CONTRACTUAL INTERFACES:

THE IMPLICATIONS OF BUILDING PRODUCTION PROCESS MANAGEMENT AND INTERORGANISATIONAL RELATIONS FOR PRODUCTIVITY IN BUILDING PROJECT COALITIONS

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For my parents

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ABSTRACT

The aim of this study is to explore the nature of productivity problems in building project coalitions arising from contractual interfaces and conflict. The study investigates the impact of contractual interfaces on the emergence of conflict in both the interorganisational relations of the contracting parties and the operational context of the building production process management. It analyses the dynamics of conflict in the behaviour and performance of the project participants to establish a link between conflict and productivity problems. The focus of the study is the interface between the mechanical and electrical (M&E) contractor and the main contractor. The interface between the main contractor and the client, as well as the design team members, is examined in so far as it affects the relationship between the main and the M&E contractor.

The investigation reveals conflict as a potentially creative or destructive behavioural process that emanates from competition between the economic interest of the client and the professional/commercial interests of the consultants and contractors, in conjunction with low levels of trust. In so far as the building production process requires the inputs of all the participants, i.e., the client, the consultants and the contractors, competition gives rise to negotiations. As long as the negotiations comprise integrative bargaining, conflict is creative and results in collective problem solving. In the presence of low levels of trust as reliability or predictability, the more powerful party resorts to strategies of control, domination or manipulation to pursue its own interests at the expense of those of others. Thus negotiations become distributive and conflict becomes dysfunctional. The weaker negotiating party either resists the strategies of power of the more dominant party by applying discretion in the use of their knowledge, and by matching their level of effort to rewards, or capitulates. The level of resistance or capitulation of the weaker party is dependent on their relative size and financial strength compared to those of the dominant party. The study indicates that the nature and level of conflict has a direct impact on the level of motivation, performance and consequently the productivity of the project participants.

The investigation finds that conflict is inherent to the contracting system and needs to be managed (Lavers, 1992; Smith, 1992; Langford et al, 1992). It finds that building project coalitions are organised as networks at the start of the project but may be transformed into political organisations during the project life-cycle (Mintzberg, 1991 (d): 374; Pfeffer, 1981: 27-9). The imprecise definitions of functions and activities contained in the contractual documents provide the grounds for and facilitate the political activity of the project participants. The investigation therefore supports Clegg's (1992) postulation that

the 'contractual documents provide the constitutional and constitutive grounds and framework within which the meaning of the contract is negotiated, contested, and sometimes contained' (Clegg, 1992: 135). The opportunistic interpretations resulting from negotiations over the meaning of the contract (Tavistock Institute, 1966) very often impede the full or effective enforcement of the contractual functions and activities, thus reinforce conflictual behaviour. The project managers' capability to manage conflict, though important in terms of preventing escalation of conflict, is indicated to have limited impact on performance levels of project participants.

The research concludes that the economic and legal governance structures in the wider business context of building production processes do not foster fair, co-operative and non-confrontational exchange relations (Lane and Bachmann, 1996), and do not appear to discourage the imposition of onerous business agreements by the economically more powerful on those more dependent. It therefore suggests that fundamental changes in both governance structures of building project coalitions as well as attitudes of project coalition representatives are required as the means by which productivity improvements may be carried out.

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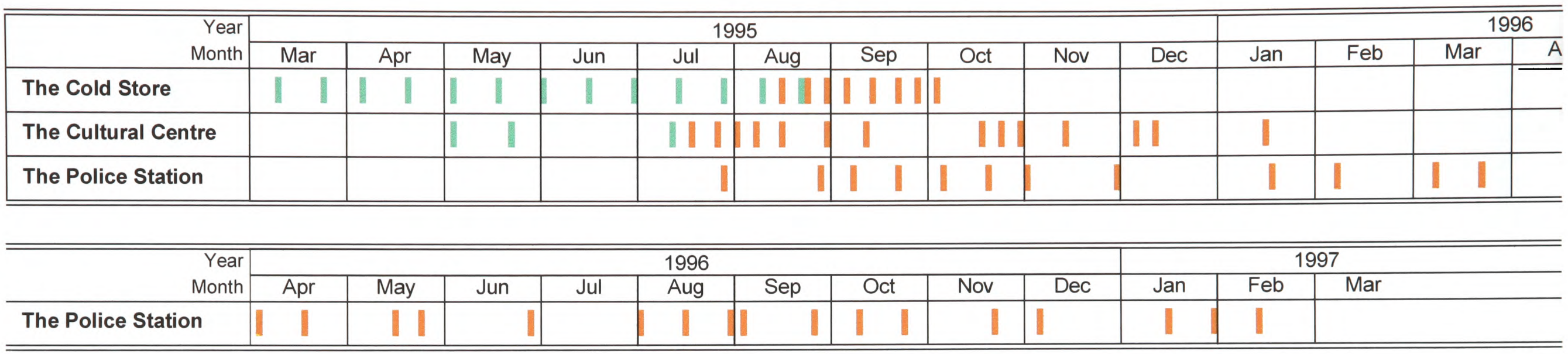

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CASE STUDY DIARY

GLOSSARY

CAD	Computer Aided Design
D&B	Design and Build
IT	Information Technology
M&E	Mechanical and Electrical
QA	Quality Assurance

ORGANISATIONS IN THE COLD STORE PROJECT COALITION

Finance Co.	Financiers
Operation Co.	Operators
FinOp Ltd	The joint venture constituting the Client
Design Co.	Client's Architect
Structure Co.	Client's Structural Engineer
Services Design Co.	Client's Services Consultant
QS Co.	Client's Quantity Surveyor
Construction Co.	Main Contractor
Design Associates	Main Contractor's Architect
Structures Associates	Main Contractor's Structural Engineer
M&E Advisor	Main Contractor's M&E Installation Advisor

Services Co.	M&E Contractor
Site QS	Main Contractor's Quantity Surveyor

ORGANISATIONS IN THE CULTURAL CENTRE PROJECT COALITION

Encoll	English College
Japcol	Japanese College
Japan Construction	Main Contractor
Architect Co.	Main Contractor's Architect
Structure Ltd	Main Contractor's Structural Engineer
Services Design Ltd	Main Contractor's Services Consultant
A/V Ltd	Main Contractor's Audio/Visual Consultant
Acoustics Ltd	Main Contractor's Acoustics Consultant
EQS Co.	Main Contractor's External Quantity Surveyor
INME	Main Contractor's In-house M&E Engineer
INQS	Main Contractor's In-house Quantity Surveyor
UK Services	M&E Contractor

ORGANISATIONS IN THE POLICE STATION PROJECT COALITION

City Police	The Client
PHE	Client's In-house Public Health Engineer
IT Group	Client's In-house IT specialists
Security	Client's In-house security Consultant
Estates	Client's Estates branch
Surveyor Co.	Client's Building Designer

Structures	Client's Structural Engineer
Services Associates	Client's Services Consultant
PW Co.	Client's Party Wall Consultant
Claims Co.	Client's Claims Consultant
QS Ltd	Client's Quantity Surveyor
Construction Plc	Main Contractor
QuanSurv	Main Contractor's Quantity Surveyor
M&E Co.	M&E Contractor

CHAPTER 1 INTRODUCTION

1.1 PRODUCTIVITY IN THE BRITISH CONSTRUCTION INDUSTRY

Concerns about low productivity in the UK construction industry and the time and cost overruns that result from it have been voiced for a very long time and have led to numerous commissioned reports and studies on the subject (for example, NEDO, 1970; NEDO, 1983; NEDO, 1988). A wide array of inter-related factors contributing to delays and escalation in construction cost have been identified. They range from organisation of design and construction work to management and control of project participants' inputs (Ball, 1988, NEDO, 1983; NEDO, 1988). The common attribute of these factors is that they arise, in one form or another, from the fragmentation of the building production process and the multitude of contractual interfaces within the building project 'coalition' (Winch, 1989). The fragmentation of the building production process creates communication and co-ordination problems (Tavistock Institute, 1965; 1966; Shammas-Toma et al., 1998), whilst the contractual interfaces give rise to conflict (Clegg, 1992). Starting from the precedents set by previous research regarding how productivity problems arise from aspects of building production process management and interorganisational relations, this research explores the origins of such problems and provides reasons as to why they arise. Thus the following conceptual research question is posed, at the broadest level, to guide the direction of the study and is refined later:

Why do management processes and interorganisational relations in building project coalitions give rise to productivity problems?

1.1.1 SOURCES OF PRODUCTIVITY PROBLEMS

The literature addressing productivity issues and problems in the British construction industry attributes the productivity ills to the fragmentation of the production process, poor management methods and conflict, on the one hand; and the producers' motivation, attitudes and behaviour, on the other (for example, NEDO, 1983, 1988; Stephenson, 1996; Beardsworth et al., 1988; Ball, 1988). Fragmentation of the production process exacerbates the problems of planning and control over the procurement process and creates difficulties of integration, communication and co-ordination (NEDO, 1983). Furthermore, it gives rise to a multiplicity of contracts and contractual interfaces which allegedly cause conflicts (Clegg, 1982).

Discrepancies and delays in the production of design information, ambiguities regarding the roles and responsibilities of design team members, poor leadership within design teams, and the inability of manual procedures and techniques to cope with complexities lead to inadequate design co-ordination and progress monitoring at the design stage (NEDO, 1988). Thus the conflicting design requirements of different technical disciplines may not be resolved and may give rise to conflict (Baden Hellard, 1992). The site management's lack of comprehensive technical competence or training in administrative, business and human aspects of management, as well as their absence of 'control over the quantity and quality of labour supply' may lead to poor performance of subcontractors at the construction stage (NEDO, 1988: 8). This may give rise to conflict between the main

contractor and specialist and trade contractors, between or amongst the latter contractors, and between the contractors' representatives (Langford et al., 1992).

Destructive conflict leads to higher insurance premia, more claims specialists in all their guises, increased risks and uncertainties, and higher project costs and prices (Fellows, 1992: 123). It therefore has 'a negative impact on the costs and profitability of all involved' (Marshall and Bresnen, 1998: 25). The filing of a legal claim wastes time and financial resources which could be utilised more effectively by improving performance on current work, or pursuing potential future work. It moreover escalates the amount of the claim because 'a settlement in binding resolution is often for only 20 to 50 percent of the amount claimed' (Stephenson, 1996: 8).

The motivation, attitude and behaviour of producers are functions of their interorganisational and interpersonal relations. The temporary nature of building projects (Bryman et al., 1987) discourage the development of long-term relationships between project participants, and the projects' limited budgets encourage the participants to emphasise their short-term financial concerns (Zikmann, 1992: 54). This may lead to competition between the participants and conflicts of interest. The predominance of subcontracting as the means of organising construction activity often involves co-operation of people who have not worked together before (Beardsworth et al., 1988). The absence of familiarity both between the project management team and the specialist and trade contractors' management staff and between the latter and their operatives - who tend to be labour-only subcontractors (Bresnen et al., 1985), in conjunction with the limited duration of building projects, inhibit the build up of mutual confidence and trust in the parties (Beardsworth et al.: 613). Furthermore, owing to the division of project

management function between the project management team and the specialist and trade contractors' management staff, the former's lines of authority become blurred leading to ambiguity in responsibility which may result in conflicting objectives (Gardiner and Simmons, 1992: 111). Lacking adequate time to develop consultative procedures, the project management team may tend to adopt directive styles of management which may become a 'source of friction' (Beardsworth et al.: 615). The workforce, in turn, may not necessarily do or know what is expected of them. For example, they may produce poor quality work, adopt a slow pace so as not to complete tasks on schedule or walk off site without completing their tasks thus causing disruption to the works (Ball, 1988: 203-4). On the other hand, they may lack adequate training or motivation to carry out their tasks satisfactorily. In either case, their behaviour may cause conflict between their employers - the specialist and trade contractors - and the main contractor. The relationship between factors causing productivity problems and conflict in the construction industry is represented in figure 1.1.

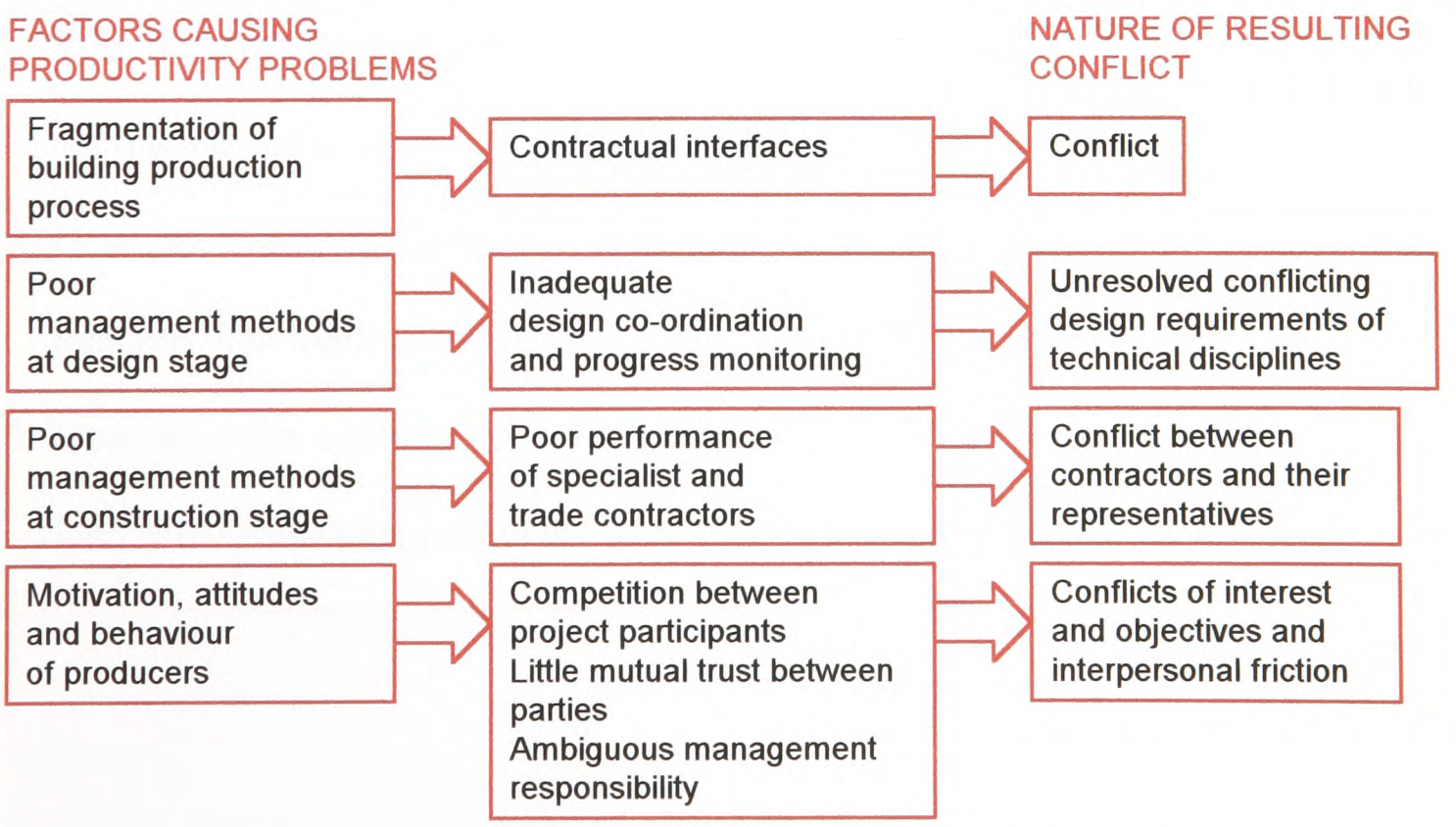

Figure 1.1: Links between productivity problems and conflict in the construction industry

Based on the above account, conflict is a main cause of productivity problems and appears to be a feature of both contractual and human relations. To investigate why it arises, the interorganisational and interpersonal relations between the project coalition participants and their representatives, and the way these relations are managed need to be explored. In view of the numerous organisations taking part in building project coalitions, the investigation needs to be narrowed down to include two key players. The main contractors, as organisers of construction activity, constitute the obvious choice as one of the key players. Mechanical and Electrical (M&E) contractors, by virtue of their substantial proportion of total project cost and the complexity of products and services they provide (Gray and Flanagan, 1989; Bennett and Ferry, 1990), constitute the second key player.

At this juncture, the research question posed earlier is reformulated in three parts, or as three related questions, to sharpen the focus of the investigation:

1. Why do main contractors' interorganisational and interpersonal relations with M&E contractors in building project coalitions give rise to conflict between the two parties?
2. How do main contractors' management processes facilitate or undermine their relations with M&E contractors?
3. How do main contractors' management processes and interorganisational relations with M&E contractors affect the parties' productivity problems?

1.1.2 GAPS IN PREVIOUS RESEARCH ON PRODUCTIVITY RELATED ISSUES

Despite the considerable volume of research carried out in and around the area of productivity and factors influencing it, the types and sources of productivity problems reported seem to have changed little over the past few decades (for instance, compare the findings of the Banwell report (1964) to those of Latham (1994)). This may be attributable, in part, to technical issues including the slow development of information production technology, construction techniques, and methods of project procurement. It may, on the other hand, be equally related to the more intangible and less well researched social issues of interorganisational power disparity, politics, conflict and lack of trust amongst project participants, as the initial observations of cases suggested. Therefore, consideration of the latter dimensions in parallel and assessment of their combined effect on the productivity of main and M&E contractors, form the core of investigation in this study.

The next section proposes a definition for productivity in the context of this study, and identifies the framework by means of which it is to be evaluated. Section 1.3, discusses the significance of the study, and section 1.4 outlines the plan of the thesis.

1.2 PRODUCTIVITY IN BUILDING PROJECT COALITIONS

The term productivity in the context of this study denotes a participant organisation's ability to meet the programme and cost targets set by the main contractor, which in turn is

determined by the client's required project completion date and budget. The programme and cost targets are a participant's project outcome. Compliance with the specified time and cost criteria is often taken as one of the benchmarks for a participant's performance (Lynton, 1993). The productivity of a participant organisation can therefore be evaluated on the basis of the discrepancy between the targets set by the main contractor and the performance achieved by the participant organisation (Liu and Walker, 1998: 210). This evaluation can be facilitated by a framework based on the behaviour-performance-outcome cycle. In this framework, the behaviour of a participant is governed by: the targets set by the main contractor, the participant's organisational goals and the aggregate behaviour of its representatives. The performance of a participant is determined by: the participant organisation's and their representatives' past success on previous projects, and the representatives' level of aspiration, motivation and willingness to apply initiative and expend effort (Ibid.: 212). The productivity of a participant organisation can therefore be explained through the analysis of its behaviour and performance variables.

Accordingly, the productivity of M&E contractors in building project coalitions may be explained, on the one hand, by the impact of their time and cost targets, their organisational goals, and the determinants of their organisational behaviour; and, on the other, by the implications of their behaviour and capability on their performance. The purpose of this investigation is limited to examining why M&E contractors, in selected building project coalitions, are or are not able to meet their contractual requirement of completing their tasks within specified programmes. The study does not intend to consider optimisation of productivity beyond that which is required by the client's specification.

1.3 THE SIGNIFICANCE OF THIS STUDY

The level of performance of building projects is generally evaluated in terms of project completion within time and to cost targets set by clients (see for example, Latham, 1994: 63). Because the building project coalition is a 'temporary multi-organisation' (Cherns and Bryant, 1984), each participant has their own targets the achievement of which determines the level of project performance for the organisation concerned. Therefore the level of performance of building projects is dependent upon the levels of performance of project participants or their productivity.

The productivity of project participants has a direct impact on the profitability of the project to the client and the participants, and on the losses incurred by the latter as penalties resulting from delays. The importance of productivity is further reflected in the productivity target of '30 percent real cost reduction by the year 2000', initiated by the Chartered Institute of Purchasing and Supply and recommended by the Latham Report (1994: 80). Because building production processes in the construction industry take place in the context of project coalitions, identification of productivity problems is likely to generate improvements which will benefit the industry in the long run.

Moreover, if particular interorganisational and interpersonal factors are identified that give rise to conflict and hamper the collaborative efforts of project participants, they are likely to present the pre-requisites for interorganisational collaboration and partnering in building projects, by default.

1.4 PLAN OF THE THESIS

The thesis is organised in seven chapters. Chapter 2, explores the nature of the link between conflict and productivity problems by considering the determinants of behaviour and performance, and how they may give rise to conflict. It then examines the link between conflict and productivity problems in building project coalitions by defining the concept of conflict, by identifying its sources in project participants' interorganisational and interpersonal relations, and by considering the potential impact of conflict on main and M&E contractors' performance in the building production process. Exploration of the themes leads to formulation of secondary questions that the fieldwork investigates and attempts to answer.

Chapter 3, discusses the research methodology by presenting the rationale for a qualitative research and a grounded theory approach, and by describing the research design. It moreover explains the nature of the data collected, how it informs the research, the context in which it was collected, the period over which it was collected, and the framework used to analyse it and to theorise from it.

Chapters 4, 5 and 6 present the case projects selected for longitudinal study and the key findings. The results are supported by quotes from interviews and project meetings, tables constituting the conceptual models and organograms and graphical representations aiding the understanding of organisational structure and information flows.

Chapter 7, analyses the research data presented in the case studies, through comparisons and contrasts, and discusses the research questions posed in Chapters 1 and 2. By arguing

the weaknesses of current practices, the chapter proposes improvements that are comparable to on-going research, yet go further in terms of the changes they recommend and their possible impact.

CHAPTER 2 CONTRACTUAL INTERFACES AND IMPLICATIONS FOR PRODUCTIVITY IN BUILDING PROJECT COALITIONS

2.1 INTRODUCTION

This chapter explores the themes emanating from the productivity related literature. Sections 2.2 and 2.3, consider the determinants of behaviour and performance, respectively, both in relation to mechanical and electrical (M&E) contractors and at the broader theoretical level. Section 2.4, explores the behavioural issues that may give rise to conflict in building project coalitions thus establishing the premise for the emergence of conflict in interorganisational and interpersonal relations within these coalitions. Section 2.5, discusses the occurrence of conflict both within and between the constituents of the building production process, examining how conflict may affect the performance of main and M&E contractors and how it may be contained or managed. Section 2.6, concludes the review of literature and categorises the secondary questions arising from the review thematically.

2.2 DETERMINANTS OF BEHAVIOUR

M&E contractors' behavioural criteria, outlined in Chapter 1, have three components: 1) the combination of time and cost targets set by main contractors and services installation tasks defined by clients; 2) short and long term objectives of M&E contracting organisations; and 3) the aggregate of M&E contractors' representatives' behaviour. These components can be abstracted as the project goals, organisational goals, and organisational behaviour of M&E contractors respectively. Project goals are claimed to trigger the behaviour-performance-outcome cycle in project procurement by prompting participants' actions (Liu and Walker, 1998: 212). The nature of these actions is dependent upon the characteristics of project goals. For example, the fluidity and ambiguity of project goals may lead to self-interested action by participants through redefinitions and interpretations of goals which may result in acrimony (Tavistock Institute, 1966: 51-2). Organisational goals constitute some of the stimuli that cause individuals within the organisation 'to engage or not to engage in certain activities' (Liu and Walker, 1988: 212). Other stimuli include individuals' personal goals, capabilities, and motivation coupled with their perception of senior management's, and colleagues' expectations of them (Ibid.: 211). Organisational behaviour comprises two levels of activities: those at the macro level of the organisation, and those at the micro level of the individual. Macro organisational behaviour is concerned with structure, design and action of organisations in socio-economic contexts; micro organisational behaviour deals with individuals' attitudes, motivation and performance (Staw, 1984: 628). These dimensions of organisational behaviour are elaborated below.

2.2.1 MACRO ORGANISATIONAL BEHAVIOUR

The sociological, political and economic factors influencing the behaviour of organisations are collectively referred to as the environment or the business environment. The latter impact on organisations in a number of ways. The powerful interests within the environment create and sustain organisations which are dependent on the environment for legitimacy - balancing the social and economic goals (Mintzberg, 1991(a): 389) - and resources (Benson, 1983: 35, 47). This dependence constitutes a source of uncertainty for organisations and hampers their control over factors influencing their operations (Pfeffer, 1991: 382). The resource dependency of organisations links them together in interorganisational networks and populations of organisations (Benson, 1983: 50) making them interdependent (Pfeffer, 1991: 382). The link between technological, organisational and institutional innovations, characteristic of advanced capitalist societies, gives rise to large dominant organisations (Benson, 1983: 52), or corporations, which influence competitive conditions within the environment.

To manage uncertainty and interdependence, organisations - or rather their representatives - engage in political activities like merger, joint ventures, interlocking directorates, movement and selective recruitment of executives and other personnel, regulation, reduction of competition, and protection of markets and sources of supply (Pfeffer, 1991: 383; Harrigan and Newman, 1990; see Haughton, 1994; and Johnston and Lawrence, 1988 for examples of these activities). They enter into tacit agreements for voluntary, co-operative restraint of competition amongst their organisations, supported by antitrust and antimonopoly laws (Henderson, 1991: 378, 380). These political activities, though co-operative in appearance (Harrigan and Newman, 1990; Kanter, 1989: Chapter

5), may be characterised by competition, negotiations, co-operation or confrontation (Henderson, 1991: 377-9).

Henderson likens competition to a major battle which many contending businesses enter into. To survive it, organisational representatives negotiate in order to achieve a degree of co-operation or restraint from their adjacent business interests, or what Henderson refers to as 'competitors' (1991: 378). The success of negotiations, in terms of outcomes resulting in co-operation as opposed to conflict, depends on four factors. Firstly, the relative bargaining power of the negotiators which is proportional to their opponents' dependence upon them (Bacharach and Lawler, 1981: 209-10; Emerson, 1962: 32). This power may arise from the structure of the institutional framework within which the negotiations are carried out, or be attributable to capital and a dominant position in the market (Bachmann, 1998: 313). Secondly, the negotiators' tactics and skills in obtaining the best possible compromise from their opponents without antagonising them (Henderson, 1991: 377). The third factor which is persistently argued in the literature as contributing significantly to co-operation is the existence, nature and level of trust - whatever it is defined to be - in negotiators' relationship (for example, Lane and Bachmann, 1998; Fells, 1993 with reference to employer-employee relationship). The close links between trust and power/dependency (see for example, Fox, 1974 with reference to employment relations; Hardy et al.: 1998) create the conditions for the combination of trust and power constituting the fourth factor on which co-operation depends (for example, Bachmann, 1998).

In view of the above discussion, co-operation resulting from successful negotiations with adjacent business interests may be underpinned by institutional power of the legal system

or state policy, on the basis of which interorganisational and interpersonal trust may be created (Bachmann, 1998: 313; Lane and Bachmann, 1996). It may be underpinned by market power and voluntarism in which case the dominant party's manipulation results in the weaker party's capitulation (Hardy et al., 1998). It may, on the other hand, be based on various forms of trust such as calculation of potential profit (Dasgupta, 1988; Henderson, 1991: 378; Williamson, 1993) or cost of retaliation in case of defection (Deakin and Wilkinson, 1998: 148, 149); common values embedded in societal culture (Fukuyama, 1995) or mutual obligations developed through long-term relationships (Lorenz, 1998). Co-operation may moreover be based on a combination of power and trust (Fox, 1974 with reference to employer-employee relations). If co-operation is not reached voluntarily, negotiations break down and confrontation occurs. In a confrontation, deciding what is acceptable may be guided by emotions or arbitrariness; deciding what is attainable is based on evaluating the other party's degree of intransigence (Henderson, 1991: 378). Enforcement of co-operation in a confrontation may comprise external measures, such as resorting to law or other institutions who set codes of behaviour and practice (Deakin and Wilkinson, 1998: 149-150).

The above accounts of political activity demonstrate the centrality of power to the behaviour of organisations, the importance of human agents who act out the power games, and the role that trust plays in interorganisational and interpersonal relations. On this premise, it is pertinent to consider power and its impact upon behaviour, through politics, in the context of organisations, as well as the socio-economic and socio-cultural issues of trust which allegedly constitutes a prominent feature of behaviour in interorganisational and interpersonal relations.

Power and politics in organisations

The literature suggests two basic perspectives of power: legislation on 'what power is', attributed to Hobbes and his successors; and interpretations of 'what power does', ascribed to Machiavelli and his successors (see Clegg, 1989 for a review and critique of relevant literature). Although some angles of the concept of power are considered here for the purpose of defining it, emphasis is placed on the strategy and mobilisation of power in order to analyse its manifestations and consequences for organisational behaviour.

The concept of power, though pervasive in social theories, is problematic to define due to lack of consensus. Amongst features of power about which there is consensus are: its relational quality, its correspondence to subordination, and its reciprocity to hierarchical structures (for example, Clegg, 1989: Chapter 8; Fox, 1974: Chapter 2; Pfeffer, 1981: 2-4). Power exists in a relational context, or what Clegg refers to as a relational field of force (1989: 207), wherein party A gets party B to do what the former wants him/her to do and which party B would not otherwise have done (Pfeffer, 1981: 2-3). Party A's exercise of power over party B is contingent upon subordination of the latter by way of consent or capitulation (Clegg, 1989: 208; Fox, 1974: 98-9), or party A's capacity to overcome party B's resistance (Pfeffer, 1981: 3; Fox, 1974: 99). Party B's resistance is itself construed as power exercised by party B over party A, thus setting in motion a process that passes through circuits of power and resistance (Clegg, 1989: 207; 18). The relative power of one party over the other is rooted in the relative importance of the activities carried out by the former and, in this sense, is structurally determined (Pfeffer, 1981: 98).

In the context of organisations, two divergent concepts of power are identified: power as domination and resistance; and power as authority and illegitimate resistance (Hardy and Clegg, 1996: 626). The former concept is based on the premise that owners and controllers of the means of production have the capacity to dominate subordinates by way of power vested and legitimated in organisational structures; and that subordinates have the capacity to challenge this domination through their knowledge of operations and discretion in the use of that knowledge (for example, Fox, 1974; Friedman, 1977: Chapter 6). The latter concept of power is grounded on two diverse assumptions. One assumption regards authority as power which has been transformed and legitimised through the development of norms and expectations. Accordingly, the process of transformation makes the exercise of influence, arising from hierarchical structures, acceptable or indeed expected (Pfeffer, 1981: 4-6). Thus authority is not resisted and not dependent on the determinants of power. The other assumption, views illegitimate or 'alegitimate' power as formally unauthorised, officially uncertified, widely not accepted (Mintzberg, 1991(b): 372), and therefore essentially negative. This form of power is associated with the exercise of discretion by organisation members whose position within the organisational structure does not sanction their activities (Clegg, 1989: 189).

Mobilisation of power or political activity within organisational settings takes place around individuals' and groups' interests (Hindess, 1986: 115) and is aimed at protecting or furthering their interests. Therefore interests influence 'reasons for action' in so far as they are taken account of in the decision making process (Ibid.: 128-9, 121). The formulation of reasons, however, are limited to the discourses available to and implemented by individuals and groups which, in turn, are contingent upon these actors' situation and changes within it (Ibid.: 121-2, 130).

Dominant actors within the organisation utilise power to either prevent or defeat conflict (Hardy and Clegg, 1996: 628). Prevention of conflict may involve management strategies aimed at resulting in the political inactivity of subordinates. Defeat of conflict, on the other hand, may involve management strategies aimed at opposing subordinates' resistance or subordinates' strategies aimed at opposing management's resistance. Conflict prevention strategies may entail responsible autonomy to subordinates, whereby the latter are given discretion over their work in order to win their loyalty; or direct control of subordinates, whereby close supervision of the latter attempts to limit their discretion (Friedman, 1977: 6-7). These strategies may result in subordinates' consent for a number of reasons. Firstly, the subordinates are generally excluded from the decision-making process. Secondly, they may be ignorant of their own interests (Hindess, 1982) either because they know no alternatives, or view the status quo as natural and unchangeable, or regard it as beneficial (Lukes, 1974: 24). Thirdly, they may be ignorant of the nature and strategy of power implemented. Fourthly, they may regard the cost of achieving their aims as relatively higher than the benefits of success (Hardy and Clegg, 1996: 628). The strategy of defeating conflict comprises political activity to 'acquire, develop, and use power and other resources to obtain one's preferred outcomes in a situation in which there is uncertainty or dissensus about choices' (Pfeffer, 1981: 7).

The above characteristics of organisational political activity are reflected in Bacharach and Lawler's (1980) view of political behaviour as evaluation, by one party, of their power in relation to that of other significant competitors, and selection, by that party, of countertactics to thwart the competitor's tactics. These tactical encounters take place during the bargaining process and are conducted through it. Bargaining is 'the give-and-take that occurs when two or more interdependent parties experience a conflict of

interest' (Ibid.: 44) and serves two contradicting purposes of resolving the conflict and benefiting both parties. The key constituent of bargaining is tactics used by one party to influence the other. The tactics used in a bargaining relationship can impact on the potential resolution of conflict.

