii) or (iii) depending on whether or not the reason for the change could have been reasonably anticipated before going out to tender:

> An advisory group was set up to look at all sewage treatment works and how we would refurbish them across the board. That advisory group produced a policy document after we had gone out to tender, and after work had started on site. Because of this document we decided that we really ought to be putting in more process units. Therefore part way through the job we were designing additional units that we gave to the contractor as a variation order, and which added significantly to the cost; that led to a number of problems. The contractor was quite happy because he was getting more work and the chance to make more money. It all went smoothly from that point of view but internally there was some difficulty. (F11P)

Project control requires the presence of systems and procedures that will limit the number of scope and design changes to a functional minimum for the client. This documentation can be written as stand alone procedures or as part of a quality system and quality plan. The link between quality and control has already been mentioned in Section 1.3. A suitable starting point in terms of quality systems is the international quality system ISO 9000. This series of standards forms the backbone of numerous reports and books on quality in construction: Cornick (1991, Oliver (1990), Ashford (1989) for example. An alternative approach to scope and design change control is to focus on value management as a control mechanism. Kelly and Male (1993) have applied this approach to the construction industry. They regard the philosophy of value engineering as one which, 'looks towards reducing cost without sacrificing quality'. The strategy development model described in Chapter 9 of this thesis does not constitute a quality system, nor a value management system on its own, but it does represent a practical tool for reviewing and auditing organisation-specific project management procedures. It can be used by organisations as an 'action learning' tool in project management, and is suitable organisations with or without an existing quality or value management system in place.

Cost control is an essential component of any construction project. This can be as simple as fixed budgets established early in the predesign process by a client board as in the case of Client C, or a more elaborate system incorporating many checks and authorisations at each stage of the project process, as in the case of Client F. Whichever system is used it can become a cause of intraorganisational conflict between the project manager, users and operatives, and the senior client decision makers. The following two examples illustrate this type of conflict:

> [Comment from the client's projects officer.] I think cost limits are set almost too early in the university. They ask us for an estimate of what the job costs and we do that as a paper exercise; we have to estimate the whole thing through. This estimate immediately translates into a cost limit, no matter what happens to tenders coming in. (C11M)

> [Senior project manager for Client E.] We always put in contingencies; but our contingencies are always argued about with our client lords and masters, therefore you never really have the amount of money you would like to have to do the job. In my position you are always in a state of stress to some extent trying to keep within the sanctioned cost. There are so many aspects now within a project that can push the price up. Nothing ever goes down. For example, this project was sanctioned in 1988; but it didn't really get going till 1989. Then we got into difficulties and we had to bring forward the construction stage. We had to put a 12 hour day in, but this was never considered within the estimate of the job. We had to see where we could pay for that within the constraints of our contingencies, and that was very difficult. (E12M)

Cost control systems normally operate in the background without causing significant conflict beyond the predesign stage; the predesign process taking into account the criteria embodied within the cost control system so that manifest conflict does not arise. Where project circumstances do invoke the cost control system, there could be built-in measures that help to ensure that any consequent changes lead to minimum alteration of the initial brief.

6.8.4 Summary of strategic implications

Project control has been identified as a factor vital to project success. The integration of the client into the project process has been highlighted; this applies to building and non-building projects, and needs to take into account the organisational complexity of client organisations and the relatively high degree of differentiation between client organisation members and other members of the project organisation. Without sufficient acknowledgement and control of these issues, the number of dysfunctional conflicts will certainly be higher than would otherwise be the case. The close relationship between organisation design and control systems has been discussed.

The importance of information control for making decisions has been emphasised and it was recommended that individual organisations address the requirements of project communication according to their own needs and style of management. A further point worth mentioning here is that whatever the communication system used by an organisation it will probably serve the organisation better if it is sufficiently flexible to

allow integration with the communication methods used by other project organisations. The strategy employed by Client D was one of making decisions at a 85-90% level of information. The architect describes the method:

> A decision was sometimes more important than the quality of the decision. If we were 85-90% correct, it would be there; take the decision and get it built. This method has been borne out because the quality of decisions if we had waited for more information, would have been very little better, if any better at all. For example we could have waited for the Department of Education and Science to approve the design; we'd have been waiting a very, very long time. They weren't capable of responding fast enough. A problems with any bureaucratic organisation is that one of its criteria is to protect itself; therefore instead of saying, 'this is an 85-90% answer', it would be looking to say, 'we should do this to achieve 100%'.

In the context of process control, feed back information can be invaluable, but is frequently lost in the wake of the pressing demands of the next project. A project manager of Client E commented:

> One project goes into another, goes into another, and what happens on the first project generally is forgotten by the time you have gone onto the tenth project. And whether some of these things are actioned is debatable. It may not be healthy for some people to be investigated. (E12M)

The use of a strategy development model can provide organisations with a systematic tool for gathering together the lessons learned from dysfunctional conflicts, whether felt, perceived or manifest, and applying this body of knowledge to future revisions of project strategy. This process is comparable to the function of a review and audit in a documented quality system such as ISO 9000.

6.9 Administration

6.9.1 Tendering and general administration

Several conflicts regarding contractual arrangements and communication of information have been discussed in earlier sections; the conflict types included in Table 6.21 are additional to these. Only a small number of data were collected referring explicitly to the tendering process. Conflict data type 9 describes a latent conflict that came to light during a non-case-specific interview with a senior project manager from Client A. Since this was not associated with a particular case study interview it has not been included in the latent conflict category. However, the

occurrence of anomalies in tender documentation was recognised as a cause of conflict in four projects in the validation survey.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
75	All tenders received were priced above the initial project budget	-	1	-	3
9	Several errors or anomalies were discovered in tenders during tender analysis	-	-	-	4
103	There was a notably slow response from one or more parties or lengthy admin. procedures	1	4	-	1

[1] Shows number of additional conflict data collected during validation survey.

Table 6.21 Administration data: tendering and general administration

Minor conflict regarding speed of response from various parties was a particular cause of concern for an architect employed by Client G:

> The major problem is that you have no hold over any of the statutory authorities or the county council, the fire officer and people like that. You have no means of forcing these people to speed up. They will do what they have to do, and they will do it in their own time. They're not bothered about the problems or the pressures that you've got regarding your project. (G22M)

6.9.2 Contract and conditions of contract

The data types relating to contract and conditions of contract are shown in Table 6.22.

	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
78	Some contractual or administrative details were unclear	-	1	-	3
77	Some problems arose regarding the contract and conditions of contract used	-	3	-	3
101	The client's own conditions of contract were used or major modifications issued with a set of standard conditions	-	1	1	3
27	Use of an in-house construction team led to extra cost which would otherwise have been borne by an external contractor's liability	1	1	-	-
11	Avoiding client liability for design	-	-	2	-

[1] Shows number of additional conflict data collected during validation survey.

Table 6.22 Administration data: contract and conditions of contract

In general the data tended to relate to specific project criteria. In one case a project was awarded money from the EEC but this required changes to the programme so that the contractor was required to construct his pipeline very early on. There was minor conflict here:

> He [the contractor] knew he had to do this but he wasn't going to receive his fittings until much later and so he was always having to go back to put his fittings on, which contractors do not like to do. It got a bit messy. (F32P)

On a couple of projects the use of the Institution of Civil Engineers (ICE) 5th Edition contractual conditions were referred to. In one case a client that did not normally use these conditions found them to be totally unsatisfactory:

> Two major problems were certainly (a) the contractor and (b) the ICI 5th edition conditions of contract. On a design and build, which we normally do, we wouldn't have had half of these problems because it would have been the contractor who would have been taking the lead to solve them. That is why we use design and build on our factories. In fact we are going to use a design and build building contract for our civils work in future until a more appropriate contract comes along; hopefully the new engineering contract, but that is very early yet. We are doing some preliminary work on that contract. I've been to seminars and so on.

6.9.3 Contractual disputes

Conflicts relating to contractual disputes are shown in Table 6.23.

#	Description of data type	Class of data			Extra conflict data[1]
		Latent conflict	Conflict	Strategy	
79	One or more disputes over money occurred between participants	-	1	-	7
76	Several contractor claims were submitted	-	5	-	8
28	Arbitration	-	-	1	-
24	One or more of the participants went into liquidation	-	2	-	3

[1] Shows number of additional conflict data collected during validation survey.

Table 6.23 Administration data: contractual disputes

The contractual system is an adversarial system that generates conflict in normal use. Contractor claims are often legitimately used to process additional works or

allowances for mitigating circumstances that were not included in the original contract documentation. Manifest conflict is not normally a part of these discussions and in many cases contractor claims can be settled amicably between the contractor, client, and designer. Situations that might lead to manifest conflict may include a failure to check out the financial standing of a main contractor or subcontractor, or a particularly low bid or fast programme submitted at the tender stage. These are typical factors that cause the contractor to try and make some extra money using the claims route. The prevailing economic climate is also an important factor to be taken into account by the astute client.

The methods used to deal with severe contractual disputes has not been the focus of this research, however a recent discussion of the various options: negotiation, conciliation, arbitration, and litigation can be found in Fenn and Gameson (1992).

6.9.4 Summary of strategic implications

Contractual documents are evolving all the time. None are perfect; many can be used to good effect. Clients need to be aware of the limitations and problems of whichever contract they use. A CIRIA publication aimed at clients suggests that all contractual methods have their advantages and disadvantages and that the prospective client should consider these carefully (CIRIA, 1983):

> If the balance does not seem appropriate to your project it is wise to consider other contractual methods, bearing in mind that the choice of contractual method can never be clear-cut or clinical.

Larger more experienced clients may write their own conditions of contract. However, this is a practice discouraged by construction industry associations because it takes time for participating organisations to become familiar with each new set of contract conditions. A more common approach is for clients to append a number of amendments to a standard set of conditions. This is less confusing for the contractor providing the list of amendments is not too excessive.

It is perhaps unfortunate that the development of contractual methods and their associated selection criteria have proceeded largely independently and without reference to the recent growth of knowledge about building and managing effective teams. The above report goes on to say that, 'high quality, appropriately experienced people working *harmoniously* can often overcome theoretical disadvantages whereas inappropriate people *not working harmoniously* can lose potential advantages' (italics

added), but then fails to advise the reader on the techniques available for developing effective *harmonious* teams.

A further consideration worth pointing out is the often implicit assumption by many publications aimed at clients of construction activities that the majority of clients are novices, about to embark on their first project. Little in the way of practical literature has been found to address the needs of the more experienced client who would like to build on an existing knowledge base, developed first hand by a process of trial and error, by a more ordered and structured development process (Bresnen and Haslam, 1991). In contrast to this the reader is again directed to Chapter 9 as a potential starting point for consolidating and progressing an existing (as opposed to an empty) project management knowledge base.

CHAPTER 7
BY WAY OF VALIDATION

7.1 Introduction

The methodology used to collect the data and conduct the research interviews has been described in detail in Chapter 5. The process can be schematically represented as a serial progression as illustrated in Figure 7.1.

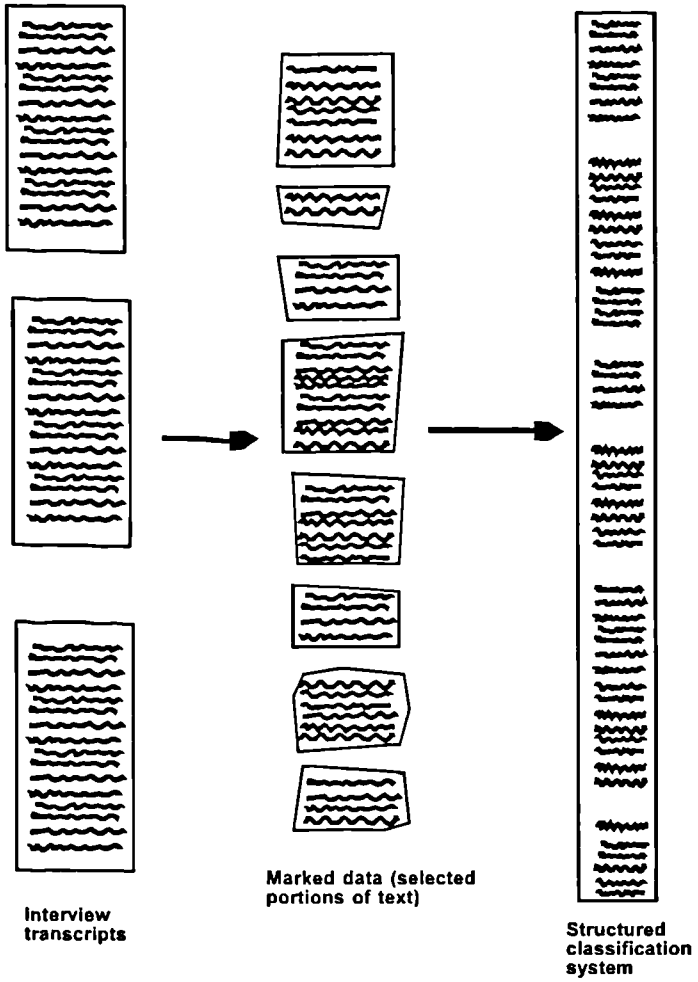


Figure 7.1 Schematic representation of research methodology

However, the process was not quite as clear cut as Figure 7.1 suggests. Interview transcripts were studied as soon as they were produced and any interesting portions of text marked. After the first few transcripts had been marked up a classification system started to emerge, although to begin with the categories used were fairly fluid. The marked portions of text formed the main body of the research data; they described real situations that had led to project conflict, or strategic measures taken during the

project, particularly where the result was to minimise dysfunctional conflict or to stimulate functional conflict. The structured classification system that developed was used as a basis for progressing the detailed conflict analysis presented in Chapter 6.

As more and more transcripts were studied, similar themes and characteristics began to recur. In most cases data-type descriptions began as very brief comments and did not necessarily convey the precise meaning of the data they represented. In their original form they served well as reminders of the original data form and content, however, the wording of these statements or data types was gradually refined and re-worded as an increasing number of transcripts were processed until each statement reflected the meaning of a group of data as accurately as possible. The main goal was to phrase each statement so that it would be recognised by a respondent as pertaining to his or her project as appropriate. For example 'new technology' became 'some problems occurred due to the use of high-tech equipment or design aids during the project'; and 'poor design aspects' became 'one or more design aspects failed to meet stated or expected requirements'.

Refining the data-type descriptions also brought to light one or two misplaced data items that were perhaps better described by an alternative statement. In some cases, no alternative could be found and a new statement had to be constructed. For example, 'intrafirm conflict' and 'internal management of participant' became combined to form 'at least one participating firm seemed to have internal management problems or insufficient management resources available'; and 'getting the brief right' was re-worded as two separate statements: 'the project brief was incomplete at the start of the design stage' and 'the project brief was not a true representation of the client's needs at the start of the project'.

This process of refining statements describing data types with successive interview transcripts can be regarded as an early form of validation in which similar themes are collected together and a common understanding developed. Other early forms of validation included asking fellow researchers to read transcripts or portions of transcripts and then to see if they came up with similar data descriptions. This gave some encouraging signs to the emerging data classification system early on.

Nevertheless, it is important to consider and minimise the effect of any researcher bias in describing the data; failure to do so may severely impair the validity of the research outcomes. Researcher bias is probably more difficult to avoid in a purely quantitative analysis in which contextualisation of the data is often scant or even absent. There is

also a danger that in a purely quantitative approach the researcher may begin to 'force' the data into incomplete or inaccurate categories, again leading to invalid conclusions. The method adopted in this research was to use both a qualitative and a quantitative approach to processing and analysing the data. Descriptive statements were used in the first instance as convenient markers to group together similar conflict episodes and strategic measures which could be discussed and analysed qualitatively. Once the major themes and subthemes of the data had emerged, and the descriptive statements had been adequately refined, a quantitative approach was integrated with the qualitative method. One potentially valuable outcome of this was the identification of a number of statistical associations between various causes of conflict. The results of both of these methods have been integrated into Chapter 6 to give a better understanding of conflict analysis than could have been achieved by using either a qualitative or quantitative approach in isolation.