Trust in interorganisational and organisational relations

The concept of trust, similar to that of power, is difficult to define owing to the differing contexts in which it may be considered, the numerous perspectives from which it may be viewed, and the various meanings ascribed to it. For instance, trust in the context of interorganisational relations, between representatives of organisations involved in an exchange relationship, may be viewed from an economic, legal, or political perspective (For example, Williamson, 1993; Deakin, Lane and Wilkinson, 1994; Deakin and Wilkinson, 1998; Fox, 1974; Hardy et al., 1998). Whilst trust in the context of interpersonal relations, between parties to a social relationship, may be viewed from a sociological or psychological perspective (see for example, Kramer and Tyler, 1996). Furthermore, there is evidence of multidimensional concepts of trust based on combinations of perspectives from which trust is viewed (see for example, Lane, 1998: 4 for a review of corresponding literature). Accordingly, the theoretical bases on which trust is constituted comprise calculation, institutional, and power and dependency (Ibid.: 4-14).

Calculation in economic exchange, equates trust to risk so that one party's decision to accept the risk involved in another party's performance - i.e. the probability that the latter's performance will be beneficial or at least not harmful to the former - is representative of the former's trust in the latter (Gambetta, 1988: 217). This perspective

associates trust with 'the expectation of an ongoing relationship' and the knowledge that waning of trust in a long-standing exchange relationship will lead to higher transaction costs in the form of 'self-protective actions' by one party to counteract the potential opportunistic behaviour of the other (Tyler and Kramer, 1996: 3-6). It is claimed that this form of trust may be developed and strengthened through repeated exchanges between the same parties and may be linked to reputation (Dasgupta, 1988: 59). It is moreover claimed that trust could be learned through co-operation between members of exchange communities, such as networks, when they recognise their common interests, even in antagonistic situations (Powell, 1996: 52-62). This learning process is facilitated through governance structures which allow constant monitoring and consultation by and between the members (Ibid.).

The calculative model of trust leads to a fundamental consideration. If acceptance of risk is based on an evaluation of probabilities, if repeated exchanges between two parties take place owing to the benefits the latter gain, and if co-operation is based on common interests and facilitated through monitoring, then where does trust fit in? If trust fundamentally signifies 'reliability' (see for example, Deakin and Wilkinson, 1998: 153), then, is calculative trust not 'a contradiction in terms' as claimed by Williamson (1993: 485)? Indeed Williamson rejects the notion of 'calculative trust' on the grounds that 'trust is irrelevant to commercial exchange' (1993: 469). He bases this assertion on the argument that commercial exchange relations take place between human actors who are boundedly rational and opportunistic, and that these relations involve incomplete contracting (Ibid.: 485). He therefore proffers that commercial relations be viewed as calculative relations involving risk rather than trust, and that trust be reserved for personal relations only (Ibid.: 485-6). Fox makes the same point by arguing that because the nature

and extent of the terms of economic exchange are specifically defined or prescribed, and not left to the discretion of the parties as they are in a social exchange, the way is left open for bargaining over the terms; thus the parties do not trust each other (1974: 71). Consideration of these views poses the questions: To what extent does trust, as 'reliability', feature in the exchange relations of project participants? Is it underpinned by calculation?

The institutional theory of trust views trust as a mechanism to reduce risk (Lane and Bachmann, 1996). This mechanism comprises shared assumptions and shared understanding, created through the constitution of meaning, and common expectations and common beliefs, created through the constitution of norms (for example, Sydow, 1988: 36). Shared meaning and common norms are established by the legal and financial systems, trade associations, chambers of commerce, and other institutions that constitute the business framework within which economic exchange takes place (Lane and Bachmann, 1996). They comprise the societal culture in which trust is said to be rooted (Fukuyama, 1995). By referring to these shared meanings and common norms in their interaction, organisational representatives are said to create predictability in their behaviour thus giving rise to interorganisational trust (Lane and Bachmann, 1996; Sydow, 1998). It is suggested that the level of predictability in organisational representatives' behaviour is dependent on the degree to which they share norms and values and are able to subordinate their individual interests to those of their respective organisations (Fukuyama, 1995: 10). It is further suggested that the importance attached to predictability in behaviour is associated with the nature of the relationship, i.e., the level of uncertainty associated with future contingencies, the degree of interdependence, and the potential for opportunism (Deakin and Wilkinson, 1998: 147).

The way in which meaning is codified and the conditions for predictability established is through the business contract (for example, Bachmann, 1998: 315). The latter is said to create trust of a 'contractual' kind by providing a promise to fulfil a minimum set of obligations (Sako, 1998: 89). To underpin this promise with guarantees of performance, in other words to deter the contracting parties from behaving opportunistically, a business contract may either be supported by bonds, collateral, or provisions for penalty payments in case of breach, or it may contain incentive provisions for enhanced performance, such as piece work in employment contracts (Deakin and Wilkinson, 1998: 149-150). The function of the contract in creating trust in interorganisational relations is seen to be related to the business framework and the effectiveness with which it promotes information flows, spreads the costs of conflict, monitors organisations, and reduces uncertainty (Ibid.: 155). This assertion is supported by comparative empirical research (Ibid.: 155-167; Lane and Bachmann, 1996: 372-389). The questions that arise from the institutional trust literature, are: To what extent does trust as predictability enter the project participants' relations? Is it underpinned by legal sanctions?

An alternative way of creating predictability in the behaviour of organisational representatives is suggested through the use of power, based on the premise that power may be considered a functional equivalent of trust (Hardy et al., 1988: 66). Power-induced predictability may take two forms. It may be merely an impression created by the dominant party, through management of meaning, in order to manipulate the weaker party into co-operation (Ibid.: 76-8, 81-2). It may, on the other hand, represent capitulation by the weaker party who has no option but to co-operate (Ibid.: 82-3). The link between power and trusting or distrusting relations is argued in a more or less similar way in the context of the employment relationship. Here the degree to which superordinates trust

subordinates, i.e. the level of institutional trust, is perceived to be 'embodied in the rules, roles, and relations' the former imposes on or seeks to get accepted by the latter (Fox, 1974: 67-8). Thus people occupying high discretion roles may be perceived as being trusted by their superordinates to exercise choice over their decisions within prescribed limits; whilst those occupying low discretion roles, which are highly prescribed in nature, may be perceived as being distrusted (Ibid.: 69). However, it is possible that the high discretion of the former group may be tolerated by the management owing to the potential illwill that may arise should prescription be increased (Ibid.: 95). Similarly, the low discretion employees may acquiesce to the status quo partly because they have been ideologically socialised or indoctrinated by various agencies into accepting hierarchy and their inferior status and partly because they perceive no alternatives (Ibid.: 88, 91; see also the discussion under power and politics). They therefore submit to 'a forced compliance underpinned by power' which appears like a high trust relation (Ibid.: 94). These considerations pose the questions: To what extent are impressions of trust created through power-induced predictability or capitulation? Are these impressions based on domination and dependency, respectively?

The literature on trust, on the one hand, argues in favour of trust as a basis for co-operation because the absence of trust leads to unco-operative behaviour and costs money or gives rise to mal-practices. Costs are generally associated with 'monitoring and measuring performance' by the less-informed party in a relationship involving 'information asymmetry' (Deakin, Lane and Wilkinson, 1994: 333). They are incurred to ensure equity in the exchange (Ouchi, 1980: 130). Mal-practices, in the form of failure to deliver a promise, lead to the foregoing of a renewal of contract in long-term relationships (Deakin, Lane and Wilkinson, 1994: 334). On the other hand, it is recognised that the

absence of trust in exchange relations is inevitable owing to the parties' opportunism (Williamson, 1975: 258), their goal incongruence (Ouchi, 1980: 131-2), or the inadequacy of measures used to foster trust (Deakin, Lane and Wilkinson, 1994: 344). It is therefore postulated that unco-operative behaviour and conflict are likely in exchange relations. Consequently, what has been suggested is that more emphasis be placed on proceduralising conflict resolution through institutional frameworks like trade associations, chambers of commerce, and quality assurance bodies (Ibid.). The relationship between the business environment and the modes of macro organisational behaviour is demonstrated in Figure 2.1.

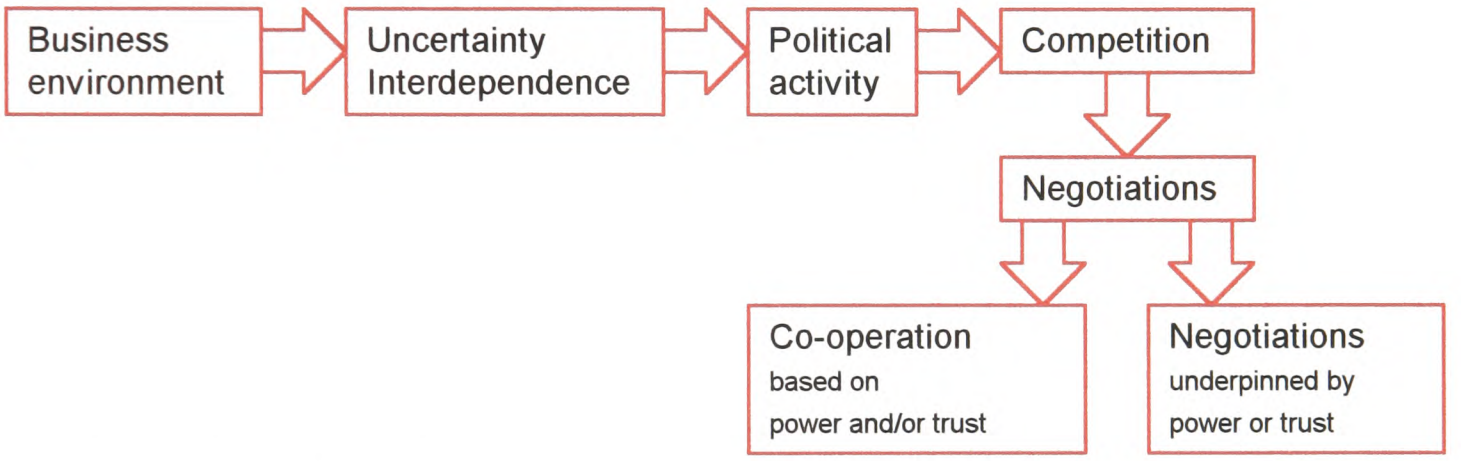

Figure 2.1: Relationship between the business environment and macro organisational behaviour

2.2.2 MICRO ORGANISATIONAL BEHAVIOUR

Having considered the impacts of power, politics and various guises of trust on macro organisational behaviour, attention is now focused on the impacts of these variables on organisational behaviour of individuals engaged in exchange relations. To assess these impacts, the way power and trust engendering methods may be used by one party in the exchange relation, and their potential influence on the motivation, work attitudes and performance of the other are considered.

Power and politics in interpersonal relations

Power, in the context of interpersonal relations, may be defined as: one party's potential ability to influence the behaviour of the other, to overcome his/her resistance, and to get him/her to do things that they would not otherwise do (Pfeffer, 1992: 30). This definition comprises three important attributes of the power relationship. Firstly, the power recipient's perceptions and assessments of the power holder and his/her methods of using power (Jacobson, 1974: 52). This attribute represents the recipient's 'dependency' (Emerson, 1962: 32) or rather the conditions of interdependence giving rise to the power relationship (Pfeffer and Salancik, 1978: 40; Pfeffer, 1992: 38). Secondly, the power recipient's reasons for accepting or rejecting the power attempts (Jacobson, 1974: 52). This attribute represents the recipient's 'motivational investment in goals mediated by [the power holder]', and the 'availability of those goals to [the recipient]' outside the recipient-power holder relationship (Emerson, 1962: 32). Thirdly, power may be latent or implicit to the relationship and exist as a probable cause of behavioural change, or tendency to comply by the power recipient, when exerted, or it may be manifested explicitly through behavioural change (Jacobson, 1974: 52-3).

Potential power is utilised and realised through processes, actions, and behaviours referred to as interpersonal politics which influence the power recipient's behaviour or tendency to behave (Pfeffer, 1992: 30). The use of power is associated with competitive or zero-sum situations where one party's gain is equivalent to the other's loss (Riker, 1974: 63). It is moreover linked with conditions of moderate interdependence where differences in point of view lead to disagreements and conflict (Pfeffer, 1992: 38-44; 176). Low interdependence does not warrant the use of power; whilst high interdependence supposedly acts as an incentive for the parties to work together, to forge

common goals and to co-ordinate their activities (Ibid.). The nature and level of interdependence is related to scarcity of resources which in turn is related to budget allocations (Ibid.: 41). Differences in the parties' point of view about goal divergence or how to achieve goals arise from task specialisation and division of work, the diversity of the parties' backgrounds, training and incentives, and the absence of external threats or competitive pressures to encourage the parties to work together (Ibid.: 42-4).

The power recipient's perception of the power holder is related to the former's frame of reference which is governed by the principles of contrast, commitment and scarcity (Pfeffer, 1992: Chapter 10). The principle of contrast concerns the order in which situations and proposals are presented by one party so as to affect the judgement or response of the other in favour of the former. The principle of commitment is related to that of contrast in so far as the order of situations and proposals presented by one party affects the consistency of the other's behaviour and choice. The principle of scarcity is linked to the relative availability of/demand for resources and their price (Ibid.).

A change in the power recipient's attitude toward accepting power attempts may be effected through three processes of influence. One process is based on the motivational impacts of gaining potential benefits or avoiding potential punishments through 'compliance' (Kelman, 1972: 142). This process utilises 'reward power' to mediate both material and personal rewards, such as social approval, acceptance and liking; and 'coercive power' to mediate material and personal punishments, such as disapproval, rejection and dislike (Jacobson, 1974: 58-9; Raven, 1972: 174). The second process of influence derives from the recipient's desire to establish or maintain a relationship with the power holder through 'identification' (Kelman, 1972: 142). This process uses 'referent

power', corresponding to the extent of attractiveness of power holder to the recipient, to engender opinions, attitudes and behaviours similar to those of power holder within the recipient (Jacobson, 1974: 60; Raven, 1972: 174-5). Parallels may be drawn between this source of power and the principle of ingratiation, entailing liking of one party for the other, which initiates the rule of reciprocity (Pfeffer, 1992: 213-221). The third process of influence is grounded in the recipient's value system and may give rise to the recipient's acceptance of influence through internalisation, i.e., by aligning his/her actions and beliefs with his/her values (Kelman, 1972: 142). This process utilises three sources of power, 'expert power', arising from the power holder's knowledge and ability, 'legitimate power', arising from cultural values, and recipient's acceptance of hierarchy and power holder's legitimacy, and 'informational power' to change the recipient's cognitive system (Jacobson, 1974: 59-62; Raven, 1972: 173-5; Pfeffer, 1992: 207-213 with reference to informational influence).

The sources of power identified above emanate from the power holder's control over resources (including information), his/her ties to resource controllers, the combination of situational factors and the power holder's characteristics, his/her formal authority arising from his/her position within the hierarchy and within the communication structure, and the match between situational factors and the power holder's traits like style, skill and capacities (Pfeffer, 1992: 71-81).

In conclusion, the use of power involves making decisions about the allocation of scarce resources in situations of interdependent activity, in favour of one party as opposed to another, which may lead to disagreements (Pfeffer, 1992: 54). The relationship between

competitive situations and power-based modes of behaviour is demonstrated in Figure 2.2.

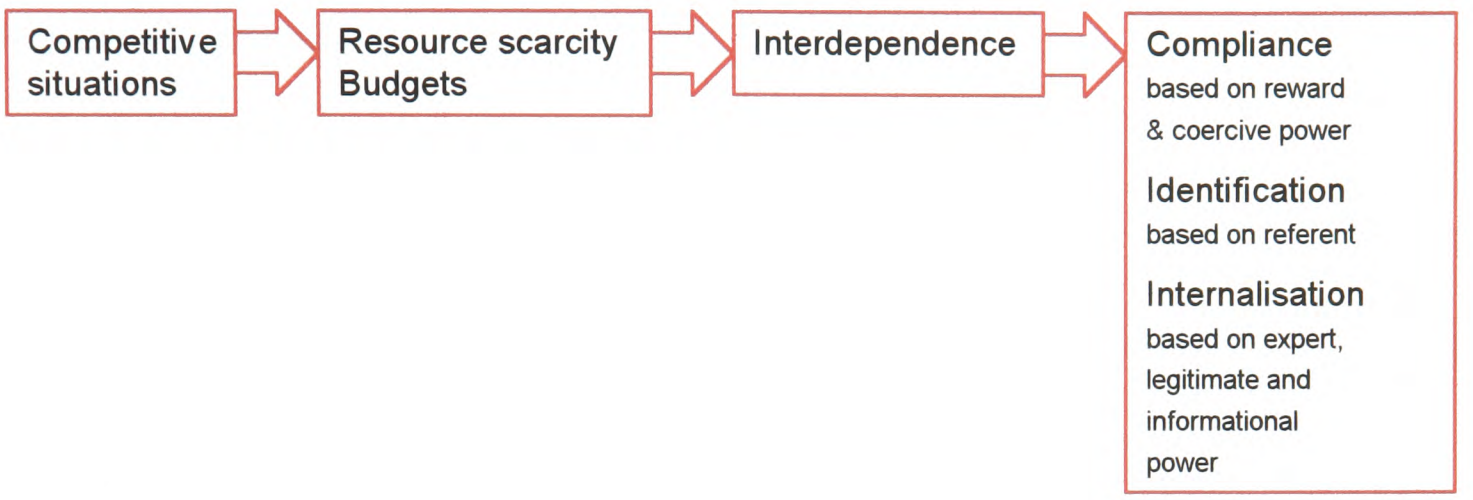

Figure 2.2: Relationship between competitive situations and power-based modes of behaviour in interpersonal relations

Trust in interpersonal relations

Trust in the context of interpersonal relations is held to signify one party's decision to depend on the other, and is said to involve risk (Riker, 1974: 65). The decision to rely on others may be based on the potential advantages that the dependent party, or the trustor, is likely to gain (Lane, 1998). For example, broadening the responsibilities of subordinates may result in time and cost savings associated with monitoring, checking and controlling their work (Handy, 1976/1993: 283-4). Deciding to trust others may involve an evaluation or prediction of the trustee's behaviour (Riker, 1974: 76-81). This evaluation or prediction may be based on the trustor's prior experience of the trustee's work or capacity; trial and error, i.e., giving trust, releasing control and waiting for the trustee's response; and reciprocity (Handy, 1976/1993: 284). It may moreover be based on signals of trustworthiness, like 'reputation, brands, and adoption of quality standards', sent by the trustee (Lane, 1998: 21). The trustee's trustworthiness may in turn be governed by the

degree to which their goals coincide with those of the trustor (Riker, 1974: 81). In these regards, both the trustor's and the trustee's behaviours may be considered to be motivated by calculativeness (discussed under 'trust in interorganisational and organisational relations', above).

Trust is associated with co-operative situations where the parties' gains are inter-related and the use of power may be superfluous (Riker, 1974: 63-4). A certain level of trust is said to develop in conditions where emphasis is placed on the long-term interests of the parties, where the risks are relatively small, and where effective and open communication between the parties is facilitated through easy contact (Good, 1988: 37). Certain types of communication, such as evaluative, spontaneous, emphatic, and equality-expressing, are said to build interpersonal trust (Jacobson, 1972: 101). For instance, evaluative communication, be it approving or disapproving comments, allegedly increases the willingness of the recipient to rely on the judgement of the communicator and leads to a change in the recipient's behaviour (Ibid.: 102). Whilst equality-expressing communication, entailing a reduction in the power distance between the communicator and the recipient, allegedly increases the recipient's attraction to the communicator and his/her tendency to imitate the communicator thus increasing the communicator's ability to influence the recipient (Ibid.).

The level of trust in interpersonal relations may be manifest in the degree of delegation of responsibility or control in a superordinate/subordinate or hierarchical relationship (Handy, 1974/1993: 283-5), in the level of discretion or prescription in work roles of subordinates (Fox, 1974), or in the nature of transaction rules - i.e., whether task-centred or function-centred (Marsden, 1998) - governing the employment relationship. On the

other hand, these manifestations may be underpinned by complex power relations as discussed in the previous sub-section. Therefore just as self-reliance is an indicator of power over other people and control over events (Riker, 1974: 66), reliance on others, or trust, may be considered an indication of powerlessness over people or the outcomes they control. It may not reflect the superfluousness of power, as Riker claims, rather, it may depict the ineffectiveness of explicit power in situations of interdependence.

To the extent that interpersonal relations are based on communication, a central position in the communication network may constitute a source of power (see Pfeffer, 1992: Chapter 6). Therefore a superordinate or group leader located centrally in the communication structure of a group may be in a position to influence the group members in an apparently non-coercive manner. This inference raises questions about the differences between 'use of power' and 'development of trust' as influence mechanisms. Is trust fundamentally different from, and a more effective alternative to power? Or, is it merely a more agreeable form of power and dependence?

The relationship between co-operative situations and trust-based modes of behaviour is demonstrated in Figure 2.3.

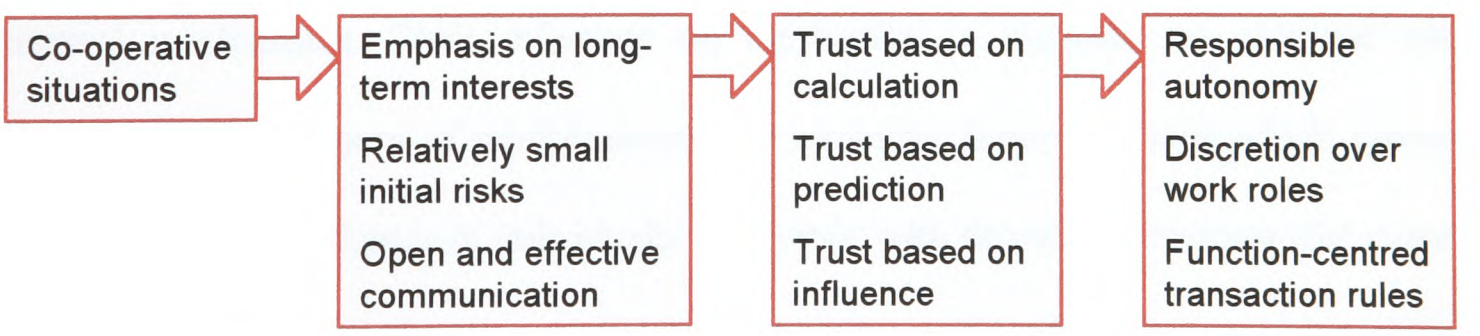

Figure 2.3: Relationship between co-operative situations and trust-based modes of behaviour in interpersonal relations

2.3 DETERMINANTS OF PERFORMANCE

M&E contractors' performance criteria, outlined in Chapter 1, have three components: 1) M&E contracting organisations' and their representatives' past success on previous projects; 2) the level of aspiration of M&E contractors' representatives; and 3) the motivation and willingness of M&E contractors' representatives to apply initiative and expend effort. The past success or failure on previous projects has a direct or an inverse relation, respectively, to the level of aspiration on future projects (Liu and Walker, 1998: 212). The level of aspiration refers to the time and cost targets the M&E contractors' representatives try to attain (Ibid.: 211). This may in turn be governed by project and M&E contractors' goals discussed in the previous sub-section. The motivation and willingness of M&E contractors' representatives to apply initiative and expend effort, as well as being related to the other two components of performance, are influenced by a number of other factors. These factors may be categorised broadly as reward and punishment, according to the scientific management principles, and job satisfaction, according to the human relations principles (for example, Druker and White, 1996: 71).

Reward and punishment represent sources of power, as discussed above, and are thus control mechanisms. Their influence on motivation is regarded as extrinsic and is explained by the theory of reinforcement (for example, Hamner, 1974) which associates modification of or change in individuals' behaviour with financial incentives (for example, Staw, 1984: 645-6). Broadly related to this theory, albeit from a somewhat different perspective, is the expectancy theory (for example, Vroom: 1964). This theory correlates individuals' tendency to behave in a certain way with the value they attach to the outcomes which, in turn, is related to the rewards they expect to attain by achieving the

outcomes as well as their capability to achieve high performance (Staw, 1984: 646). Emanating from this theory is the goal setting theory (for example, Locke and Latham, 1990) which postulates direct and positive relations between goal difficulty and levels of performance (see O'Reilly, 1991: 431-4 for a review of relevant literature).

Job satisfaction represents attitudes to work and is considered as 'the fulfilment of individual values' (Locke (1976) in Staw, 1984: 631). Its influence on motivation is regarded as intrinsic and is explained by a number of theories like job design, equity, and leadership (Staw, 1984: 632). Job design theory (for example, Hackman and Oldham, 1976, 1980) is based on need-fulfilment theory of motivation (for example, Maslow, 1954) and attributes internal work motivation to the five job characteristics of skill variety, task identity, task significance, autonomy, and feedback (Staw, 1984: 632). Equity theory (for example, Greenberg, 1987) relates performance levels of individuals to their perceptions of procedural and distributive justice and fairness of treatment (see O'Reilly, 1991: 431-4 for a review of relevant literature).

Leadership theories are derived from two perspectives. One perspective, focuses on the interaction between supervisors and subordinates (for example, Crouch and Yetton, 1987); the other, on the impact of executive leadership on the entire organisation (for example, Gardner, 1990). This section is concerned with the former perspective. The impact of leadership on job satisfaction is governed by style and contingency theories. Style theories attribute the level of subordinates' effort and effectiveness to the style of leadership adopted by the group leader or the manager (Handy, 1976/1993: 100). Two opposing styles are identified in the literature based on the extent to which they involve the use of power by the leader. They are the authoritarian and the democratic styles, also

referred to as structuring and supportive styles (Ibid.: 101). The former style is characterised by the leader's full authority to make decisions, to control, to reward or punish; the latter, is characterised by sharing decision-making and control with the group members (Ibid.: 100). Contingency theories add another dimension to style theories by linking them to the situational requirements governed by leader-member relations, the task structure, and position power of the leader (Fiedler, 1967) as well as the level of maturity of the group members (Hersey and Blanchard, 1977).

Leader-member relations determine the degree to which the group members trust and like the leader and are willing to follow him/her. The task structure determines how well the task has been defined for the group members and the extent to which it can be executed through detailed instructions. Position power of the leader determines the degree to which he/she can exercise authority to influence the group members through reward or punishment, for instance (Fiedler, 1967 cited in Mullins, 1993: 247-9). Maturity refers to the group members' experience in carrying out the type of task in question and their ability to set high but realistic goals and to accept responsibility for outcomes (Hersey and Blanchard, 1977 cited in Mullins, 1993: 252-4; Guirdham, 1990: 364). Based on these accounts, two leadership styles or behaviours have been identified, task behaviour and relationship behaviour, and four levels of readiness or maturity, low, low to moderate, moderate to high and high. Task behaviour is the extent to which the leader directs group members' actions, sets their goals and defines their roles and responsibilities. Relationship behaviour is the extent to which the leader partakes in two-way communication with the group members, listens to them and supports and encourages them. These behaviours may be used in four different combinations: high relationship/low task, high relationship/high task, low relationship/ low task and low relationship/high task.

These leadership styles and member maturity levels combine to create four leadership behaviours: telling, selling, participating and delegating. Telling involves high levels of guidance and limited supportive behaviour. It is appropriate for low levels of maturity. Selling involves high levels of both directive and relationship behaviours. It is appropriate for low to moderate levels of maturity. Participating involves high levels of two-way communication and supportive behaviour and low levels of guidance. It is appropriate for moderate to high levels of maturity. Delegating involves little direction or support with low levels of both task and relationship behaviours. It is appropriate for high levels of maturity. The relationship between style and contingency theories of leadership and leader's behaviours are presented in Figure 2.4.

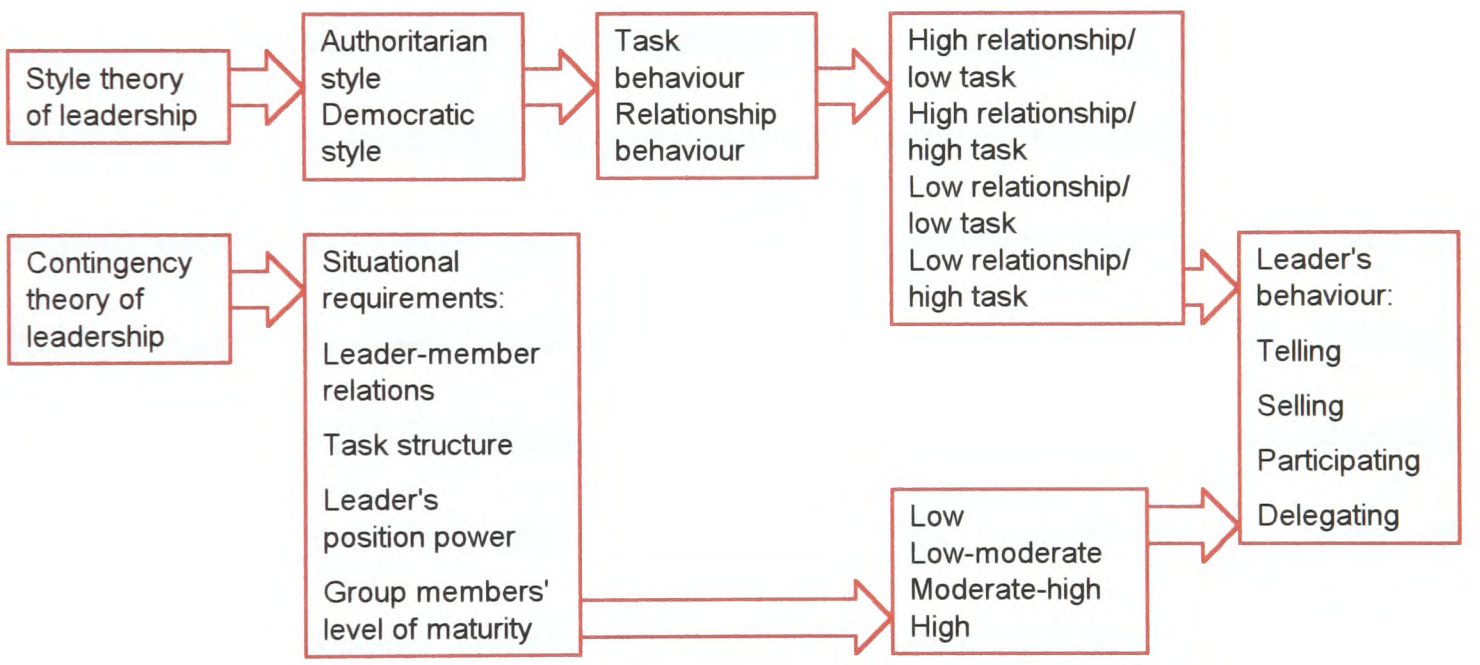

Figure 2.4: Relationship between style and contingency theories of leadership and leader's behaviour

The leader performs three roles, motivating the group members, encouraging their participation and forging them into a team (Guirdham, 1990: 372-5). Motivation has already been discussed. Participation entails the involvement of subordinates or group members in the decision-making and control processes as a means of securing their

commitment (Handy, 1976/1993: 279-82). It is generally achieved through collective problem-solving (Guirdham, 1990: 373).

Team building, in order to be effective, needs to take account of group characteristics, the nature of the task and the environment in which the group is going to function. These factors present the constraints to team building (Handy, 1976/1993: 155). The group characteristics refer to group size, member characteristics, individual objectives, and the stage of development of the group (Ibid.: Chapter 6). Group size is directly linked to diversity of talent, skills, knowledge, and individuals' propensity for participation. Member characteristics like attitudes, values and beliefs govern the nature of groups; homogenous groups promote satisfaction, whilst heterogeneous groups display conflict. Individual objectives include hidden agendas that are not declared to the group. For a group to be effective individuals' objectives need to coincide through trade offs, they need to trust each other, and/or they need to have a 'common enemy' (Ibid.: 162). Team building is generally developed through the four stages of forming, storming, norming and performing (Ibid.: 165-6). Forming involves establishment of the group by discussing its purpose, its composition, and leadership. Storming involves conflict arising from revelations of individuals' agendas and a redefinition of group objectives, procedures and norms. Norming involves establishment of rules about how the group is to work, how it is to take decisions, and what the group's expectation of each member is. Performing is the culmination of the group development and involves the productive phase of the group provided the other stages have been completed successfully.

The nature of the task must match the type of group formed to undertake it. One way of doing this is by allocating task associated roles to each group member. The importance of

the task to the group members is directly related to their level of commitment to the group. The environment in which the group functions affects team building through the leader's position power, the intergroup relations, and the physical location of the group.

In conclusion, the performance of group members is dependent upon a number of variables exerting external or internal influences upon group members' motivation, work attitudes and work outputs. Amongst these variables, leadership plays an important part and leads to the following question: How effective can leadership be in motivating group members, encouraging their participation in decision-making, forging them into a team, avoiding or managing conflict, and having a positive impact on the participants' performance?

2.4 CONFLICT IN INTERORGANISATIONAL RELATIONS WITHIN BUILDING PROJECT COALITIONS

This section explores the contribution of building project participants' organisational behaviour to the emergence of conflict in interorganisational and interpersonal relations within building project coalitions. Firstly, various definitions of conflict in the context of building projects are reviewed. Secondly, power strategies, political activities, and bases for trust and distrust are considered in the interorganisational and interpersonal relations of project participants and linked to the forms of conflict identified.

2.4.1 CONFLICT IN BUILDING PROJECT COALITIONS

Conflict in building project coalitions is viewed in two different ways. The 'pragmatists' (Lavers, 1992: 7) regard it as an inevitable characteristic of the contracting system which may have a positive or a negative effect on the performance of project participants and needs to be managed (for example, Smith, 1992; Langford et al., 1992). The 'strategists' (Lavers, 1992: 7), on the other hand, consider conflict as a negative influence on performance and are concerned with tackling its root cause in order to avoid it altogether (for example, Colledge, 1992; NEDO, 1991; Turner-Wright, 1992). Conflict is defined as 'any divergence of interests, objectives or priorities between individuals, groups, or organisations; or nonconformance to requirements of a task, activity or process' (Gardiner and Simmons, 1992: 111). It takes two forms: functional and dysfunctional (Smith, 1992), also referred to as creative and destructive (Stephenson, 1996). Functional or creative conflict arises essentially from competition between the contracting parties and when managed and controlled, it is claimed to increase the parties' potential for success. Dysfunctional or destructive conflict arises when functional conflict is not resolved and leads to animosity or disagreement which limits the parties' potential for success (Smith, 1992: 29, 30; Stephenson, 1996: 27).

Consideration of conflict in building project coalitions is important because in addition to the obvious costs like higher insurance premia, more claims specialists in all their guises, increased risks and uncertainties, and higher project costs and prices, it gives rise to hidden costs arising from reduced performance (Fellows, 1992: 123). Investigation of reduced performance attributed to conflict lies at the centre of this study and prompts the following questions: 1) Why does conflict arise in building project coalitions? 2) Why

does it becomes dysfunctional? 3) How does it affect the behaviour and performance of the parties in building project coalitions?

2.4.2 CONFLICT IN INTERORGANISATIONAL RELATIONS OF BUILDING PROJECT COALITION PARTICIPANTS

Conflict in interorganisational relations of building project coalition participants is the outcome of the participants' organisational behaviour, which in turn is influenced by the macro factors comprising the project environment, the coalition structure, culture and technology. The project environment constitutes the context of operation of building projects and impacts on the way the project participants manage uncertainty, interdependence and competitiveness. The project coalition structure determines the relative power of project participants, and in conjunction with project culture and technology, influences their sources of power, the political activities they engage in and the power strategies they adopt.

Building project environment

The business environment of building projects comprises a wide range of public and private institutions from local government planning and building by law authorities, through public utility providers, to financial, commercial and legal organisations (Baden Hellard, 1988: 6). Each of these organisations represents distinct interests and exerts differing pressures, in terms of the demands for legitimacy, on project coalitions. These organisations, together with the construction industry on which building projects rely for their resources, constitute the sources of uncertainty and dependence for project coalitions.

The environmental complexity of building projects, together with the market diversity and hostility of the construction industry (Lansley, 1987: 144; Sidwell, 1990: 162) create a high level of competition and risk for the supply side. Competition leads to the absence of adequate measures taken to deal with the impact of risk as well as opportunistic behaviour manifested as avoidance or transfer of risk (Latham, 1994; see also the case studies). The occurrence of risk and consequential losses, the failure to anticipate risk, or ambiguous allocation of it are identified as some of the causes of conflict in building project coalitions (Lewis, Cheetham and Carter, 1992: 76-7). The adversarial nature of the construction industry is proof of the wide scope of this conflict (for example, Fenn and Gameson, 1992; Latham, 1994; NEDO, 1991).

To manage environmental uncertainty and interdependence, construction project organisers delegate the tasks involved in the building production process, including the control, co-ordination and integration of inputs, to specialist professional and commercial firms. This trend reflects the fragmentation of the construction industry structure (Abdel-razek and McCaffer (1987), Ball, 1988: Bennett and Ferry, 1990; Gray and Flanagan, 1989) and leads to narrow subdivisions of work and labour, packaged, sold and purchased as independent services and products through market transactions (Howell et al., 1996: 2-3). This mode of work organisation contradicts the principle of ends/means negotiation used to resolve design and construction problems in 'prototyping' models of production which are considered more appropriate to complex, uncertain and fast-track projects (Barlow et al. 1997: 5; Howell et al.: 1996: 3). The purchase of services and products has thus the potential to cause conflict between the project organisers, the professionals, and the commercial firms.

To ensure the competitiveness of participant organisations, the project organisers select them on the basis of competitive tender processes. These processes mark the beginning of the political activities of organisations participating in building project coalitions. Inter-firm competition amongst professional and commercial firms exerts downward pressure on their prices limiting the resources available to them for the execution of the project (Loosemore, 1999: 177; Latham, 1994: 44). The inherent uncertainties of design, the developments in the design and construction and the emergence of unexpected problems during the course of the project, exhaust the firms' limited resources 'leading to the emergence of distinct winners and losers' and creating the potential for dispute (Loosemore, 1999: 177). In their attempts to redistribute the resources, the professional and commercial firms enter into negotiations with the project organisers/managers on the basis of claims for extra work and expenses (Baden Hellard, 1992: 38-9). The negotiators' effective response to conflict is likely to improve co-ordination, whilst their poor response may lead to escalation of conflict (Zikmann, 1992: 55).

Two types of response are identified as available to negotiators: passive and active (Zikmann, 1992: 55-6). Passive responses include: denial, avoidance and capitulation of conflict. Denial of conflict may increase tension between conflicting parties and lead to concealed hostility, frustration and gradual withdrawal of co-operation. Conflict avoidance may result in perseverance of unresolved problems and may reduce the parties' commitment to project goals. Capitulation to threats and demands of the other party may lead to suppression as opposed to resolution of conflict. Active responses to conflict comprise aggressive responses and creative responses. Aggressive responses are manifested as domination, distributive bargaining, and compromise. Domination of weaker parties may lead to stifling of future initiative, reduced creativity and poor future

decisions. Distributive bargaining, or driving a hard bargain, may lead to withdrawal of co-operation by the other party. Compromise may lead to over inflation of parties future demands, with the aim of achieving some of them. Creative responses, also referred to as integrative bargaining, may lead to co-operative and joint problem solving and workable solutions (Ibid.). The success of the negotiations depend on the 'personalities, experiences and attitudes' of the negotiators, the policies of their organisations, the nature of their power relationship with their opponents, and their perceptions of their opponents (Loosemore, 1999: 178). The breakdown in negotiations leads to escalation of disputes and open conflict. The nature of negotiations and their potential outcomes are illustrated in Figure 2.5.

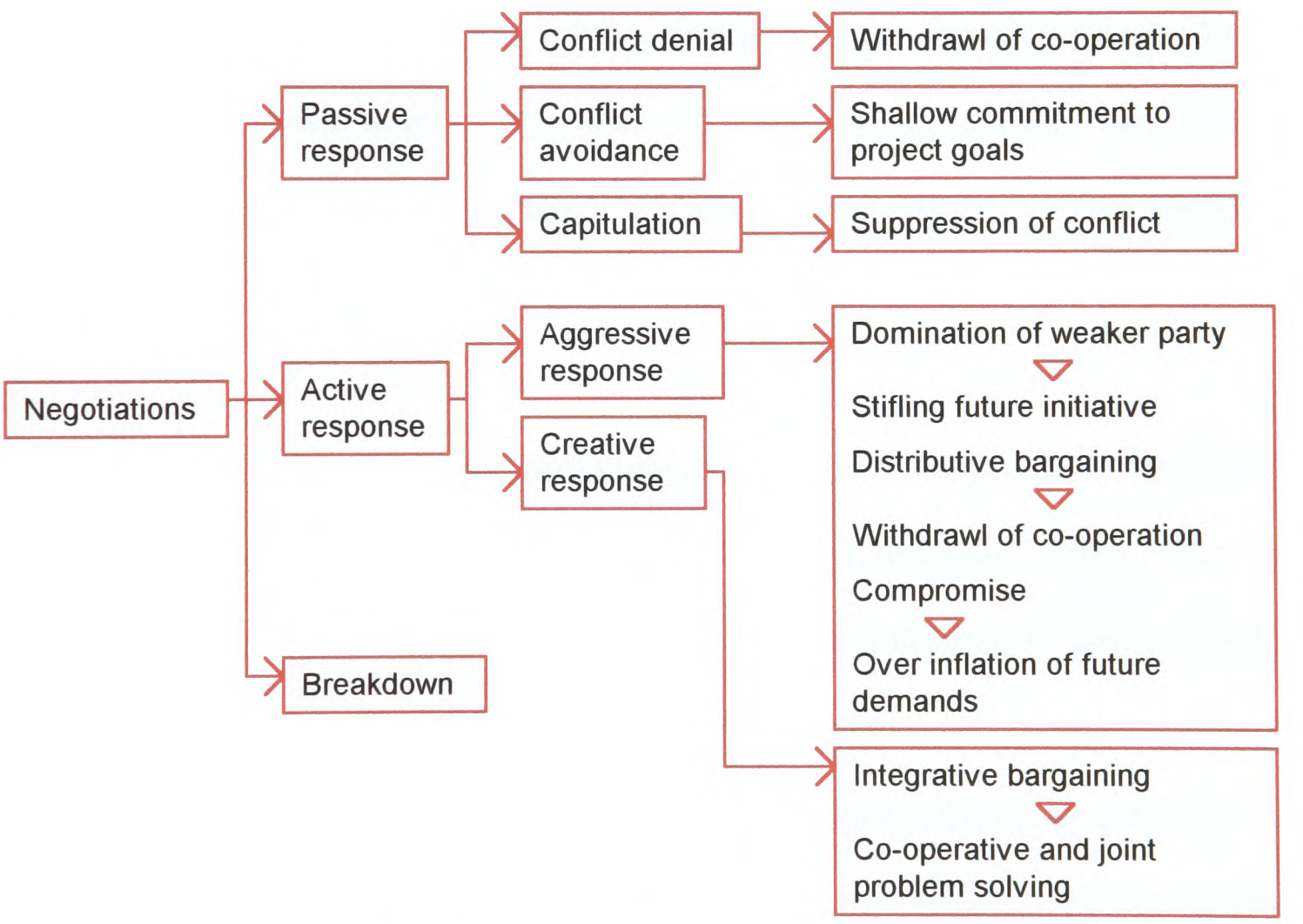

Figure 2.5: Interorganisational negotiations and their potential outcomes

The concept of authority, as power which has been transformed and legitimised through the development of norms and expectations, may be difficult to reconcile with the temporary nature of building project coalitions. This is reflected in the discussions about the difficulties faced by main contractors' management team in supervising subcontractors owing to the ambiguities of the lines of authority (for example, Beardsworth et al., 1988: 616). Therefore in the context of building project coalitions, power as domination and resistance may be a more appropriate concept. Examples of domination as the type of power used to manage conflicts are provided by: denying or delaying payments, withholding contracts, and levying damages (Langford et al., 1992: 64). The sources of power available to project participants vary in accordance with their position within coalitions. For instance, clients, by virtue of funding building projects, have economic and decision taking power on which the other project participants depend; whilst professional and commercial firms have expert power on which clients depend. The economic domination of clients, through the tender process, may be resisted by other participants through submission of claims against variations as discussed above.

The political activities of building project participants are centred around their interests and distinctiveness as profit-making organisations (Loosemore, 1999: 178). The conflicting nature of these interests may be attributed to the diversity of their professional and commercial backgrounds which influence the frameworks of reference available to and implemented by the participants. The power strategies adopted by the latter may, accordingly differ. They may attempt to prevent or contain conflict, which according to some conflict management specialists is the essence of good management (for example, Baden Hellard, 1988: 35; Fellows, 1992: 122), or they may lead to escalation of conflict and the need for its defeat. Where large power disparities exist between the participants,

or the will for resolving conflict is lacking, negotiations are counterproductive and formalised processes such as arbitration or even litigation may be required (Zikmann, 1992: 57).

To explore the link between the building project environment, the project participants' power, political activity, tactics and conflict, the following questions are investigated: 1) To what extent does the project environment contribute to the emergence of conflict between the project participants? 2) What power strategies and tactics are adopted by the participants? 3) How do these strategies and tactics impact on conflict handling, and on the resolution or escalation of conflict?

Building project coalition structure: The network of independent firms

Building project coalitions comprise networks of independent organisations undertaking the functions of design, production, installation, and construction of the final building product. Therefore, they are vertically disaggregated (Miles and Snow, 1986: 64). The participant organisations are assembled as groups by agents. In some coalitions a single agent, for instance, the design and manage consultant or contractor, sublets all the functions (Masterman, 1992: 107). In others, two or more agents undertake this task, for instance, the project manager and the management contractor or the construction manager (Ibid.: 78; 96). Furthermore, each participant organisation may use an agent to sublet the sub-functions within the function that it undertakes, i.e., it may subcontract or sub-subcontract. In this respect, building project coalitions are brokered (Miles and Snow, 1986: 64). The main functions of building project coalitions are integrated and controlled through the market mechanisms of contracts and payment by results. However, this

mechanism does not eliminate the need for supervision by the main contractors' management team (Beardsworth et al., 1988: 616).

The vertical disaggregation, brokerage and market mechanism characteristics of building project coalitions identify them with 'dynamic networks' (Miles and Snow, 1986: 64-5). However, their reliance on supervision and their lack of full-disclosure information systems (NEDO, 1988; Shammas-Toma et al., 1998) - comprising continuously updated broad-access computerised information systems enabling mutual and instantaneous verification of contributions, set them apart from these network types. The full disclosure information system is the binding force within dynamic networks and is used to create trust speedily in relationships which have not had the opportunity to build trust over a long period of time (Miles and Snow, 1986: 65). Therefore its absence in building project coalitions is likely to have substantial repercussions for the coalitions' culture and the potential for trust building in interorganisational relations of project participants.

Dynamic networks take various forms. Examples include industrial districts, research and development networks, business groups, and strategic alliances (Powell, 1996: 53-62). All these forms involve some degree of long-term collaboration and pooling of know how; shared assets, responsibility and risk in the form of technological and managerial contribution and capital investment; and willingness to co-operate (Powell, 1990: 316-7; 324-7). Building project coalitions, though sharing some attributes of these forms, do not fully conform to any particular configuration despite some claims to the contrary (for example, Powell, 1990: 306-7; see Winch, 1994: 596-7 for a discussion of the invalidity of such claims). For instance, building project coalition participants are more often than not selected on the basis of competitive tendering rather than long-term collaboration.

They tend to transfer their knowledge or skill through market transactions rather than exchange them through pooling. They attempt to avoid responsibility and transfer risk to other participants rather than share them (Shammas-Toma et al., 1998). These divergent attributes of building project coalitions from networks may be explained by the heterogeneity of the coalition group arising from the professionals' diversity (Powell, 1990: 326). The latter characteristic is claimed to inversely relate to trust, to the participants' willingness to enter into long-term collaborations, and to their calculative attitudes (Ibid.). It is these distinguishing features of the building project coalition which have earned it the title: 'network of independent firms' (Winch, 1996(c): 5).

The uncertainty, complexity and dynamic characteristics of the business environment in which a building project coalition operates, necessitate an organic structure capable of 'sophisticated innovation' - a structure 'that can fuse experts drawn from different specialties into smoothly functioning creative teams' through collaboration (Mintzberg, 1991(c): 347). They further require a structure that relies on mutual adjustment, as the method of co-operation, facilitated through liaison devices like integrating managers and matrix structures. Such a structure would delegate to the integrating managers the power to make decisions according to need, whilst allowing the experts to decide on the basis of their expertise. It would be decentralised both vertically and horizontally (Ibid.: 348). Yet, based on the literature, the structures of building project coalitions do not appear to create smooth functioning creative teams, partly due to the dearth of collaboration discussed above, and partly because they rely on formal, sequential communication for co-ordination purposes (Tavistock Institute, 1966: 18-22; Shammas-Toma et al., 1998). Furthermore, negotiations for resources between the project management team and the professionals and contractors leads to the possibility of conflict (Sidwell, 1990: 163). This

conflict may be rooted in the competitive forces amongst the participants and the 'political games' they play (Mintzberg, 1991 (d): 372).

The above accounts of the building project coalition structure suggest a question and a hypothesis, respectively: 1) How does the building project coalition structure contribute to the emergence of conflict between the project participants? 2) The building project coalition is organised as a network at the start of the project but may be transformed into a political organisation during the project life-cycle (Mintzberg, 1991 (d): 374; Pfeffer, 1981: 27-9).

Building project coalition culture

Organisational culture is defined in two distinct ways. It is conceptualised either as 'something an organisation 'has'', or as 'something an organisation 'is'' (Legge, 1995: 185). The former concept characterises organisational culture as: shared values and norms learned collectively, through problem solving processes, over time, and established into a valid pattern of basic assumptions to be passed on to future members of the organisation (Deal and Kennedy, 1988: 4, 13-15; Ouchi, 1981: 195; Schein, 1992: 12). According to this concept, the culture of organisations is shaped by both external and internal factors. The business environment is considered as the single, most important influence; whilst the 'values', or standards of achievement, the 'heroes', or the role models, and the 'rites and rituals', or the routines of day-to-day life, are identified as the requisite elements of a strong culture (Deal and Kennedy, 1988: 13-15). Thus the strength of culture is attributed to: the strength of conviction of the organisers; the stability of the group constituting the organisation; the intensity of the group's learning experience; and the quality of the learning process (Schein, 1994: 129). The concept of what an organisation is, regards

organisational culture as: a phenomenon that is 'socially produced and reproduced over time, influencing people's behaviour in relation to the use of language, technology, rules and law, and knowledge and ideas', and which cannot be manipulated or changed; only described and interpreted (Meek, 1988: 293, cited in Legge, 1995: 187).

The instability of building project coalitions' membership, their insufficient shared history of experience, and the presence of many groups with different types of shared experiences is contrary to the conditions required for the creation of a strong culture as defined above. This may provide an explanation for short-termism and conflict-prone nature of interorganisational relations within building project coalitions (for example, Beardsworth et al., 1988; Shammas-Toma, 1998). Short-lived projects and short-term financial concerns are identified as disincentives to the development of long-term relationships, giving rise to an 'aggressive 'winner takes all' project mentality' (Zikmann, 1992: 54). This mentality is reflected in the 'use of threats, financial manipulation and other forms of coercion' which form the context for several types of conflict including: conflicts of interest, structural conflicts, value conflicts, relationship conflicts, and data conflicts (Ibid.).

Observers of social relations in the construction industry also tell a discouraging tale about various participants' views of one another:

> 'I have seen many parties who have low respect for the skills of the other party. I may even venture to suggest that this seems a particular feature of the UK construction scene. Parties who see each other in a shallow way, as stereotypes, will not have much mutual understanding' (Smith, 1992: 32).

The multiorganisational constituency of building projects and the heterogeneity of the participant organisations together imply a variety of cultures based on 'people's different experiences of reality' and the existence of a range of sub-cultures within building project coalitions (Legge, 1995: 187). Therefore whilst a collective consensus, in the form of 'shared values, shared beliefs, shared meaning, shared understanding' (Morgan, 1997: 138), is not likely to arise within project coalitions, the prominence of conflicting dominant sub-cultures is quite likely. One reason for this phenomenon may be attributed to the governance structure of project participants' interorganisational relations. The market transactions between the participants underpin their relationship with 'the power of legal sanction' and place a premium upon the value of the goods or services being exchanged rather than the relationship (Powell, 1990: 301-2). Therefore the participants tend to pursue their individual goals and interests independently and irrespective of those of others. This is contradictory to the functional interdependence of the coalition and creates conflicts of interests within the latter (Tavistock Institute, 1966: 22).

There are similarities and contrasts between the cultural aspects of building project coalitions and those of dynamic networks. The participants in both forms of organisation are heterogeneous. The networks may be formed for short or limited periods to undertake a project, as in the case of research and development networks or joint ventures; or they may be formed for extensive periods, as in the case of industrial districts or long-term partnering arrangements. The basis for the formation of networks is relational contracting involving 'sequential transactions within the context of a general pattern of interaction' (Powell, 1990: 301). The longitudinal nature of interaction in networks allows the potential for the evolution or the establishment of shared values, shared beliefs, shared meaning and shared understanding. Thus a more cohesive culture can exist within

networks which emphasises reciprocity and mutually supportive action rather than the price of goods or services being exchanged. In networks one party is dependent upon the resources controlled by another and there are advantages in pooling of resources (Ibid.: 303). Self-interested behaviour of a participant may result in its removal from the network (Miles and Snow, 1986: 65-6). Networks are formed to improve the competitive advantage of organisations who may independently be competitors.

The above discussion leads to the question: To what extent is a conscious attempt made by the project organisers to create cohesive cultures within building project coalitions? This question needs to be considered in the light of the influence of culture on conflict, since culture may determine the relative frequency of conflicts, the ability of participants to resolve conflicts, and the likelihood of achieving a productive or dysfunctional outcome (Gardiner and Simmons, 1992: 114).

Building project coalition technology

Information is by far the most important material in the building production process followed by the human skill implemented in producing, interpreting and using the information to construct the building product. The flow of information has been likened to the lifeblood of the system in which it circulates (Schein, 1994: 130). The building production process comprises three subprocesses: brief preparation, design, and construction. The flow of information from one sub-process to the next is facilitated by decision-making stages which increasingly reduce uncertainty about the final building product through time (Winch, 1996(a): 3-4).

To the extent that the building production process involves the creation of a prototype, the building project coalition needs to 'learn, adapt, and innovate' (Barlow et al., 1997: 5; Schein, 1994: 130). The state of Information Technology (IT) within the coalition is claimed to determine the coalition's ability to learn through 'informating' (Zuboff, 1988). For instance, an information system that enables the construction of models of critical processes within the coalition will make those processes 'visible and understandable' to the project participants (Schein, 1994: 130). One example of such a system is Computer Aided Design (CAD). However, despite evidence of its increasing use, CAD is criticised on grounds of not allowing for the practicalities of construction and reducing the CAD operator's buildability experience by further separating the design and construction processes (Shammas-Toma, 1998: 187). Therefore the use of technology alone is not likely to improve the flow of information.

As the responsibility for building production is devolved to the designers, engineers and specialist contractors, the need for liaison between them increases giving rise to a greater requirement for integration and co-ordination mechanisms (Johnson and Scholes, 1989: 280). This devolution further necessitates the monitoring and control of the quality of participants' inputs and increases the importance of co-ordination and direct supervision functions (Beardsworth et al, 1988: 607). The question that arises at this point is: What impact does the technology implemented in the production, co-ordination, integration and control of information make on the occurrence of conflict?

2.5 CONFLICT IN THE BUILDING PRODUCTION PROCESS AND ITS IMPACT ON PERFORMANCE

The building production process comprises a number of subprocesses each of which is undertaken by one or more organisations. These organisations are related either contractually or functionally. The potential sources of conflict occur within or between these subprocesses at organisational interfaces (Baden Hellard, 1988). The management of the building production process involves co-ordination, integration, and control of participant organisations' inputs, facilitation of their co-operation, prevention of the occurrence of disputes or their speedily resolution (Baden Hellard, 1992: 35). It involves limiting the deterioration of functional conflict, which is a feature of building project coalitions, (Dodd and Langford, 1990: 395) into dysfunctional conflict. The participant organisations' willingness to co-operate and their propensity for bargaining and competition over financial rewards are subject to the project systems (Gardiner and Simmons, 1992: 112). The latter comprise the selection of the procurement method and interpretation of the contractual conditions, organisation of the building production process, and the quality and control system adopted for the project (Ibid.: 112-5). Potential sources of conflict exist within and between these systems.

Based on the above discussion, the success of building production process management appears to depend on the effectiveness of the project leader, on the one hand, and the project participants' teamwork, on the other. The measure of success is the extent to which the occurrence of dispute or dysfunctional conflict, as opposed to functional conflict, is prevented (Baden Hellard, 1992: 35). This section explores the potential sources of conflict within and between building production sub-processes and project

systems, and considers the potential impact of conflict management upon project participants' performance.

2.5.1 LATENT CONFLICT IN THE BUILDING PRODUCTION PROCESS

The building production process is of a pre-determined and limited duration referred to as the project 'life-cycle' (Sidwell, 1990: 159-61). The process comprises three broad stages: the establishment of the client's requirements and project objectives in the brief; the translation of these requirements and objectives into buildable information in the form of the design; and the implementation of this information into a built form through the process of construction. Each stage contains a number of subprocesses that are potentially conflictual (Gardiner and Simmons, 1992: 112).

The brief preparation stage

The brief preparation stage involves determining the function of the building, in terms of the technical and physical requirements; its aesthetics, in terms of the visual and experiential aspects of the external and internal spaces; its construction and running costs; and its period of construction, in terms of the occupation date. These elements, by their very nature, are conflicting (Baden Hellard, 1988: 7). The technical and physical requirements of the building may be incompatible with the aesthetics desired by the client. These requirements may not be achievable within the budget allocated. They may have higher running costs than that specified or they may not be realisable by the occupation date. Furthermore, the department responsible for funding the project within the client organisation may not approve it and may be in conflict with the department proposing it (Cherns and Bryant, 1984).

These considerations give rise to the following questions: 1) What types of conflict emanate from the brief preparation stage? 2) How do they impact on the participants' level of aspiration, motivation, and willingness to apply initiative and expend effort?

The design stage

The design stage comprises the selection of the design consultants and the production of construction, structural and services information by the consultants based on the client's requirements contained in the brief. The selection of the design consultants is generally based on competitive fee bidding (Latham, 1994: 44-5). This method is onerous both for clients and for consultants. It requires a good brief containing relatively fixed requirements in order to result in a lump-sum fixed fee for the consultants' design services. Whilst it encourages the consultants to submit low fee bids initially in order to secure the contract and attempt to claim for extra work resulting from inevitable variations in the client's requirements during the course of the contract. Competitive fee bidding is held to focus attention on 'issues of contractual liability, thereby undermining the possibility of co-ordination and teamwork' (Shammas-Toma et al., 1998: 185, 189). It gives rise to adversarial relations between the client and the consultants.

Each consulting organisation has its own project objectives and organisational interests which tend to conflict with those of others (Sidwell, 1990: 162, 163). The design process has three elements. The overall spatial configuration or form of the building is developed by the architect/design consultant who specifies the building materials and components based on the client's requirements. The building structure is developed by the structural consultant who specifies the structural system and its performance requirements. The building services is developed by the services engineer who designs the layout and

specifies the performance requirements of the services system. The diverse organisational interests of the consultants, the conflicting elements of the brief and the diversity of a building project's technical requirements, result in conflicting design requirements between different disciplines that need to be resolved as part of the design process. For instance, an overlap may occur in consultants' technical and spatial requirements or their responsibilities (Baden Hellard, 1992: 38; 47). Negotiations involved in the process of resolving conflicts in the client's requirements or between the requirements of other organisations may give rise to a better design solution (Baden Hellard, 1992: 37). In this respect, conflict is 'creative'. However, if these conflicts are not resolved they give rise to acrimony and become dysfunctional.

The foregoing discussion leads to the following questions: 1) What types of conflict emanate from the design stage? 2) How do they impact upon the performance of participants?

The construction stage

The construction stage involves the selection of a main contractor, who in turn selects the specialist and trade contractors required for the production of the building based on the information supplied by the consultants. The selection of the main contractor is carried out through a competitive tender process. The firmness of the tender price is dependent upon the firmness of the client's requirements (Baden Hellard, 1992: 38-9). When these requirements change, the construction cost and time criteria become renegotiable and give rise to conflict between the client and the main contractor (Ibid.). The selection of specialist and trade contractors too is based largely on competitive tendering (Latham, 1994: 61). The changes in the client's requirements may give rise to renegotiations of cost

and time criteria by the specialist and trade contractors and may lead to disagreements and disputes between them and the main contractor. Given the wide range and the large number of construction sub-processes and work packages employed on building projects, it is not hard to imagine the propensity for dysfunctional conflict arising from the construction process.

The construction process has two elements: conformance to the functional, aesthetic, cost and time criteria set out by the brief and conformance to the design. The source of conflict in the first element is changes to the client's requirements referred to above. Conformance to the consultants' design is one of the most contentious areas in the construction process (for example, Latham, 1994: 24). The fieldwork undertaken as part of this study, indicates that the design information produced by the consultants may prove impractical to construct (Chapter 5; Chapter 6). The division of responsibility for design, particularly between the consulting engineer and specialist engineering contractor, contributes to this problem (Latham, 1994: 28). The absence of co-ordinative measures regarding buildability issues broadens the gap between design and construction and exacerbates the potential for conflict between the consultants and the main/specialist and trade contractors (Shammas-Toma et al., 1998: 184). Furthermore, the diverse interests of the specialist and trade contracting organisations together with the numerous work package interfaces give rise to conflicting requirements by these contractors which need to be resolved during the construction process (Dodd and Langford, 1990). Figure 2.6 represents the composition of the building production process. The division lines within each stage represent the areas where dysfunctional conflict may occur.

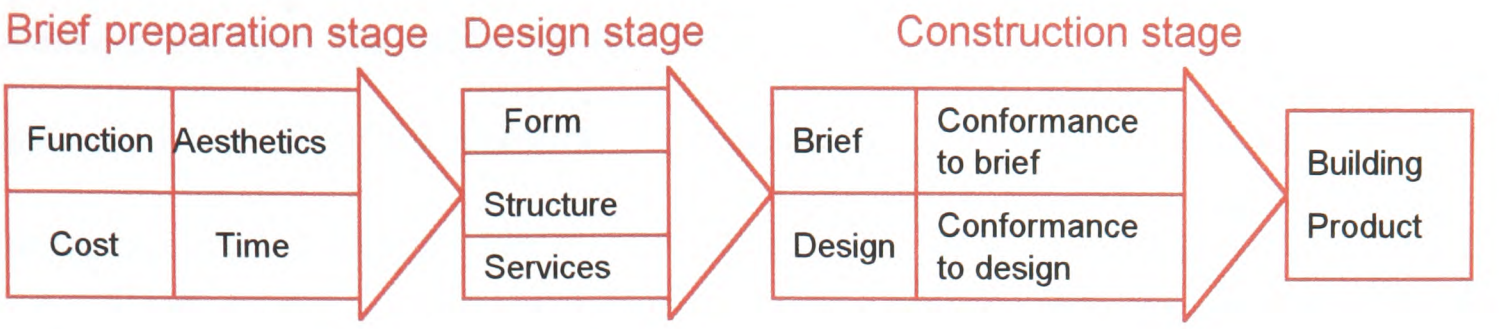

Figure 2.6: Building production process

The purchase of services and products from professional and commercial firms along the building supply chain has significant consequences for the management of building production. The leadership of management team has shifted away from the client's architect to the contractor or the quantity surveyor as project managers (Bresnen, 1996). This shift in project role may contribute to disagreements and disputes between the architect and the project manager as the case studies indicate. Another implication of the current modes of work organisation for building production management has been the increasing delegation of the management function to participant organisations. This has created control problems for project management team and is another source of conflict between managers and producers (for example, Beardsworth et al., 1988).

Based on the foregoing discussion the following questions are posed: 1) What types of conflict emanate from the construction stage? 2) How do they impact upon the performance of participants?

2.5.2 LATENT CONFLICT IN PROJECT SYSTEMS

Management of the building production process begins at the inception of the project and ends with the hand over of the completed building. Although the management tasks for each sub-process are delegated to the organisation leading the sub-process, the project

manager oversees the entire production process (Gardiner and Simmons, 1992: 112; Sidwell, 1990: 159). The literature suggests that the contractual system, establishing the roles and relationships of the project participants, and the management and control systems, co-ordinating and overseeing participants' inputs, set the parameters for destructive conflict in interorganisational relations in building project coalitions (Gardiner and Simmons, 1992).

Contractual system: Procurement methods and contractual relations

The client's selection of a procurement method sets the framework for the building project coalition to meet its construction requirements. The procurement method defines the contractual relations between the coalition participants and allocates their roles and responsibilities for the duration of the project (Masterman, 1992: 1; Winch, 1996(b): 16). The contractual relations and the participants' responsibilities establish hierarchical and lateral relations between them giving rise to the network configuration of the coalition (see sub-section 2.4.1, above).

A wide array of procurement methods are implemented by clients to construct buildings. They are either based on standard forms of contract, amended to suit the client's purposes, or are custom-made forms produced by the client for the particular project in question or the types of project constructed on a regular basis. The procurement methods generally used divide into three broad bands: separated or co-operative, integrated, and management oriented, based on the degree of separation or integration of design and construction processes they provide (Masterman, 1992). This study is concerned with the separated and the integrated methods.