It was always an important criterion that the research should reflect project management in practice, as experienced by its practitioners, with minimal interference from the researcher's own perceptions and objective standpoint. This was a factor in the development of the research methodology, and the reason that detailed structured questionnaires were avoided during the collection of the main research data; it was decided that these instruments would have tended to force the data into rigid categories representing presupposed conditions for and experiences of conflict.

In order to support the quantitative element of the research a validation survey was carried out on the conflict data-types. The method used for this was to construct a questionnaire from the data-type statements and map them back onto the original data source, that is the original interview respondents. The validation exercise also provided some additional data to enhance the original data which has already been referred to in Chapter 6. A schematic representation showing the various links between the validation survey and the rest of the research process is shown in Figure 7.2.

7.2 Survey and Questionnaire Design

A standard questionnaire was designed for completion by project managers, design consultants, users and operators. This was logistically more practical than preparing different questionnaires for different respondents, particularly with a total sample size of only 30. The questionnaire was designed in the form of a table in which each descriptive statement formed one row in the table. The validation questionnaire,

accompanying letter, and subsequent reminder can be found in Appendix C, Section C.2.

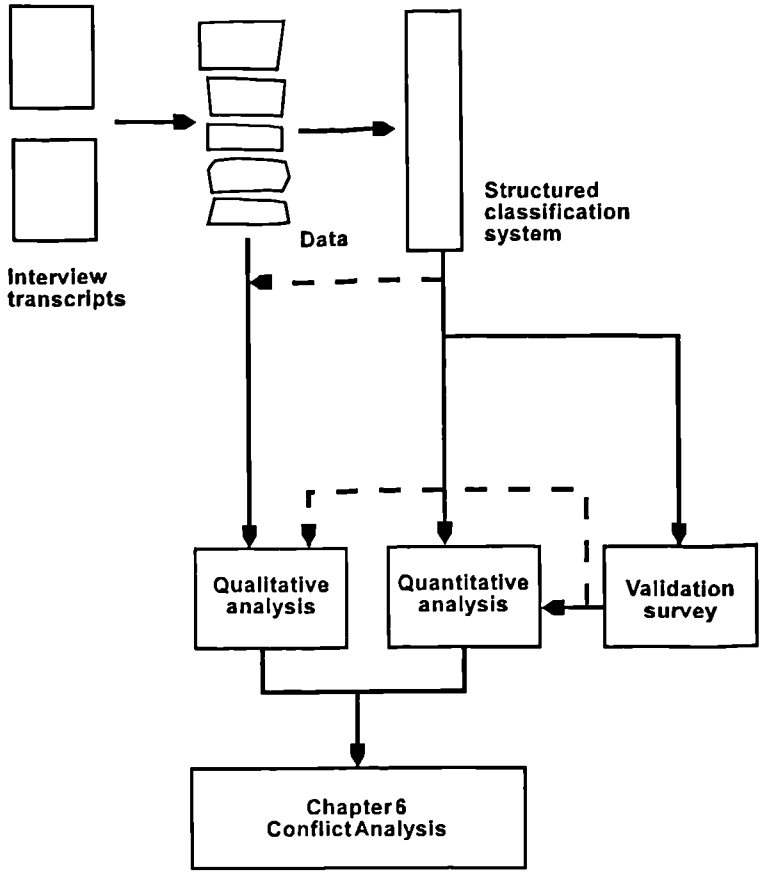


Figure 7.2 Schematic representation of validation survey

In order to improve the response rate, respondents were contacted beforehand by phone to secure their approval and willingness to participate. In all cases respondents seemed very willing to help; this may have reflected their earlier willingness to help during the main data collection stage.

It was decided to limit the scope of the validation survey to data types relating only to conditions for conflict, rather than trying to include those describing elements of project management strategy as well. The main reason for doing this was to reduce the overall length of the questionnaire in a bid to encourage respondents to fill it in.

Before sending the questionnaire out to respondents, a copy of it was circulated to eight members of staff having some experience of the administration of questionnaire based surveys. Many of the comments and suggestions from this regarding the style and structure of the questionnaire and the covering letter were incorporated into the final version. A further mini-pilot study was carried out on a colleague in the

Department of Building Engineering and Surveying at Heriot-Watt University. This revealed one or two statements which were too general or ambiguous; again suggestions were incorporated into the questionnaire. Space was allowed for comment at the end of the questionnaire and respondents were given the opportunity to indicate their interest in a summary of the research findings when available.

7.3 Analysis and Discussion of the Validation Survey

The number of valid questionnaires returned was eighteen out of thirty, representing a response rate of sixty percent. A few of the respondents were unable to be contacted due to a change of company, or relocation abroad. A full listing of the responses can be found in Appendix D, Section D.2.

A summary of the results are presented in Tables 7.1 and 7.2. Table 7.1 shows a breakdown of the results in terms of the seven main data classification categories; Table 7.2 breaks the data down by respondent interviews.

Category	Responses in agreement		Responses not in agreement	
	no.	(%)	no.	(%)
Predesign	2	(50)	2	(50)
Design	17	(63)	10	(37)
Construction	17	(77)	5	(23)
Commissioning	0	(0)	1	(100)
Organisation	11	(50)	11	(50)
Control	17	(77)	5	(23)
Administration	7	(78)	2	(28)
	71	(66)	36	(34)

Table 7.1 Frequency of validation survey responses by category

The tables show that sixty-six percent of the validation responses were in agreement with the data types derived from the original interview transcripts. This is an encouraging result and provides significant evidence that the data types are, on the whole, good representations of the original data.

Despite this positive result it is important to realise that most validation exercises have several weaknesses which should be taken into account when making inferences from the results. First of all, it is noted that all the original interviews were carried out on historical projects, some of which were up to two years post-completion. Add to this

Interview code	Responses in agreement		Responses not in agreement	
	no.	(%)	no.	(%)
A21M	1	(20)	4	(80)
A41M	3	(60)	2	(40)
B11P	4	(50)	4	(50)
B21P	2	(40)	3	(60)
B22P	3	(100)	0	(0)
C21M	1	(100)	0	(0)
C31P	0	(0)	1	(100)
C33M	5	(83)	1	(13)
D11M	5	(63)	3	(37)
E11M	3	(60)	2	(40)
E21M	14	(88)	2	(12)
E31M	6	(75)	2	(25)
F11P	4	(57)	3	(43)
F23P	2	(67)	1	(33)
G11M	0	(0)	3	(100)
G12P	4	(67)	2	(33)
G14P	1	(100)	0	(0)
G22M	13	(81)	3	(19)
	71	(66)	36	(34)

Table 7.2 Frequency of validation survey responses by interview

another year before the validation survey was carried out and this clearly amounts to significant room for error regarding a respondent's memory of project events. Bearing this in mind it can be argued that an agreement of sixty-six percent is even more significant that at first thought! A second point is that there were six respondent entries in which a respondent agreed with a statement but did not agree that conflict had occurred. These entries have been identified in the validation table in Appendix C by placing them in italics. The presence of these data demonstrate that there is sometimes a fine line between what is regarded as conflict and what is not. It seems likely that the threshold between conflict and no conflict varies between respondents. The validation analysis does not attempt to take these inconsistencies into account; the six data referred to have been treated as responses in agreement with the original data on the basis that the respondents agreed with the description. This is more important than a respondent's opinion of whether or not conflict occurred given the length of time that has elapsed as already discussed. Thirdly, the style of the questionnaire can also affect

the results obtained. A questionnaire that requires too many repetitive type responses from respondents may tend to cause some respondents to tick boxes indiscriminately just to get the thing finished. This last point was raised by a colleague who had reviewed the questionnaire. However, it was decided that the technical background of most respondents would mean that they would be sufficiently familiar with the format used.

7.4 Chapter Summary

The validation survey has provided additional evidence in support of the data-type descriptions used in the classification structure. A total of 71 (or 66 percent) of the responses received were in agreement with these descriptions originally derived from the interview transcripts. This is an encouraging result, particularly given the time that elapsed between project completion, respondent interview, and the validation survey.

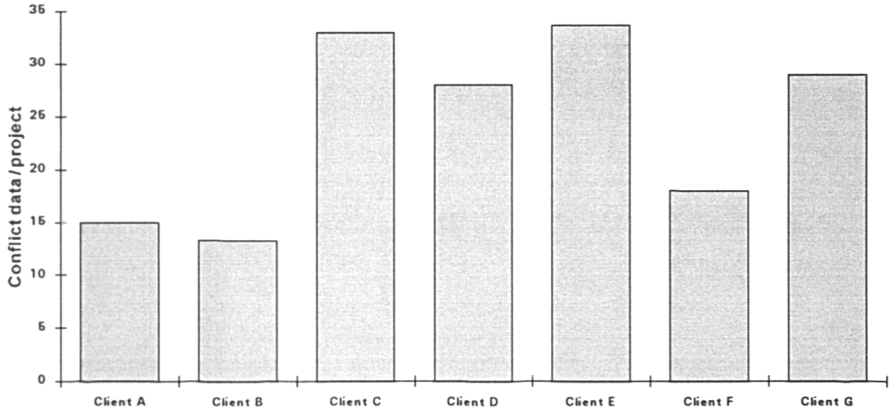
CHAPTER 8
RECOMMENDATIONS TO CONSTRUCTION INDUSTRY CLIENTS

8.1 Introduction

These recommendations have been prepared primarily for the benefit of those organisations and individuals that have helped and given of their time during the period of this research. It is hoped that they will find the following report both interesting and stimulating. However, it should be pointed out that it has not been the main purpose of this research to study individual clients in isolation on a consulting basis, but to study conflict and project strategy across a collection of projects and clients. Therefore, these recommendations represent a composite picture rather than a full and detailed report for each client. It should also be remembered that the amount of research material collected for each construction client varies and consequently direct comparisons between clients should be greeted cautiously and with due consideration of these differences. Copies of the conflict and strategy analysis presented in Chapter 6, and the strategy development model described in Chapter 9 will be made available to the construction clients studied and other interested parties as requested. Any clients wishing to investigate a more detailed application of the model, tailored to their own organisation could be considered on an individual basis. The use of 'action research' as a link between generic academic research and specific industrial applications is an established concept (Easterby-Smith et al, 1991; Nicholson and Coughlan, 1993) and is considered again in Chapter 10.

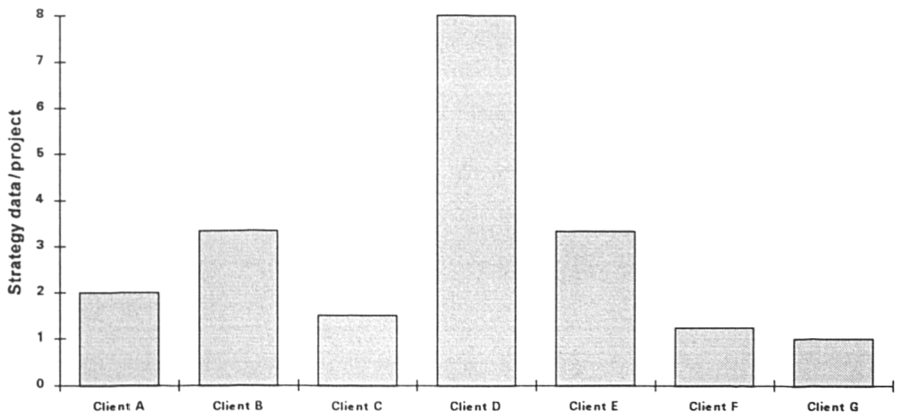
Figure 8.1 shows a histogram of the average number of conflicts reported per project for each client. It provides a simple comparison between the 'conflict levels' of the different clients. However, since the number of interviews and type of personnel interviewed varied from client to client, a method of compensation was applied to try and improve the comparability between clients. Each case study included at least one interview with a project manager (or its equivalent). Consequently, to help achieve a common benchmark only interviews with project managers have been taken into account. This avoids introducing bias into the graph of Figure 8.1 from interviews with users on the periphery of some projects, in which relatively few conflicts were reported.

For example, a value of 15 conflicts per project for Client A was obtained by counting the number of conflict data from the interview transcripts for the four project managers interviewed (one for each project) and then dividing this number by four; repeating this procedure for the additional data obtained from the validation survey, but this time remembering to divide by the number of valid questionnaires received from these project managers; and finally adding the two answers together to obtain a compensated average per project. Thus, there are 28 coded interview data (see Table D.1, column 4: 'conflict') that begin with the codes A11M, A21M, A31M, and A41M; and 16 additional data (see Table D.2, column 5: 'additional data') beginning with the codes A21M, and A41M (only two of the four project managers returned usable questionnaires). The average number of conflicts per project was arrived at by adding together 28÷4 and 16÷2, giving a value of 15, as illustrated in Figure 8.1.



(Contains interview survey data and additional validation survey data.)

Figure 8.1 Average number of conflict data collected per project



(Contains interview survey data only.)

Figure 8.2 Average number of strategy data collected per project

Figure 8.2 is a histogram of the average number of strategy data collected per project. These values were obtained in a similar fashion to those of Figure 8.1, however, since

the validation survey did not include strategy data, for the reasons outlined in Chapter 7, Figure 8.2 contains data collected only during the research interviews. This accounts, in part, for the wide disparity of the number of data between Figures 8.1 and 8.2.

Figure 8.3 shows the average distribution of conflict data across each of the project and business categories defined in Chapter 5. It also shows the proportion of data arising from the original interview survey and the validation survey in each category.

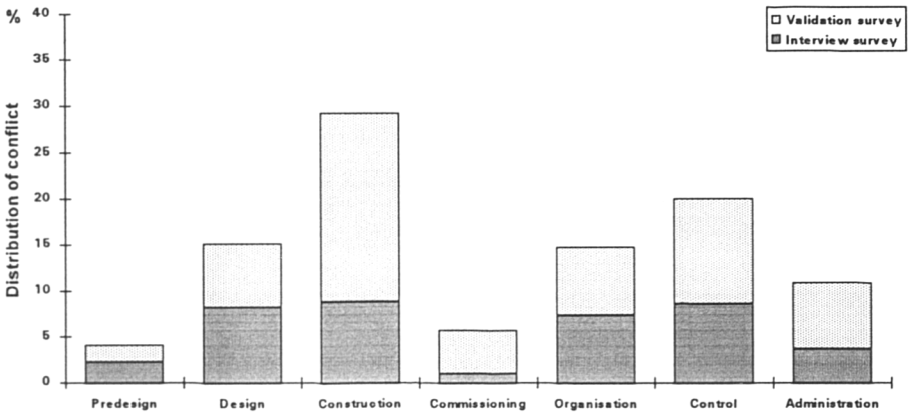


Figure 8.3 Average distribution of conflict data showing source of data

This information is presented as separate histograms for each of the clients, A to G, in Figures 8.4 to 8.10. Each graph has been partly superimposed onto a histogram of the combined average shown in Figure 8.3. Unlike the graphs shown in Chapter 6, these graphs take into account the conflict data from the interview survey and the additional data from the validation survey.