The most commonly used method in Britain is the separated or the traditional system (Masterman, 1992: 19, Chapter 3). This method entails the selection by the client of a design team and a main contractor based on competitive fee bidding and tendering processes, respectively. The contractor's bid is often prepared on the basis of the client's specifications - design, performance criteria and construction methods - generally put together by architects and engineers (Eccles, 1981: 451). The specifications provide information regarding the type of specialities and labour skills required on the project and form the basis for both hiring specialist and trade contractors by main contractors and hiring labour by specialist and trade contractors. The traditional method establishes contractual relations between the client and the design team; the client and the main contractor; the main contractor and the specialist and trade contractors; and the specialist and trade contractors and their subcontractors and labour-only subcontractors (Masterman, 1992: 25), as represented in Figure 2.7.

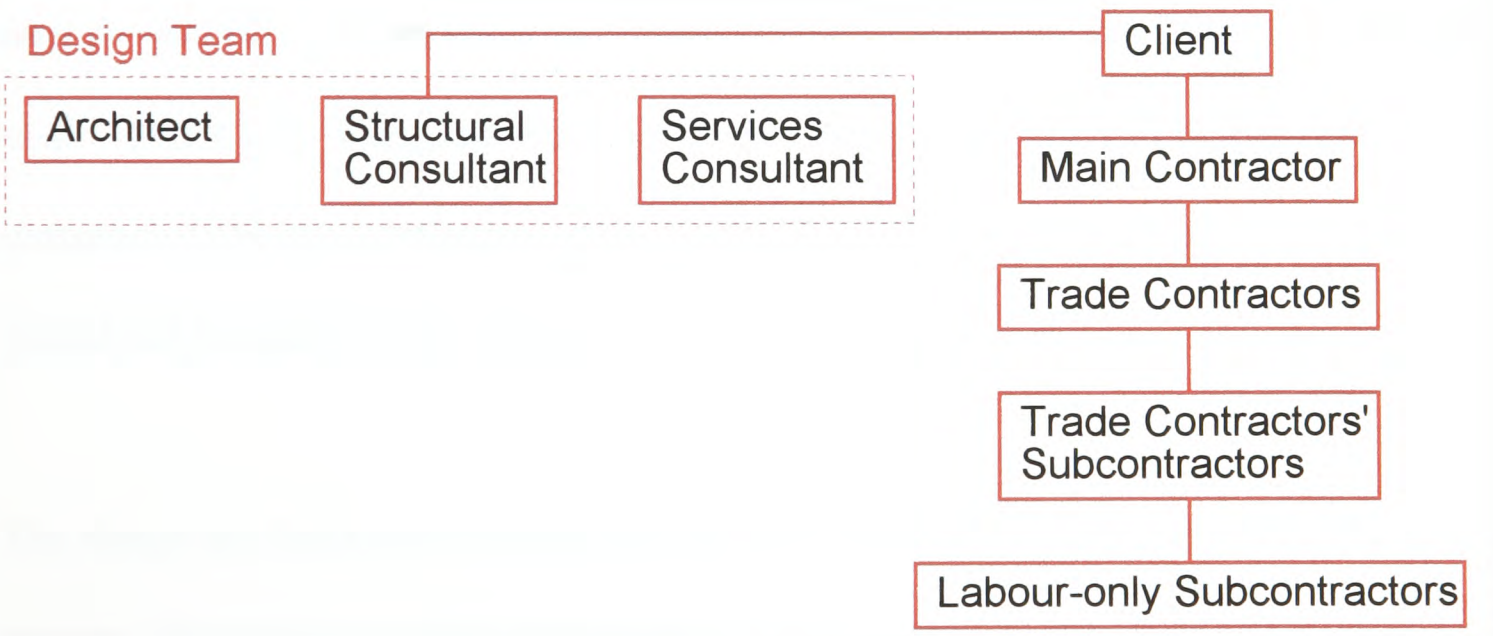

Figure 2.7: Contractual relations in the traditional procurement method

The sources of conflict in this method are ascribed to poor teamwork. Poor teamwork arises from poor communication, uncertainty and disagreements. 'Tenuous or non-

existent' communication links between the project participants fail to establish 'team' attitudes towards the production task (Lewis et al., 1992: 74). The weakness of communication links is, in turn, associated with the mutual independence of the project participants which results from the institutionalisation of their roles (Tavistock Institute, 1966: 45; 44; see also Ball, 1988: Chapter 4). The uncertainty surrounding the client's requirements, the design and the building construction is recognised by all the project participants. However, the responsibility for it is passed on by one participant to the other. (Tavistock Institute, 1966: 51). The disagreements amongst the design consultants have already been discussed (see sub-section 2.4.1, above). Those between the design consultants and the main contractor are the result of renegotiations arising from variations in the contract and buildability problems (Baden Hellard, 1988: 8; Masterman, 1992: 49). The disagreements between the client and the main contractor arise due to the conflict between the project objectives and the organisational goals of the contractor. Those between the main contractor and the specialist and trade contractors are often caused over the payment of extra items, or the late payment of interim instalments, etc. (Langford et al., 1992: 64-5). The disagreements amongst the specialist and trade contractors are the outcome of the poor definition of the boundaries of their corresponding work packages (Dodd and Langford, 1990: 393-4).

The design and build procurement method is the most prominent amongst the integrated systems. The most appealing characteristic of this method to the client is the single point of contact established by selection of a main contractor responsible for both design and construction of the building. The selection is based on a competitive bid prepared on the basis of the client's requirements which may vary in the extent of design detail. The contractor organises the design and construction activities by implementing: 'pure design

and build', whereby it supplies both design and construction expertise contained in-house; 'integrated design and build', when it buys in design expertise in addition to the in-house resources; or 'fragmented design and build', when no in-house design expertise exists and the contractor buys it in on a project-basis to be able to undertake design and build projects (Masterman, 1992: Chapter 4). The design and build procurement method establishes contractual relations between the client and the main contractor; the contractor and the design team; the contractor and the specialist and trade contractors; and the specialist and trade contractors and their subcontractors and labour-only subcontractors (Masterman, 1992: 59). These relationships are represented in Figure 2.8.

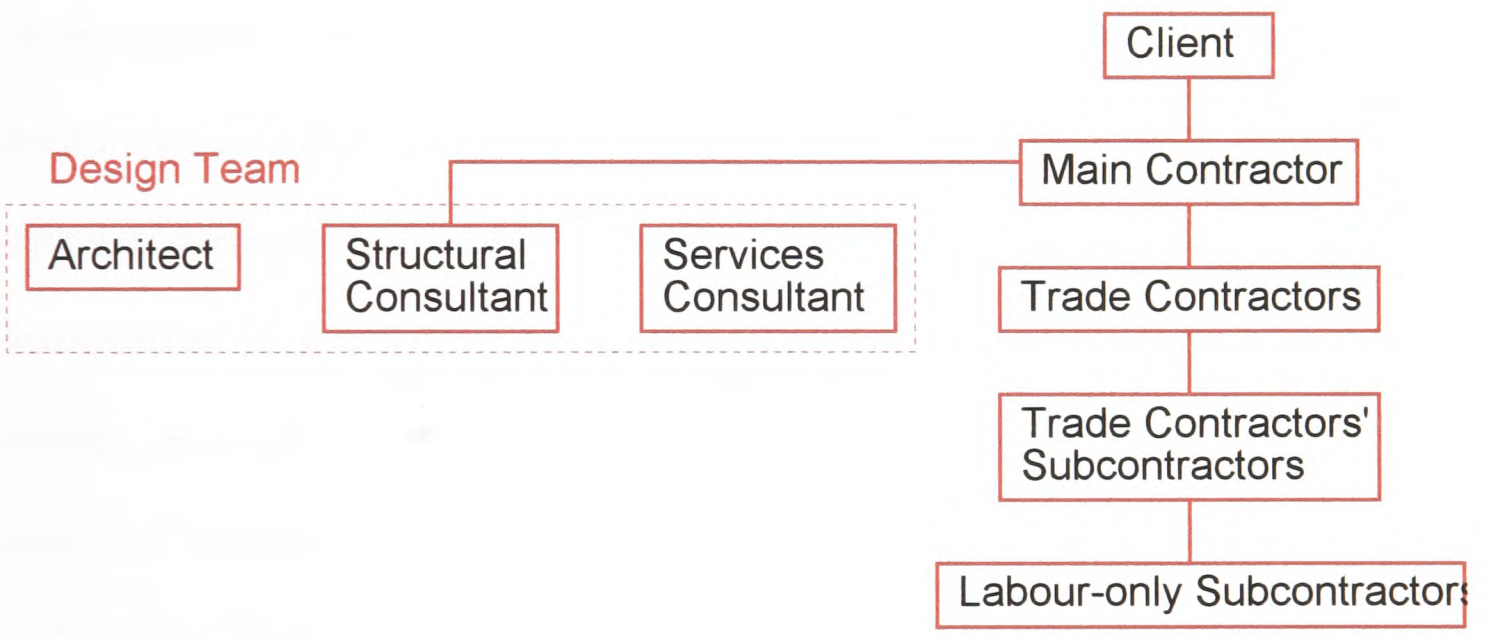

Figure 2.8: Contractual relations in the design and build procurement method

Despite claims that the design and build procurement method fosters a more co-operative relationship (for instance, Grout, 1991), some researchers consider that both functional and dysfunctional conflict exist to equal measures in this method as they do in the traditional method (for example, Smith, 1992: 33). This consideration leads to the question: What, if any, is the link between the procurement method implemented and intracoalition conflict?

The sources of conflict in this method are attributed to ineffective co-ordination and quality of built product (Shammas-Toma, 1998: 186). The general trend seems to be for contractors to subcontract the design to consultants based on competitive tendering. Therefore the production of design details are not generally undertaken by consultants until they have been awarded the job. This shortens the time available to contractors to consider the buildability of the design. Furthermore, as the main reason for adopting the design and build procurement method is financial, the quality of the building may not live up to expectations (Ibid.: 187).

The literature suggests that the occurrence of conflict is not necessarily related to the type of procurement method adopted. It is more fundamentally related to the contractual system that describes and governs the building production process (Clegg, 1992). The contract documents, irrespective of the procurement mode they represent, merely construct an 'ideal model' of the building project coalition which is 'unreal: it does not actually exist' (Ibid.: 133-4). Therefore they cannot and do not provide ways of dealing with the 'uncertainties' of every day life in the coalition. Furthermore, owing to the 'indexicality' of the contract documents and the role diversity of the coalition participants, the contract documents are interpreted differently and very often in a self-interested way (Ibid.: 134-5). One instance where the contract indexicality, the role diversity of the participants and the uncertainties of the building production process combine to create conflict, is exemplified by the participants' 'role ambiguity' (Dodd and Langford, 1990). Based on the indexical and unreal attributes of contracts, Clegg goes on to theorise that: 1) '[C]ontractual documents provide the constitutional and constitutive grounds and framework within which the meaning of the contract is negotiated, contested, and sometimes contained' (1992: 135). 2) Conflict is an outcome of the 'functioning of

power/knowledge relations on construction sites.' Manifestations of conflict represent 'the strategies of power of the participants in the site organisation seeking to maintain control over costs and profits' (Ibid.: 139). These theories seem to be compatible with the second hypothesis formulated in subsection 2.3.1 above, and will constitute the third and fourth hypotheses of this study.

Subcontracting relations

Owing to the separation of design and construction activities, the responsibility for the production of each process may be devolved to separate entities of designers and contractors. Therefore subcontracting of activities may include subletting any one or combination of the constituent elements of the design process, for example, design of the form, structure or services (see Figure 2.7). It may also include any one or combination of the inputs in the construction process such as: hiring the workforce; hiring the workforce, equipment and materials; hiring the plant; or hiring the workforce, plant, and the purchase and assembly of materials (Ball, 1988: 91).

The subletting of design work was established in the nineteenth century with the phenomenon of professionalisation (Ball, 1988: Chapter 4). The subletting of construction work by the main contractor has been ascribed to: the 'span' of the type of work it undertakes, the 'short-term overload' in the main contracting firm, the inconvenience of a project's geographical location, or the main contractor's 'lack of specialist capability' (Hillebrandt and Cannon, 1990: 138). Accordingly, four types of activities or inputs may be subcontracted: fix only; supply and fix; design, supply and fix; and design, manufacture, supply and fix (Gray and Flanagan, 1989: 11). The provision of these inputs - by a specialist or a trade contracting firm to a main contracting firm - which are then

incorporated into the final building product, constitutes a subcontracting relation (Thoburn and Takashima, 1992: 1).

The nature of the subcontracting relation, in terms of its independence from or relative dependence on the contractor, is governed by the degree of subcontractor's control over the four phases of the work process: 'product conceptualisation, design process, work organisation, and production' (Druker and Macallan, 1995: 53 based on Chaillou, 1977). Based on these criteria, three subcontracting relations may exist in the context of building project coalitions: speciality subcontracting, which involves responsibility for conceptualisation and design of certain aspects of the project; supplier subcontracting, which involves responsibility for design, work organisation and production; and capacity subcontracting, which involves responsibility for production in accordance with specific instructions to meet demand (Druker and Macallan, 1995: 53-4; Rainnie, 1992: 55; Thoburn and Takashima, 1992: 13, 2). Consideration of the subcontracting relation prompts the question: To what extent does the subcontracting relation contribute to the emergence of conflict between the contracting parties?

The Japanese dimension

In view of the success of Japanese interfirm networks, low levels of dispute and conflict in Japan's construction industry and major Japanese construction firms winning an increasing share of the international construction market, a Japanese dimension is added to this research for comparative purposes (Bennett et al., 1987: 7; Edwards and Samimi, 1997; Fellows, 1992: 126). This is done through the study of a building project procured by a major Japanese contracting firm. The comparative study is aimed at exploring whether Japanese management methods succeed in avoiding or containing conflict, in the

context of the British construction industry? If these management methods succeed, they may provide useful lessons.

There are six major contractors in Japan which operate identically in terms of providing construction services, and recruitment and training of staff (Bennett et al, 1987: 26-52). Their services range from finding construction sites for clients, helping to arrange the required finance and then designing to constructing and maintaining high quality buildings and engineering products. They tend to have long-term relations with major clients and negotiate or bid for projects on the basis of considerable detailed design, and construction works budgets and schedules. Upon entering a contract both contractors and clients, guided by 'a Confucian sense of social obligation' (Ibid.: 33), tend to sustain their long-term relationship. According to the authors claims for loss and expense are rare. If, however, a contractor demonstrates incurring extra costs despite performing well, adjustments to the contract sum are negotiated between the contractor and the client. The outcome of these negotiations is dependent upon the bargaining power of the parties.

The procurement of a project, once a bid is won, starts with attempts to control the construction process through construction works planning, scheduling, quality control, safety and committing the site work-force to the project's success. The major contractors tend to have long-term relationships with their specialist and trade contractors and suppliers, some of whom work exclusively for the contractor within a network of 'shita-uke' (Porter, 1990: 407-8). The contractors in turn belong to groups of affiliated companies or 'keiretsu' (Powell, 1996: 58; Porter, 1990: 408).

Project management and control systems

Management of the building production process, similar to all other management activities, involves planning, organising, leading and controlling humans, materials, machines, methods and financial resources. The humans also require motivating (Baden Hellard, 1988 : Chapter 4). These management functions are generally carried out by the project manager or the project team. The combination of management functions and skills and the leadership styles required to carry them out vary at every stage of the building project life-cycle owing to the differing environmental conditions and management problems (Sidwell, 1990: 159-60). At the brief preparation stage, the influence of external factors like the investors, the owners/operators, the local planning authority, the community or pressure groups, etc. require 'flexibility, awareness, entrepreneurial skill and political perspicacity' (Ibid.: 160). The management functions include: planning decisions based on the client's likely future requirements, organisational decisions, and leadership decisions. The planning decisions determine the function, aesthetics, cost and time elements of the project. The organisational decisions concern the selection of project participants and the extent of their management responsibilities. The leadership decisions comprise the overall management of the project coalition including the motivation and control of the project participants (Baden Hellard, 1988: 43). Therefore the manager needs to adopt a high relationship/high task leadership style (see Section 2.3; Figure 2.4).

At the design stage, the influence of various consultants, the planning authority, building by laws, etc. require liaison, co-ordination and negotiation skills and the ability to cope with bureaucracies (Sidwell, 1990: 160). The management activities at this stage comprise: delegating the responsibility for the design development to the consultants, co-ordinating and controlling the four facets of function, aesthetic, cost and time stipulated

by the brief, and stimulating the consultants (Baden Hellard, 1988: 44). At the construction stage, the influence of manufacturers, suppliers, labour, etc. require monitoring, control and leadership skills (Sidwell, 1990: 160). The management function at this stage includes: programming and planning of activities, selection and appointment of specialist and trade contractors, recruitment of labour, control and supervision of the participants and the workforce (Beardsworth et al., 1988: 612-17). The most appropriate leadership styles at these stages may be both high relationship/high task and low relationship/high task (see Section 2.3; Figure 2.4). The choice of style is contingent upon the situational factors discussed in Section 2.3. Based on this discussion, the following question arises: To what extent does the project manager's leadership style create conflict amongst the participants?

The flow of management authority varies at every stage of the project life-cycle and is related to the emergence of disputes. At the brief preparation stage, it is both downwards from the client to the project manager and upwards from the project manager to the client. The downward flow is related to the client's contractual position. The upward flow represents the project manager's responsibility to manage the client's requirements in an order of priority (Baden Hellard, 1988: 43). At the design stage, the management flow is downwards from the project manager to the consultants and inwards from the consultants over their operation work tasks. This downward flow is supposed to remedy the 'sideways management' situation arising from the equal status of the consultants which may lead to conflicts of their functional requirements (Baden Hellard, 1988: 46-7). At the construction stage, the flow is downwards from the contractor to the specialist and trade contractors and upwards from the contractor to the project manager (Baden Hellard, 1988: 47-8). In the design and build procurement method the main contractor undertakes

the project management functions. The management flows within the three stages of the building production process are represented in Figure 2.9.

Management flows within the brief preparation stage

Alternative management flows at the design stage in the traditional and design and build procurement methods

Alternative management flows at the construction stage in the traditional and design and build procurement methods

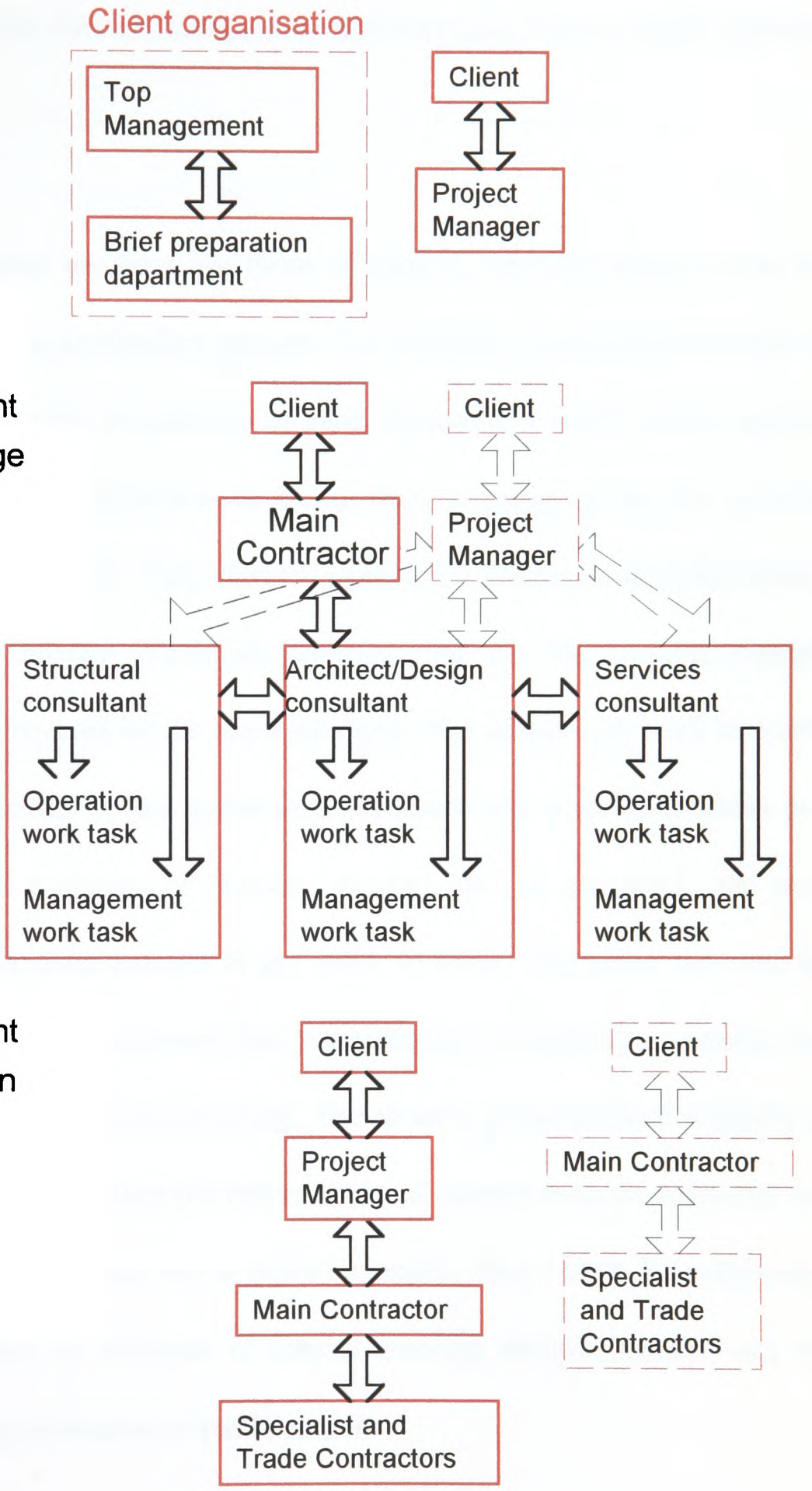

Figure 2.9: Management flows at the three stages of the building production process in the traditional and design and build procurement methods

The divisions within the management flow between the client and the professional project manager and between the latter and the commercial contractor are said to be at the root of many disputes (Baden Hellard, 1988: 37). The question that arises at this juncture is: How do divisions within the flow of management authority give rise to conflict between the project participants?

By far the most fundamental divisions are those of control, resulting directly from the fragmentation of the building production process. For example, the regimentalisation of the design functions within the boundaries of each consultant's remit creates narrow visions of the design problem and leads to each consultant guarding against the intrusion by others' functional requirements. This militates against the functional interdependence of the building production process (Tavistock Institute, 1966: 44, 45). Another example of fragmented control is provided by the site operations. The division of work into self-contained packages undertaken by the autonomous specialist and trade contractors in a sequential manner creates problems of 'activity density', on the one hand, and poor workmanship, on the other (Beardsworth et al., 1988: 614-16). This raises the need for greater supervision by the site management thus contradicting the financial economies that constitute one of the reasons for subcontracting. The absence of hierarchical authority of the site management, however, makes the enforcement of control over the specialist and trade contractors' workforce difficult and at times impossible (Ibid.: 616). This discussion leads to the question: How do divisions of control amongst design functions and site operations impact on the performance of participants?

Management of conflict in the building production process

The foregoing discussion identified the areas within the building production process where conflict inducing factors occur. To facilitate the smooth operation of the process and the harmonious relations of the project participants, the management team must either keep these factors under control to prevent the emergence of disputes, or effectively respond to them once they have arisen (Zikmann, 1992: 54).

To keep conflict inducing factors under control, collaborative skills are required. These skills are regarded as significant pre-requisites for teamwork and are said to play a decisive part in managing conflict constructively by turning varied solutions and arguments into more effective and comprehensive decision-making and problem-solving processes (Guirdham, 1990: 3). Destructive conflict can turn discussions into contests and can lead to ineffective or no solutions, as well as destroying working relationships (Ibid.). Japanese style of management is exemplified for its collaborative orientation, emphasis upon relationship skills - developing subordinates and supporting supervisors, and co-operation rather than individual performance (Ibid.).

Based on the discussions in this chapter, it is pertinent to consider: What conflict management methods are implemented by project managers and how they impact on participants' performance?

Conflict resolution and its impact upon performance

Conflict resolution depends upon the effectiveness of project planning and advance consideration of possibilities or likelihood of conflict as well as on the project manager's response to conflict. The project manager's response to conflict is similar to those of

negotiators discussed in Sub-section 2.4.2. The effectiveness of project planning is contingent upon risk management. Risk management is considered the most important duty of a project manager (Lewis, Cheetham and Carter, 1992: 80). Risk management techniques should be applied at the early stages of a project when the potential for management and control is greatest (Ibid.). Risk management is said to take place through three phases of identification, analysis, and response. Risk identification involves establishing the risks which are likely to cause the most serious threat to project success. This is done by thinking through the project, anticipating the problems and considering solutions. Risk analysis comprises the quantification of the effects of anticipated risks on the project. Risk response is based on the consideration of avoiding, reducing, retaining, or transferring risk (Ibid.: 80-81). Risk transfer and allocation are carried out through the contract, by means of cost-contingencies, or through insurance, by means of insurance premiums. The question that emerges from this discussion is: What conflict management methods are implemented by project managers and how do they impact on the participants performance?

2.6 CONCLUSION

This chapter explores the nature of the link between conflict and productivity problems by considering the relationship between productivity and determinants of behaviour and performance. It thus establishes the premise for investigating why the link occurs by

relating conflict to the factors influencing behaviour and performance. This relationship is represented in Figure 2.10.

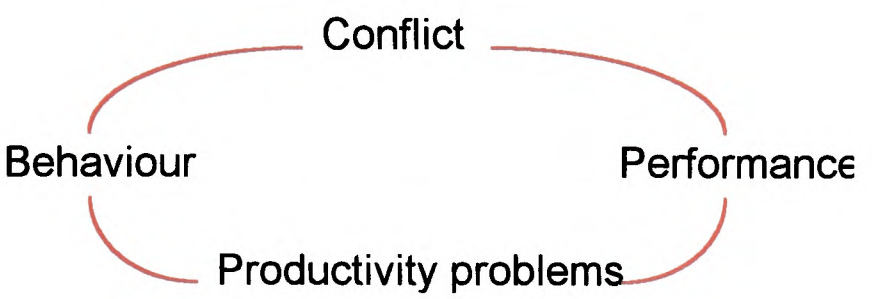

Figure 2.10: Relationship between conflict, behaviour, performance and productivity problems

Project goals, organisational goals, power, political activity, and trust are identified as the factors which influence and determine M&E contractors' behaviour at both the macro level of the organisation and the micro level of the individual. At the macro level, power relations may give rise to dominance and resistance, or authority and illegitimate resistance. Power may be used to prevent conflict by implementing 'responsible autonomy' or 'direct control' strategies; or it may be used to defeat conflict. Trust as reliability and a basis for co-operation in interorganisational relations may develop on a calculative basis, it may be used as an impression to manipulate the opposite party, or it may disguise capitulation by the weaker party. On the other hand, it may constitute a risk-reducing mechanism used to create predictability in the behaviour of parties to avoid conflict. At the micro level, one party may influence the other through: compliance, by using reward or coercive powers; identification, by using referent power; and internalisation, by using expert, legitimate or informational power. Relations may give rise to dominance and resistance, or authority and illegitimate resistance. The source of one party's power over the other is attributed to: control over resources, ties to resource

controllers, combination of situational factors and power holder's characteristics, and formal authority. Trust in interpersonal relations may develop on similar bases to those in interorganisational relations. It is manifested in: the delegation of responsibility and control, discretion or prescription in work roles, and task-centred/function-centred transaction rules. Power and trust in interpersonal relations may be used to prevent, defeat or avoid conflict.

The past success on previous projects, the level of aspiration of representatives, and the motivation and willingness of representatives to apply initiative and effort constitute the factors which determine M&E contractors' performance. The latter aspect of performance is influenced by both extrinsic factors, like reward and punishment, and intrinsic factors, like job satisfaction. Amongst the intrinsic factors, leadership makes a major contribution to the motivation of group members. The combination of leadership styles and situational requirements give rise to the level of trust between group members and the leader, the level of task definition, the level of leader's authority, and the level of the group's ability to set realistic goals and to accept responsibility for the outcomes. The leader's three roles of motivating the group members, encouraging their participation in decision-making, and forging them into a team play an important part in the performance of the group members.

The link between conflict and productivity problems in building project coalitions is established by defining the concept of conflict, identifying its sources in project participants' interorganisational and interpersonal relations, and considering the potential impact of conflict on participants' performance in the building production process.

Consideration of the above issues gave rise to subsidiary questions and hypotheses that were used to guide data collection and analysis during fieldwork. These questions and hypotheses - distinguished by the letters Q and H before the question or hypothesis number - are categorised thematically below.

2.6.1 CONFLICT AND ITS RELATION TO BEHAVIOUR AND PERFORMANCE

This theme contains the questions relating to the emergence of both creative and dysfunctional conflict in building project coalitions, and their impact on the behaviour and performance of project participants (see pp. 37-8).

Q1) Why does conflict arise in building project coalitions?

Q2) Why does it become dysfunctional?

Q3) How does it affect the behaviour and performance of the parties in building project coalitions?

These questions correspond to the three research questions posed in Chapter 1. They are elaborated further under the themes of contractual/interorganisational conflict, operational/interpersonal conflict, management of conflict, and impact of conflict on performance.

2.6.2 CONTRACTUAL/INTERORGANISATIONAL CONFLICT

This theme aggregates the questions relating to the emergence of conflict attributed to the contractual framework (pp. 60, 63-4), the building project environment (pp. 43), project coalition structure (p. 46), culture (p. 49), and technology (p. 50), on the one hand; and the questions relating to various forms of trust in the project participants' exchange

relations (pp. 21, 22, 23), on the other. The questions address research questions 1 and 2 posed in Chapter 1.

Conflict attributed to contractual framework

Q4) What, if any, is the link between the procurement method implemented and intracoalition conflict?

Q5) Do Japanese management methods succeed in avoiding or containing conflict in the context of the British construction industry? (This question applies to the second case study, only.)

Conflict attributed to building project environment

Q6) To what extent does the project environment contribute to the emergence of conflict between the project participants?

Q7) What power strategies and tactics are adopted by the participants?

Conflict attributed to project coalition structure

Q8) How does the project coalition structure contribute to the emergence of conflict between the project participants?

Conflict attributed to project coalition culture

Q9) To what extent is a conscious attempt made by the project organisers to create cohesive cultures within building project coalitions?

Conflict attributed to project coalition technology

Q10) What impact does the technology implemented in the production, co-ordination, integration and control of information make on the occurrence of conflict?

Trust in project participants exchange relations

Q11) To what extent does trust, as 'reliability', feature in the exchange relations of project participants? Is it underpinned by calculation?

Q12) To what extent does trust as predictability enter the project participants' relations? Is it underpinned by legal sanctions?

Q13) To what extent are impressions of trust created through power-induced predictability and capitulation? Are these impressions based on domination and dependency, respectively?

2.6.3 OPERATIONAL/INTERPERSONAL CONFLICT

This theme combines the questions relating to the emergence of latent conflict at brief preparation, design and construction stages (pp. 53, 54, 56), on the one hand; and conflict arising from project management and control systems (pp. 66, 36, 68), on the other. The questions address research questions 2 and 3 posed in Chapter 1.

Latent conflict at brief preparation stage

Q14) What types of conflict emanate from the brief preparation stage?

Q15) How do they impact on the participants' level of aspiration, motivation, and willingness to apply initiative and expend effort?

Latent conflict at design stage

Q16) What types of conflict emanate from the design stage?

Q17) How do they impact upon the participants' level of aspiration, motivation, and willingness to apply initiative and expend effort?

Latent conflict at construction stage

Q18) What types of conflict emanate from the construction stage?

Q19) How do they impact upon the participants' level of aspiration, motivation, and willingness to apply initiative and expend effort?

Conflict arising from project management and control systems

Q20) To what extent does the project manager's leadership style cause conflict?

Q21) How effective can leadership be in motivating group members, encouraging their participation in decision-making, forging them into a team, avoiding or managing conflict and having a positive impact on the participants' performance?

Q22) How do divisions within the flow of management authority give rise to conflict?

2.6.4 MANAGEMENT OF CONFLICT AND ITS IMPACT ON PERFORMANCE

This theme groups the questions relating to the way interorganisational and interpersonal conflict is handled and/or resolved (pp. 43, 70) and links them to the participants' performance. The questions address research question 2, and 3 posed in Chapter 1.

Q23) How do the power strategies adopted by the participants impact on conflict handling, and on the resolution or escalation of conflict and the participants' performance?

Q24) What conflict management methods are implemented by project managers and how do they impact on the participants' performance?

The above questions help the investigation of conditions on the basis of which the truth or falsity of the following hypotheses is asserted.

H1) '[C]ontractual documents provide the constitutional and constitutive grounds and framework within which the meaning of the contract is negotiated, contested, and sometimes contained' (Clegg, 1992: 135; see p. 61).

H2) Conflict is an outcome of the 'functioning of power/knowledge relations on construction sites.' Manifestations of conflict represent 'the strategies of power of the participants in the site organisation seeking to maintain control over costs and profits' (Clegg, 1992: 139; see p. 61-2).