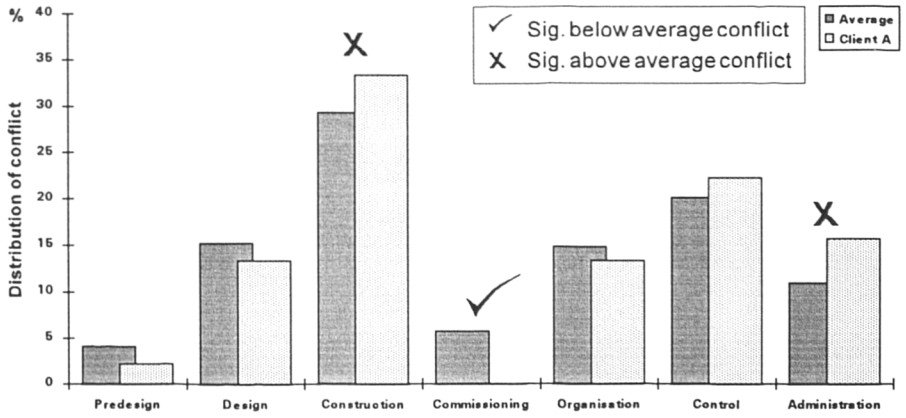


Figure 8.4 Distribution of conflict: Client A

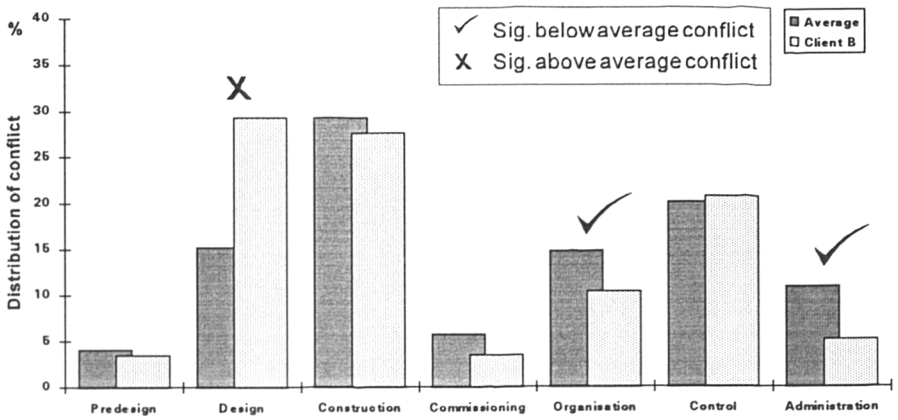


Figure 8.5 Distribution of conflict: Client B

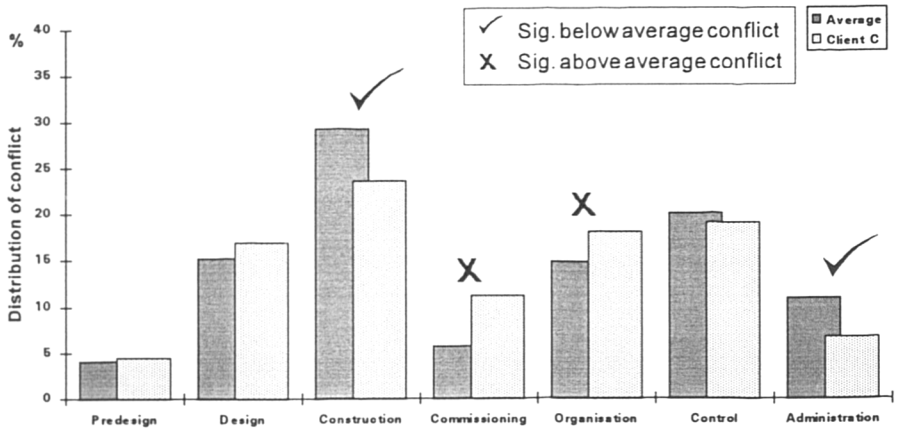


Figure 8.6 Distribution of conflict: Client C

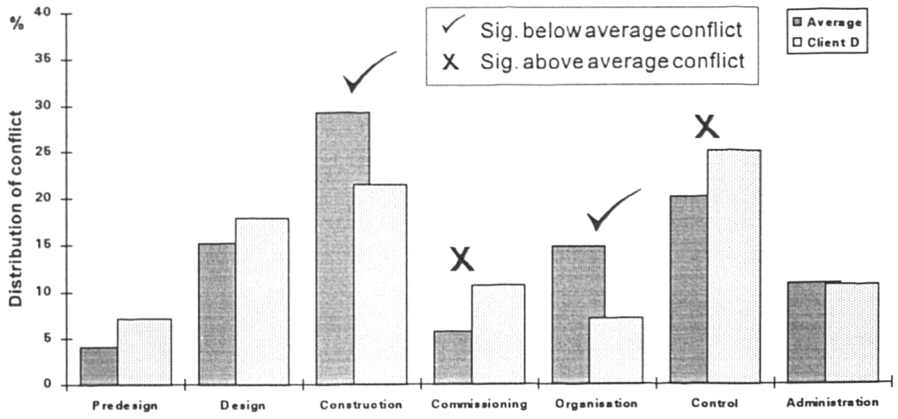


Figure 8.7 Distribution of conflict: Client D

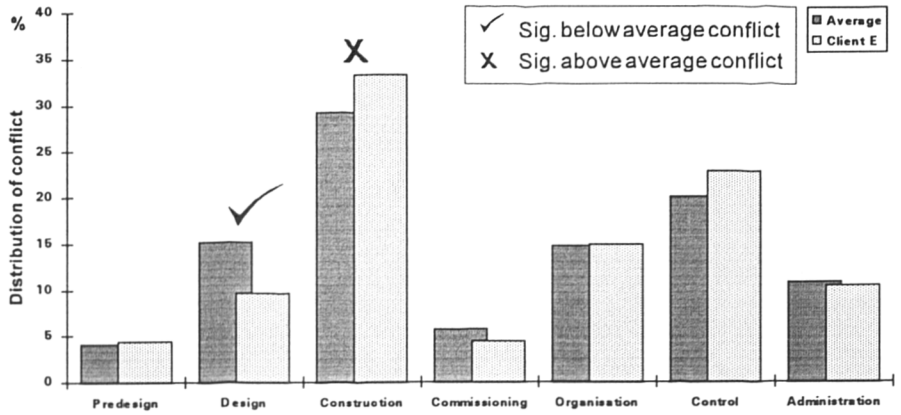


Figure 8.8 Distribution of conflict: Client E

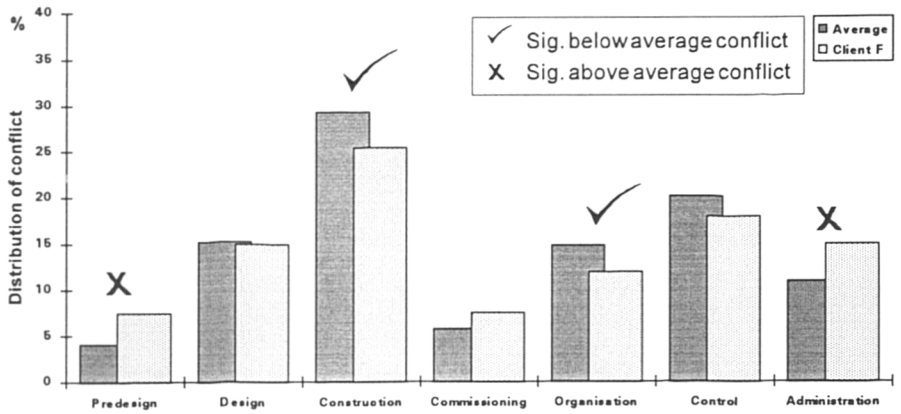


Figure 8.9 Distribution of conflict: Client F

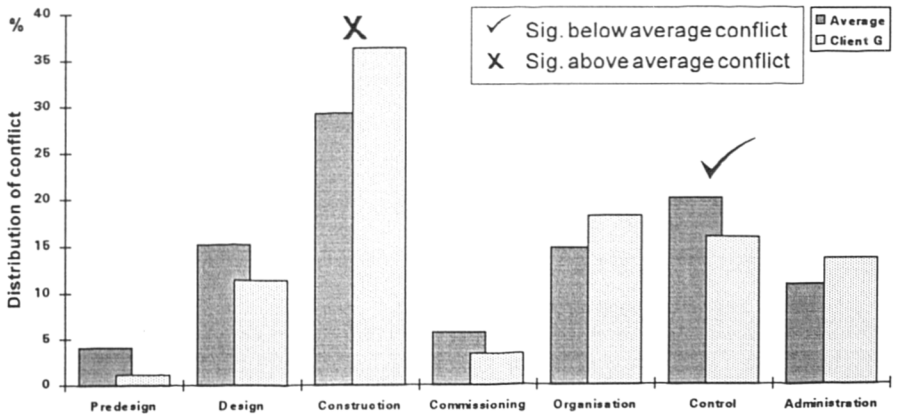


Figure 8.10 Distribution of conflict: Client G

8.2 Summary Client Report

This section contains a brief résumé of the major trends and characteristics suggested by Figures 8.1 and 8.2. Individual clients may also find it useful to refer to the appropriate conflict distribution graph (from Figures 8.4 to 8.10) when reading this section. A more detailed description of each case study project is given in Appendix A.

Figure 8.1 shows that the average number of conflicts per project varies from 13, in the case of Client B, to 34 for Client E. The average value for all clients is 24 conflicts per project. This variation cannot be attributed solely to differences in project management strategy between the clients, but in part reflects the importance of the type of construction project in which a client is engaged. It is even more difficult to make comparisons of strategy between clients from Figure 8.2. Strategy data were collected during the research on the basis of their usefulness for controlling conflict; either as a stimulant to generate low intensity conflict, providing a useful creative influence to a project, or as a destimulant to reduce the occurrence of more intense, harmful conflict episodes. The strategy data collected do not claim to represent every project management strategy used by the clients studied.

With reference to Figures 8.4 to 8.10 it is noted that there is a striking resemblance between all seven client graphs and the average distribution of conflict shown by the darker shading, and illustrated separately in Figure 8.3. It is postulated from this that the majority of clients in the construction industry may find a similar distribution of conflict present in their projects too. In other words, although the average number of conflicts per project will tend vary according to the project management ability of the project organisations and individuals engaged on the project, and the risks and uncertainties associated with the type of project being carried out, the distribution of conflict between the various project stages and business categories will tend to reflect the average distribution presented here.

Of course there are exceptions to this trend; two noticeable ones being conflicts during the commissioning stage for Client A, and conflicts during the design stage for Client B. In the case of Client A no conflicts were reported during the commissioning stage. This may reflect the type of construction project normally engaged in by Client A, namely speculative industrial units, for which users are not normally found until after practical completion; thus reducing the potential for last minute changes and additions requested at or near the commissioning stage. In the case of Client B, the relatively high proportion of design conflicts may reflect this client's increasing

attention to detail and standardisation in the design of housing association stock; it may take an appreciable length of time for some project organisations engaged in their projects to take full account of this new and growing emphasis.

The graph in Figure 8.1 shows that Clients A and B have the lowest number of conflicts (on average) per project. Both of these clients are involved almost exclusively in building projects. They tend to use contractors on a regular basis and have a preference for design and build style contracts. Client A is an industrial developer and Client B is a large housing association; both clients have developed fairly extensive and detailed employer's requirements for use by contractors. It is also the policy of Client B to standardise on design and construction methods. In contrast to this, Client F, a water authority, is engaged almost exclusively in civil engineering projects. There are two distinguishing factors which may account for the relatively low average for conflict experienced by Client F. Firstly, it has a regular design team familiar with its work. These design consultants were originally employed by Client F, until they were hived-off into a separate company. They now bid for design work alongside other companies and have successfully won many design contracts. Secondly, Client F has developed a computerised system of contractor performance and appraisal that is frequently updated and is well respected by its competitors. This system is used in the selection of firms for tendering and takes into account previous performance indicators and the type of work required in each project to be carried out.

Client E is a large process engineering company with a project control department to assist in the running of projects. Many of the projects carried out by this client involve complex chemical processes and have novel design features. Client E, like Client A, has produced comprehensive literature on company project management policy, and also substantial documentation on safety procedures. However, little evidence surfaced during this research to verify the extent to which these documents were used or to ascertain how up-to-date they are kept with changes in company policy or project management practice. There were a number of indications that the system for assessing and appraising contractor performance for future invitations to bid could be improved. A further factor that may have had an important bearing on the relatively high level of conflict for Client E was the raised level of organisational uncertainty and change that seemed to be present at the time of the research interviews. This resulted from a steady shift in contract strategy from internally managed contracts to one of surveillance and coordination by internal project managers; direct control passing to external management consultants.

The research did reveal one particularly useful project strategy regularly carried out by Client E; the hazop (hazard and operability) study. This study is essentially a review of process specifications and design characteristics, aimed at checking for any aspects of design that may compromise safety or operability. It is also noted that at the time of the research a major initiative was underway to begin operating project management activities to a formalised quality system. The system being installed is based on the BS 5750 (ISO 9000) quality system standards. It is suggested that a significant proportion of the conflict-related problems experienced by Client E are those commonly experienced during change by large organisations with an essentially bureaucratic and hierarchical structure.

Of the remaining three clients, Client D is represented by a group of sponsors performing a one-off project on behalf of the Department of Education and Science; and Clients C and G, a university and a city council respectively, are involved in various building projects. Although Client D seems to have a relatively high level of conflict, the reader is reminded that this information is from a single project, carried out under a severe time restriction, and in which there was almost a complete redesign of the project as initially proposed by the project promoter. Clients C and G exhibit an average value of conflicts per project. In the case of Client C, the occurrence of conflict largely reflects the complex internal structure of the client and also suggests an insufficient level of project control resources, including policy documentation, given the large number of projects that are carried out. Client G seems to operate effectively as a design team but has a slightly laissez-faire relationship with its regular main contractor, the operations division of the same council. It is noted, however, in their defence that a significant number of the conflicts reported did stem from misunderstandings between Client G and a neighbouring county council.

8.3 Statistical Associations

The following statistical associations reveal significant links between certain causes of conflict. They have been discussed in detail in Chapter 6 and are presented here in summary form only. By studying these associations it is possible to gain a greater understanding of the dynamics of project conflict. At the end of each description the enquiring reader is directed to the appropriate sections of Chapter 6 for further information.

1. Conflict caused because a project brief was 'incomplete' or 'not a true representation of the client's needs at the start of a project' was associated with

conflict caused by at least one participating firm having internal management problems or insufficient management resources available. (Sections 6.3.1 and 6.7.1)

2. Conflict in the programming of construction activities was associated with conflict arising from the poor selection of firms to take part in a project. (Sections 6.5.3 and 6.7.1)

3. A second association involving conflict in the programming of construction activities was with conflict caused by the inappropriate appointment of certain individuals onto a project team. (Sections 6.5.3 and 6.7.1)

4. Conflict resulting from design changes in a project was also associated with conflict caused by the inappropriate appointment of certain individuals onto a project team. (Sections 6.7.1 and 6.8.3)

5. Conflict involving members of the design team was associated with conflict caused by a lack of communication. (Sections 6.4.2 and 6.8.2)

6. Conflict caused by design aspects failing to meet stated or expected requirements was associated with conflict attributable to design information arriving late or just plain difficult to obtain. (Sections 6.4.4 and 6.8.2)

7. Conflict due to the use of high-tech equipment or design aids during a project was also associated with design information arriving late or difficult to get hold of. (Sections 6.4.4 and 6.8.2)

8.4 Recommendations

The following nineteen recommendations are derived from the research and reflect particular conflicts that have occurred or effective strategic measures employed. As in the previous section directions to further information in Chapter 6 are provided. A cross reference is also provided to locate the question from the survey pertaining to each recommendation in Appendix C, Section C.3.