H3) The building project coalition is organised as a network at the start of the project but may be transformed into a political organisation during the project life-cycle (Mintzberg, 1991 (d): 374; Pfeffer, 1981: 27-9; see p. 46).

CHAPTER 3 RESEARCH METHODOLOGY AND ANALYTICAL FRAMEWORK

3.1 INTRODUCTION

The review of productivity literature, the nature of the research questions emanating subsequently, and the conceptual framework linking productivity to behaviour and performance, pointed towards a qualitative research orientation and design. The early case visits, indicated the importance of social issues like power disparity, politics, and trust in interorganisational and interpersonal relations of project participants and their representatives. These indications led to further reviews of literature in the corresponding areas, and the emergence of sub-questions which constituted the framework for data collection.

This chapter is organised in two sections. Section 3.2, discusses the research methodology by explaining the paradigm selected, the strategy adopted and the design of the investigation procedure. Section 3.3, considers the analytical framework by describing the data analysis methods, and drawing conclusions with theoretical implications.

3.2 RESEARCH METHODOLOGY

Based on the research design literature, there are two paradigms for carrying out research, the quantitative and the qualitative. The quantitative paradigm assumes only one reality which constitutes the truth being investigated, and which can be viewed and measured objectively and independently of the researcher (Creswell, 1994: 4). It assumes that the facts of the investigation can be extracted and reported from the evidence collected allegedly without value judgements and that the research findings are based on established and well defined concepts and variables (Ibid.: 5-7). The qualitative paradigm, on the other hand, accommodates several realities constructed subjectively by the informants and the researcher, and influenced by the researcher's interactions with and interpretations of the situation being investigated (Stake, 1995: Chapter 3). It leads to the emergence of definitions that evolve from value-laden information during the course of the investigation (Ibid.).

The quantitative paradigm or methodology comprises a theory or a hypothesis selected prior to the investigation and proposed to be tested, a definition of the unit of analysis and the variables, the measuring tools, the testing, and the verification processes (Jankowicz, 1995: 89). It is based on a deductive logic, or the principle of cause and effect and is used both to understand and explain phenomena through references to theories, and to contribute to those theories through development of generalisations (Creswell, 1994: 7). The qualitative methodology involves investigation of complex problems that are multi-disciplinary in nature and arise from social rather than technical and scientific issues (Jankowicz, 1995: 90-93, 95-99). It is based on inductive logic and uses large units of analysis as settings in which situations unfold to allow the emergence of patterns or

theories which may explain the phenomena being investigated (Creswell, 1994: 7; Stake, 1995: Chapter 3).

Both quantitative and qualitative methodologies may be used to discover or generate a theory - referred to as grounded theory - through the comparative analysis of social units of any size (Glaser and Strauss, 1967: Chapter 1). The comparative analysis process comprises 'joint collection, coding, and analysis of data' drawn from documentary or empirical evidence (Ibid.: 43, Chapter 2). The main criticism of grounded theory concerns its problem of credibility ascribed to 'unsystematic', 'impressionistic', and 'exploratory' characteristics of qualitative methods, and 'sloppy' or 'unsophisticated' nature of flexible quantitative methods used to arrive at a theory (Ibid.: Chapter 9). The advantage of the theory is related to the varied insights it facilitates from which theoretical conceptualisations may be derived (Ibid.: Chapter 11).

3.2.1 RESEARCH STRATEGY

The selection of a paradigm for the research process is ascribed to a number of factors such as the researcher's worldview, training and experience, and psychological attributes as well as the nature of the problem and the audience for the study (Ibid.: 9). This study bases the selection of the paradigm on the nature of the research problem. In so far as the latter is concerned with understanding relationships and social consequences, it is exploratory and is therefore investigated by describing the scenarios in which the relationships are embedded and by analysing the situations that give rise to the social consequences (Jankowicz, 1995: 98). In other words, the research problem is investigated by adopting a qualitative approach (Ibid.).

In the domain of qualitative research, a broad range of strategies govern approaches to investigation. These include ethnographies, phenomenological studies, histories, case studies, and multisite case studies (Creswell, 1994: 11-12; Marshall and Rossman, 1995: 40). Before discussing the criteria for selection of a strategy, a brief summary of each strategy is outlined below.

Ethnographies, phenomenological studies, and histories

Ethnographies are in depth studies of particular aspects of a society, culture or group, through participant observation over lengthy periods of time (Bell, 1987: 7-8). They are not based on theoretical models (Yin, 1994: 14). Instead, they facilitate recognition of common problems, by members of similar groups, and present potential ways of resolving them (Bell, 1987: 8). The main criticism of ethnographic studies is their problem of representativeness and generalisability (Ibid.).

Phenomenological studies are in depth studies of shared human experiences and the way these experiences are structured to form worldviews (Marshall and Rossman, 1995: 82). They involve descriptions of a small number of people, studied over extensive and prolonged periods of time, with the purpose of developing 'patterns and relationships of meaning' (Creswell, 1994: 12). They comprise a continuous analytical process comprising clarification of the researcher's preconceptions and biases, identification of the phenomenon being investigated, and synthesis of the patterns and relationships of meaning into structures of experience (Marshall and Rossman, 1995: 82-83).

Histories are accounts of past events based on primary or secondary sources of data comprising testimonies of eyewitnesses, documents, records, etc., or reports based on

eyewitness accounts, respectively (Marshall and Rossman, 1995: 89). The data may be collected by utilising a range of techniques from in depth interviews to study of archives (Ibid.: 40).

Case studies and multiple case studies

Case studies are all-encompassing or holistic studies of contemporary events or phenomena within their real-life contexts (Yin, 1994: 13). They involve the collection of a wide range of data, both qualitative and quantitative, the nature of which may be guided by the review of theoretical literature (Ibid.). Case studies are criticised on the basis of their lack of vigour, the impact of the researcher's bias on the direction of the findings and conclusions, their problem of generalisation, and the cumbersome data they generate (Ibid.: 9-10). Multisite, multiple, or comparative case studies are considered as variants of case studies in terms of design or selection criteria, and are distinguished from them on the premise of each case serving a distinct purpose in the overall process of inquiry (Ibid.: 14).

The selection of a strategy for investigation is attributed to the level of analytic interest, i.e., whether individual, group, organisation, or interorganisation; the informational adequacy and efficiency of the method, i.e., whether it enables the research questions to be investigated thoroughly and within the available time; and the theoretical framework (Marshall and Rossman, 1995: 42). It is moreover related to three conditions: 1) the type of research questions and the nature of the study; 2) the investigator's control, or lack of it, over behavioural events; and 3) the focus of the investigation on contemporary/historical events (Yin, 1994: 4).

In this study, two levels of analytic interest emanate from the research questions, interorganisational and individual. The research questions necessitate the study of context specific behaviour, processes, relationships, and interactions incorporating complex and unknown variables. Therefore they need to be explored within their real life situations and explained in terms of contextual variables identified during the research process (Ibid.: 43-4). Because the research findings are aimed at answering questions rather than testing or verifying theories and hypotheses, and in so far as they may give rise to generalisations drawn from recurrence of certain activities, problems or responses, the research adopts a qualitative, multiple case study approach.

The exploratory and explanatory nature of the research established above and suggested by the 'why' and 'how' type research questions posed, suggest ethnography, history, case study and multiple case study strategies (see Marshall and Rossman, 1995: 41; Yin, 1994: 6-7). Lack of participation in the research process and absence of control over behavioural events, eliminate ethnography from the list of potential strategies. Furthermore, the contemporary focus of the research, which is an implicit feature of the research questions, removes history from the above list of strategies. To examine the extent of contextual impact on behaviour, processes, relationships and interactions, multiple case studies are selected with each case presenting a different operational framework.

3.2.2 RESEARCH DESIGN

The design of multiple case studies is generally based on the logic of 'replication' (Yin, 1994: 45). Replication involves selection of cases to support the prediction of conditions under which certain phenomenon does or does not take place. Accordingly, replication

may be literal or theoretical, respectively (Ibid.: 46). The design process starts with the formulation of research questions, and involves the definition and selection of cases, identification of data sources, outline of data collection techniques, proposals for validation of data, access arrangements and consideration of confidentiality (Stake, 1995: 51-4).

Definition of cases

The cases, in the context of this study, comprise portions of building project coalitions. They present the real life situations in which the context specific behaviours of main and mechanical and electrical (M&E) contractors, the building production management processes, and the interpersonal relations and interactions of the contracting organisations' representatives are studied. The cases are bounded by contractual interfaces between clients and main contractors and those between main contractors and M&E contractors. The key problems anticipated at the outset were those of access to all the parties involved, and inhibitions to open communication with the parties' representatives which might affect the data collected. The major events to be observed were identified as site meetings between main and M&E contractors where the actors could be watched in situ so that their power relationships, the politics they engaged in, and the existence, nature, or absence of trust in their interactions could be studied.

Selection of cases

The cases were selected, firstly, to facilitate understanding the problems that arise from real life situations discussed above, and their impact upon main and M&E contractors' performance and productivity. Secondly, they were expected to lead to assertions or modifications of generalisations about main and M&E contractors' behaviour,

performance, and productivity presented in the literature. To facilitate understanding the above problems, the cases needed to be diverse so as to present a range of possible scenarios. They moreover needed to provide easy and open access to data sources (Stake, 1995: 4). This meant that they had to be both easy to get to and supportive of the study by providing the data required. To lead to assertions or modifications of generalisations, the cases needed to incorporate similar operations or conditions that may give rise to recurrence of activities, problems and responses.

Based on the above criteria, the cases were selected from industrial, commercial and public sector and were procured through integrated design and build and the traditional methods. They were located in London and the South East because the initial contacts and informants who facilitated access were based in London and could provide suitable projects in Kent, Cambridge, Woking and London. Furthermore, this part of the UK was the centre of building activity in the mid-1990s when the research was undertaken. The cases incorporated a high proportion of mechanical and electrical services input. They were of comparable size, cost, and complexity, the limits of which were dictated by the research programme and objectives which imposed a restriction of maximum twelve months services installation duration on the projects.

At the start of fieldwork, four cases were selected; one each from the industrial and commercial sectors, and two from the public sector. The former cases were procured through the integrated design and build method and involved small M&E contracting organisations of relatively equal size. The latter cases were procured through the traditional method and included large M&E contracting organisations of comparable size. To add a cultural dimension to the study, one of the design and build projects was

selected on the premise of being organised by Japanese interests. These similarities and differences constituted the grounds for comparisons and contrasts of the cases from which analytical generalisations were to emerge.

Shortly after the fieldwork had begun, one of the cases from the public sector was abandoned because it provided limited insight into the real life situations and the problems arising from them that the research intended to investigate. It was therefore predicted that the required data may not be collected from the case and that the corresponding research effort may be put to better use on the other cases.

Data sources

The data sources were selected on the premise of providing the opportunity to learn about the cases. Therefore they were not absolutely identical in every case. Although there was a core of data sources that were used in all the cases, additional or alternative sources were used to supplement or provide data which could not be obtained through the other sources. The data sources used comprised documents, key representatives of organisations participating in building project coalitions, and site meetings. The documents included contracts between main and M&E contractors, clients' requirements/briefs, minutes of site meetings, and company literature. The key representatives, forming the core of data sources, included architects/design consultants, services consultants, main contractors' project managers, and M&E contractors' project engineers. The other representatives who provided additional sources of data included main contractors' in-house quantity surveyors, a main contractor's M&E installation advisor, a main contractor's contracts co-ordinator, a main contractor's site manager, and an M&E contractor's operational director. The site meetings between main and M&E

contractors comprised forums for discussing progress of the works, problems and potential solutions. They constituted the scenarios where interaction between the contractors' representatives took place and where insight into events, problems, responses, etc. was provided.

Data collection techniques

In so far as the major characteristic of qualitative research is identified as interpretation, the emphasis in this study is placed upon observation of the workings of the cases, recording what happens, examining what it means, redirecting observation, and refining or substantiating the meanings (Stake, 1995: 8-9). The data collection techniques correspond to the data sources. They comprise review of the documents discussed above, in depth interviews with the key people identified above, non-participant observation at the site meetings between main and M&E contractors, and viewing and first hand experience of the progress of the works on the sites themselves.

Document review

Review of documents served two purposes of providing background information on the cases and contextual information on the participant organisations; as well as presenting clues about meanings of actions and the possible root of problems.

In depth interviews

In depth interviews were used to obtain both general background and particular topic related data about the cases. They were moreover used to obtain various subjects' perspectives on the cases, events, and problems so as to construct the 'multiple realities' that are said to characterise cases (Stake, 1995: 64). Two sets of interviews were planned

at the outset. One set was carried out at the early stages of the research and involved the key representatives of participant organisations constituting the core of data sources, as well as those who provided additional sources of data. The questions underpinning these interviews related to early thought processes about the research. The second set of interviews were carried out at the end of case projects and involved main contractors' project managers. These interviews were aimed at plugging the gaps in the information provided by the data already collected, providing additional data necessitated by redirectioning the investigation, and obtaining project managers' views about M&E contractors' performance and productivity.

The degree of structure incorporated in the interviews was guided by the range and types of questions required to ascertain the nature of case projects, the modes and conditions of engagement of project participants, their roles and responsibilities, and their modus operandi particularly the management processes they utilised. These topics formed the framework for the questions (see Easterby-Smith, Thorpe and Lowe, 1991: 74-5). To the extent that the questions were posed broadly and sought to elicit interviewees' attitudes and perceptions, they were semi-structured. They led to both informal and semi-formal conversational type interviews (Buchanan, Boddy and McCalman, 1988: 60) that helped uncover the processes at work and discover the subjects' meaning perspectives (Marshall and Rossman, 1995: 80), i.e., the meanings that interviewees attached to issues and situations (Easterby-Smith, Thorpe and Lowe, 1991: 73).

Because a diverse range of subjects were interviewed in each of the cases and the cases varied, each questionnaire was designed separately to obtain the required data. However, the design was systematic across the cases, to obtain comparable data with regard to the

context, conditions governing interorganisational relations, management processes, etc. The questionnaires tended to be rather long, around or in excess of twenty questions, in order to obtain the specific information referred to above. The decisions regarding the contents of the questions were to a large degree guided by the researchers' experience as an architect and knowledge of the construction industry. The interviewees were sent a copy of the questionnaire prior to the interview so as to form an awareness of what was to be asked and how long the interview might take. They were sent a copy of the interview notes in due course, with a 'thank you' note, and were asked to comment on the accuracy or misinterpretations of the researcher. Three interviewees replied with their alterations which were incorporated in subsequent interpretations. Copies of interview questionnaires are provided in the Appendix.

Altogether, thirty interviews were conducted. Of these, five proved abortive when one of the case studies was abandoned as explained previously. Of the remaining interviews, four were held with people who provided access to the cases and were not involved with the projects; eleven were carried out informally on the sites as conversations with the participant organisations' representatives; and ten were organised as semi-formal interviews either on the sites or in the representatives' offices. The problems encountered with interviews included some subjects' reluctance to partake at all or to divulge information.

Almost at the outset of research the use of audiotapes was ruled out in favour of note-taking both during and immediately after the interviews. This decision was based, most importantly, on the sensitivity of the issues and the belief that more confidential information may be obtained in the absence of a tape recorder. It was moreover

influenced by the transcription time or cost, and by the large volumes of raw data it would generate.

Observation

Observation was carried out to increase understanding of the cases through watching the actors in their own environment and recording events, telling the stories as they unfolded, describing the situations, the problems, their resolution or irresolution (Stake, 1995: 60-2). It therefore required longitudinal involvement of varying durations with each case. It took the form of non-participant attendance at the site meetings between main and M&E contractors. In total, sixty seven meetings were attended: twenty one in Kent, over an eight months period; seventeen in Cambridge, over a nine months period; and twenty nine in London, over a twenty months period (see the Case Study Diary on page xi). The site meetings were held at regular intervals although the regularity varied from case to case. For example, the fortnightly and the weekly site meetings in Kent and London, respectively, were conducted quite regularly with one or two cancellations during the attendance period. Whilst those in Cambridge, particularly the design co-ordination meetings, were quite irregular and had a high rate of cancellation over the attendance period.

The observations provided insight into the subjects' behaviour, thus enabling interpretations of meanings of those behaviours based on the assumption that 'behaviour is expressive of deeper values and beliefs' (Marshall and Rossman, 1995: 79). At the early stages of research, observation was general and was recorded as descriptions of events and behaviours in the site meetings as site diaries. As the research sub-questions emerged,

through the second literature review, observation became more focused around the topics of the questions and the recorded accounts were gradually categorised accordingly.

Data validation

To establish the validity and reliability of the case studies, a number of principles were used. These included triangulation (Stake, 1995: 111-5; Yin, 1994: 91-3) to enable transferability of the findings to another context (Marshall and Rossman, 1995: 143-4); creation of case study databases (Yin, 1994: 94-98) to establish the credibility and validity of the findings (Marshall and Rossman, 1995: 143, 145); and maintenance of a chain of evidence (Yin, 1994: 98-9) to ensure confirmability of the findings (Marshall and Rossman, 1995: 145).

Triangulation

The type of triangulation employed was methodological involving collection of data through the combination of approaches described above (Stake, 1995: 114-5). These multiple sources of evidence enabled the study of a wide range of historical, attitudinal, and behavioural issues which converged to provide answers to the research questions posed (Yin, 1994: 92-3). These answers led to conclusions from which generalisations were made based on and tied to the theoretical framework adopted for the study. Thus the findings were made transferable to other contexts (Marshall and Rossman, 1995: 143-4).

Case study databases

The case study data bases were compiled in the following manner. The contract documents provided data on the nature of interorganisational relations between main and

M&E contractors and the quality of information supplied by the former to be processed by the latter. The clients' briefs presented data on the nature of projects and the facilities they sought to provide. Minutes of meetings produced detailed information on the progress of the works, the project participants' tasks and thus implicit data on the performance and productivity of the latter. The company literature presented impressionistic images of the contracting organisations involved thus giving rise to data on their relative size, market share, dominance and power. The in-depth interviews expanded on the data relating to interorganisational relations, and provided data on the contracting organisations' performance targets, the contextual framework within which they carried out their tasks, the processes and procedures that governed their actions, and the attitudes of the participant representatives. The non-participant observation enabled collection of data on the behaviour of representatives and the factors which influenced them. The various categories of data were then compiled so as to tell the storey of each case. The credibility or validity of data was ensured through a degree of cross-checking facilitated by some overlap in the questions directed at the subjects interviewed.

Chain of evidence

To maintain a chain of evidence, the case studies presented in Chapters 4, 5 and 6 make cross-references to the databases whenever appropriate. The databases were compiled as readily accessible hard or soft copy files and were referred to regularly during the write up. Furthermore, the data confirm the general findings and lead to the implications of the findings (Marshall and Rossman, 1995: 145).

Access and confidentiality

The approach adopted in gaining access to the cases was 'opportunistic', i.e., contacts were used as far as possible (Bryman, 1988: 15; Buchanan et al, 1988: 56; Crompton and Jones, 1988: 70) to select potential projects, and then clearance was sought from the people responsible for the projects (Bresnen, 1988: 38, 39). The contacts were either directly involved with or had knowledge of appropriate projects. When negotiating access, they were assured that the findings would not be published (Buchanan et al, 1998: 57) and were promised a copy of the executive summary upon completion of the study. The emphasis on confidentiality was carried through to the interviews and was demonstrated by the absence of tape recorders as explained previously. It was believed that overt expression of confidentiality would improve the quality of data collected (Crompton and Jones, 1998: 70) and would result in disclosure of sensitive information which the subjects would not divulge in the presence of a tape recorder. The procedure followed in gaining entry to the cases is outlined below.

In the case of the first project, a meeting with a contact in an M&E consultant firm was set up where provisional access to the project was provided subject to the client's and the main contractor's approvals. The client's consent was sought and obtained by sending them a copy of the research proposal and assuring them of the confidentiality of data collected. They then provided a contact in the main contracting firm who was also sent a copy of the research proposal, assured of the confidentiality of data collected, and informed about the nature of access required. Upon perusal of the research proposal, the contact in the main contracting firm agreed to a meeting. The meeting revolved around the project and was effectively an introduction to it. It was followed by an introductory

visit to the site of the project where the project manager's consent to my regular attendance at the site meetings was obtained.

In the case of the second project, the research proposal was sent to a contact in a main contracting firm. Upon the study of the proposal, the contract arranged a meeting where the nature of access to the project was discussed and entry to the project agreed. The contracting firm was the client's agent and did not require the client's approval. The meeting led to an introductory visit to the site of the project where the project manager's approval to my observations at the site meetings was obtained.

In the case of the third project, a meeting with a contact in the Heating and Ventilating Contractors Association was set up where a number of personnel managers in large M&E contracting organisations were contacted by the former. Three personnel managers responded positively and were sent copies of the research proposal. Three meetings were attended with them and access to two projects was obtained. However, one of these projects was abandoned a third of the way through the contract period as discussed above.

The problem of access to data was not resolved by gaining entry to the projects (Bryman, 1988: 16). On the first case study, the M&E contractor's project engineer co-operated reluctantly and partially, on grounds of being too busy to partake in interviews. On the third case study, a considerable period of time elapsed before both the main and the M&E contractors' suspicions about my role as a spy for the other organisation dematerialised (Buchanan et al, 1988: 58).

3.3 ANALYTICAL FRAMEWORK

The analytical framework comprises the methods and tools implemented to analyse the data collected and to theorise from the findings. It is therefore considered in terms of data analysis procedure, analytic methods, and generation of theory.

3.3.1 DATA ANALYSIS PROCESS

Data analysis is defined as 'the process of bringing order, structure, and meaning to the mass of collected data' (Marshall and Rossman, 1995: 111). Qualitative data analysis, in particular, is considered as 'a search for general statements about relationships among categories of data' from which grounded theory may be constructed (Ibid.). The process of data analysis consists of examination, categorisation, tabulation, and recombination of the evidence with the purpose of addressing the objectives of the inquiry (Yin, 1994: 102). It is considered an integral part of qualitative research, commencing when first impressions are made and continuing until the final write up (Stake, 1995: 71).

Analytic strategy

The analytic strategy is influenced by decisions made prior to data collection regarding the conceptual framework, selection of cases, research questions, and data collection approaches (Miles and Huberman, 1994: 10; Stake, 1995: 84). The adoption of a strategy for analysis is regarded as a means of treating the evidence fairly, producing convincing analytic conclusions, ruling out alternative interpretations, and selecting an appropriate analytical technique (Yin, 1994: 103). Analytic strategies may be based on theoretical propositions, or case descriptions (Ibid.: 104-5). The former strategy focuses attention on certain data, identified by theoretical considerations of the investigation, so that other data

may be ignored. It helps to organise the entire case study and to define alternative explanations that are to be examined as part of the validation process of the findings. It is guided by the research questions posed (Ibid.: 103-4). The latter strategy identifies types of events which may be quantified, and 'patterns of complexity' which may explain them or their causes (Ibid.: 104-5). Analytic strategies may, moreover, be based on the way meanings about cases are reached. This may take two forms: Direct interpretation of individual instances, or categorical aggregation of instances (Stake, 1995: 74). The former strategy ascribes meaning to single occurrences of phenomena. The latter strategy interprets collective occurrences of phenomena (Ibid.: 76). It is more suited to case studies aimed at understanding phenomena or relationships within them (Ibid.: 77).

This investigation adopted a combination of three analytic strategies. The conceptual framework and the research questions that developed from theoretical considerations proceeding the initial stages of data collection, guided the type of data sets that were collected. The case descriptions presented accounts of events under study as they unfolded, thus providing insights into why they took place based on which explanations about the events were proposed. The focus on relationships identified in the research questions gave rise to categories of phenomena from which interpretations were made.

3.3.2 ANALYTIC METHODS

A number of analytic methods are suggested in the literature (for example, Marshall and Rossman, 1995: 113; Yin, 1994: 102). They all seem to have the following features in common: coding data; reflecting and commenting upon data; searching data for 'similar phrases, relationships between variables, patterns, themes, distinct differences between subgroups, and common sequences'; identifying patterns and processes and applying them

to the next set of data collection; formulating generalisations about consistencies found in the database; and comparing the generalisations with formal theories identified in the literature (Miles and Huberman, 1994: 9).

In this study, the analytic method adopted was based on Miles and Huberman's 'interactive model' of data analysis (1994: 12). This model comprises an iterative process of three flows of activity, namely, data reduction, data display, and conclusion drawing/verification (Ibid.: 10-12). The components of this model are represented in Figure 3.1.

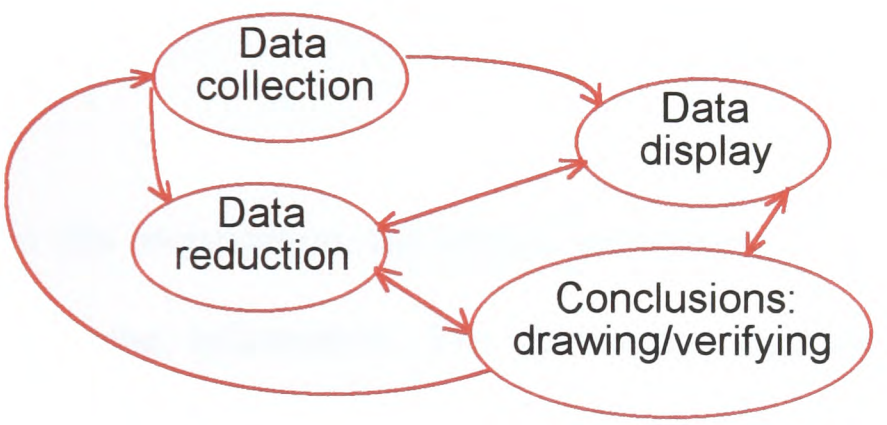

Figure 3.1: Interactive model of data analysis (Miles and Huberman: 1994: 12)

Data reduction

Involves condensing the raw data collected through review of documents, interviews, and observations by selecting, focusing on, simplifying, abstracting and transforming the data appropriate to the inquiry (Miles and Huberman, 1994: 10). This process may be undertaken by applying any number of the following eight analytical methods: Contact summary, codes and coding, pattern coding, memoing, case analysis meeting, interim case summary, vignettes, prestructured case, and sequential analysis (Ibid.: Chapter 4). This study employed most of these analytical methods except for vignettes and prestructure

case. The methods that were employed are described briefly below, before their application to the data collected is discussed.

Contact summary

A contact summary is a précis of the key points of the field notes taken after a case visit. It is based on a few key questions that focus attention on the essence of the data recorded. The questions may address the people, events or situations observed; the dominant themes or issues; the research questions and the variables in the conceptual framework; the potential hypotheses, speculations, or hunches suggested by the visit; and other data sets that need to be collected on future visits (Miles and Huberman, 1994: 51-2).

In this investigation, the contact summaries prepared after each site visit contained the following information: The participant organisations' representatives attending the meeting; the agenda discussed; the problems relating to the items of the agenda, particularly those affecting the performance of the participants and the progress of the works, the solutions suggested or proposed, or irresolution of the problems and their consequences; the possible roots of the problems observed and the reasons for participant representatives' behaviour; the gaps in information that needed to be plugged.

Codes and coding

In order to make sense of contact summaries, interview notes and documentary evidence, they are analysed into sections of distinct but related information which are labelled, or coded, to ascribe meanings to them. These labels or codes are then used to categorise the sections of information so that they are retrievable for clustering, display and drawing

conclusions/verifications. This process of analysis and combination is referred to as coding (Miles and Huberman, 1994: 56-7).

Codes can take three forms: descriptive, interpretative, and pattern codes representing different levels of analysis ranging from descriptive to inferential, respectively (Miles and Huberman, 1994: 57-8). They may be created, as a structured list, derived from the conceptual framework, the research questions, etc., prior to data collection (Ibid.: 58); or be allowed to emanate from the data (Glaser and Strauss, 1967: 105). In either case, the codes change as the research develops, as the data are analysed or further data collected, or as unpredicted themes emerge. It is important to maintain the relationship of the codes in a coherent structure.

This study employed all three forms of codes referred to above. In the early stages of raw data analysis, descriptive codes representing classes of phenomena being investigated, were used. They were derived from the initial research aims comprising the investigation of the relation between: 1) M&E contractors' selection procedure and conditions of appointment; 2) their behaviour and performance; and 3) the effectiveness of the services system delivered. Four codes were created, namely, project description, client organisation, project conception and history, and project procurement. The data coded 'project procurement' were analysed using the subcodes of procurement method, project design, organisation of construction work, and management of construction work. The data coded 'project design' were further analysed using the sub-subcodes of services design, design teams, and management of project at design stage, and so on. The coding procedure was structured to reflect the relationships between the research aims. Table 3.1 presents this initial coding procedure. The first column refers to the coded text; the

second column contains the codes; and the third column denotes the particular research aim to which the code relates.

Table 3.1: The initial coding procedure applied to early stages of data analysis

SECTIONS OF DATA CODED	CODES	RESEARCH AIM
PHYSICAL PROPERTIES OF PROJECT Description of facilities	PROJECT DESCRIPTION	2 AND 3
NATURE OF OWNER/OPERATOR Description of companies funding and/ or operating the facilities	CLIENT ORGANISATION	1
PROJECT EVOLUTION Description of project conception, development, and realisation	PROJECT CONCEPTION AND HISTORY	1, 2 AND 3
OPERATIONAL CONTEXT OF PROJECT Selection of procurement method Description of procurement method adopted Main contractor's responsibility	PROCUREMENT METHOD	1 AND 2
CONDITIONS GOVERNING PROJECT DESIGN Design development of facilities Design responsibility Relationship between design and cost	PROJECT DESIGN	2 AND 3
Client's services requirements Nature of services design input	Services design	3
Design team members Their selection criteria Their roles and responsibilities	Design teams	2 and 3
The management structure of the project at design stage Management of information flow Communication modes and channels	Project management at design stage	2 and 3
NORMS GOVERNING CONSTRUCTION WORK ORGANISATION Subdivision of work into work packages The tendering system	ORGANISATION OF CONSTRUCTION WORK	1, 2 AND 3
Pre-tender list, pre-tender interview, tender invitation and documents Client's requirements	Main contractor's tender process	1, 2 and 3
Tender information produced by main contractor	Main contractor's tender documents	1

Table 3.1 (Continued)

SECTIONS OF DATA CODED	CODES	RESEARCH AIM
Criteria for selection of main contractor	Main contractor's selection process	1
Conditions governing main contractor's appointment The letter of intent The form of contract	Main contractor's conditions of appointment	1
Nomination of M&E contractors History of M&E contractor's involvement	M&E contractor's tender process	1
Tender information produced by M&E contractor	M&E contractor's tender documents	1
Criteria for selection of M&E contractor	M&E contractor's selection process	1
Conditions governing M&E contractor's appointment	M&E contractor's conditions of appointment	1
Components of project structure, their function and their inter-relation	Project coalition structure	2
THE MANAGEMENT STRUCTURE OF THE PROJECT AT CONSTRUCTION STAGE Management of information flow Modes of communication and communication channels	MANAGEMENT OF CONSTRUCTION WORK	2 AND 3
Motivating trade contractors Encouraging teamwork amongst them Controlling their productivity, workmanship, and observation of Health and Safety regulations	Management of trade contractors	2 and 3

As the number of observations increased, the conditions governing the participants' behaviour and performance were better understood, the participants' interactions made more sense, their strategies and tactics were gradually grasped, and the consequences of their actions became increasingly clear. These observations led to modification of the research problem and questions, further reviews of literature, and formulation of subsidiary questions presented in Chapters 1 and 2. These questions inspired reviews of

codes into more interpretative forms. For example, the codes relating to main and M&E contractors' selection procedure and conditions of appointment were modified to those addressing the contractors' interorganisational and interpersonal relations (Research question 1). Conflict, as a salient feature of the these relations, was introduced into the coding procedure (Research question 1). The data relating to project participants' behaviour were coded as conflict inducing, conflict handling, and conflict resolving processes (Research question 2). The data related to M&E contractors' performance were coded as performance enhancing and performance deteriorating processes (Research question 3). The codes relating to the effectiveness of the services system delivered were omitted. The final version of these codes is provided in Table 3.2.