PREDESIGN

Predesign 1: The briefing process is arguably the most important stage in many projects. It is at this time that the effects of potential conflict are most easily

modified and directed towards a useful rather than dysfunctional outcome. The level of structure and effort put into the briefing process should reflect: (a) the complexity of the project being carried out, (b) any previous learning experiences by the parties involved from similar projects, (c) the organisational complexity of the client, and (d) the level of familiarity between key project personnel from the main contractual parties. (Sections 6.3.1 and 6.3.4; Section C.3, Q3a-Q3d)

Predesign 2: Project managers and designers are encouraged to communicate early with planning officials, building inspectors, parish councils, etc. when preparing to make a planning submission. By doing this it should be possible to work through conflicts of interest and gain tacit agreement before detailed design work is carried out. This can significantly reduce the possibility of an unexpected refusal at a planning meeting prior to construction that might otherwise result in significant delay, extra cost, and serious interpersonal conflict. (Section 6.3.2; Section C.3, Q4)

DESIGN

Design 1: Written guidance should be provided and agreed regarding the level of interaction expected or required between client and designer during the design stage. This should be clearly specified and reflect the ability of client representatives and any users/operatives involved to comprehend adequately and comment usefully on design proposals put forward. The ability of users/operatives and client representatives to communicate and interact with design consultants should be formally assessed at the briefing stage and measures taken to develop this interface as appropriate. (Section 6.4.1; Section C.3, Q5)

Design 2: Design consultants should be selected that have a commitment to visiting the construction site regularly to assist in problem solving, rather than relying entirely, or almost entirely, on the telephone or fax. The distance of design firms from the construction site should be taken into account. Site visits are important to develop and maintain a team spirit between designers and other project personnel. (Section 6.4.2; Section C.3, Q6)

CONSTRUCTION

Construction 1: Price variations within a contract should be agreed by the respective quantity surveyors before they are carried out rather than at the end of the contract. (Section 6.5.1; Section C.3, Q7)

Construction 2: When choosing the contractual arrangements to be used, clients and designers should first consider those that enable an early relationship to be developed with the main contractor, such as management contracting or design-and-build, in which the contractor is afforded opportunity to contribute specialist construction knowledge to the design process. (Section 6.5.1; Section C.3, Q8)

Construction 3: For all but the smallest, or most straight forward, of projects, the project manager should undertake a team briefing (or project orientation exercise) to help develop and strengthen constructive relationships between the parties involved and align the objectives and goals of the individual participants into a set of shared common project goals and objectives. (Section 6.5.1; Section C.3, Q9)

Construction 4: Clients should be advised of the risks associated with supplying equipment and materials direct to a contractor; risks that may offset any anticipated advantages. Delay in the delivery of materials, or inadequate vendor design information can lead to interorganisational conflict, increased cost and project delay. (Section 6.5.3; Section C.3, Q10)

Construction 5: Clients engaged in projects that need to be designed with flexibility to allow for possible changes in scope and design during construction should obtain prior confirmation from design consultants that allocated design resources will be sufficient to process these changes and maintain continuity of design staff. (Section 6.5.3; Section C.3, Q11)

Construction 6: Regular clients of the construction industry should seek to standardise design and construction methods used in their projects. (Section 6.5.3; Section C.3, Q12)

COMMISSIONING

Commissioning 1: Commissioning personnel should be involved sooner rather than later in a project; preferably before the design is finalised. (Section 6.6.2; Section C.3, Q13)

ORGANISATION

Organisation 1: Clients should perform a thorough check on the management ability of contractors and important specialist subcontractors. (Section 6.7.1; Section C.3, Q14)

Organisation 2: Except for small or relatively simple projects, clients should consider selectively screening key project personnel, including design staff and leading site foremen. This may require the use of a recognised psychometric instrument such as PAPI (Perception and Preference Inventory). These measures can help to ensure the formation of a harmonious project team, and also serve as a useful diagnostic tool for project managers when interpersonal conflict does develop. (Section 6.7.1; Section C.3, Q15)

Organisation 3: Clients should aim to develop a constructive relationship with a small number of reliable contractors and design firms, rather than always seeking to employ the firm that submitted the very lowest tender received. (Section 6.7.4; Section C.3, Q16)

CONTROL

Control 1: Project mangers should liaise sensitively with local residents, land owners and other groups to minimise the harmful environmental impact of their project. However, a reasonable balance should be maintained when assessing concessions to be made in the favour of residents or land owners. (Section 6.8.1; Section C.3, Q17)

Control 2: Clients and other organisations should periodically review their internal and external project communication procedures. (Section 6.8.2; Section C.3, Q18)

Control 3: Regular meetings involving client representatives, designers and construction personnel, should be augmented with unminuted ad hoc meetings involving only a few individuals on a need to know basis both on and off the construction site. (Section 6.8.2; Section C.3, Q19)

Control 4: The client's cost control system should have measures built into it which help to ensure minimum dysfunction to the requirements of the original brief when project circumstances cause it to be invoked. (Section 6.8.3; Section C.3, Q20)

ADMINISTRATION

Administration 1: Clients should be advised of the advantages and disadvantages of whichever conditions of contract they choose to use, particularly with regard to contractually imposed limits upon their own influence and control during the project and the apportionment of risk and uncertainty between the parties. (Section 6.9.4; Section C.3, Q21)

8.5 Quantitative Report on Recommendations

A short concluding survey was carried out to test the reaction to these recommendations by ninety-nine companies not involved in the research programme. A useful response rate of 46% was obtained. Table 8.1 shows the distribution of useful, non-useful, and unreturned questionnaires. Non-useful returns included those returned by the Royal Mail marked 'gone away' or returned 'blank' by a company.

Useful returns	**46**
Returned by Royal Mail	7
Returned 'blank'	4
Unaccounted for	42
Total	**99**

Table 8.1 Distribution of questionnaire returns in final quantitative check

Responses were also categorised by type of company as: architects (ARCH), clients, including local authorities, universities and water companies (CLIENT), main contractors (MC), other design/management consultancies (OTHER), quantity surveyors (QS), and subcontractors (SC). Table 8.2 shows the distribution of company types of the 46 useful replies received.

Architects	5
Clients	22
Main contractors	7
Other design/management consultancies	5
Quantity surveyors	5
Subcontractors	2
Total	**46**

Table 8.2 Distribution of useful returns by company type

A copy of the questionnaire used during this quantitative survey is included in Appendix C, Section C.3. Each question required the respondent to read a recommendation and then rate his or her reaction to it as: (i) strongly agree, (ii) agree, (iii) disagree, or (iv) strongly disagree. The questionnaire in Appendix C, Section C.3 shows the number of valid responses obtained in each category for each question.

Table 8.3 shows the average response made by each group of companies for the nineteen recommendations described above. In calculating the average response rating 'strongly agree' was graded as 2.00, 'agree' as 1.00, 'disagree' as -1.00 and 'strongly disagree' as -2.00. Shaded columns indicate that a graph is also shown for additional clarification; see Figures 8.11 to 8.16.)

Company	RECOMMENDATION										
Type	Pre 1a	Pre 1b	Pre 1c	Pre 1d	Pre 2	Des 1	Des 2	Cons 1	Cons 2	Cons 3	Cons 4
ARCH	1.80	1.60	1.20	0.80	1.20	0.75	1.00	1.00	0.40	1.00	2.00
CLIENT	1.41	1.36	0.50	-0.05	1.41	1.09	1.36	1.19	0.50	1.36	1.43
MC	1.86	1.57	0.71	0.43	1.71	1.43	1.71	0.57	1.57	1.57	1.57
OTHER	2.00	1.80	1.20	0.60	1.60	1.40	1.20	1.20	1.20	1.60	1.40
QS	1.60	1.80	1.60	1.60	1.40	1.60	1.20	1.20	-1.00	1.40	1.80
SC	1.00	1.50	1.00	0.00	1.50	1.50	1.00	0.50	0.00	1.50	1.50
AVERAGE	1.59	1.52	0.83	0.37	1.46	1.22	1.33	1.04	0.54	1.39	1.56
STD	0.33	0.17	0.36	0.55	0.16	0.29	0.24	0.30	0.83	0.20	0.22
See Figure			8.11	8.12					8.13		

Table 8.3 Average response ratings for recommendations (cont. overleaf)

Company	RECOMMENDATION											
Type	Cons 5	Cons 6	Com 1	Org 1	Org 2	Org 3	Cont 1	Cont 2	Cont 3	Cont 4	Adm 1	AV.
ARCH	1.00	-0.20	0.60	1.20	-0.60	1.60	1.20	1.00	1.20	1.20	1.20	1.04
CLIENT	1.05	0.18	1.00	1.14	0.45	0.80	1.41	1.19	0.55	1.00	1.32	1.01
MC	1.29	0.71	0.86	1.29	-0.29	1.43	0.86	1.29	1.43	0.67	1.71	1.19
OTHER	1.40	-0.40	1.20	1.60	-0.20	0.80	1.60	1.60	0.60	1.00	1.60	1.21
QS	1.40	0.80	1.60	1.60	0.20	0.80	1.20	1.40	0.00	1.25	1.80	1.18
SC	1.00	-1.00	0.50	1.00	0.00	1.50	1.50	1.50	0.00	1.00	0.50	0.89
AV.	1.15	0.17	1.00	1.26	0.11	1.02	1.30	1.27	0.67	1.00	1.44	1.07
STD	0.18	0.63	0.37	0.23	0.34	0.36	0.24	0.20	0.54	0.19	0.29	0.12
See Figure		8.14			8.15				8.16			

Table 8.3 (cont.) Average response ratings for recommendations

An overall impression of the respondents to these recommendations can be found by looking at the average response rating from each group of companies (see last column in Table 8.3). A combined average response rating of 1.07 with a standard deviation of 0.12 is obtained for all groups, suggesting firm agreement from most respondents.

However, there are some noticeable differences of opinion between company types for a few of the recommendations; these occurrences are highlighted in Table 8.3 and illustrated in Figures 8.11 to 8.16.

Figure 8.11 confirms that the organisational complexity of the client is regarded as an important consideration in the briefing process by most of the groups surveyed. However, a response rating of 0.50, that is between 'disagree' and 'agree', was obtained from the construction clients themselves.

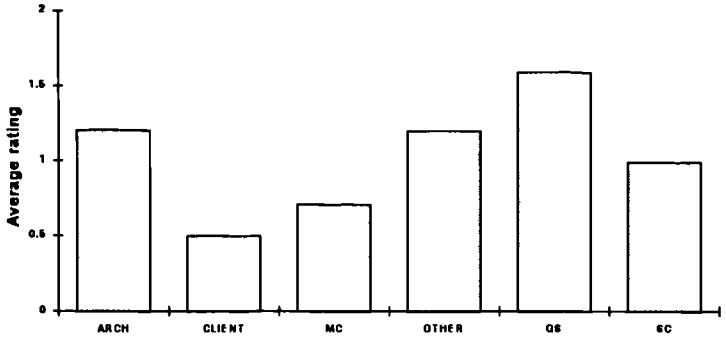


Figure 8.11 Average response ratings for recommendation *predesign 1c*

Figure 8.12 is also concerned with an issue in the planning and briefing stage of projects. There is a marked difference between the response from clients and subcontractors on the one hand, and quantity surveyors on the other. A response rating

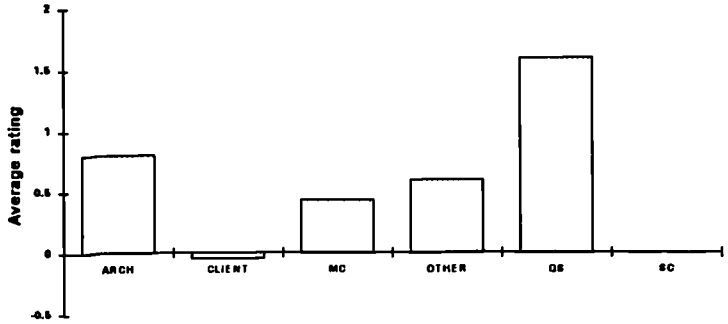


Figure 8.12 Average response rating for recommendation *predesign 1d*

of 1.60 was obtained from the quantity surveyors indicating fairly strong agreement with the recommendation that the level of familiarity between key project personnel is an important consideration in performing the planning and briefing process. However, the clients surveyed are less convinced as indicated by their average response rating of only -0.05.

Figure 8.13 provides significant evidence that main contractors agree that contractual arrangements should first be considered that afford them greater opportunity to contribute during the design stage. This recommendation gains a varying amount of support from the other groups but is clearly disagreed with by the quantity surveyors.

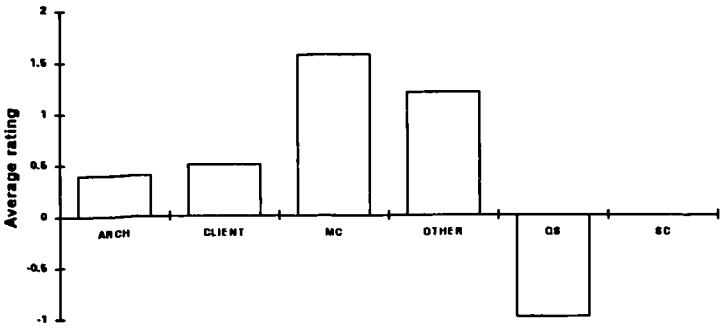


Figure 8.13 Response ratings for recommendation *construction 2*

Figure 8.14 shows significant differences of opinion over the practice of standardising on design and construction methods. In this survey only the main contractor and the quantity surveyors were in positive agreement with this recommendation.

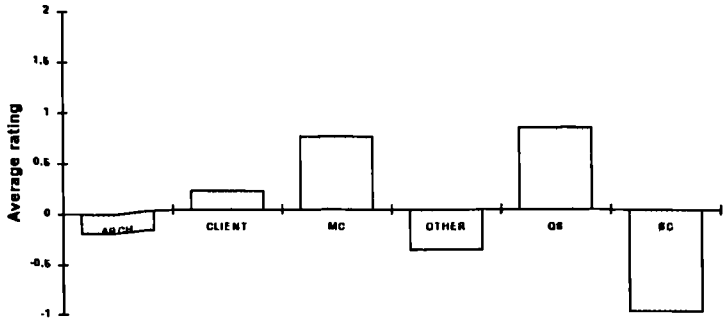


Figure 8.14 Response ratings for recommendation *construction 6*

There was neither strong agreement nor disagreement in the case of the recommendation illustrated in Figure 8.15. On balance clients were mostly in favour of using some method of selectively screening key project personnel; architects being the least in favour. This difference of opinion may vary depending on whether these methods, including the psychometric testing, are used to initially select team members, or used after the formation of a team as a management tool to help manage the resulting team more effectively.

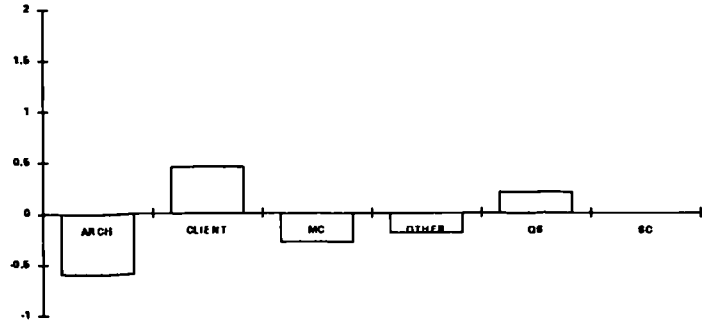


Figure 8.15 Response ratings for recommendation *organisation 2*

Figure 8.16 shows significant agreement from architects and main contractors for the use of additional unminuted meetings performed on an ad hoc basis. A more muted response was obtained from clients and design and management consultants (other than architects), and the average response rating by quantity surveyors and subcontractors was exactly midway between 'disagree' and 'agree'.

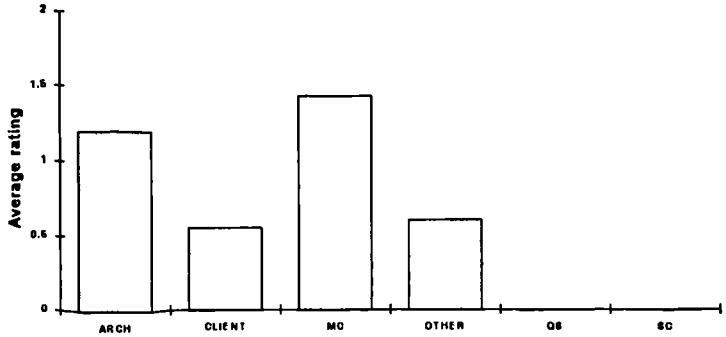


Figure 8.16 Response ratings for recommendation *control 3*

8.5.1 Summary

The quantitative check on the recommendations advanced in this chapter included useful responses from 46 companies, comprising architects, clients, main contractors, other design and management consultancies, quantity surveyors, and subcontractors. Significant differences of opinion between company types occurred in six out of nineteen recommendations: predesign 1c and 1d, construction 2 and 6, organisation 2, and control 3. These differences are illustrated in Figures 8.11 to 8.16. Overall, the average response rating for the nineteen recommendations indicated firm and significant agreement.

CHAPTER 9
OUTLINE OF A MODEL FOR STRATEGY DEVELOPMENT

9.1 Introduction

The model described in this chapter partly reflects the stages carried out during this programme of research. Five themes have been taken from the research which are related as illustrated in Figure 9.1.

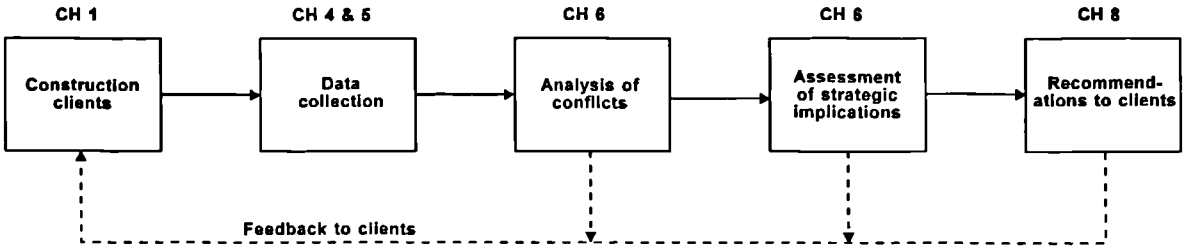


Figure 9.1 Research stages reflected in strategy development model

Organisations wanting to apply the model would not be expected to carry out an enquiry to the same level of detail as that reported in this thesis. However, the principles would remain the same. Information was collected during the research from interviews with project managers, design consultants, construction staff and users. This information was processed into written format by transcribing the interviews initially recorded on audio-cassette. These transcriptions were complemented by the researcher's attendance at some site and design team meetings. The collection of data included gathering specific project facts, and gaining general impressions and insights by observing the interaction of participants and identifying areas of interest that recurred during interviews.

A comprehensive analysis of the data was then carried out and any strategic implications identified. These findings are reported in Chapter 6. This served both to confirm relationships that were already suspected, for instance the importance of the briefing stage as a harbinger of conflict later in the project if it is not adequately performed (see Section 6.3.1), and to suggest new and unexpected findings, such as the potential value of psychometric testing in selecting and managing the individuals that form the main project team (see Section 6.7.1). A set of recommendations for consideration by the construction clients studied are reported in Chapter 8. They are a direct output from the research and represent a significant form of feedback to clients.

All of these stages have been incorporated into a model suitable for application by any organisation regularly involved in construction activities as: client, design consultant, construction specialist, or project manager.

9.2 Description of Model

Each construction project brings with it various conflict and change processes which take place during a project and continue to do so until the end product is finally delivered. The model of strategy development outlined in Figure 9.2 provides the project strategist with a mechanism to generate and utilise potentially valuable project feedback. This information can be used to gain a better understanding of relationships between conflict and management strategies employed during a project. It is essentially a cyclical model and can be operated for one project at a time, or be applied to several projects at the same time. The model stages are described below.

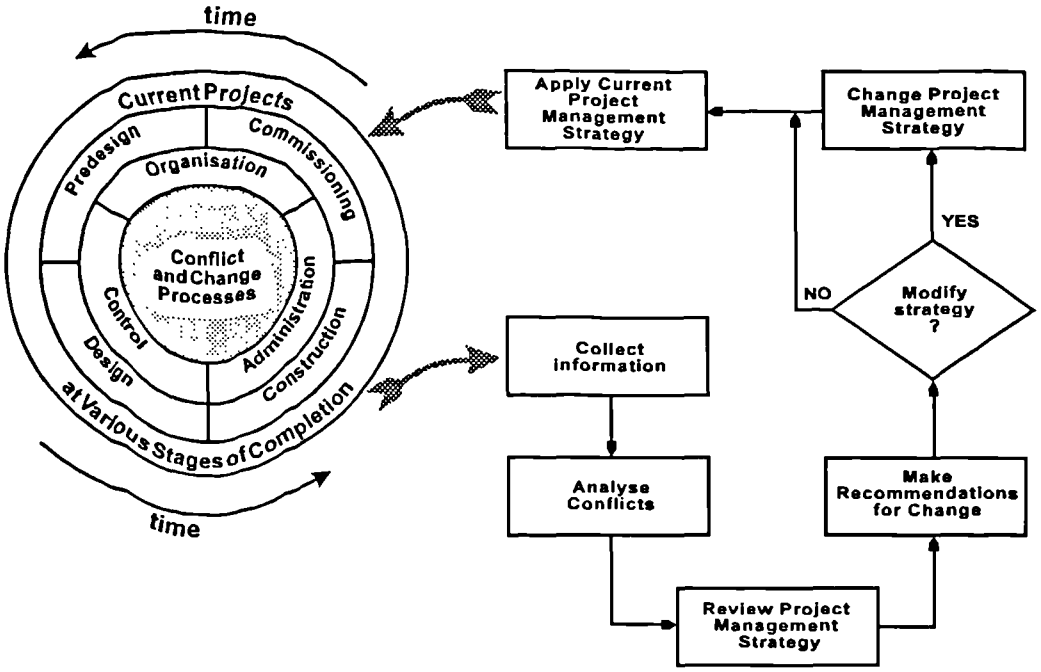


Figure 9.2 Schematic diagram of strategy development model

The observation of people and activities in a project is an ongoing process for most of the key personnel involved, albeit a passive one at times. Within a construction project, readily available and tangible forms of evidence would include minutes of meetings or reports arising from serious disputes, including those prepared during conciliation, arbitration, adjudication, or contract dispute reviews. A member of the project team may also make useful observations during informal conversations, and unminuted

meetings. However, the unaided collection of information is likely to be haphazard, unpredictable and somewhat incomplete. For the requirements of this model it may be necessary to use an information checklist with several levels of detail, not dissimilar to the classification system developed in Chapter 5 (See Figure 5.2). This can then be used as part of a disciplined and determined approach to the collection of conflict data. The process of collecting information can be administered by any member of the project team acting in a project management capacity or closely involved in the project. However, it is important to maintain this commitment over a period of time and/or projects for it to be effective; snapshots wont work.

The collection of information feeds directly into the next stage of the model: conflict analysis followed by strategy review. It is suggested that these are the most critical stages of the model and that, to a large extent, they will determine the level of benefit an organisation derives from applying the model. This is because the output from these stages form the basis of any recommendations for change in the next stage of the model. Conflict analysis would probably follow a similar pattern to the analysis presented in Chapter 6. Each conflict would need to be analysed by a company in terms of its current project management practice. As a result, a company may soon expect to identify areas for strategic change. There is a reverse order dependency in the model similar to the dependencies in a construction project. In the same way that a flawed planning and briefing exercise can jeopardise the success of a project, an inaccurate analysis and review of conflict and strategy may lead to poor recommendations.

The following descriptions taken from the research data illustrate the kind of relationships that may begin to emerge during the analysis and review stages of the model; one example has been included for each of the construction and business categories defined in the classification structure described in Chapter 5:

> Predesign: In two projects early liaison with utility and regulatory bodies was considered essential to avoid time consuming conflicts in the design or construction phase.
>
> Design: In three cases conflict occurred between users and the architect over design aspects - for the project manager in these situations the key question was to what extent each conflict was ultimately damaging or constructive to the project.

Construction: In five cases poor performance by a contractor or supplier was cited as being a cause of conflict. This could signify the need for a review of tender selection criteria, perhaps developing better links with fewer companies.

Commissioning: Insufficient time for commissioning was a particular conflict raised by one frustrated user who felt he had been abandoned by the installing subcontractors and found little support from 'official' channels now that the project was supposedly complete. Should more time have been allocated to commissioning, or would stronger links between the designer, user, and supplier early on have helped, perhaps through a project orientation exercise?

Organisation: Seven case studies included conflict due to 'the wrong person being assigned to the job'. Passing the buck may account for some of these, but this type of conflict was actively avoided by two clients who used some means of individual personnel selection for key project posts.

Control: Controlling relationships with local residents was a source of aggravation for two project managers trying to keep access roads clean. There was an interpretative problem over the word 'acceptable'.

Administration: The liquidation of a major participant led to unexpected conflict in three cases, pointing to the need for more effective financial checking, particularly relevant in the recent economic climate.

With every cycle of the model the process of conflict and strategy analysis culminates in the formulation of recommendations for action. These recommendations may include suggestions for major or minor changes; procedural, organisational, or tactical change; they may apply to projects throughout an organisation, or be limited to a subset of projects having particular characteristics.

Recommendations made as a result of using this model would apply directly to on organisation's current project management strategy. Minor changes may lend themselves to immediate correction without delay; more sweeping changes may require further confirmation before arriving at a decision to proceed. Once a number of

recommendations have been accepted, the process of upgrading current project management strategy may be put into action. Alternatively, no changes are made and the next project is carried out using the same project management strategy as before.

9.3 Chapter Summary

The proposed model has the potential to serve as an early warning device for project organisations to forestall potentially serious dysfunctional conflict. However, it is not intended to be a panacea for all project management crises. There may also be some cultural barriers to overcome before it can be installed and become accepted by the members of an organisation. Nevertheless, these challenges should be carefully weighed against the benefits that might be realised. One immediate benefit would be the increased turnaround of project feedback; during the research several project managers commented that the same problem sometimes occurs time and time again, but in each case as soon as the next project comes along new pressures and problems mean it gets lost and forgotten yet again. Conflict analysis used in conjunction with strategy review can become a vehicle for highlighting weak areas of project management strategy; encouraging the development of these areas in a way that suits the particular organisation or firm concerned.

CHAPTER 10
CONCLUSIONS

10.1 Conclusions and Final Thoughts

10.1.1 Research conclusions

The research has confirmed the ubiquitous occurrence of conflict in construction projects. Conflict has been concurrently classified and identified across a broad range of clients and in all the major project stages.

The research has established a link between some of the management strategies employed during a project and the resulting potential for conflict. It has been shown that certain management strategies are useful for containing or managing harmful conflict, while others cause conflict to increase. These strategies have been fully discussed in Chapter 6 and are summarised in the form of recommendations to construction clients in Chapter 8.

10.1.2 A methodology for construction research

The thesis presents an account of important methodological issues encountered during research into the impact of conflict on construction projects and the relationship between conflict and project management strategy. From a practical point of view, a wider application of the findings was more desirable than a narrow one. This was achieved by analysing in depth, projects from a small number of client organisations resulting in a deeper and richer set of data than would have been obtained from the use of more standardised formal methods and large representative samples. A key concern throughout was that the research should reflect project management in practice with minimum interference from the researcher's own perceptions and objective standpoint. For this reason, detailed and structured questionnaires were avoided during the collection of the main research data; they in themselves would have presupposed the conditions for and experiences of conflict by project managers. In conducting the research the importance of cultural aspects became increasingly evident. Conflict is an emotive term and this coupled with an industry having an historical background littered with damaging conflict, increased the sensitivity of some practitioners to the use of the word conflict. Nevertheless, the concept of functional conflict, which was alien to most, has been identified as a useful component for developing project management strategy.

The research methodology included a degree of flexibility to allow a fitting response to new information as it arrived. For the most part the research progressed in stages, however, as in a construction project, a process of continuous improvement and refinement was required to take advantage of new ideas and perspectives as they emerged. So, although the methodology was planned and structured initially as a sequential progression, it also developed organically as improvements and discoveries were made at each stage. A structured classification system has been established that focuses attention on seven major project and business categories.

Lessons were learned during the preliminary investigation which were developed and carried forward to the main investigation. In this way the preliminary investigation fulfilled an important formative role during which objectives and techniques were refined. Following the main investigation, a questionnaire based survey was conducted to test the researcher's initial interpretation of the interview data and to enhance the research data. This also served as a learning opportunity in the design and use of survey questionnaires which augured well during a final quantitative check on the main research outcomes.

Finally, the ability to tie up and finish a piece of research is important but not always well done. The practical application of this research was carefully considered and steps were taken to disseminate the research outcomes to as wide an audience as possible. A number of publications have resulted from the research and others are planned. The distribution of a second questionnaire, containing recommendations from the research, to one hundred construction related organisations with an option for further information, was another avenue of dissemination employed.

10.1.3 Implications for a diverse and differentiated environment

Organisational complexity and diversity is not a new concept. There are many protagonists of a contingency theory for organisations in which it is accepted that there is no one best way to organise and that different ways of organising vary in their effectiveness according to the prevailing environmental and technological conditions. This research reaffirms the relatively high level of organisational differentiation in the construction industry. Client organisations such as universities, national and multinational companies, and local councils typically display a significant degree of internal differentiation between their various departments. This can serve as a cornerstone for harmful conflict and is not always adequately appreciated by clients

and their internal or external advisors. A second level of differentiation, and perhaps of greater importance for the long term future of the construction industry is the interorganisational differentiation that continues to exist between architects, quantity surveyors, contractors, engineers and clients.

On reflection it seems plausible that many of the statistical associations identified between causes of conflict in this research may be ultimately traced back to a lack of preparedness by participants to acknowledge and manage differentiation between themselves. For example, the statistical association linking conflict resulting from design changes in a project with conflict caused by the inappropriate appointment of certain individuals onto a project team, may have more to do with an individual's lack of orientation between himself or herself and other participants than with a lack of technical skills or abilities *per se*.

The same theme is also expressed in some of the recommendations made to construction clients. For example, participants are reminded in Chapter 8 to take into account the organisational complexity of the client during the briefing process; the merits of early communication with planning officials and other officers; the benefits of performing team briefing and orientation exercises; and the use of psychometric instruments as catalysts for team building and performance. These measures are essentially directed at reducing inherent levels ignorance between participants regarding organisational differentiation and its harmful consequences.

10.1.4 Failing forwards: a model for strategic development

One measure of the success of a programme of research is the degree of appropriability of the research outputs afforded to others at the end of the research period, in this case clients and other organisations in the construction industry. The level of differentiation and diversity within the industry has already been emphasised; a further consequence of this is the difficulty of providing generic answers to the industry's problems. Nevertheless, the research has produced a model for the development of project management strategy within organisations. This model is fully described in Chapter 9. It is an interactive model requiring the consideration of and possibly some input from other organisations in a construction project. After using the model an organisation may begin to recognise and understand some of the areas of organisational differentiation between itself and other contributors and the potential damaging effect that these differences can have. It is a reciprocal model which can be applied to an

ongoing programme of capital projects, providing organisations with a framework for addressing strategic issues and making considered changes as appropriate.

10.2 Future Research

10.2.1 Action research

It is anticipated that many of the implications of the research can be further explored and tested through the application of the model proposed for strategy development. Consequently, it is a natural step forward to focus attention on a single construction client with a view to developing a closer relationship with their current project management activities, and to customise the model to their own particular circumstances. This approach is congruent with the emerging research philosophy called 'action research' which generally has the following two features (Easterby-Smith et al, 1991):

(1) A belief that the best way of learning about an organisation or social system is through attempting to change it, and this therefore should to some extent be the objective of the action researcher.

(2) The belief that those people most likely to be affected by, or involved in implementing, these changes should as far as possible become involved in the research process itself.

Opportunity exists to explore and develop this type of research activity in association with at least one of the construction clients studied in this research. A further avenue of work is the application of the research methodology developed to study, learn and disseminate lessons learned during a recent large and successful manufacturing relocation project in Glasgow.

10.2.2 Construction as a manufacturing process

The research provides a thorough grounding in conflict and change processes within the construction industry which may serve as a valuable precursor to a broader series of research programmes addressing the issue of 'Construction as a manufacturing process'. This is one of the themes profiled in recent documentation from the SERC to launch a major new research initiative entitled 'Innovative Manufacturing' (SERC, 1993):

> The Malpas review identified a need to establish a 'coincidence of purpose' between academia, industry, Government and key agencies and institutions to ensure that scarce research resources are harnessed for the national well-being. The importance of interdisciplinarity and the management of interfaces was stressed; for example in the integration of manufacturing, design, and processing.
>
> The objective of this research [Construction as a manufacturing process] is to harness . . . the ideas and culture prevalent in mainstream manufacturing sectors in order to transform the nature of construction in this country and in the long term, through greater wealth creation, turn a trade deficit into a trade surplus.