Table 3.2: The final coding procedure applied to final stage of data analysis

SECTIONS OF DATA CODED	CODES	RESEARCH QUESTION
CHARACTERISTICS OF MAIN PARTICIPANTS	CONTEXT	1
Client organisation		1
Design teams		1
Main contracting organisation		1
Construction group		1
M&E contracting organisation		1
ENGAGEMENT OF MAIN PARTICIPANTS		1
Selection, appointment, roles and responsibilities of design team members		1
Selection, appointment, roles and responsibilities of main contractor		1
Selection, appointment, roles and responsibilities of construction group		1
Selection, appointment, roles and responsibilities of M & E contractor		1
PROJECT DESCRIPTION		1
Project conception		1
Project history		1
Project design and management		2
Project construction and management		2
CONTRACTUAL FRAMEWORK: INTERORGANISATIONAL RELATIONS	CONTRACTUAL FRAMEWORK	1 AND 3
Power disparity		1 and 3
Power strategy		1 and 3

Table 3.2 (Continued)

SECTIONS OF DATA CODED	CODES	RESEARCH QUESTION
Trust-based co-operation		1 and 3
OPERATIONAL FRAMEWORK: INTERPERSONAL RELATIONS		2 AND 3
The leadership behaviours		2 and 3
Motivation of project participants		2 and 3
Participation in decision making		2 and 3
Team building		2 and 3
CONTRACTUAL/INTERORGANISATIONAL CONFLICT	CONFLICT	1 AND 3
Conflict attributed to contractual framework		1 and 3
Conflict attributed to building project environment		1 and 3
Conflict attributed to project coalition structure		1 and 3
Conflict attributed to project coalition culture		1 and 3
Conflict attributed to project coalition technology		1 and 3
Low trust in project coalition exchange relations		1 and 3
OPERATIONAL/INTERPERSONAL CONFLICT		1
Latent conflict at brief preparation stage		1
Latent conflict at design stage		1
Latent conflict at construction stage		1
Conflict arising from project management and control systems		1, 2, 3
MANAGEMENT OF CONFLICT AND ITS IMPACT ON PERFORMANCE		2 AND 3

Pattern coding

Pattern codes, by virtue of grouping categories of information into coherent and meaningful units of analysis, allow themes to emerge. They focus data collection on particular types of phenomena. They facilitate the formation of a 'cognitive map' and enable deeper understanding of events and interactions. Finally, they provide the basis for cross-case analysis through identification of common themes (Miles and Huberman, 1994: 69). Pattern codes comprise the four elements of themes, causes/explanations, relationships among people, and theoretical constructs (Ibid.: 70).

The analysis of the codes set out in Table 3.2, into the four constituent elements of pattern codes, gave rise to the categories of patterns presented in Table 3.3.

Table 3.3: Four categories of pattern codes

CATEGORIES OF PATTERN	PATTERN CODES
THEMES	The conflict process Emergence of interorganisational conflict Emergence of conflict in the building production management process Impact of conflict on the performance of project participants
CAUSES/ EXPLANATIONS	The nature of building production processes and procedures and emergence of creative conflict Power disparity, power strategies, distributive bargaining, dysfunctional conflict and its impact on resources and performance Fragmentation of production process, fragmentation of control, functional inefficiencies, divergent sub-cultures, poor quality and slow dissemination of information, and exacerbation of conflict Calculation, risk, legal sanctions and power-induced predictability in project participants relations Project manager's inability to enforce project participants' performance
RELATIONSHIPS AMONG PEOPLE	Determinants of project participants' interpersonal relationships Limitations of management processes to contain or resolve conflict arising from clashes of organisational interests Limitations of management processes to contain or resolve conflict arising from clashes of human factors The strategic nature of conflict management
EMERGING CONSTRUCTS	Conflict is inherent to the contracting system The political nature of building project coalitions The inter-relationship between national culture and socio-legal structures The impact of professional bodies and commercial associations upon the divisions amongst the project participants

Based on Table 3.3, a behaviour-conflict-performance-outcome cycle (see Figure 2.10) is proposed as a more accurate model explaining performance in building projects than a purely behavioural one. This model may be expanded as shown in Figure 3.2.

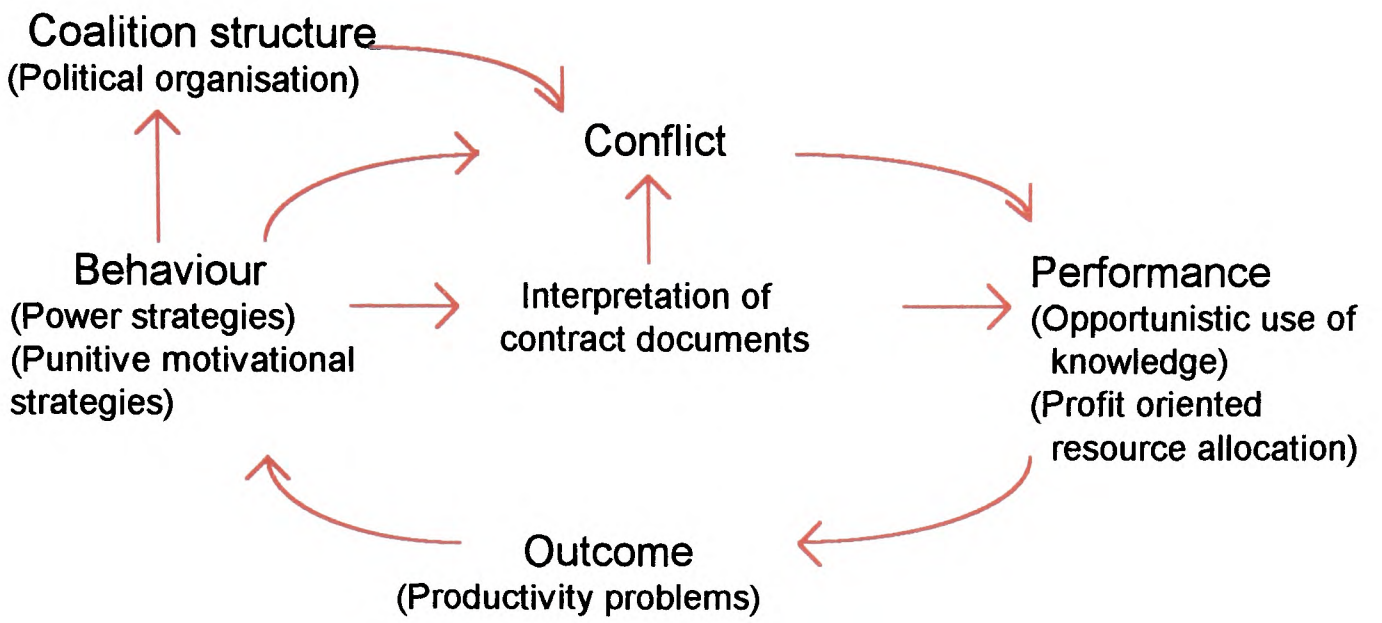

Figure 3.2: Behaviour-conflict-performance-outcome cycle

Memoing

Memoing or memo writing involves abstraction of ideas about coded data and their relationships, and integration of these abstractions into a coherent concept (Miles and Huberman, 1994: 72). They constitute the analytical framework that enables derivation of pattern codes from coded data. They moreover provide the tools for examining, questioning, and modifying the initial framework (Ibid.: 74).

One example of the memo written to guide derivation of the first pattern code in the theme category (see Table 3.3), involved conceptual abstraction from the data coded 'pre-contract processes', 'contractual conflict', 'interorganisational conflict', and 'interpersonal conflict' (Table 3.2). The memo comprised:

> Although conflict seems to have many varied causes, explanations, and manifestations, it appears to be processual, originating somewhere, fluctuating positively and negatively during the project life-cycle, and culminating somewhere. Where does it originate?

Case analysis meeting

A case analysis meeting provided the opportunity for the researcher to present a summary of the case to other researchers for the purpose of obtaining feedback and guidance (Miles and Huberman, 1994: 76). These types of meetings occurred regularly during the course of the investigation. They mostly comprised one-to-one meetings between the researcher and the supervisor. However, on occasions, attendance in seminars involving other researchers and colleagues provided the opportunity for exposure to broader perspectives and cross fertilisation of ideas.

Interim case summary

The interim case summary is a report on what has been found and what remains to be found on a case. It contains a review of findings, the quality of supporting data, and the agenda covering the proceeding data collection (Miles and Huberman, 1994: 79). Several interim report summaries were prepared during the course of this investigation.

Sequential analyses

The various methods of analysis discussed above, ranging from data coding through generation of pattern codes and memo writing to interim case summaries, comprise an iterative process of analysis. They progressively lead to more focused data collection and more in depth analyses of data through further iterative processes. Thus, they constitute a sequential analytic process (Miles and Huberman, 1994: 86).

The interim case summaries formed the formal junctures in the study at which the iterative process of analysis engaged in up to that point culminated; and the case analysis meetings

were the occasions during which the next iterative process or the next stage in the sequential analysis began.

Data display

Data displays are tools for drawing and verifying descriptive conclusions about a case. Similar to the analytic methods discussed previously, data displays can be used throughout the investigation as a means for analysis. By presenting the full data set in the same location, they facilitate comparisons, recognition of differences and similarities, and identification of patterns, themes, trends, etc., thus enabling formation of answers to research questions and aiding generation of theories (Miles and Huberman, 1994: 90-92).

Data displays take three broad forms. They may comprise reduced, focused data organised in a coherent structured manner; they may take the form of matrices composed of defined rows and columns; or they may constitute networks consisting of nodes of text linked together by lines (Miles and Huberman, 1994: 93). Data display forms correspond to research questions and data codes. Exploratory research questions or data coded at the early stages of research may require partially ordered displays like context chart or checklist matrix (Ibid.: 102-110). Studies concerned with unfolding of events and sequence of processes, may favour time-oriented displays such as event listing, event-state network, etc. (Ibid.: 110-122). Research questions and data codes addressing people's interactions, such as the questions posed and data coded in this study, may best be served by role-ordered matrices (Ibid.: 122-7). Finally, when a set of clearly defined variables are available, a conceptually oriented display like the conceptually clustered matrix, the cognitive map, or the effects matrix may be most appropriate (Ibid.: 127-141).

To aid a better understanding of the relationships between the project participants, the contractual relations within the building project coalitions, the organisation of the design teams, the construction groups and the services works packages, and the information flow routes within them were represented graphically by 'organograms' (Luck, 1996: 77). These demonstrated the hierarchy and the lines of authority within the project coalitions and presented comprehensive pictures of all the members of the management teams involved in the projects including those not taking part in the meetings. Various other matrices indicating the relationships between variables were also composed in the first case study and referred to in the second and third. The analysis of the cases was based on the conceptually clustered data developed in the conclusion to Chapter 2.

Conclusion drawing/verification

The comparisons and contrasts of the cases pulled the various strands of data together and condensed the findings into concepts and issues that the study had set out to investigate, examine and possibly propose. The conceptual overlaps in the analytical data clusters provided verification of the findings by allowing the examination of the data to be carried out from various angles and perspectives. The pattern codes that emerged from the conceptual clusters case data constituted the framework for the conclusions drawn.

3.4 SUMMARY

This chapter described and discussed the use of case studies and multiple case studies as the research strategy adopted to carry out the investigation. It defined the three relatively comparable building projects that were selected as the cases and their selection methods. It described the data sources used and the data collection techniques employed. Documents, organisational representatives, and site meetings attended on a regular basis over the greater portion of the projects' life-cycle comprised the data sources. Non-participant observation of interchanges amongst key players, and interviews with architects, services engineers, main contractor's project managers, M&E contractor's project engineers, an M&E contractor's operations director, and a main contractor's site manager constituted the data collection techniques.

The chapter moreover examined the data validation processes engaged in, and the issues of access to and confidentiality of the cases and the companies involved. Having considered the context, nature and collection of data, the chapter then went on to discuss the strategy and methods implemented to analyse and display data, through coding, and to draw conclusions and verifications from the information thus produced, through pattern codes.

CHAPTER 4 CASE STUDY 1: THE COLD STORE

4.1 INTRODUCTION

This chapter presents the first example of the construction project coalitions selected for in depth, longitudinal study of the main and mechanical and electrical (M&E) contractors' behaviour, building production management processes, and interpersonal relations and interactions of the contracting organisations' representatives. In the first instance, it provides a descriptive account of the main participants' characteristics, their engagement procedures, and the properties of the project which constitute the context for events, processes and interactions being investigated. It then considers the contractual and operational frameworks which govern the main and M&E contractors' interorganisational and interpersonal relations, respectively, thus identifying the salient feature of the relations and building production management processes. It subsequently examines the impact of the main contractor's management processes on the performance of the M&E contractor. The chapter comprises four sections:

Section 4.2, provides outline profiles of the main participants; sets out the pre-contract processes establishing the roles and responsibilities of the design teams, the main and the M&E contractors; and describes the conception, history, design and construction of the project.

Section 4.3, examines the nature of the project participants' interorganisational relations arising from the contractual framework; and assesses the nature of their representatives' interpersonal relations vis-à-vis the operational framework.

Section 4.4, identifies conflict as a dominant feature of the relations discussed in the previous section. It establishes the types and manifestations of emergent conflict, considers the management processes implemented to handle or resolve conflict, and their impact upon the behaviour and performance of the main and M&E contractors.

4.2 CONTEXT

This section provides a brief description of the organisational characteristics of the client, the design teams involved, and the main contractor. It defines the selection processes, the appointment criteria, and the roles and responsibilities of the design teams, the main contractor, and the M&E contractor. It then recounts a précis of the project's conception, history, design development and construction process.

4.2.1 CHARACTERISTICS OF MAIN PARTICIPANTS

Client organisation

The client organisation was a limited company formed for the purpose of commissioning this project and comprised a joint venture between the financiers (Finance Co.) and operators of the facility (Operation Co.). For convenience, the client organisation is

referred to as FinOp Ltd. The relationship between the partners was rather complex. Finance Co. agreed to fund the project on the condition of purchasing the freehold of the land on which it was to be constructed. Operation Co., who were the landowners, agreed to sell the freehold of the site and to become leaseholder operators of the facility upon its construction. By virtue of their position in the relationship, Finance Co. were the dominant party and had overall control over decisions regarding project procurement.

Design teams

There were two design teams involved in this project, FinOp Ltd's team, and main contractor's (Construction Co.'s) team. FinOp Ltd's design team comprised an architectural firm (Design Co.), a structural engineering firm (Structure Co.), and a services consulting firm (Services Design Co.). The team consulted with FinOp Ltd's project manager (Principal Project Manager) with regard to matters of considerable financial implication, and interfaced with Construction Co.'s design team through an interfacing project manager (Interfacing Project Manager). FinOp Ltd's design team was organised as shown in Figure 4.1. The solid links represent lines of influence arising from the team member's position and role within the organisation.

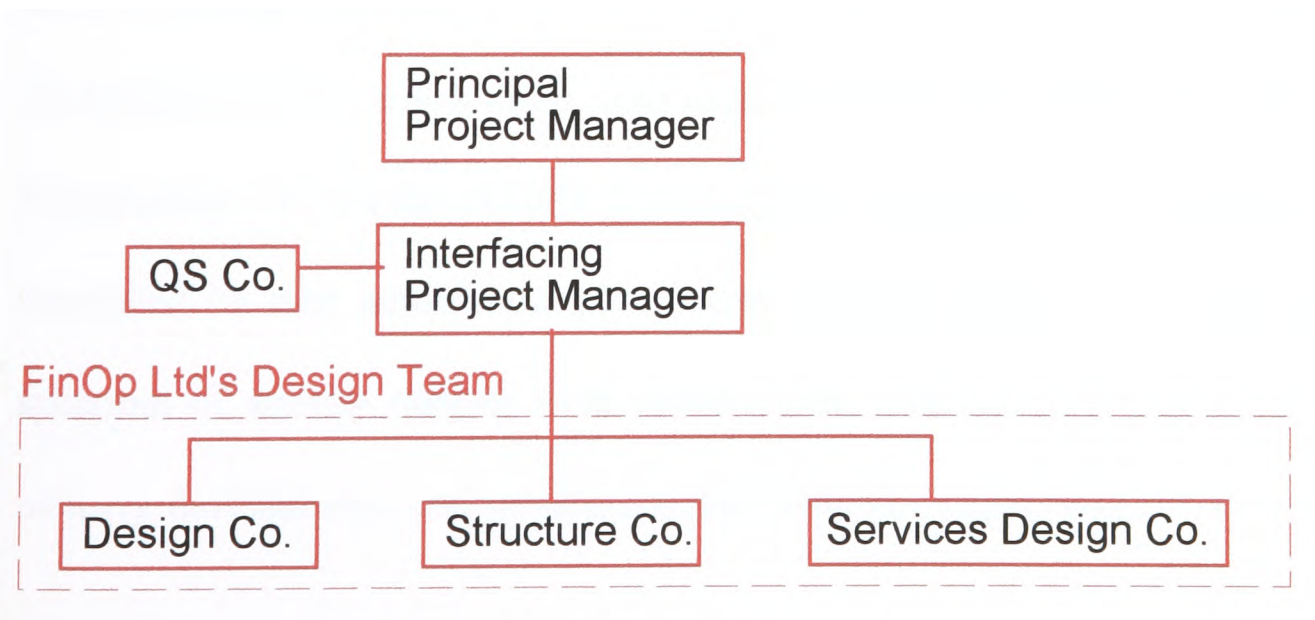

Figure 4.1: Organisation of FinOp Ltd's design team

Construction Co.'s design team comprised an architectural firm (Design Associates), a structural engineering firm (Structures Associates) and the M&E contractor (Services Co.). The team consulted with Construction Co.'s project manager (Project Manager). The latter, in turn, consulted with Construction Co.'s site-based quantity surveyor (Site QS) and an M&E installation advisor (M&E Advisor). The design team were organised as shown in Figure 4.2. The solid links represent the lines of influence arising from the team members' position and role within the organisation.

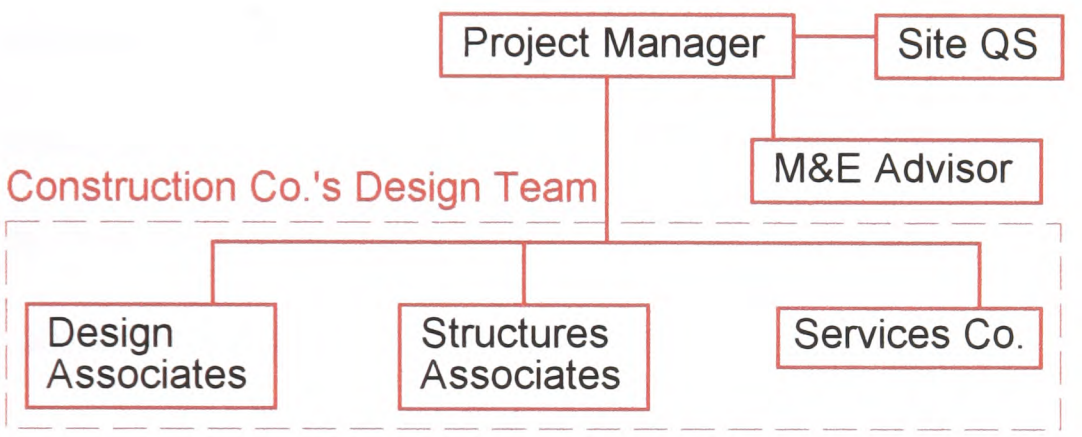

Figure 4.2: Organisation of Construction Co.'s design team

Main Contracting organisation

The main contracting organisation (Construction Co.), is a Limited Company and the main operating subsidiary of its Parent, a leading public limited construction company established in 1970, which offers construction services throughout the UK and overseas. Construction Co. is a functionally divisionalised organisation, the operations of which are controlled by nine autonomously managed regional offices. It is involved in a broad spectrum of activity ranging from construction, civil and structural projects, to water industry development, and mechanical and electrical engineering. It has experience in a

number of procurement methods including traditional, target cost, construction management, or design and construct.

Since their formation, Construction Co. has pursued a strategy of steady growth planned around diversification. A prominent example of this strategy is their joint venture with one of Europe's leading construction companies, which has extended Construction Co.'s range of activities to include the large infrastructure projects in the UK. This extension of activities has been facilitated by Construction Co.'s access to their joint venture partner's advanced construction technology and enhanced expertise. To implement their strategy of steady growth, Construction Co. alleged rely upon the calibre of their staff, by recruiting the best people and continually developing and motivating them; and focus on customer satisfaction irrespective of the project size.

Construction Group

The construction group comprised Construction Co.'s management team and the specialist and trade contractors. Construction Co.'s management team consisted of the Project Manager, a site manager (Site Manager), and four site supervisors (Site Supervisors 1, 2, 3, and 4). The organisation of the construction group is presented in Figure 4.3. The solid links represent the lines of influence arising from the group members' position and role within the organisation.

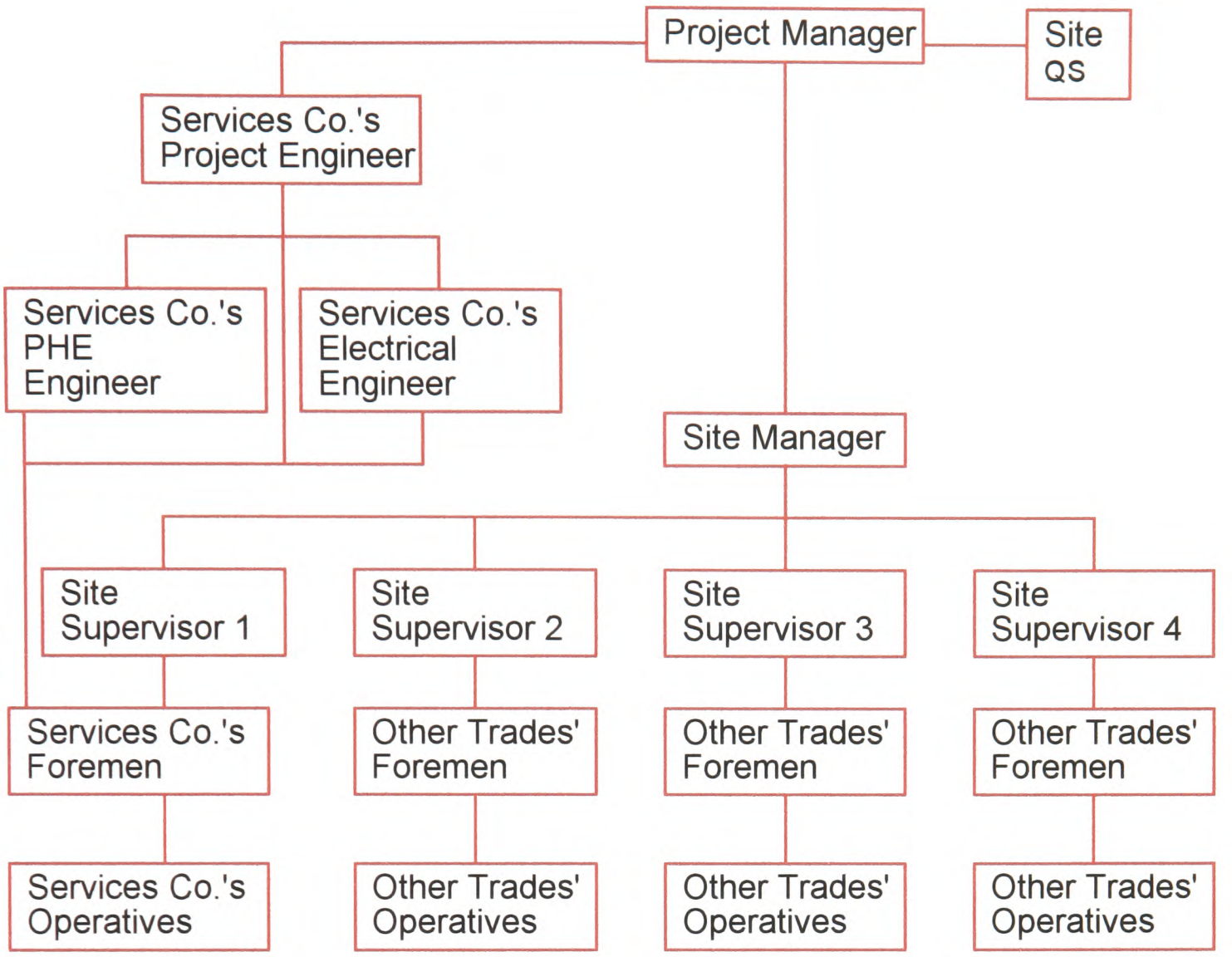

Figure 4.3: Organisation of construction group

4.2.2 ENGAGEMENT OF MAIN PARTICIPANTS

To establish the basis for the relationship between Construction Co. and Services Co., their respective selection processes, appointment criteria and roles and responsibilities were investigated and are described at some length in this sub-section. Observations indicated that the parties' relationship was subject to, the procurement method, FinOp Ltd's relations with their design team, Construction Co.'s relations with their design team, Services Co.'s relations with other members of Construction Co.'s design team and with members of the construction group. Therefore outlines of the procurement method, the engagement criteria of design team members and those of construction group members are also provided here.

Selection, appointment, roles and responsibilities of FinOp Ltd's design team members

FinOp Ltd had varying relationships with their design team members some of whom were appointed as individuals from known organisations. Others were selected, based on previous working relationships, and appointed as service providing firms through a competitive fee bidding process. FinOp Ltd's design team produced the scheme design and supervised its development into detail design and construction.

The principal Project Manager worked within Finance Co.'s organisation. He was responsible for managing the project from FinOp Ltd's perspective, in terms of making the 'important decisions' which had financial implications. The Interfacing Project Manager worked in Services Design Co.'s project management division. FinOp Ltd had appointed him, based on QS Co.'s recommendations, to act as their Project Manager and to interface between their and Construction Co.'s design teams. QS Co.'s representative worked in Services Design Co.'s quantity surveying division which, at the time of study, had a working relationship with Finance Co. of over three years. FinOp Ltd had appointed QS Co. to provide advice on project procurement method, to monitor the cost of the project and to prepare monthly interim certificates indicating the amount and cost of the work undertaken.

Design Co. was the first consulting firm to get involved in the initial phase of the project in the late 1980s, and the only survivor of the professional team which grew around the project between late 1980s-early 1990s. They were responsible for the design of the building from feasibility to planning stages. Despite their long-term relationship with Operation Co., however, Finance Co. considered them unsuitable to act as FinOp Ltd's

agent owing to the small size of their practice. Finance Co. selected and engaged Structure Co. on the basis of their previous work experience with them. The latter were responsible for the schematic structural design of the building. Services Design Co., who were recommended to Finance Co. by QS Co., were engaged on an hourly basis prior to the commencement of contract, and thereafter were re-engaged on a fixed-fee basis owing to their satisfactory performance. Services Design Co. produced the technical specification document for the services and were responsible for overseeing and monitoring the installation of services, witnessing commissioning and commenting upon Services Co.'s design proposals. The nature of FinOp Ltd's relationship with their design team members is summarised in Table 4.1.

Table 4.1: FinOp Ltd's relationship with their design team members

DESIGN TEAM MEMBER	ORGANISATION OF ORIGIN	NATURE OF ENGAGEMENT	RELATIONSHIP WITH FINOP LTD
Principal Project Manager	Finance Co.	Appointment of individual	Employee of Finance Co.
Interfacing Project Manager	Services Design Co.: Project Management Div.	Appointment of individual	Recommended by QS Co.
QS Co.	Services Design Co.: Quantity Surveying Div.	Appointment of firm	3 years plus with Finance Co.
Design Co.	Design Co.	Selection and appointment of firm	10 years plus with Operation Co.
Structure Co.	Structure Co.	Selection and appointment of firm	Previous work experience with Finance Co.
Services Design Co.	Services Design Co.	Hourly-based appointment of firm followed by project-based appointment	Recommended by QS Co.

Procurement method

Services Design Co.'s representative explained that Finance Co. selected the design and build (D&B) procurement method based on QS Co.'s recommendation and owing to time restrictions both before and after the commencement of construction. These restrictions

related to Operation Co.'s target date for having the building operational in order to store the current year's harvest. Construction Co.'s Project Manager, on the other hand, considered Finance Co.'s choice a strategy of shifting all the design and construction responsibility onto Construction Co.. The appropriateness of this selection was doubted by both Services Design Co.'s representative and the Project Manager. The former believed that the D&B method could have been appropriate had Operation Co. not made changes to the design as the project progressed. The latter was of the opinion that Finance Co.'s choice was misguided in view of the considerable amount of design carried out by Design Co. prior to tender stage, and that the traditional procurement route would have been better suited to the project.

Selection, appointment, roles and responsibilities of Construction Co.'s design team members

Construction Co. appeared to have a stable and steady relationship with most of the design team members. The Project Manager and the Site Qs were employees of Construction Co. The former was responsible for the development of FinOp Ltd's concept design into a buildable scheme and its construction. The latter was responsible for measuring and valuing the work carried out by the specialist and trade contractors.

Design Associates were known to Construction Co. both as a good practice in the South East and on the basis of their previous involvement on traditional contracts, for seven to eight years. Their participation on this D&B project was a one-off, however, not to be repeated, according to the Project Manager. Design Associates were engaged on the basis of Construction Co.'s own conditions of appointment - developed over the years and continually updated. These conditions did not vary much from the standard conditions of

appointment but were tailored in Construction Co.'s favour. They required Design Associates to produce information more quickly. Design Associates were responsible for the production of detailed design and construction production information. Structures Associates had worked with Construction Co. for around five years. Their engagement was based on Construction Co.'s own conditions of appointment. They were responsible for the design of building structure and drainage system. M&E Advisor had worked with Construction Co., in an M&E consultant capacity, for three to four years. The engagement of their representative on this project, in a supervisory capacity, indicated Construction Co.'s uncertainty about Services Co.'s performance. Services Co. was one of two nominees proposed by FinOp Ltd. Their selection, appointment, roles and responsibilities are discussed later in this sub-section. The nature of Construction Co.'s relationship with their design team members is summarised in Table 4.2.

Table 4.2: Construction Co.'s relationship with their design team members

DESIGN TEAM MEMBER	ORGANISATION OF ORIGIN	NATURE OF ENGAGEMENT	RELATIONSHIP WITH CONSTRUCTION CO.
Project Manager	Construction Co.	Appointment of individual	Employee of Construction Co.
Site QS	Construction Co.	Appointment of individual	Employee of Construction Co.
Design Associates	Design Associates	Selection and appointment of firm	7-8 years
Structures Associates	Structure Associates	Selection and appointment of firm	Around 5 years
M&E Advisor	M&E Advisor	Appointment of individual	3-4 years
Services Co.	Services Co.	Selection and appointment of firm	None. One of two nominees by FinOp Ltd

Selection, appointment, roles and responsibilities of Construction Co.

Construction Co.'s selection

Construction Co.'s selection was based on a competitive tender process. FinOp Ltd, their design team, and QS Co. collectively agreed to include six main contractors - chosen on

the basis of their experience - on a pre-tender list. They invited the contractors to a pre-tender interview and selected four of them to submit tenders. Services Design Co. sent out tender invitations to the four contractors accompanied with tender documents. The latter comprised FinOp Ltd's requirements for phase A of the development - the large sized facility, basic drawings and few estimates of work packages but no Bill of Quantities[1], and the form of contract to be entered into by the prospective main contractor.

The contractors were given five or six weeks (five, according to Construction Co., six, according to Services Design Co.) to produce their tenders. Upon receipt of tender documents, Construction Co. assessed the potential contractual risk of the project with the aid of their legal consultant. Half way through the tender period, Finance Co. decided to limit their financial risk and fund the smaller facility in phase B of the development first. Their aim was to extend their investment to include phases A and C, if and when the prospects seemed favourable. Thus FinOp Ltd's outline requirements changed, leaving Construction Co. with two weeks to prepare their new tender.

During this period, Construction Co. - with the aid of their design team engaged on a no-job-no-fee basis - rationalised the building structure, although they did not have enough time to simplify the complex construction of the roof into a more buildable solution. They moreover lowered the specification of drainage facilities, based on ground condition tests carried out at own cost, and suggested the use of excavated material as ground-fill. Thus Construction Co. proposed a more economical means of producing the building that gave

1. A document which itemises the elements of work to be undertaken thus enabling them to be priced individually and then summed up so as to produce a reasonably accurate estimate of the works.

them a competitive advantage over the others. These and other initiatives gave rise to savings that were used to provide additional facilities in the project. Before preparing their tender submission, Construction Co. visited Operation Co. to find out about their operational requirements by discussing the shortcomings of their existing facilities.

Construction Co.'s tender submission comprised their previous D&B experience, the contract sum analysis, the contractual terms and conditions to be resolved, their standard Bond format, their proposals, an alternative design bid and associated savings, preliminaries, building insurer's register Rules and Certification, architectural specifications, structural specifications, mechanical and electrical specifications, management team at construction phase, the curriculum vitae of the staff involved, the consulting civil, structural, high way and drainage engineers' (Structure Associate's) company brochure, the programme of works, management method of specialist and trade contractors, health and safety provisions, Construction Co.'s Quality Assurance (QA) system and QA system management, and architectural and structural drawings.

To prepare the programme of works, Construction Co. prepared a Bill of Quantities on the basis of the tender documents they received. They analysed it to obtain bulk figures for the amount of work contained in every construction phase. These figures together with Construction Co.'s data banks, containing rates of production of various elements of the works, and their expertise determined the duration of construction phases. Key dates, like the start of steel frame, then determined the start of each phase.

To arrive at the overall tender price, the cost of carrying out each element of the Bill of Quantities, such as foundations, drainage, finishes, services, etc., was estimated based on

the number of human hours involved and their hourly rate stored on Construction Co.'s data base; these costs were summed up, and to them were added the overhead, the profit and the contingency sum. The latter provided financial cover for unforeseen circumstances.