10.3 Curriculum Development

The question of education is probably central for improving the long term resolution of project conflict caused by differentiation, and for increasing the ability of organisations to appropriate new research knowledge, for instance the strategic implications of conflict suggested by this research. The nature of the problem is cogently described by Walker (1989):

> Undergraduates have been educated in relatively watertight compartments which reflect their professional aims. Architects have done a course in architecture, engineers in engineering, etc. Graduates therefore emerge with relatively little understanding of the skills and contributions made by the people with whom they are expected to work in a project team.

There is significant scope for a reorganisation and improvement of the educational provisions made available to undergraduates embarking on a career in the construction industry. Such an endeavour would require liaison between institutions of higher education, professional associations, and major construction and professional firms. As an example, a new generation of courses might offer a common broad-based core consisting of modules reflecting the seven major themes defined in this research: briefing, design, construction, commissioning, organisation, control and administration; followed by a fourth year in which the student can specialise in a chosen area.

10.4 Summary of Main Conclusions

This thesis has identified and examined a number of research issues concerning conflict in the construction industry. In particular, it has shown that:

(1) **Dysfunctional conflict** in construction projects remains a common occurrence despite an increase in the number of styles of contract available to construction clients and significant changes in the client and contractor selection and bidding process over the last fifteen years.

(2) The use of **team building and development techniques**, and participant orientation exercises, especially during the early phases of a construction project can play an important role in providing a unified sense of direction and a clear order of priorities among participants for the rest of the project. Potential conflicts between project members that are teased out and addressed within this framework may be resolved quickly using a constructive and integrative approach.

(3) The **selective screening of individual project personnel** is frequently missing in construction projects. A result of this can be a collection of poorly matched individuals within the team. The use of recognised personnel selection methods can help towards ensuring an effective project team, both in terms of functional capability and interpersonal compatibility.

(4) The use of a **formalised system of conflict analysis and strategy review**, modelled on the research process developed in this work, may help clients or their professional advisors to produce recommendations for improving their own particular project management strategy.

APPENDIX A
CASE STUDY PROJECTS

PROJECT A1

First of three phases of a prestigious riverside business development by Client A, to provide 300,000 sq ft of commercial and industrial space. Building contract for this phase was £2.23 million. Construction stage started on 29 August 1989 and was due to be completed on 25 May 1990, however, didn't get completed until the end of August 1990. The building contract used was JCT80 with quantities and Client A's standard amendments, for instance, one party rather than two can bring a dispute to arbitration. The units are speculative and are available to tenants on 12 year internal repairing leases, subject to rent reviews at three year intervals.

PROJECT A2

Phase four of a technology park. Predesign began in the Autumn of 1989. Construction started in July 1990 and was completed in April 1991. The construction contract was about £1.7 million; the total cost would also include about £200,000 in fees, and one or two minor contracts, for example, landscaping. Contract used was JCT80 with quantities.

PROJECT A3

A civil engineering contract constructed on a 'greenfield' site near Barnard Castle. The project involved Client A setting up a basic infrastructure for the site, including roads, sewers, services and so on. It was then intended at a later date to develop factory units on the site which would be sold. The building contract used was the ICE 5th Edition. The contract period was initially 16 weeks; this extended to 40 weeks by completion.

PROJECT A4

Speculative building project. The development comprised two detached, two semi-detached and three terraced high quality advanced factories ranging in size from 2,400 sq ft to 10,000 sq ft. The units are set in steel frame construction with concrete floors; standing seam profiled steel sheet roofs, and roof lights. The building contract was £1.25 million. Contract used was JCT80 with quantities and amendments. Construction began on site June 1990; the building was completed April 1991.

PROJECT B1

Twenty four flats for the elderly. The total project cost was £1.00 million. A JCT form of contract was used. The building requirements were fairly

straightforward, however, gradients on the site caused some design difficulties. The date of practical completion was 7 April 1991. Council nomination rights for the properties were about 33 percent.

PROJECT B2

Fourteen flats for the elderly at South Shields, including one for a disabled person. Total project cost: £523,306. The design was continuous terrace with an inner courtyard; high quality building and high quality landscaping. Date of practical completion was 2 October 1989. The contract used was JCT63 with 77 revision private edition with quantities. Tenants are satisfied with the scheme.

PROJECT B3

Sixty-five houses and flats for families and the elderly. The total project cost was £1.49 million, including fees. Date of practical completion was 20 October 1989. In terms of design complexity, the buildings were not complex, however, there was one particular consideration that needed taking into account: a water main passed through the centre of the site.

PROJECT C1

Conversion of a careers building into student residences. The project cost was £230,000. A second building had to be converted into a new office for the careers staff. This was done on a second building contract. There were some problems moving the careers staff, however, the project was completed on time and within budget.

PROJECT C2

Residences containing 60 bedrooms. Designed and built within 8 months. The building was designed in 6 weeks and constructed in 28 weeks. The style of contract was contract management with the quantity surveyor acting as project manager. All the building elements were sublet so that there was no overall contractor.

PROJECT C3

Highly serviced extension for departments of chemistry and geology. Project cost was £3.4 million. Fairly complex building in terms of building services. The building was also connected to a computer centre and included a large atrium, as a focal point for the University. Design was complicated by the fact that the new building floors had to meet the old building floors exactly, making the concealment of service ducting difficult.

PROJECT D1

A City Technical College; total building cost was £5.4 million, plus an additional £1.6 million for equipment and furniture. The original proposal was to refurbish a school; the DES having identified a site. However, the sponsors didn't want a refurbished school and threatened to pull out. At the last minute the DES gave permission for an alternative design but without increasing the budget. The final scheme was a merger between two different contracts: a management contract and a design-and-build contract.

PROJECT E1

Fuel oil storage project comprising the specialist construction of a huge fixed roof tank at a cost of £3.2 million. A small amount of general piping, mechanical and instrumentation work was involved but tank construction predominated.

PROJECT E2

Adipic acid uprate: actually two separate projects totalling £8.4 million, each of which was run as design and build, managing contractor jobs by two different contractors. The work was of a 'cut-and-carve' nature within the existing Nylon Works but involved most of the construction disciplines.

PROJECT E3

SCMP (Speciality chemicals manufacturing plant) is a 'greenfield', small batch processing plant costing £5 million. It contained the full range of construction disciplines and was handled as an 'in-house' design and construct project.

PROJECT F1

Upgrade and refurbishment of three sewage works. Total project cost about £2 million. On projects of this type the client normally uses separate contracts for the civil engineering, the mechanical and electrical work, and the electrical control work. On this project they used just one contract, ICE 5th edition, and listed approved suppliers for the contractor to approach. Worked very well.

PROJECT F2

Interceptor sewer and pumping stations. A two phase project. This case study concerns only stage 2. The first stage was mainly laying a pipeline. Stage 2 was more complex and involved putting in overflows, sewer connections, pumping stations and a rising main. From a design point of view it was a fairly normal submersible pumping station, however, it did require a comparatively high head for the pumps. This greatly restricted the number of suppliers of pumps for the project. Also, because there was no other heavy electricity consumer near the site, it was difficult to get an adequate supply of electricity to meet project requirements.

PROJECT F3

Another pumping station and rising main project. Began before Client F became privatised. After privatisation, there were a some unusual lines of responsibility within the project organisation. The Client's project manager became part of a separate design company during the project. The project was also modified to take into account a new clean technology factory in the area with high water demand.

PROJECT G1

Local community sports centre. Project cost: £1.05 million. The JCT80 intermediate form of contract was used with named subcontractors and specialist suppliers. Client G is a city council which has recently been reorganised, at which time the administration of the Direct Labour Organisation (DLO) was split off from the architects. This project began before the council was reorganised, after which several members of staff had to change location. However, since the staff themselves didn't change this did not seem to cause many problems.

PROJECT G2

Phase one of a three phase local housing development consisting of three aged person's bungalows, plus a disabled person's bungalow. Project cost: £192,000. Contract used was the intermediate JCT, 1984 edition.

APPENDIX B
PROGRAMME FOR CODING DATA AND EXAMPLE OUTPUT

Project files are written in a programming language by Innovative Software Inc., called 'Smart' project processing language, which supports an integrated package.

Instructions for selecting data from interview notes

(1) Check text for any occurrences of *'s and replace with alternative; then enclose data items with bold stars as :*... data item ... *; turn off bold.

(2) Save file to original disk and to a temporary location.

(3) Check number of data items then execute SELECT; save new file as temp1.

(4) Check that each item consists of one paragraph only then load macro to separate data items into discrete paragraphs. Save as temp2.

(5) Go to end of document using 'control end' keys then add data coding format using second macro. Save as temp3.

(6) Return to end of document then execute REVERSE to put data back into original sequence.

(7) Enter coding details. Save and back up.

Instructions for making data subsets

(1) Determine the number of items in data subset.

(2) Execute SUBSET. When no more entries can be found exit the programme by pressing control z.

(4) Selected files can be saved to disk or printed.

(5) Further subsets can be made from the first subset.

Project file SELECT

```
1: clear
2: input $entries Enter number of data items
3: reformat document normal left 5 right 70 indent 0 spacing 1
4: bold insert document
5:
6: split horizontal 15 blank
7: goto 2
8: marker set end
9: margin left 5
```

```
10:
11:  %0=$entries
12:  while %0>0
13:  %0=%0-1
14:  goto 1
15:  goto p111c1
16:  find "*" options F
17:  find "?" options B
18:  delete remainder
19:  goto p111c1
20:  undelete
21:
22:  find "*" options F
23:  find "*" options F
24:  delete remainder
25:  goto p111c1
26:  move remainder
27:  undelete
28:  goto 2
29:  p111c1
30:  insert
31:  endwhile
32:
33:  goto 1
34:  close window
35:  goto p111
36:
37:  end
```

Project file REVERSE

```
 1:  input $entries Enter number of entries
 2:  input $pages Enter number of pages
 3:  input $lines Enter number of lines on last page including diamond
 4:
 5:  goto p111
 6:  find "*" options F
 7:  marker set last
 8:
 9:  %1=$entries
10:  %2=$pages
11:  %3=$lines
12:  while %1>1
13:  %1=%1-1
14:  goto p%2
15:  goto l%3
16:  find "Ref:" options B
17:  move remainder
18:  goto last
```

```
19:  find "Ref:" options B
20:  insert
21:  endwhile
22:
23:  goto last
24:  marker unset last
25:  goto p1
26:  goto l1
27:  end
```

Project file SUBSET

```
 1:  split horizontal 12 blank
 2:  message Goto end of document then continue
 3:  suspend
 4:
 5:  input $search Enter search string
 6:  %1=$search
 7:
 8:  label again
 9:
10:  find "%0" options B
11:  find "*?" options F
12:  delete remainder
13:  clear
14:  find "Ref:" options B
15:  move remainder
16:  goto 2
17:  insert
18:  goto 1
19:  jump again
```

Example output

(Taken from subset with selection criteria 'Subject: \Conflict \Negotiation')

*

Ref: **DC/ME1/p3par-1**
Subject: \Negotiation \Conflict
Context: \Contracts
Parties: \CPO \PO
Subprocess: \Construction
Project: \

> **Claims are resolved internally. For instance, a house needed 100% replastering because the plaster had fallen off. We agreed a valuation and had it done.**

Comment: Many of the projects put out to tender by the council are won by their own DLO. There is no formal contract and therefore no litigation is involved. 'Claims are resolved by negotiating around a table.'

*
Ref: **UD/UD_MS1/p4par-3**
Subject: \Conflict \Negotiation
Context: \Organisation
Parties: \CPO \CS \PM
Subprocess: \Conception \Briefing
Project: \SEAS

> **On the other hand the prevailing internal politics meant that the users where unable to be specific enough early enough, but this would not have accounted for most of the problems. A lesson to learn is that ". . . you must get the users to agree their specification with the E & B dept before you approach the Architect".**

Comment: Internal conflict between different user groups; and lack of negotiation within the CPO.
*
Ref: **IC/1M24041/p5par3**
Subject: \Conflict \Negotiation
Context: \Organisation
Parties: \PM \CPO
Subprocess: \
Project: \

> **[Is there anything to add about project conflict?] On conflict, if we do have conflict, it is the PM who has to sort it out. That is the top and bottom of it. On some of the larger projects we will have Monday morning meetings. This meeting reports any exceptions. It doesn't want to know what is going well, but is held only to sort out problems. The meeting is normally held from ten till eleven. Any business not covered by then must be brought up at the next meeting. Any disagreement between two or more people arising at this meeting would need to be sorted out by those concerned after the meeting.**

Comment: Responsibility for sorting out conflict. Use the meetings.
*

APPENDIX C
INTERVIEW GUIDE AND SURVEY QUESTIONNAIRES

C.1 Interview Guide

Background

This interview is part of a second investigation to supplement the findings of an earlier investigation carried out concerning the relationship between conflict, change and project management in construction projects.

Main research objective

To determine possible relationships between conflict, change and project management techniques and, where relationships are established, to explore new or modified project management practices in order to harness the potential positive outcome of conflict, resulting in project change for the better, and to limit damage caused by dysfunctional conflict.

Specific project information required

1. Briefly, what were the circumstances surrounding the decision to build?
2. What were the start and finish dates of the following project phases: predesign (up to the decision to go ahead), design (including briefing), construction, and completion (defined as "put into useful operation")?
3. What was the approximate cost of this construction contract and also the total project cost?
4. Which conditions of contract were used and between whom?
5. Can you identify the main personnel involved in the project from this organisation?
6. Can you name the other main contributors, e.g. contractor, consultants etc., including a contact person and telephone number where possible?
7. How many changes, both design and scope, occurred during this project, and were any of these important financially.

Areas for discussion and exploration

8. How would you describe your own involvement in the project and how does this project compare with other projects you have been involved with?
9. In what ways do you consider the project as being successful?
10. In what ways was this project challenging, particularly with respect to any particular problems or difficulties encountered?
11. Do you consider that any of the project objectives were unrealistic?

12. During the project period can you think of any aspects of the project that you were less than happy about?
13. What input, if any, did the project tenants/users/operators make during the project?
14. Looking back, what is your impression of the level of harmony, trust and goodwill between participants during this project?
15. And your impression of the level of arguments and/or distrust?
16. Can you recall any instances of conflict (either perceived, felt or manifest) however small or insignificant they may seem?
17. Can you recall any instances where someone else's behaviour caused you stress or anxiety?
18. In hindsight, what would you do differently, or suggest someone else should do differently, if you were about to start an identical project?