During tender negotiations, Construction Co.'s negotiator made the commercial decision to take sums of money off certain elements. This decision was based on the assumptions that the elements in question may be provided cheaper than priced, and/or FinOp Ltd's requirements were vague and open to interpretations. The deductions eroded the contingency per element of the works. The tender cost around £40,000.

Services Design Co. singled out Construction Co.'s *cost*, i.e., the reduced *contract sum* they agreed to subsequent to negotiations with FinOp Ltd, as the most important criterion for their selection, followed by their proposal and their previous work.

Construction Co.'s appointment, roles and responsibilities

FinOp Ltd appointed Construction Co. on the basis of a letter of intent. A letter of intent, according to the Project Manager, is effectively a summarised version of the contract and, together with client's monthly payments, forms a legally binding contract in a court of law. Though not a substitute to the contract, a letter of intent is used as a temporary legal arrangement between the parties to the contract to plug the time-gap spanning the contractor's appointment and the preparation of the contract proper that, owing to protracted legal proceedings, very often exceeds the contractor's lead-in period or even the contract period itself. On this project, the Contract was not prepared until the last

month of the contract period. Construction Co. regarded this time-lag as a ploy by solicitors to charge larger fees.

Construction Co.'s conditions of appointment, as set out in their letter of intent, constituted their roles and responsibilities and stipulated their system of payment. According to these conditions, Construction Co. were responsible for the design and construction of Phase B described in the Contract documents within a fixed lump-sum price and a 32 weeks period. They were to provide a Design Warranty and a Performance Bond to FinOp Ltd by signing the Bond form tailor-made by the latter - Construction Co. modified this condition by providing their standard Bond form. They were moreover to require the provision of direct design Warranties to FinOp Ltd by their design consultants and trade contractors with design liability. The letter of intent further stipulated that if the works were brought to a halt for some reason attributable to FinOp Ltd, Construction Co. would be paid a sum equivalent to the amount of work already undertaken. Although Construction Co. did not experience any problems associated with working on the basis of a latter of intent, the Project Manager speculated that problems could have arisen had they fallen out with FinOp Ltd at an early stage in the project.

The Form of Contract finally entered into was the JCT Standard Form of Building Contract with Contractor's Design, 1981. FinOp Ltd made minimal modifications to this Contract primarily because Construction Co. countered those modifications which would have had onerous implications for them. For instance, they refused to accept the changes to the 'contractor's obligations' clause, requiring the disclosure by Construction Co. of the warranty agreements between them and their trade contractors with design liability; and altered the wording of the 'Design Warranty Agreement' which FinOp Ltd required

Services Co. to sign. Construction Co.'s payment system was based upon monthly valuations carried out by QS Co. Variations or savings were added to or subtracted from the following valuation. Construction Co. passed on the payment system to Services Co. and other Trade Contractors.

Selection and appointment of construction group

The specialist and trade contractors were largely selected through tender processes. Construction Co.'s Proposals Co-ordinator - the person responsible for negotiating with FinOp Ltd at tender stage - explained the rationale for this method of work organisation. He stated that it avoided the management liability and risks that direct employment of tradesmen would impose on the firm; compensated for the limited estimating resources at the firm's local offices; and obtained a realistic picture of the market rather than relying on manufacturers' and suppliers' prices. He expressed a preference for long-term commercial contracts with specialist and trade contractors, however, claiming that partnerships were more viable means of procuring construction projects. An example of the engagement of a specialist contractor is provided below in relation to Services Co..

The limited tender period together with trade contractors' reluctance to tender competitively with the knowledge that their chances of securing a contract were slim, made the job of obtaining 4-6 tenders for every work package impractical. Therefore Construction Co. submitted quotations for some of the work packages at tender stage, based on their experience of previous works, and invited tenders later on. Some tenders received subsequently exceeded these quotations forcing Construction Co. to engage the trades people involved in the work packages directly, as supply-and-fix or labour-only

subcontractors. The trade contractors' engagement was based on letters of intent and those who refused to work on this basis were not considered.

Selection, appointment, roles and responsibilities of Services Co.

Services Co.'s selection

Services Design Co.'s representative explained that subsequent to meetings between Operation Co. and their Fruit Specialist - who had no contractual standing and acted as a Sub-Consultant to Operation Co. - agreement was reached to nominate two M&E contractors. The nominations were based on the contractors' regional location, their capability in terms of suitability to the project, their history of involvement with the project from the early days, their quotations submitted in the early 1990s, their reputation and previous experience.

Services Co. received their final invitation to tender from Construction Co. in October 1994. The tender documents comprised Operation Co.'s outline services requirements, amounting to 258 pages of performance specifications, and basic drawings but no Bill of Quantities. Services Co.'s Project Engineer expressed dissatisfaction at being given only a month to compile the final tender compared to the five years that Operation Co. had had to make up their mind. Services Co. translated Operation Co.'s outline services requirements into detail design specifications, comprising technical/performance specifications, and layout/sizing of the services. Their tender documents moreover contained the cost of the M&E works and their installation programme. Construction Co. negotiated both of these down; the cost reduction is not known but the programme was reduced form 27 weeks to 19.

Services Co.'s *cost* - the reduced price of the M&E works package they agreed to subsequent to negotiations with Construction Co. - was the deciding factor in Services Co.'s selection, according to the Project Manager.

Services Co.'s appointment, roles and responsibilities

Construction Co. appointed Services Co. on the basis of a letter of intent. The Project Manager claimed that although they tried to avoid the practice of engaging trade contractors on letters of intent, it was not always possible to do so for reasons already discussed. He further pointed out that the practice was rife in the construction industry. Services Co.'s letter of intent contained their conditions of engagement in terms of the nature and duration of their work, the agreed cost of the works, their responsibilities/liabilities, and the form of contract that Construction Co. required them to enter into. It further stipulated that if the works were brought to a halt for some reason, Services Co. would be paid a sum equivalent to the amount of work already undertaken. The letter of intent moreover required Services Co. to provide a design warranty to Operation Co. and a performance Bond to Construction Co.

Once FinOp Ltd and Construction Co. signed the main Contract, Construction Co. and Services Co. entered into the JCT Standard Form of Building Contract with Contractor's Design, 1981: Dom/2. Construction Co. countered FinOp Ltd's attempts to impose onerous Design Warranty conditions on Services Co. by crossing the conditions out, on behalf of Services Co., upon the return of the signed Warranty.

4.2.3 PROJECT DESCRIPTION

Project conception

The project, which from this point onward is referred to as 'The Cold Store', was conceived by Operation Co. who are a family firm composed of two brothers. The latter are fruit and hop farmers who own 700 acres of farmland - on which they grow apples and pears - as well as a cold store and distribution centre where they store and package their fruits before distributing them to retail outlets. One of their plots incorporates the existing site on which a development comprising 3 separate but functionally similar buildings, containing cold stores, was envisaged in 1988/9 to replace the existing facility.

Project history

The project planning phase, preceding conception, has a long history. One of the partners in Operation Co. was the chairman of the Parish council around two decades ago. During that period, he built a number of small industrial units in the vicinity of the present site to which no one objected. Ten years later, he applied for and obtained established [industrial] use for the site and submitted an application for planning approval for the present development without any local opposition. The Local Authority granted planning approval around late 1988/early 1989 possibly because of the employment opportunity that the development was likely to create for the region. The start of the development process took a further five years owing to shortage of funds.

During this period Operation Co. looked for sources of finance while the Funders of the project (Finance Co.) looked for additional cold storage facilities for their imported fruit. One of the directors in Finance Co. is an ex-merchant banker and therefore has access to funds; while the site in question is 30 minutes away from Finance Co.'s ports. Both parties

knew an agent in the fruit import industry who introduced them and effectively brought them together. Providing financial assistance to realise the project seemed advantageous to Finance Co. and the formation of a joint venture appeared a viable proposition to both parties. The initial joint venture negotiations began in August 1994 and the final agreement was reached in February 1995.

The Cold Store, comprises a new cold storage facility, a chilled distribution centre, associated roads and parking areas, new access into site, road widening works to the side road adjacent to the site and drainage works. The facility stores fruit produce grown on the surrounding grounds as well as imported fruit. The Cold Store, constitutes phase B of a three phased development, 33,000 metre square in area. Each phase contains facilities of similar nature but of varying sizes. The Cold Store is the medium sized facility and occupies the central section of the site. It has a gross foot print of 10,600 metre square and consists of:

- Controlled atmosphere industrial stores for fruit storage, of approximately 1,450 metre square floor area.
- Pre-pack and grading area, approximately 3,000 metre square.
- Chilled storage area, approximately 2,200 metre square.
- Chilled assembly and distribution area, approximately 1,800 metre square.
- Office space, 700 metre square in area.
- Ancillary ground floor accommodation - including offices, canteen and toilet facilities, 500 metre square in area.
- Storage, 700 metre square in area.
- A gate house, 45 metre square in area.

Operation Co. had envisaged to incorporate their existing facility, in terms of equipment and machinery, in the new premises. However, this concept was only partially realised as the cost of moving and upgrading some of the old machinery to match the new proved uneconomical.

The development had an initial contract value of approximately £6 Million, which grew larger upon completion[2]. The construction works began in January 1995, were scheduled for completion in 32 weeks, that is, in August 1995, and were completed by the end of October 1995. The services installation had an initial contract value of around £600,000 and cost around £800,000 upon completion. The installation began in May, were scheduled for completion in 19 weeks, and were completed in 23 weeks.

Managing project design

The changes in concept design at tender stage, discussed earlier, which led to Construction Co.'s inability to simplify the roof construction, resulted in a five fold increase in the tendered cost of the roof that was financed by Construction Co.. Further design changes were introduced by FinOp Ltd, during this phase, subsequent to reviews in operations, which gave rise to alterations in layout. Although reductions in the amount of work Construction Co. had to carry out resulted from these changes, they added two weeks to the programme. While some of the changes could be incorporated into the works and were absorbed in the programme, others involved dismantling and re-routing of services and led to extra work. Subsequently not all the savings arising from the changes accrued to FinOp Ltd; a portion was allocated to Construction Co. for the extra work, and further sums were paid to trade contractors who had been inconvenienced.

Services design

The M&E Advisor commented that the quality of Services Co.'s work was good but the level of their specification was based on cost rather than on durability and the services were designed to last around ten years only. FinOp Ltd instigated and paid for a series of design changes related to the main refrigeration. There were design development and other changes too that, according to the Project Manager, Services Co. should have anticipated and were thus asked to pay for.

The design of services was dogged with two problems. The first, based on the Project Manager's comments, was obtaining responses from Services Design Co. because the consultant they dealt with was relatively young and inexperienced and lacked the specialist knowledge required on this project. Consequently he was reluctant to approve information at will, which caused Services Co. a lot of aggravation. The second problem was Services Co.'s delays in the design of mechanical services, and their slow costing of changes owing to staff shortages. The Project Manager thought that Services Co. should have sublet the design of mechanical services.

Flow of design information

Construction Co.'s design team members produced the building design information electronically and transferred it to one another in hard copy format by mail or courier. The flow of design information generally took place in the following way:

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2. The Project Manager did not divulge the final contract sum.

- The Project Manager prepared a schedule of information required from Construction Co.'s design team at the beginning of the project and tied it into the main programme.
- The design team produced and sent their design information to one another and to the Project Manager who sent it to the Interfacing Project Manager to distribute amongst FinOp Ltd's design team for comments/approval.
- FinOp Ltd's design team commented upon/approved the design information and sent it to the Interfacing Project Manager who, in turn, sent it back to the Project Manager.
- The latter logged in the new information and distributed it within Construction Co.'s design team for revision.

The information relating to design alterations required by Operation Co. generally flowed from the latter to the Interfacing Project Manager, and through him to the Project Manager and Construction Co.'s design team. If the design alterations involved an important decision that had substantial financial implications for FinOp Ltd, the corresponding information was sent to the Principal Project Manager for consideration and comments before being sent to the Interfacing Project Manager. The flow routes for information relating to building design and alterations are presented in Figure 4.4. The black flow route represents information sent by Construction Co.; the blue flow route represents that sent by FinOp Ltd. The dashed line represents informal communication.

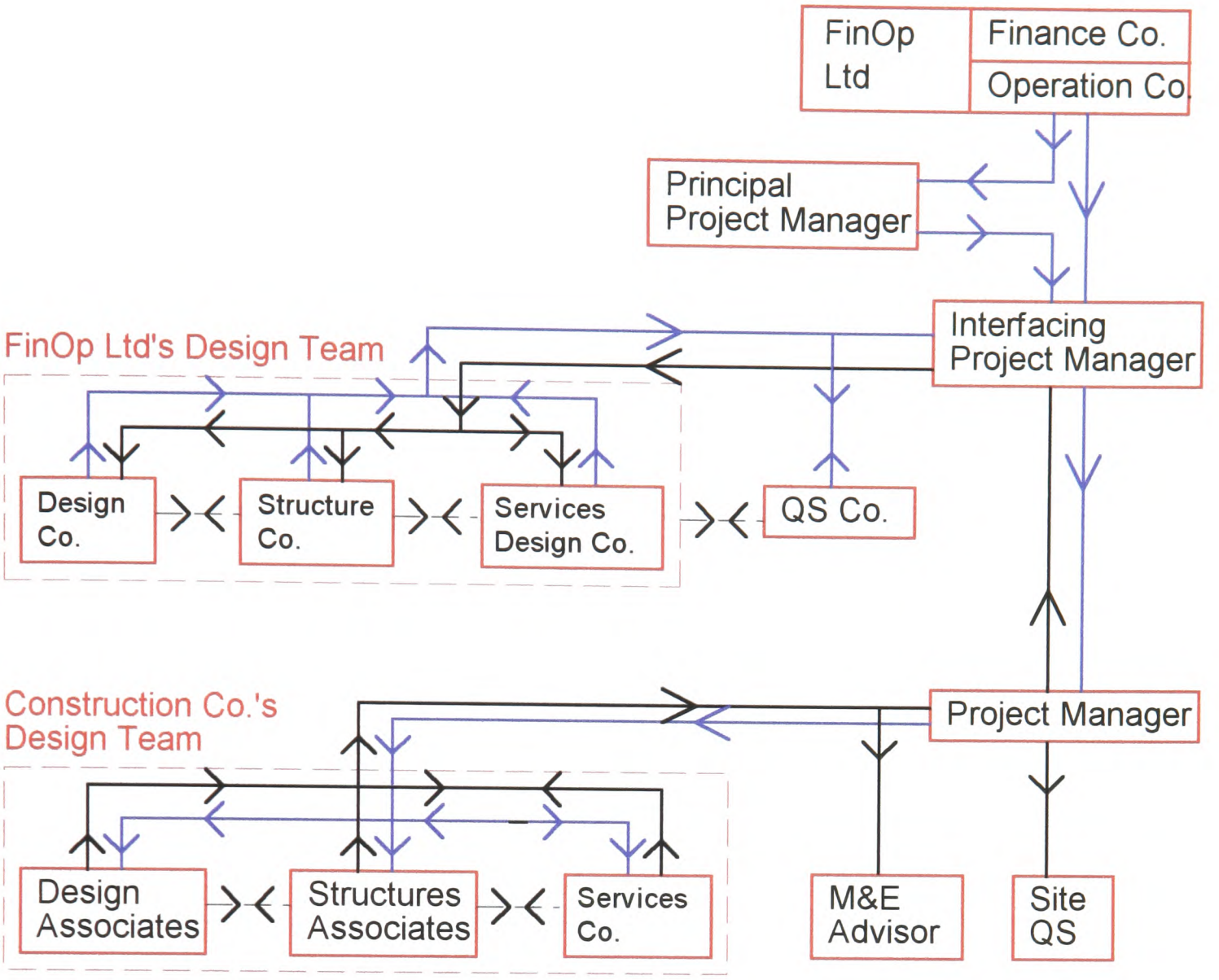

Figure 4.4: Building design information flow route

The flow of information was subject to communication within Construction Co.'s design team and between them and FinOp Ltd's design team, on the one hand, and decision-making processes by the members involved, on the other.

Communication

Construction Co.'s design team members communicated mostly informally - represented in dashed line in Figure 4.4 - by telephone and facsimile; confirming matters of contractual importance, drawing approvals, etc. in writing. They met formally with the Project Manager at design co-ordination meetings, and communicated with him informally in the interim periods. The Project Manager and the Interfacing Project Manager were the

principal channels of communication between FinOp Ltd and Construction Co., respectively. Their communication was strictly formal and took place through monthly meetings and correspondence. FinOp Ltd's design team members communicated largely informally, by telephone and facsimile, according to Services Design Co.'s representative, although they did meet formally every fortnight and backed up important issues with correspondence. They communicated with FinOp Ltd, regarding contractual matters, through the Interfacing Project Manager. No contractual information was regarded as authorised under their contract with FinOp Ltd unless issued by the Interfacing Project Manager. To the query as to whether the Interfacing Project Manager slowed down the communication process, Services Design Co.'s representative responded that he did but not to the detriment of the project. He claimed that 'a response from the Interfacing Project Manager could be obtained in 24 hours or less, when required'.

Decision-making processes

In the context of construction projects no design decision, however minor, can be made in isolation, without considering the chain of consequences it is likely to give rise to. For this reason, any design decision that needed to be made by a member of Construction Co.'s design team had to be communicated to the Project Manager and other team members or discussed in design co-ordination meetings. Once a decision was agreed upon or ultimately made by the Project Manager - who was the decision-making authority within Construction Co.'s design team organisation - it was communicated to FinOp Ltd's design team, via the information flow route, for comment or approval. At least this was what was supposed to take place in theory. In practice, the Project Manager made the urgent decisions *before* communicating it to FinOp Ltd in order to keep to the programme.

Design co-ordination and control

Construction Co. took on the responsibility for design co-ordination, partly to save the fees that Design Associates would have charged for undertaking the task, and partly because they considered themselves better suited to the job. The Project Manager stated that Construction Co.'s usual practice was to employ full-time design co-ordinators on projects either with a contract value in excess of £12M, or of complex nature. The low contract value of this job made the employment of a design co-ordinator economically nonviable; whilst the fast track nature of the design and variability of FinOp Ltd's requirements gave rise to management complexities that merited the services of a full-time design co-ordinator. Construction Co. decided not to allocate a design co-ordinator; a decision that was rashly made in the opinion of the Project Manager. Design co-ordination and control took place through meetings held at fortnightly intervals between Construction Co. and their design team and chaired by the Project Manager.

The design co-ordination meetings involved identification of problems and attention to queries raised by FinOp Ltd, in response to which the team members suggested solutions and made comments and the Project Manager recommended a course of action to each member. The meetings moreover served as a forum for monitoring the progress of information production by the design team members. In the Project Manager's view, Design Associates did not have adequate experience in D&B projects, did not produce their design input on time or to adequate quality and thus delayed Structures Associates and Services Co.'s input production. According to Design Associates' Project Architect, the slow production of design information was a result of inadequate resources - the equivalent of one and a half persons' time - allocated to the job.

Managing project construction

Planning the construction works

During the two weeks lead-in period prior to commencing construction, Construction Co. set out their aims and objectives, established their goals and targets, and planned the construction works by mobilising the key specialist and trade contractors they had already selected, and selecting those outstanding. Construction Co.' aims were to finish on time, which, according to the Project Manager, was a challenge; to do better, financially, than the margin they had allowed against the job; to develop a good working relationship with FinOp Ltd to secure the potential for more work; to produce as good a quality job as they could - bearing in mind the 'gulf between what FinOp Ltd expected and what they were paying for'; and to achieve a very low incident job by preventing the occurrence of accidents.

To finish on time, Construction Co. expanded the programme of works, developed during the tender process, to include detailed activities. The duration of each activity was determined using data banks containing the production rates for the activity, in conjunction with Construction Co.'s expertise and judgement. To improve their margins, they negotiated down the tender prices of their prospective specialist and trade contractors, and used low specifications when they came across vague areas in FinOp Ltd's requirements. To develop a good relationship with FinOp Ltd, the Project Manager arranged monthly technical meetings attended by all the design consultants and occasionally by the trade contractors or their subcontractors, to discuss and answer the queries of Structure Co. and Services Design Co., which by the end of the project exceeded 250 per consultant. Construction Co. were budget conscious in their production quality which caused disagreements between them and FinOp Ltd. This was reflected in

the Project Manager's comment: '[FinOp Ltd] are paying for a Ford and expecting a Rolls Royce'. To prevent the occurrence of accidents, Construction Co. prepared a safety plan, based on CDM regulations, which required every trade contractor to submit a Method Statement and Risk Assessment stating the party responsible for the risk. The Project Manager enforced the safety plan.

Planning of the construction works revealed three problem areas. Firstly, certain works had not been anticipated, priced, or programmed. Secondly, some items of work were grossly under-priced. Thirdly, some delivery periods were incorrectly anticipated. These factors squeezed the programme towards the end date and required skilful juggling of activities within the available spaces in order to complete the works. To compensate for the planning errors, Construction Co. reanalysed their tender price and renegotiated the prices of work packages in parallel with the design and procurement of various stages.

Flow of production information

The flow of production information during the construction process generally took place in the following way:

- Construction Co.'s design team sent the production information to the Project Manager who checked, commented upon and returned it for revision.
- Construction Co.'s design team sent the revised information to the Project Manager, who sent it to the Interfacing Project Manager to distribute amongst FinOp Ltd's design team for comments/approval - when Construction Co.'s design team urgently required feedback/approval, they sent the information to FinOp Ltd's design team directly with a copy to the Interfacing Project Manager.

- Upon receipt of the approved information, the Project Manager sent it to Services Co. and other trade contractors through the Site Manager.
- When Services Co.'s or other trade contractors' Foremen received information that conflicted with the situation found on site - which happened quite often[3] - they lodged requests for further information with Construction Co.'s Site Supervisor, who passed it on to the Site Manager, who forwarded it to the Project Manager, who, in turn, sent it to their Design team. This process was lengthy and inefficient because by the time the response to a query reached the site it was already out of date. Moreover, FinOp Ltd's continued design alterations throughout the construction stage exacerbated the query process.

The flow routes for information relating to building construction and design alterations, and that requested by trade contractors are presented in Figure 4.5. The black flow route represents information sent by Construction Co.; the blue flow route represents that sent by FinOp Ltd; and the green flow route represents the queries raised on site. The dashed lines represent informal or direct communication which by passes the stipulated information flow route.

Communication

The modes and channels of communication within and between the design teams remained the same at construction stage as they were at design stage. Further channels were created to facilitate communication between Construction Co.'s design team and the construction group. These, which comprised the Site Manager, Construction Co.'s Site Supervisors,

and Services Co.'s and other trade contractors' Foremen, were the only official mediums for the flow of information between the two entities.

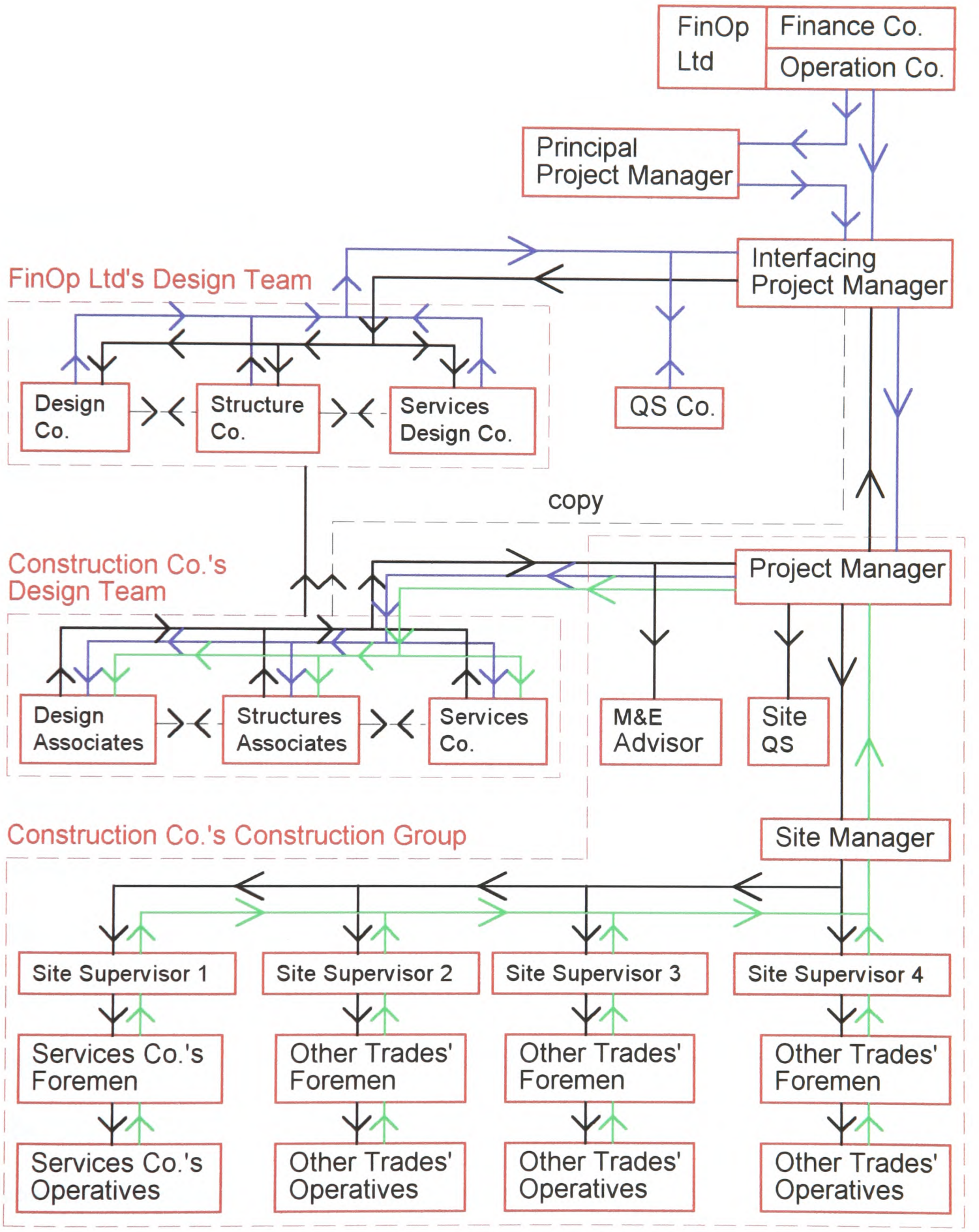

Figure 4.5: Building construction information flow route

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3. Services Co.'s Electrical Subcontractor commented, in a site meeting, that consultants' drawings were set aside almost as soon as they were received because they did not bear any resemblance to the way the building had been constructed or the services had been installed.

The operation of a formal system of communication within the project coalition arose from the contractual relations and was related to the decision-making processes. This meant firstly, that only parties bound by contracts - for example, FinOp Ltd and Construction Co.; Construction Co. and the Services Contractor; etc. - could discuss project-related issues and make mutually binding decisions under their contracts. Secondly, because of the great number of participants in the coalition, representatives were needed to communicate the problems and make the necessary decisions they were authorised to make - very often decisions that had financial implications were referred to superiors within the representatives' organisations. Thirdly, because FinOp Ltd was the head of the coalition and paid for the project they had to approve all the decisions that involved deviations from the work specified in the Contract Documents.

Decision-making processes

The decision-making processes were delegated in the following manner. The site related issues such as trade contractors' access to areas, the quality of their workmanship, their observation of Health and Safety regulation, and resolution of disagreements between them were often decided by Construction Co.'s Site Supervisors in liaison with the Site Manager. Issues relating to the programme of works and its revision, such as delays at the interfaces arising from late delivery of materials/components or unavailability of operatives and the consequent juggling of trade contractors' activities, were decided by the Site Manager in liaison with Construction Co.'s Site Supervisors and trade contractors' Foremen. In both cases the outcomes were reported to the Project Manager. The design related issues were usually decided by the Project Manager in consultation with Construction Co.'s design team and with or without FinOp Ltd's approval, depending upon the severity of the risk involved in the decision being made. Owing to the slow

production of construction information by Construction Co.'s design team, particularly Design Associates, the Project Manager faced a dilemma: To build at risk, without FinOp Ltd's approval; or to obtain approval and delay the works. A choice was often made based upon the extent or gravity of the risk involved.

The decision-making processes were generally directed by financial considerations and comprised exercises in damage limitations. When a problem arose on site, the potential solutions were often examined in the light of their costs and potential disruption, and often the cheapest solution causing the least disruption to the works were opted for.

Co-ordination and control of production inputs

Co-ordination of complex work packages, like services installation, with construction works took place through site meetings between the Site Manager and the trade contractors' foremen. The meetings between the Site Manager and Services Co.'s Foremen were held at weekly intervals and involved identification of problems that often related to discrepancies between design and construction, progress of the works, labour resources and safety issues. In response to these problems, solutions were discussed and comments made by all participants and the Site Manager recommended a course of action to each Foreman.

According to the Project Manager, levels of motivation varied amongst the trade contractors. Some were very keen and tended to pursue the Site Manager to gain access to their corresponding part of the site to get on with their work. On the other hand, there were those who needed a lot of 'pushing and organising' in order to get on with their work. When confronted with the latter category, the Site Manager tended to approach the

trade contractors' foremen, in the first instance, and require them to prompt their operatives. If this approach failed, the Project Manager contacted the project engineers and sometimes the directors of the companies. At times, if the organisations appeared to lack effective management, the Project Manager or the Site Manager intervened directly and helped along with the organisation of trade works, for instance, they ordered materials and ensured that those materials arrived on site when required. This was done to prevent delay in the execution of work packages which could delay the entire programme, claimed the Project Manager.

Construction Co. had problems with ten or so trade contractors who were unable to manage their work packages. Most of them were small organisations. Construction Co.'s major problems, however, were experienced with the Electricity and Gas Mains Suppliers who only installed their services a week before handover. Construction Co. pursued the Electricity Mains Supplier for six weeks to obtain a connection date before they were informed of the £3,000 payment required to be granted a wayleave[4], plus £300 to cover administration charges, together with a further £3,000 returnable deposit. The Project Manager regarded this payment as financial inducement.

The Project Manager arranged safety inductions, carried out at intervals on site, when the works began. At their pre-contract meetings, the specialist and trade contractors were informed of their safety requirements, including submission of method statements and risk assessments. The Site Supervisors monitored the observation of Health and Safety Regulations by the trade contractors, on a day-to-day basis, and reported deviations to the

4. Apparently the Electricity Mains Supplier owned the road adjacent to the site which the services mains had to cross before entering the site.

Site Manager. The latter brought these deviations to the attention of trade contractors' foremen and required conformance.

Services installation: organisation, co-ordination and control of services inputs

Services Co. subdivided the services works into electrical, mechanical and specialist refrigeration installations. They sublet the electrical installation to a local electrical contractor (Electric Co.); the manufacture of mechanical and public health services to a supply-only firm; their installation to labour-only subcontractors (Installers); and their insulation to a supply-and-fix firm (Insulate Co.) under their own supervision and control. They commissioned the services themselves and sublet the production of the Controlled Atmosphere Stores, chlorination and refrigeration pipes to specialist firms (CAS Co., Chlorin Co., and Refpipe Co.) with whom they worked closely.

Services Co.'s management team controlled the services installation. The team comprised: the Project Engineer, responsible for mechanical and refrigeration systems' design and for overseeing the progress, cost and quality of the installation; the Electrical Engineer, responsible for electrical design; the Public Health Engineer, responsible for the design of public health services; the Electrical, Mechanical, and Refrigeration Foremen, responsible for supervising the installation of corresponding services. The organisation of services installation is represented in Figure 4.6. The links represent lines of infiuence arising from the team member's position and role within the organisation.