C.2 Validation Survey Questionnaire

PROJECT MANAGEMENT RESEARCH QUESTIONNAIRE

All information will be treated in the strictest confidence. *Paul Gardiner on 031 449 5111 x4773*

Project: _____ **Ref.:** _____

Section 1: Level of Involvement
[Refer to Table 1, below]

Q.1
Please indicate which of the stages listed below in Table 1 you were involved with during the project? (circle number as applicable in 1st or 2nd column)

Q.2
For those stages you were involved with, please estimate the level of your involvement. (circle number as applicable on the number scale)

Table 1: Level of Involvement	Q.1		Q.2		
Project stages	Some involve-ment	No involve-ment	Level of involvement Low		High
Predesign (including project conception, inception, briefing, or procurement system planning)	1	2	1	2	3
Design	1	2	1	2	3
Construction (including procurement of materials)	1	2	1	2	3
Commissioning (including operation or management of facility after hand over)	1	2	1	2	3

Section 2: Project Analysis

[Refer to Table 2, below]

Q.3

In your opinion, which of the statements in Table 2 describe this project? (please circle number as applicable in 1st, 2nd, or 3rd column for each statement)

Q.4

For those you consider do describe this project i.e. all statements for which you cited 1 in **Q.3**, please estimate the associated level of conflict experienced by yourself or others, where

0	indicates	no conflict
1	indicates	mild conflict: tension exists but nobody feels the need to speak out about it
2	indicates	medium conflict: disagreements exist and are a cause for concern; significant discussion; some arguments
3	indicates	severe conflict: high level of aggravation; heated arguments
4	indicates	very severe conflict: may also involve intolerance of others; deliberate misconduct; breakdown of relationship

Table 2: Project Analysis	**Q.3**			**Q.4**
Statement	Statement describes project			
	Agree	Dis-agree	N/A or don't know	Associated level of conflict *None* *V. Severe*
Part 1: Predesign . . . if you had **no** involvement in the predesign stage then **go to Part 2**				
Contractual arrangements were initially unclear or unsuited to the project	1	2	3	0 1 2 3 4
The project brief was incomplete at the start of the design stage	1	2	3	0 1 2 3 4
The project brief was not a true representation of the client's needs at the start of the design stage	1	2	3	0 1 2 3 4
Appraisal of client's initial brief revealed one or more potential design or construction problems	1	2	3	0 1 2 3 4
Part 2: Design . . . if you had **no** involvement in the design stage then **go to Part 3**				
There was disagreement over some aspect of design between the client and a member of the design team	1	2	3	0 1 2 3 4
One or more design aspects failed to meet stated or expected requirements	1	2	3	0 1 2 3 4
Problems were encountered when dealing with a local authority department	1	2	3	0 1 2 3 4
Members of the design team found it difficult to finalise some aspects of design	1	2	3	0 1 2 3 4
Some problems occurred due to the use of high-tech equipment or design aids during the project	1	2	3	0 1 2 3 4

Additional design effort was used to satisfy design requirements for disabled persons	1	2	3	0 1 2 3 4
Design firm operated at a distance of over one hours drive from the construction site	1	2	3	0 1 2 3 4
Users or operators lacked the ability to interpret design layouts or to contribute effectively to the design process	1	2	3	0 1 2 3 4
Certain design regulations hindered the design process	1	2	3	0 1 2 3 4
The design brief failed to take account of one or more regulations	1	2	3	0 1 2 3 4
Users or operators were not adequately involved in the design process	1	2	3	0 1 2 3 4
Part 3: Construction . . . if you had no involvement in the construction stage then go to **Part 4**				
One or more errors occurred during construction (not attributable to design errors)	1	2	3	0 1 2 3 4
There were some unforeseen ground or foundation problems	1	2	3	0 1 2 3 4
Several differences of opinion existed between the client's and the contractor's quantity surveyors	1	2	3	0 1 2 3 4
One or more project activities were delayed due to inclement weather	1	2	3	0 1 2 3 4
The initial contract period was too short or required additional resources to achieve	1	2	3	0 1 2 3 4
There were instances of poor performance regarding methods of working, keeping to programme or delivery date by ... a main contractor	1	2	3	0 1 2 3 4
... a subcontractor	1	2	3	0 1 2 3 4
... a supplier	1	2	3	0 1 2 3 4
Differences of opinion over some design aspects existed between a contractor and a member of the design team	1	2	3	0 1 2 3 4
There were some examples of substandard workmanship or quality during construction or at hand over	1	2	3	0 1 2 3 4
Site security or vandalism was a problem	1	2	3	0 1 2 3 4
Some materials or equipment had long lead times or phased deliveries	1	2	3	0 1 2 3 4
Meeting the scaffolding requirements of all the construction teams caused some problems	1	2	3	0 1 2 3 4

The client supplied some equipment or material	1	2	3	0	1	2	3	4
During construction, insufficient design resources were allocated to process design changes promptly	1	2	3	0	1	2	3	4
Procurement of some equipment or material was restricted to only one or two suppliers	1	2	3	0	1	2	3	4
Some users or operators requested changes at or near practical completion	1	2	3	0	1	2	3	4
Part 4: Commissioning . . . if you had **no** involvement in the commissioning stage then **go to Part 5**								
There were several "teething" problems during the commissioning stage	1	2	3	0	1	2	3	4
Insufficient time was allocated in the project programme to the commissioning stage	1	2	3	0	1	2	3	4
Part 5: Organisation . . . please complete **all** of Part 5								
There was uncertainty over how much extra works to give to the main contractor	1	2	3	0	1	2	3	4
There was at least one person who did not get on well with others	1	2	3	0	1	2	3	4
One or more people in the project team should probably not have been selected for their particular role	1	2	3	0	1	2	3	4
At least one firm was unable to discharge all its obligations satisfactorily	1	2	3	0	1	2	3	4
There was a conflict of interest or responsibility for at least one project team member or firm	1	2	3	0	1	2	3	4
Distrust developed on one or more occasions between a contractor and the design team or vice-versa	1	2	3	0	1	2	3	4
At least one participating firm seemed to have internal management problems or insufficient management resources available	1	2	3	0	1	2	3	4
Significant disagreements arose between two or more participating firms during the project	1	2	3	0	1	2	3	4
There was a lack of definition for some project team members or firms regarding their contribution or area of responsibility	1	2	3	0	1	2	3	4
Part 6: Project Control . . . please complete **all** of Part 6								
There were one or more confrontations with local residents or land owners	1	2	3	0	1	2	3	4
There were some disagreements between construction staff and users or operators	1	2	3	0	1	2	3	4

One or more changes were made to the original scope of the project	1	2	3	0 1 2 3 4
Site quality inspections resulted in some construction work being condemned	1	2	3	0 1 2 3 4
One or more discussions took place to interpret stated or expected standards of quality	1	2	3	0 1 2 3 4
Lack of communication between participants was a cause for concern in some areas of the project	1	2	3	0 1 2 3 4
Several design changes were made during the project	1	2	3	0 1 2 3 4
The client continued to influence the design process after the briefing stage	1	2	3	0 1 2 3 4
Some design information was late in arriving or difficult to obtain	1	2	3	0 1 2 3 4
There were significant organisational changes or relocation of personnel as a result of the project	1	2	3	0 1 2 3 4
The project budget was initially fixed during the predesign stage	1	2	3	0 1 2 3 4
There was sometimes no-one available to make executive decisions from within the client's organisation	1	2	3	0 1 2 3 4
Formal approval was required from the client to increase the project expenditure	1	2	3	0 1 2 3 4
Part 7: Contract and General Administration . . . please complete **all** of Part 7				
Several errors or anomalies were discovered in tenders during tender analysis	1	2	3	0 1 2 3 4
There was a notably slow response from one or more parties or lengthy admin. procedures	1	2	3	0 1 2 3 4
One or more of the participants went into liquidation	1	2	3	0 1 2 3 4
Use of an in-house construction team led to extra cost which would otherwise have been borne by an external contractor's liability	1	2	3	0 1 2 3 4
All tenders received were priced above the initial project budget	1	2	3	0 1 2 3 4
Several contractor claims were submitted	1	2	3	0 1 2 3 4
Some problems arose regarding the contract and conditions of contract used	1	2	3	0 1 2 3 4
Some contractual or administrative details were unclear	1	2	3	0 1 2 3 4
One or more disputes over money occurred between participants	1	2	3	0 1 2 3 4

The client's own conditions of contract were used or major modifications issued with a set of standard conditions	1	2	3	0 1 2 3 4

Comments: (if any)

Would you like to receive a summary of the main research outcomes? YES ☐ NO ☐

Thank you for completing this questionnaire. Please return it using the prepaid envelope provided. (Paul Gardiner, Department of Business Organisation, Heriot-Watt Business School, PO Box 807, Riccarton, Edinburgh. EH14 4AT.)

C.3 Questionnaire to Test Recommendations

HERIOT-WATT BUSINESS SCHOOL

SURVEY ON PROJECT MANAGEMENT STRATEGY

Please return by SAE to:

Paul D Gardiner
Department of Business Organisation
Heriot-Watt Business School
PO Box 807 Riccarton
Edinburgh EH14 4AT

Should be returned ***within two weeks of receiving***

1. I am completing this survey because: (tick one below)

a) it was addressed to me [ ]
b) delegated to me by addressee [ ]
c) forwarded from addressee to me [ ]

2. My name is: _____

Title of position held: _____

The company: _____

Description of company's main role in construction projects: (tick one below for your company)

Architect [5] Client [22] Main cont. [7] Mech/Elec Eng [0] QS [5] Struc. Eng [0]
Sub-cont. (spec.) [2] _____
Other (spec.) [5] *Various management and design consultancies* _____

Description of your main role as: (tick one below)

Operational [0] Management [31] 50:50 split [14]

Approximately how many projects have you been involved with in the last five years: (tick one below)

1 [0] 2-5 [5] 6-10 [1] 10+ [40]

Instructions and Notes for completing this survey:

The survey is intended to test a number of recommendations resulting from a recent programme of research in construction project management. Each recommendation reflects a type of conflict that can occur or strategy which can be employed.

There are 22 questions and it will take about 15 minutes of your time to complete them. Together they assess the potential benefit to industry of these recommendations. So it is important to answer every question.

Sometimes a question will not accurately reflect what your organisation is doing. Then you can give a response based on your opinion of what should be done. All of these responses and any written comments will be combined anonymously in a research report.

THANK YOU for assisting me and contributing in this important undertaking.

3. The briefing process is arguably the most important stage in a projects. It is at this time that the effects of potential conflict are most easily modified and directed towards a useful rather than a harmful outcome. The level of structure and effort put into the briefing process should reflect:

(i) the complexity of the project being carried out: (tick one box)

strongly agree [29] agree [16] disagree [1] strongly disagree [0]

(ii) any previous learning experiences by the parties involved from similar projects: (tick one box)

strongly agree [24] agree [22] disagree [0] strongly disagree [0]

(iii) the organisational complexity of the client: (tick one box)

strongly agree [14] agree [21] disagree [11] strongly disagree [0]

(iv) the level of familiarity between key project personnel: (tick one box)

strongly agree [8] agree [21] disagree [14] strongly disagree [3]

4. Project managers and designers should communicate early with planning officials, building inspectors, parish councils, etc. when preparing to make a planning submission in order to work through conflicts of interest and gain tacit agreement before detailed design work is carried out. (Tick one box)

strongly agree [25] agree [19] disagree [2] strongly disagree [0]

5. The ability of users, operatives and client representatives to communicate and interact effectively with design consultants should be formally assessed at the briefing stage and measures taken to develop this interface as appropriate. (Tick one box)

strongly agree [16] agree [26] disagree [3] strongly disagree [0]

6. To help develop and maintain a team spirit between designers and other project personnel, design consultants should be selected that have a commitment to visiting the construction site regularly to assist in problem solving, rather than relying entirely, or almost entirely, on the telephone or fax. (Tick one box)

strongly agree [25] agree [16] disagree [5] strongly disagree [0]

7. Price variations within a contract should be agreed by the respective parties before they are carried out rather than at the end of the contract. (Tick one box)

strongly agree [21] agree [15] disagree [8] strongly disagree [1]

8. When choosing the contractual arrangements to be used, clients and their advisors should first consider methods that enable an early relationship to be developed with a main contractor so that the main contractor is afforded opportunity to contribute specialist construction knowledge during the design stage. (Tick one box)

strongly agree [12] agree [19] disagree [12] strongly disagree [3]

9. For all large or complex projects, the project manager should carry out a team briefing (or project orientation exercise) for all key personnel at the start of the project to help develop and strengthen constructive relationships between the parties involved and align the objectives and goals of the individual participants into a set of shared project goals and objectives. (Tick one box)

strongly agree [18] agree [28] disagree [0] strongly disagree [0]

10. Delay in the delivery of client-supplied materials, or inadequate vendor design information can lead to interorganisational conflict, increased cost and project delay. Clients should be advised of the risks associated with supplying equipment and materials direct to a contractor; risks that may offset anticipated advantages. (Tick one box)

strongly agree [25] agree [20] disagree [0] strongly disagree [0]

11. Clients engaged in projects that need to be designed with flexibility to allow for possible changes in scope and design during construction should obtain prior confirmation from design consultants that allocated design resources will be sufficient to process these changes and maintain continuity of design staff. (Tick one box)

strongly agree [13] agree [30] disagree [3] strongly disagree [0]

12. Regular clients of the construction industry should seek to standardise design and construction methods used in their projects. (Tick one box)

strongly agree [8] agree [16] disagree [20] strongly disagree [2]

13. Commissioning personnel should be involved sooner rather than later in a project; preferably before the design is finalised. (Tick one box)

strongly agree [10] agree [31] disagree [5] strongly disagree [0]

14. Clients should perform a thorough check on the management ability of contractors and important specialist subcontractors before they are employed. (Tick one box)

strongly agree [16] agree [28] disagree [2] strongly disagree [0]

15. Assessing each team members' strengths and weaknesses can help to ensure the formation of a harmonious project team, and also serves as a useful diagnostic tool for project managers when interpersonal conflict does develop. Except for small or relatively simple projects, clients should consider selectively screening key project personnel, including design staff and leading site foremen. (Tick one box)

strongly agree [2] agree [23] disagree [20] strongly disagree [1]

16. Clients should aim to develop a constructive relationship with a small number of reliable contractors and design firms, rather than always seeking to employ the firm that submitted the very lowest tender. (Tick one box)

strongly agree [15] agree [22] disagree [7] strongly disagree [0]

17. Project mangers should liaise sensitively with local residents, land owners and other groups to minimise the harmful environmental impact of their project. (Tick one box)

strongly agree [20] agree [23] disagree [3] strongly disagree [0]

18. Clients and other organisations should periodically review their internal and external project communication procedures. (Tick one box)

strongly agree [12] agree [33] disagree [0] strongly disagree [0]

19. Never assume anyone will do something automatically; be absolutely specific about everything. (Tick one box)

strongly agree [28] agree [15] disagree [3] strongly disagree [0]

20. Regular meetings involving client representatives, designers and construction personnel, should be augmented with unminuted ad hoc meetings involving only a few individuals on a need to know basis both on and off the construction site. (Tick one box)

strongly agree [14] agree [19] disagree [10] strongly disagree [3]

21. The client's cost control system should have measures built into it which help to ensure minimum disruption to the requirements of the original brief when project circumstances cause it to be invoked. (Tick one box)

strongly agree [6] agree [31] disagree [3] strongly disagree [0]

22. Clients should be advised of the advantages and disadvantages of whichever conditions of contract they choose to use, particularly with regard to contractually imposed limits upon their own influence and control during the project and the apportionment of risk and uncertainty between the parties. (Tick one box)

strongly agree [20] agree [25] disagree [0] strongly disagree [0]

Comments (if any):

I would like to receive a free copy of these recommendations and details of other information available from this programme of research: (tick one box)

Yes please [32] No thank you [6]

APPENDIX D
DATA AND VALIDATION TABLES

D.1 Data Table

#	Description of data type	Latent conflict	Conflict	Strategy
	PREDESIGN			
8	Appraisal of client's initial brief revealed one or more potential design or construction problems		D11M/01C	
4a	The project brief was incomplete at the start of the design stage	F31P/02L G22M/01L	C32P/12C F32P/05C	C32P/09W
4b	The project brief was not a true representation of the client's needs at the start of the design stage		A41M/02C F11P/04C	D11M/04W
82	Early liaison with utility/planning agencies			F23P/01W G22M/13W
15	Contractual arrangements were initially unclear or unsuited to the project	A11M/01L D11M/18L F32P/01L	D11M/02C E12M/12C E21M/17C F21P/01C F31P/08C/12C	
34	Contractors/designers enthusiasm for non-traditional method			C21M/01W E12M/09W
	DESIGN			
21b	Users or operators were not adequately involved in the design process		F11P/08C	
42	Users or operators lacked the ability to interpret design layouts or to contribute effectively to the design process		C34M/03C D11M/12C	
51	There was disagreement over some aspect of design between the client and a member of the design team		A11M/07C B31P/08C C33M/02C	
5	Members of the design team found it difficult to finalise some aspects of design		B11P/11C C32P/18C D11M/17C F11P/05C G22M/21C	E12M/08W
84	Design firm operated at a distance of over one hours drive from the construction site		E21M/06C E31M/10C	E21M/08W

40	Use of in-house designer or engineer			C11M/03W F23P/07W
36	Problems were encountered when dealing with a local authority department		A31M/03C/13C A41M/01C B11P/05C/08C B22P/05C D11M/16C F23P/04C G21P/01C G22M/04C	B21P/03W
20	One or more design aspects failed to meet stated or expected requirements		B11P/07C B21P/05C C32P/08C C33M/09C E11M/05C E21M/12C E31M/01C F21P/05C G22M/22C	
3a	Certain design regulations hindered the design process	G22M/07L	B11P/03C	
3b	The design brief failed to take account of one or more regulations		F11P/03C	
30	Resolving design conflict on similar/repeat projects			G13P/01W G14P/01W
86	Some problems occurred due to the use of high-tech equipment or design aids during the project		E31M/05C F21P/03C/06C	F32P/07W
38	Additional design effort was used to satisfy design requirements for disabled persons		B11P/04C C32P/01C G22M/02C	
37	Putting in extra services or supplies to safeguard future requirements			A31M/08W
	CONSTRUCTION			
48	Differences of opinion over some design aspects existed between a contractor and a member of the design team		A41M/04C F22P/04C	
44	Several differences of opinion existed between the client's and the contractor's quantity surveyors		A21M/07C G12P/06C	
81	Performing a briefing orientation exercise			D11M/19W
55	User involvement during fitting out			C33M/04W

89	Use of in-house works department			E11M/06W E12M/07W
90	The client supplied some equipment or material	F32P/09L	E21M/04C F32P/03C	
87	Some materials or equipment had long lead times or phased deliveries		E11M/01C F31P/13C	
91	Procurement of some equipment or material was restricted to only one or two suppliers		F21M/02C F31P/03C	
88	Meeting the scaffolding requirements of all the construction teams caused some problems		E21M/16C	E11M/04W
41	During construction, insufficient design resources were allocated to process design changes promptly		C32P/21C	F23P/08W
46	The initial contract period was too short or required additional resources to achieve		A31M/11C C32P/04C E12M/06C	
54	Use of standardised design or construction methods			B31P/09W
47a	There were instances of poor performance regarding methods of working, keeping to programme or delivery date by ... a main contractor		E21M/14C/18C	F23P/05W
47b	... a subcontractor		A11M/13C A31M/09C C32P/07C/15C C33M/06C C34M/02C G14P/03C	
47c	... a supplier		C32P/14C F31P/14C F32P/02C	
18	One or more errors occurred during construction (not attributable to design errors)		A11M/05C	
49	There were some examples of substandard workmanship or quality during construction or at hand over		A41M/05C B11P/06C B21P/06C B22P/02C C33M/05C	

43	There were some unforeseen ground or foundation problems		A21M/02C C32P/03C E31M/09C F22P/01C G22M/18C	
45	One or more project activities were delayed due to inclement weather		A31M/02C G22M/14C	
52	Site security or vandalism was a problem		B21P/01C B22P/01C G22M/20C	
	COMMISSIONING			
57	Some users or operators requested changes at or near practical completion		C33M/08C F22P/03C	B31P/05W E31M/06W
59	Insufficient time was allocated in the project programme to the commissioning stage		C32P/05C	
58	There were several "teething" problems during the commissioning stage		C32P/02C F22P/05C	
	ORGANISATION			
61	Using an approved panel of consultants or contractors			B21P/02W
60	Using regular participant			B11P/02W B21P/07W B31P/04W E21M/13W
93	At least one participating firm seemed to have internal management problems or insufficient management resources available		A31M/13C C21M/02C C34M/05C E21M/07C/23C F31P/07C	
16	At least one firm was unable to discharge all its obligations satisfactorily	A11M/02L E11M/03L	A31M/01C D11M/10C E11M/08C E12M/05C F31P/09C F32P/06C G12P/04C	
13a	There was at least one person who did not get on well with others	D11M/13L	C32P/20C E31M/07C	
13b	One or more people in the project team should probably not have been selected for their particular role		A11M/10C A31M/12C E21M/15C/22C F23P/06C	A11M/12W A21M/04W D11M/15W

95	Significant disagreements arose between two or more participating firms during the project	G22M/16L	G22M/06C G11M/03C	
62	Distrust developed on one or more occasions between a contractor and the design team or vice-versa	E31M/08L	C32P/16C	D11M/03W D11M/06W D11M/08W E21M/09W
26	Site-office relationships			G11M/04W
94	Social interaction between participants			E21M/24W
70	There were significant organisational changes or relocation of personnel as a result of the project		C11M/01C C34M/08C	
63	There was a lack of definition for some project team members or firms regarding their contribution or area of responsibility		A21M/06C B31P/06C C32P/11C C33M/07C E11M/07C E21M/11C E31M/02C	
22	There was a conflict of interest or responsibility for at least one project team member or firm	A11M/11L D11M/05L F22P/02L	G11M/02C G12P/03C	
64	Use of "special" consultants			D11M/07W
27	Use of an in-house construction team led to extra cost which would otherwise have been borne by an external contractor's liability	G11M/05L	G12P/02C	
6	There was uncertainty over how much extra works to give to the main contractor		F11P/06C	E21M/03W
	CONTROL			
21a	The client continued to influence the design process after the briefing stage		A11M/08C A21M/05C	
73	There was sometimes no-one available to make executive decisions from within the client's organisation		C31P/02C	
50	There were one or more confrontations with local residents or land owners		B11P/01C B31P/02C/07C F11P/07C G13P/02C G22M/17C	

1	There were some disagreements between construction staff and users or operators	E21M/20L F11P/01L	E12M/10C	
67	Use of hands on project management to avoid problems			A41M/02W
100	Use of "tension" to keep people on their toes			F31P/10W
105	Team spirit			E31M/11W
14	Lack of communication between participants was a cause for concern in some areas of the project	A21M/03L G22M/08L	A11M/06C A31M/07C B11P/10C B21P/04C C34M/04C/09C D11M/11C E21M/10C E31M/03C G12P/01C/05C G22M/10C	B22P/04W F32P/10W G14P/02W
65	General confusion over areas or levels of responsibility			A41M/06W B31P/03W C31P/01W C33M/01W C34M/07W
68	Some design information was late in arriving or difficult to obtain		B11P/09C C32P/19C E21M/05C E31M/04C F23P/02C	
74	Making decisions at 85-95% information level			D11M/09W
97	Effective use of feedback information			E12M/04W
2	One or more changes were made to the original scope of the project	C32P/10L	E12M/02C E21M/02C F11P/02C F31P/01C/06C	C33M/10W
17	Several design changes were made during the project	A21M/08L	A11M/03C E21M/01C/21C F21P/04C F32P/04C	C34M/01W
12	One or more discussions took place to interpret stated or expected standards of quality		D11M/14C	
10	Site quality inspections resulted in some construction work being condemned		G22M/19C	G22M/15W
71	The project budget was initially fixed during the predesign stage		C11M/02C E12M/11C	

98	Formal approval was required from the client to increase the project expenditure		F22P/06C	
104	Faster pace for enhanced fee			A11M/14W
96	Hazard and operability studies			E12M/01W
69	Use of standard project control sheets			B11P/12W C32P/13W
	ADMINISTRATION			
75	All tenders received were priced above the initial project budget		A21M/01C	
9	Several errors or anomalies were discovered in tenders during tender analysis			
103	There was a notably slow response from one or more parties or lengthy admin. procedures	G22M/11L	G22M/03C/05C/09C G22M/12C	
78	Some contractual or administrative details were unclear		A31M/10C	
77	Some problems arose regarding the contract and conditions of contract used		A31M/06C F31P/05C F32P/03C	
101	The client's own conditions of contract were used or major modifications issued with a set of standard conditions		E11M/09C	E11M/02W
11	Avoiding client liability for design			A11M/09W B31P/01W
79	One or more disputes over money occurred between participants		A41M/03C	
76	Several contractor claims were submitted		A31M/05C E21M/19C F22P/07C F31P/04C F32P/08C	
28	Arbitration			A11M/04W
24	One or more of the participants went into liquidation		F31P/11C G11M/01C	

D.2 Validation Table

#	Description of data type	Interview and validation survey	Interview survey only	Validation survey only
	PREDESIGN			
8	Appraisal of client's initial brief revealed one or more potential design or construction problems	D11M/01C		B11P B22P C31P C33M E31M G22M
4a	The project brief was incomplete at the start of the design stage			C21M E31M
4b	The project brief was not a true representation of the client's needs at the start of the design stage		A41M/02C F11P/04C	E31M
15	Contractual arrangements were initially unclear or unsuited to the project	D11M/02C		
	DESIGN			
21b	Users or operators were not adequately involved in the design process	F11P/08C		A41M B22P C33M E31M
42	Users or operators lacked the ability to interpret design layouts or to contribute effectively to the design process		D11M/12C	
51	There was disagreement over some aspect of design between the client and a member of the design team	C33M/02C		B22P C21M C31P E21M E31M F11P G11M
5	Members of the design team found it difficult to finalise some aspects of design	D11M/17C G22M/21C	B11P/11C F11P/05C	C33M E21M E31M
84	Design firm operated at a distance of over one hours drive from the construction site	E31M/10C		B11P D11M
36	Problems were encountered when dealing with a local authority department	A41M/01 B11P/05C/08C B22P/05C D11M/16C F23P/04C	G22M/04C	B21P C21M G12P

20	One or more design aspects failed to meet stated or expected requirements	C33M/09C E11M/05C E21M/12C E31M/01C	B11P/07C B21P/05C G22M/22C	A41M B22P C21M C31P F11P F23P G11M
3a	Certain design regulations hindered the design process	B11P/03C		B22P C21M G22M
3b	The design brief failed to take account of one or more regulations		F11P/03C	B11P
86	Some problems occurred due to the use of high-tech equipment or design aids during the project		E31M/05C	C31P D11M G22M
38	Additional design effort was used to satisfy design requirements for disabled persons	*G22M/02C*	B11P/04C	B22P
	CONSTRUCTION			
48	Differences of opinion over some design aspects existed between a contractor and a member of the design team		A41M/04C	C21M C33M D11M E11M E21M E31M G12P
44	Several differences of opinion existed between the client's and the contractor's quantity surveyors	G12P/06C	A21M/07C	B11P B21P B22P C21M E11M E31M F11P F23P G14P G22M
90	The client supplied some equipment or material	E21M/04C		D11M E31M G11M
87	Some materials or equipment had long lead times or phased deliveries		E11M/01C	D11M E31M G14P
91	Procurement of some equipment or material was restricted to only one or two suppliers			D11M E31M F11P G11M

88	Meeting the scaffolding requirements of all the construction teams caused some problems	E21M/16C		E31M G22M
41	During construction, insufficient design resources were allocated to process design changes promptly		G22M/02C	A41M C21M F11P
46	The initial contract period was too short or required additional resources to achieve			A41M D11M E11M E31M
47a	There were instances of poor performance regarding methods of working, keeping to programme or delivery date by ... a main contractor	E21M/14C/18C		A41M B21P E11M E31M F23P G11M G12P G14P G22M
47b	... a subcontractor	C33M/06C G14P/03C		B21P B22P C21M E11M E12M E31M G11M G12P G22M
47c	... a supplier			C21M C33M D11M E11M E21M E31M G11M G14M G22M
18	One or more errors occurred during construction (not attributable to design errors)			A41M B11P B21P B22P C21M C31P C33M E11M E21M E31M F11P G12P

49	There were some examples of substandard workmanship or quality during construction or at hand over	A41M/05C *B11P/06C* B21P/06C B22P/02C C33M/05C		C21M C31P E11M E31M F11P G11M G11P G14P G22M
43	There were some unforeseen ground or foundation problems	E31M/09C G22M/18C	A21M/02C	A41M E11M E21M F23P
45	One or more project activities were delayed due to inclement weather	*G22M/14C*		A41M B11P B21P E11M E21M G11M G12P G14P
52	Site security or vandalism was a problem	B21P/01C B22P/01C G22M/20C		E21M F11P G11M G12P
	COMMISSIONING			
57	Some users or operators requested changes at or near practical completion		C33M/08C	C21M C31M D11M E21M E31M F11P G12P G22M
59	Insufficient time was allocated in the project programme to the commissioning stage			C21M C31P D11M E11M F11P
58	There were several "teething" problems during the commissioning stage			B21P B22P C21M C31P C33M D11M E21M E31M F11P G11M

	ORGANISATION			
93	At least one participating firm seemed to have internal management problems or insufficient management resources available	C21M/02C	E21M/07C/23C	B22P C33M D11M E11M E31M G22M
16	At least one firm was unable to discharge all its obligations satisfactorily	E11M/08C	D11M/10C G12P/04C	B22P C21M C31P C33M G11M G22M
13a	There was at least one person who did not get on well with others	E31M/07C		B22P E21M G12P G22M
13b	One or more people in the project team should probably not have been selected for their particular role	E21M/15C/22C F23P/06C		A41M E31M F11P
95	Significant disagreements arose between two or more participating firms during the project	G22M/06C	G11M/03C	B22P C21M C33M
62	Distrust developed on one or more occasions between a contractor and the design team or vice-versa			C21M C33M E21M F23P G12P G22M
70	There were significant organisational changes or relocation of personnel as a result of the project			
63	There was a lack of definition for some project team members or firms regarding their contribution or area of responsibility	C33M/07C E21M/11C	A21M/06C B21P/03C E11M/07C E31M/02C	B22P F11P G14P G22M
22	There was a conflict of interest or responsibility for at least one project team member or firm	G12P/03C	G11M/02C	C33M E21M E31M
27	Use of an in-house construction team led to extra cost which would otherwise have been borne by an external contractor's liability		G12P/02C	
6	There was uncertainty over how much extra works to give to the main contractor	F11P/06C		G22M

	CONTROL			
21a	The client continued to influence the design process after the briefing stage	*A21M/05C*		A41M C21M C31P D11M E21M E31M G22M
73	There was sometimes no-one available to make executive decisions from within the client's organisation		C31P/02C	G12P
50	There were one or more confrontations with local residents or land owners	F11P/07C G22M/17C		B21P B22P D11M
1	There were some disagreements between construction staff and users or operators			C31P C33M E21M E31M F11P
14	Lack of communication between participants was a cause for concern in some areas of the project	E21M/10C E31M/03C G12P/01C/05C G22M/10C	B11P/10C B21P/04C D11M/11C	C21M C33M F11P
68	Some design information was late in arriving or difficult to obtain	B11P/09C E21M/05C E31M/04C	F23P/02C	A41M D11M E11M G22M
2	One or more changes were made to the original scope of the project	E21M/02C F11P/02C		C31P D11M E11M E31M
17	Several design changes were made during the project	E21M/01C/21C		A41M C31P D11M E31M F11P G12P G22M
12	One or more discussions took place to interpret stated or expected standards of quality	*D11M/14C*		A41M B21P B22P C21M C33M E11M E31M F11P G12P G22M

10	Site quality inspections resulted in some construction work being condemned	G22M/19C		A41M B21P B22P C21M E11M E31M G12P
71	The project budget was initially fixed during the predesign stage			C21M E21M
98	Formal approval was required from the client to increase the project expenditure			E11M E21M E31M
	ADMINISTRATION			
75	All tenders received were priced above the initial project budget		A21M/01C	B21P E21M F11P
9	Several errors or anomalies were discovered in tenders during tender analysis			D11M E31M F23P G12P
103	There was a notably slow response from one or more parties or lengthy admin. procedures	G22M/03C/05C/09C/12C		A41M
78	Some contractual or administrative details were unclear			C31P C33M E21M
77	Some problems arose regarding the contract and conditions of contract used			C31P D11M G12P
101	The client's own conditions of contract were used or major modifications issued with a set of standard conditions	*E11M/09C*		A41M D11M E21M
79	One or more disputes over money occurred between participants	A41M/03C		B22P C21M E11M E21M E31M G12P G22M
76	Several contractor claims were submitted	E21M/19C		B22P E11M E31M F11P F23P G11M G12P G22M

24	One or more of the participants went into liquidation		G11M/01C	C21M C33M E11M

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