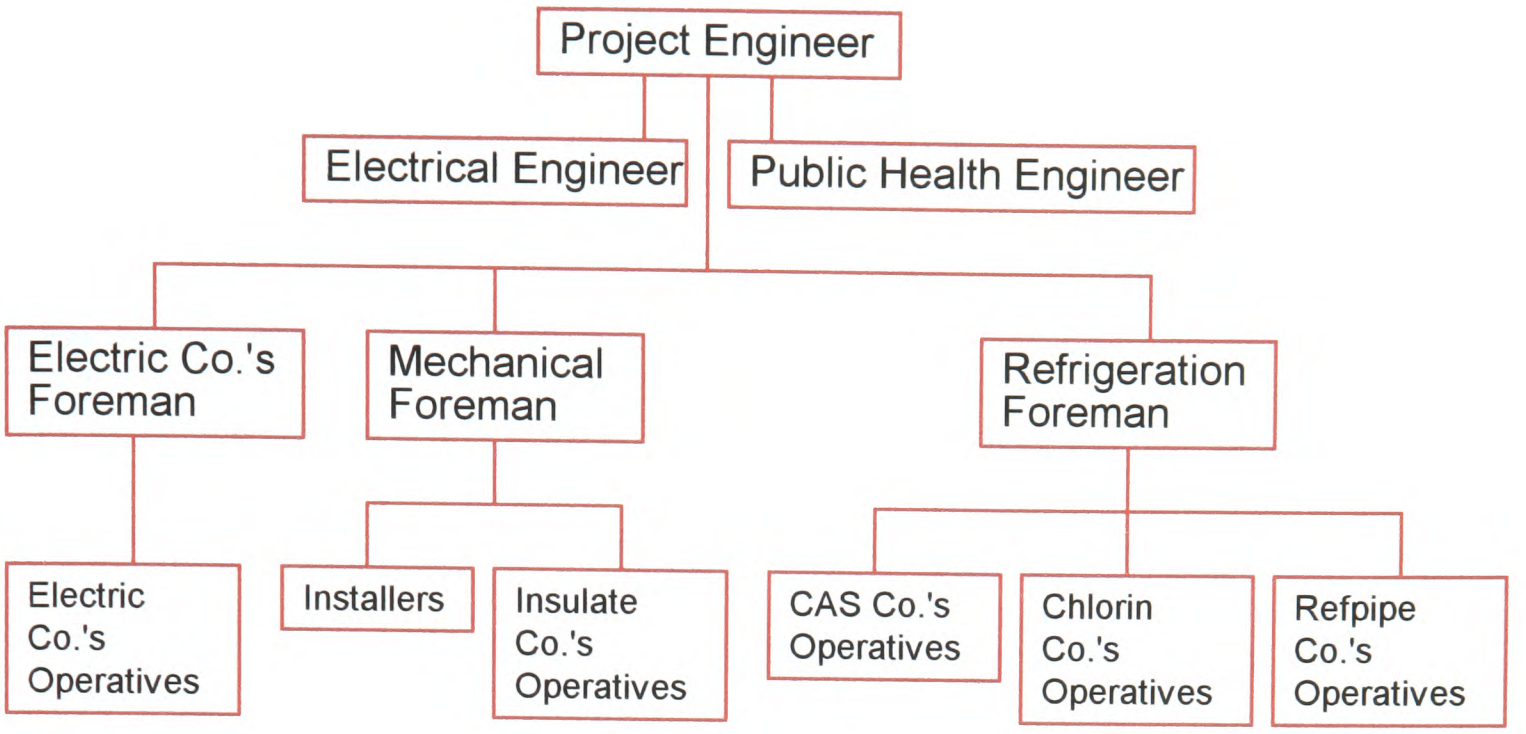


Figure 4.6: Organisation of Services works package

The Project Manager claimed that the mechanical and public health installations were not managed well and threatened to let Construction Co. down: '[Services Co.] had trouble with [plumber Installers] and [Insulate Co.'s] delivery and altogether had not organised themselves well owing to their inadequate financial and human resources.'

Changes in the services design shifted Services Co.'s time targets both laterally and longitudinally. They reprogrammed their activities so as to incorporate some of the changes and intensified installation during the last two weeks of operations to meet the end date. However, certain elements, like the Controlled Atmosphere Stores, could not be completed until the building was operational. Therefore Services Co. were given four weeks extension without incurring damages. They exceeded their financial targets partly as a result of unanticipated requirements and partly owing to the intensification of activities involving operatives working round the clock, seven days a week. The services installation cost around 10% more than the tender price. The Project Manager pointed out

that Services Co. were reluctant to accept some of the risks they should have allowed for at tender stage.

Services Commissioning

The commissioning process had to start six weeks before the hand-over and required power. However, power was not available until two weeks before hand-over. Therefore a lot of commissioning did not take place for hand-over. The commissioning tests indicated that the facility met the performance criteria specified by Services Design Co. and therefore satisfied FinOp Ltd's quality requirements.

4.3 CONTRACTUAL AND OPERATIONAL FRAMEWORKS

This section interprets the implications of the contracting parties' engagement criteria for the parties' relations by establishing whether these relations express power disparity and power strategies or various forms of trust. It then goes on to interpret the impact of the Project Manager's and the Site Manager's leadership, motivation of participants, involvement of participants in decision-making and their formation into a team, on the participants' interactions.

4.3.1 CONTRACTUAL FRAMEWORK: INTERORGANISATIONAL RELATIONS

The interorganisational relations emanating from the contractual framework of the main project participants being investigated here, may be considered as a sequence or a

hierarchy of subcontracting relations. FinOp Ltd sublet the detail design and construction production information functions to Construction Co.. Construction Co. sublet the design, manufacture, installation and commissioning of the services to Services Co.. The latter sublet the manufacture and installation of electrical, mechanical, and refrigeration services to subcontractors, and the installation of public health services to labour-only subcontractors. This hierarchical relationship is represented in Figure 4.7, and is explored below under subcontracting relations.

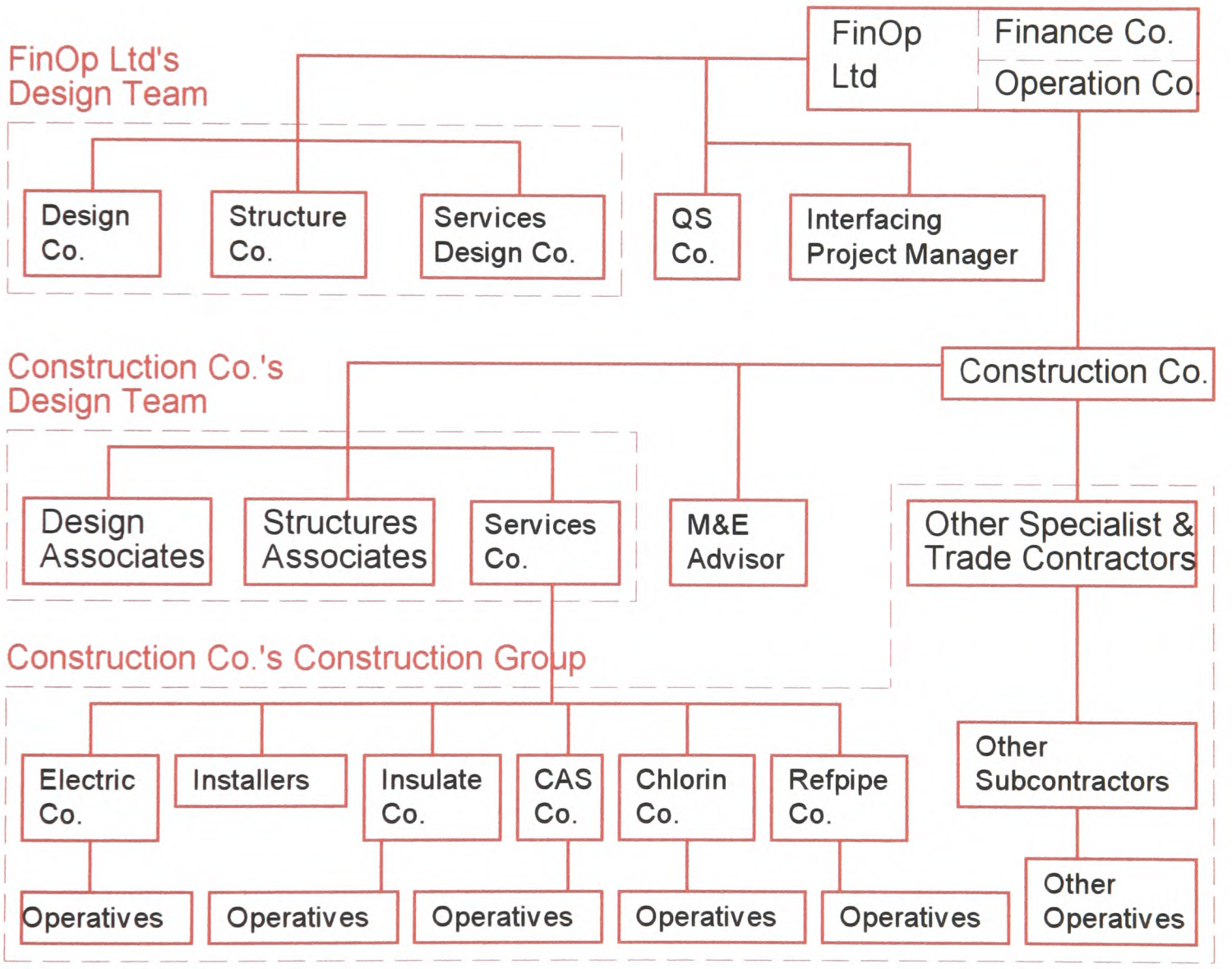


Figure 4.7: Participant organisations' contractual relations in The Cold Store
Subcontracting relations

Subcontracting relations

The nature of subcontracting relations, defined in terms of subcontractors' independence from or relative dependence on the main contractor, and governed by subcontractor's control over the four phases of work process ((Druker and Macallan, 1995: 53, based on Chaillou, 1977; Chapter 2: 66-7), may be represented in Figure 4.8.

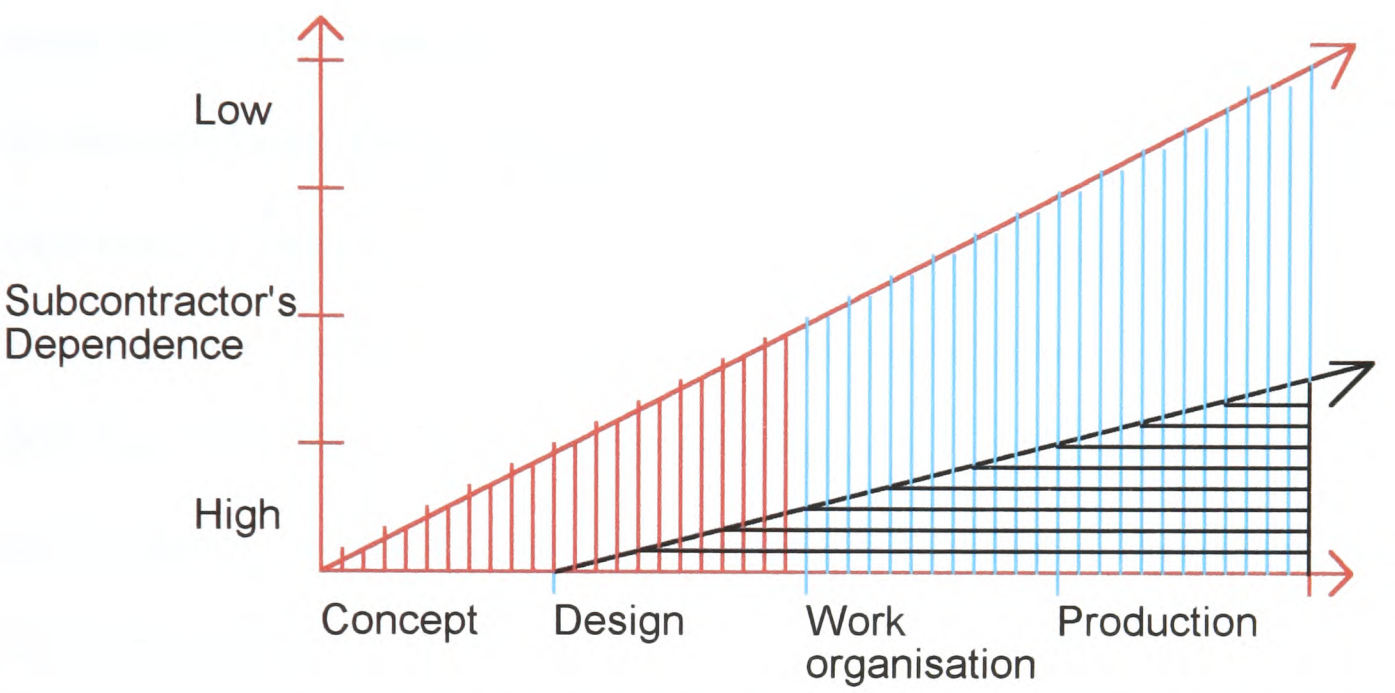


Figure 4.8: Dimensions of subcontracting relations in the Cold Store

Based on this Figure, Construction Co. were in a position of relative dependence on FinOp Ltd (hatched area in black on Figure 4.8). Not only had they (Construction Co.) not had control over the conceptualisation process, but they could not exercise total control over the development of design and construction by relying on their own technical and management expertise. Services Co., by virtue of being responsible for all four phases of services installation process, were in a position of independence relative to Construction Co. (hatched area in red on Figure 4.8). However, by subletting the production phase to subcontractors and labour-only subcontractors and lacking adequate

financial and human resources to organise and manage the works, Services Co. were relatively dependent upon their subcontractors and operatives (hatched area in blue on Figure 4.8).

Power disparity

Chapter 2 identified the existence of power in a relationship with power disparity (see pages 16-17). This means party A exercising power over party B - by getting him/her to do what the former wants - because party B is in a subordinate position and consents or capitulates to party A, or party A has the capacity to overcome party B's resistance by way of party A's position in the hierarchical structure (Pfeffer, 1981: 2-3; Clegg, 1989: 208; Fox, 1974: 98-9). Thus power was defined as a field of force between domination and resistance, or authority and illegitimate resistance. These alternative concepts of power are presented in Table 4.3.

Table 4.3: Alternative concepts of power relations

POWER RELATIONS	SOURCES OF POWER
Domination	Power vested in organisational structure (Hardy and Clegg, 1996: 626; Fox, 1977; Friedman, 1977: Chapter 6).
Resistance	Power of knowledge and discretion in the use of that knowledge (Ibid.).
Authority	Power legitimated through norms, expectations and structural hierarchy (Pfeffer, 1981: 4-6).
Illegitimate resistance	Power formally unauthorised, officially uncertified, widely not accepted (Mintzberg, 1991(b): 372).

To examine the existence of power in the relationships between the contracting parties, power disparity needs to be established. FinOp Ltd exercised power over Construction Co. by getting them to accept a number of onerous conditions including the brief tender period, change in requirements during tender stage, the complex concept design, the

reduced tender price, and appointment on the basis of a letter of intent. Construction Co. consented because they were in a subordinate position. They operated in a competitive market - a buyers market - and hoped to obtain further contracts from FinOp Ltd. Construction Co., in turn, exercised power over Services Co. by requiring them to accept a reduced tender price, a shorter programme of installation, and appointment on the basis of a letter of intent. Services Co. consented for the same reasons that Construction Co. had consented to FinOp Ltd. Therefore power disparity characterised the relations between the contracting parties being investigated. However, the nature of power relations changed during the project life cycle.

In the relation between FinOp Ltd and Construction Co., the former tended to dominate, on the strength of their position as funders of the project, whilst Construction Co. tended to resist this domination through negotiations over the financial implications of design changes, etc. by relying on their knowledge and relative discretion in the use of that knowledge. In the relation between Construction Co. and Services Co., Construction Co.'s domination was curbed by their relative dependence on Services Co.'s knowledge and relative discretion in the use of that knowledge. Therefore the power relations between the contracting parties was domination and resistance rather than authority and illegitimate resistance.

Power strategy

Chapter 2 identified two strategies adopted to use power, prevention of conflict and defeat of conflict (see pp. 18-19). The former involves management strategies resulting in the political inactivity of subordinates, like responsible autonomy or direct control (Friedman, 1977: 6-7). The latter comprises management strategies opposing

subordinates' resistance, and subordinates' strategies opposing management's resistance through acquisition, development, and use of power (Pfeffer, 1981: 7).

To utilise their respective powers to achieve their aims, the contracting parties employed differing power strategies. FinOp Ltd used direct control to scrutinise Construction Co.'s actions, whilst Construction Co. used the uncertainties and changes in FinOp Ltd's requirements to acquire bargaining power. In their relationship with Services Co., Construction Co. allowed the latter discretion over their work whilst supervising them through the M&E Advisor. Services Co. used their power of discretion to act in their own interest when allocating resources to the project and when specifying materials and components.

The implications of the contracting parties' power strategies for the emergence, handling, and resolution of conflict are elaborated in the next section. Having established the existence of power in the parties' interorganisational relations and their strategies for its use, attention is now focused on examining whether trust featured in these relations and if so, in what form and to what extent.

Trust-based co-operation

Chapter 2 defined three forms of trust in interorganisational relations, reliability, predictability and power-induced predictability, based on economic, institutional and political theories, respectively. It then argued the importance of trust-based co-operation whilst recognising the difficulties of establishing trust in exchange relations. The three forms of trust, their definitions, and the conditions on which they depend are presented in Table 4.4.

Table 4.4: Alternative forms of trust

FORM OF TRUST	DEFINITION OF TRUST	CONDITIONS NECESSARY FOR TRUST
Reliability	Calculated risk	1. Expectation of an on-going relationship. 2. Knowledge of higher transaction costs arising from waning of trust. 3. Repeated exchanges and reputation. 4. Co-operation within networks based on common interests. 5. Constant monitoring and consultation by and between members.
Predictability	Risk reducing mechanism	1. Business contract supported by bond, collateral, penalty clauses, or incentive provisions for enhanced performance. 2. The effectiveness with which the contract promotes information flow, spreads the costs of conflict, monitors organisations and reduces uncertainty.
Power-induced predictability	Impression created to manipulate weaker party into co-operation. Capitulation.	1. High discretion roles reflecting superordinates' trust in subordinates or their fear of illwill created through prescription. 2. Low discretion roles reflecting subordinates acquiescence to hierarchy or perceptions of no alternatives

To examine whether the contracting parties co-operated on the basis of trust, the nature of their co-operation is scrutinised on the basis of a few simple questions and the information provided in the above Table.

Co-operation of FinOp Ltd and Construction Co.

Did FinOp Ltd rely on Construction Co.? They appear to have taken a calculated risk by appointing Construction Co. to undertake the project. However, this risk was not based on the expectation of an on-going relationship, repeated exchanges, or co-operation within a network formed around common interests. It involved high transaction costs associated with constant monitoring and consultation by FinOp Ltd's design team and Interfacing Project Manager. Therefore it is doubtful as to whether the risk taken

reflected FinOp Ltd's reliability on Construction Co.. Did Construction Co. rely on FinOp Ltd? They certainly took risks by accepting the concept design and reducing the tender price. These risks may have been based on the potential for future work on the remaining two phases of the development; they were not, however, based on other conditions necessary for the development of calculative trust.

Did FinOp Ltd depend on Construction Co.'s predictable behaviour? FinOp Ltd entered into a business contract supported by bonds, collateral and penalty clauses. However, the flow of information and the monitoring mechanisms were not effective and uncertainty was compounded throughout the project rather than reduced. Thus providing Construction Co. with the opportunity of behaving unpredictably, for example, by making design or construction decisions without approval. Therefore FinOp Ltd could not depend on Construction Co.'s predictable behaviour. Did Construction Co. depend on FinOp Ltd's predictable behaviour? To the extent that Construction Co. entered into an agreement with FinOp Ltd on the basis of the principle of a business contract - i.e., a letter of intent - as opposed to a contract proper, they depended on FinOp Ltd's predictable behaviour. However, the Project Manager expressed reservations about the certainty of this predictability had things gone wrong. Indeed doubts regarding the predictability of FinOp Ltd's behaviour may have provided the incentive for Construction Co.'s co-operation.

Did FinOp Ltd employ power-induced predictability? In so far that FinOp Ltd selected design and Build as the method of procurement but retained control over design development and construction production information, it may be pertinent to conclude that they created impressions of a high discretion role for Construction Co.. This was

done so as to manipulate the latter into accepting more responsibility than they would have done under the traditional method of procurement. Did Construction Co. capitulate? They appear to have done so to an extent to try and please FinOp Ltd, but by no means totally.

Co-operation of Construction Co. and Services Co.

Did Construction Co. rely on Services Co.? In so far that Services Co. were one of two specialist contractors nominated by FinOp Ltd, Construction Co. took a relatively higher risk in terms of the cost of services than they would have done had they invited four or five tenders. However, they limited this risk by appointing the M&E Advisor to oversee the tender process and the services installation. Therefore they did not rely on Services Co. entirely. Did Services Co. rely on Construction Co.? They did so on a few occasions, one of which regarded the omission of onerous conditions, by Construction Co., on the Design Warranty FinOp Ltd. required of Services Co.. This reliance, though having the appearance of calculated risk, did not reflect trust because it was not based on the other conditions necessary for calculated trust. It was based, rather, on Services Co.'s lack of options.

Did Construction Co. depend on Services Co.'s predictable behaviour? Despite entering into an agreement with Services Co. that was supported by Bond, collateral and penalty clauses, Construction Co. appointed the M&E Advisor to monitor Services Co.'s work and to reduce the uncertainty associated with it. Therefore Construction Co. did not appear to depend on Services Co.'s predictable behaviour because they lacked the specialist knowledge required to ensure Services Co.'s compliance with the contract. Did Services Co. depend on Construction Co.'s predictable behaviour? They entered into an

agreement with Construction Co. based on a letter of intent, because they would not have been appointed otherwise. Therefore it is difficult to know whether they co-operated because they chose to or because they had to.

Did Construction Co. employ power-induced predictability? Construction Co. appointed Services Co. to design and install the services and specialist refrigeration on the basis of their nomination and price. Thus, Services Co.'s high discretion role was the outcome of circumstance rather than a reflection of trust, or fear of illwill resulting from prescription, or an impression created by Construction Co. to manipulate Services Co. into co-operation. Did Services Co. capitulate? Services Co. capitulated both to FinOp Ltd's unanticipated requirements and to the risks Construction Co. apportioned to them.

4.3.2 OPERATIONAL FRAMEWORK: INTERPERSONAL RELATIONS

The operational framework, comprising the communication channels, information flow routes and decision-making processes, was set up by the Project Manager. It both influenced and was influenced by the organisational representatives' interpersonal relations and interactions. The complexity of the framework demanded speedy production of information by Construction Co.'s design team to ensure its timely approval and progress to subsequent stages of information production and translation into construction. Failure to meet this demand, particularly by Design Associates, placed strains upon the relations between the architects responsible and the Project Manager, between the latter and the Interfacing Project Manager, between the architects and their counterparts in FinOp Ltd's design team, and between the Site Manager and the Foremen of Services Co.'s subcontractors. This led to Construction Co.'s design team members taking short cuts and sending information directly to their counterparts in FinOp Ltd's design team, or

bypassing the approval system and sending information directly to the specialist and trade contractors on site, thus aggravating the already strained relations referred to previously.

This sub-section assesses the impact of the Project Manager and the Site Manager on the interpersonal relations at the services installation/construction interface within the operational framework. To do so, their respective leadership of the design team and the construction group, the way in which they motivated the design team members and the specialist and trade contractors, the extent to which the design team and the construction group participated in decision-making, and the success or otherwise of the formation of design team and the construction group into teams are considered.

The leadership behaviours

Chapter 2 related leadership to the combination of leader's style and situational factors. Therefore depending on whether the leader has an authoritarian or democratic style, he/she may adopt various degrees of task or relationship behaviour. This stylistic behaviour needs to match the situational factors of leader-member relations, task structure, leader's position power, and maturity of the group or team, in order to result in an appropriate overall leadership behaviour capable of influencing the group or team members (see Section 2.3: 32-7). The relationship of leader's style and situational factors to leadership behaviour is demonstrated in Figure 4.9.

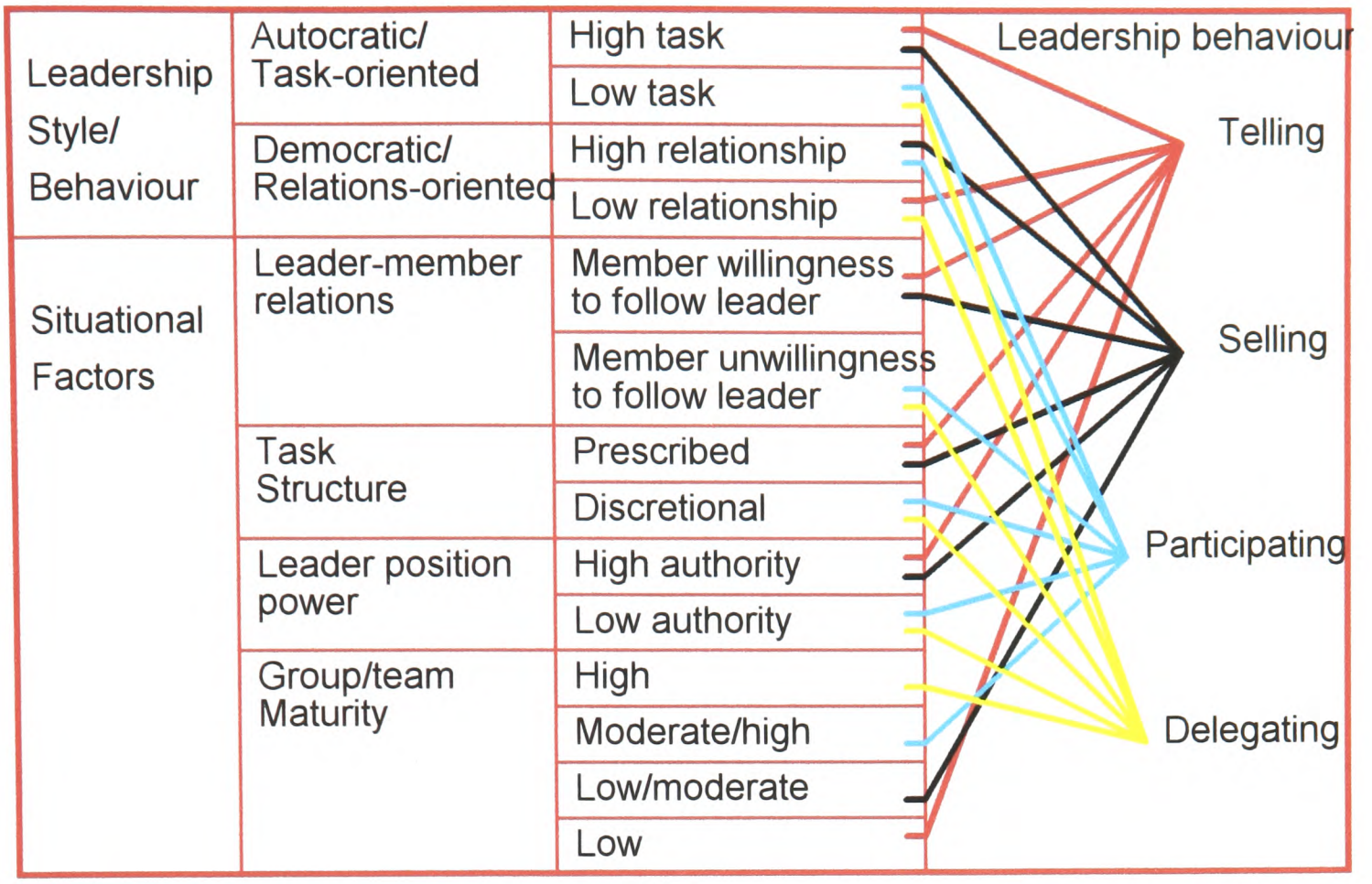


Figure 4.9: Factors influencing leadership behaviour

The Project Manager's leadership behaviour towards the design team members corresponded to the 'selling' category presented in Figure 4.9. That is, high levels of directive and relationship behaviour which is appropriate for low/moderate level of team experience in carrying out the type of task. By virtue of his responsibility and role, the Project Manager placed a high emphasis upon team members' tasks and maintained a two way communication with them throughout the project. He therefore adopted a high task/high relationship leadership style. The history of Design Associates' and Structures Associates' relationship with Construction Co. manifested itself as the corresponding organisational representatives' willingness to follow the Project Manager's guidance and instructions. Furthermore, the schedule of information required from the team members (see flow of design information, above) prescribed the structure of their tasks, whilst the authority of the Project Manager to influence their selection on future projects provided

the incentive for their co-operation. However, despite these co-operation promoting factors, the resource limitations of Design Associates and Services Co. hampered their production efforts. Thus the Project Manager's leadership behaviour had limited impact upon influencing the design team members' inputs.

The Site Manager adopted two types of leadership behaviour towards the specialist and trade contractors corresponding to the 'telling' and the 'delegating' categories in Figure 4.9. When the trades required high levels of direction and conveyed low levels of capability or experience in carrying out their tasks, the Site Manager provided them with prescriptive guidance (see Co-ordination and control of inputs, above). When the trades were willing and capable of carrying out their tasks with low levels of direction and support, the Site Manager provided limited guidance and let them get on with their work. One of the observed problems associated with telling behaviour related to the unwillingness of Services Co.'s subcontractors' Foremen to follow the Site Manager's lead owing to the low level of authority they ascribed to him. Thus the Site Manager too had problems with influencing the trade contractors' inputs.

Motivation of project participants

Chapter 2 discussed two categories of factors for motivation: Control mechanisms corresponding to the motivator's sources of power, and manifested as reward and punishment; and fulfilment of individual values relating to motivatee's attitudes to work and demonstrated as job satisfaction (see Section 2.3: 32-7). These motivational factors are demonstrated in Table 4.5.

Table 4.5: Types and theoretical bases of motivation

TYPE OF MOTIVATION	NATURE OF MOTIVATION	THEORETICAL BASIS	UNDERLYING PRINCIPLE
Reward and punishment	Control mechanism linked to sources of power	Reinforcement theory	Financial incentives or penalties
		Expectancy theory	Reward attached to high performance
		Goal-setting theory	Goal difficulty leads to high levels of performance and vice versa
Job satisfaction	Fulfilment of individual values linked to attitudes to work	Job design theory	Fulfilment of needs
		Equity theory	Fairness of treatment is linked to performance levels
		Leadership theory	Style and situational factors

The Project Manager did not appear capable of motivating Design Associates' representatives to produce information more quickly than they did because Design Associates lacked the financial incentives to do so (see Design co-ordination and control, above), both in terms of low fees and the absence of rewards attached to high performance. The high level of difficulty of their goal did not seem to lead to high performance probably because it demanded more effort than they could afford or were prepared to dedicate to the job. This argument applies, to a degree, to Services Co. and their representatives, although the penalty clauses in Services Co.'s contract created the push for the extra effort that was provided towards the end of the project. It is anticipated that the design team's low level of control over the design development may have adversely influenced the fulfilment of the team members' needs and values and their perception of the fairness with which they were treated by FinOp Ltd.

The financial incentives and penalties did not appear to have been adequate motivators for some of the specialist and trade contractors, in particular, Services Co. and their subcontractors. This view is reinforced by Services Co.'s Project Engineer's perception of

not having been treated fairly (see Services Co.'s selection, above), and is conveyed by the shortfalls in resourcing the services information production.

Participation in decision-making

Chapter 2 defined participation in decision-making as the involvement of subordinates or group members in decision-making and control processes to secure their commitment and ascribed its achievement through collective problem-solving (see Section 2.3: 36). This section considers the extent to which design team and construction group members were involved in decision-making processes and the consequences of this for their interpersonal relations.

Although the Project Manager had the ultimate authority in decision-making within Construction Co.'s design team organisation, all team members participated in design decisions that were generally discussed in design co-ordination meetings (see Decision-making processes under Managing project design, above). This process appeared to strengthen the team members' commitment to the project objectives and secure their overall co-operation.

The construction related decision-making was delegated to the Site Manager, and the Site Supervisors, although the Project Manager made the major decisions with financial and programme implications (see Decision-making processes under Managing the construction of facility, above). In addition to this formal decision-making structure, the trade contractors' foremen were occasionally involved in solving the problems encountered during the construction process. For example, Services Co.'s subcontractors' Foremen tended to resolve installation problems, and clashes between the services and

constructional elements on site in consultation with the Site Manager. This informal participation in decision-making constituted the premise for the co-operation of Services Co.'s subcontractors.

Team building

Chapter 2 identified the criteria for team building as group characteristics, nature of the task, and the environment in which the group functioned, and discussed the conditions on which they depended (see Section 2.3: 37-8). These criteria and conditions are presented in Table 4.6.

Table 4.6: The criteria and conditions for team building

TEAM BUILDING CRITERIA	CONDITIONS ON WHICH TEAM BUILDING DEPENDS	
Group characteristics	Group size	Determines diversity of talent, skills, knowledge, individuals' participation
	Member characteristics	Determines homogeneity and satisfaction, or heterogeneity and conflict
	Individual objectives	Determine hidden agendas, diversity of objectives, lack of trust
	Group development stage	Forming, storming, norming, performing
Nature of the task	Structure of the task	Determines allocation of task related roles
	Significance of the task	Determines level of group members' commitment
Group environment	Leader's position power	Determines his/her effectiveness
	Intergroup relations	Determine group members' compatibility
	Group's physical location	Determines level of members' interaction

To assess the effectiveness of the design team, their team building criteria are examined. The size of the team, whilst allowing for the required diversity of skills and knowledge,

facilitated the participation of individuals in problem-solving and decision taking. The compatibility of members' characteristics and their willingness to follow the Project Manager gave rise to a fairly homogenous team which by and large avoided overt conflict. Individuals' objectives, though diverse and manifest in terms of the resources allocated to the project, were nonetheless reconciled on the strength of fighting the common enemy, FinOp Ltd and their design team. Although the forming, storming, and norming phases of the design team development had taken place prior to the commencement of the investigation, it is anticipated that they lay the foundation for a reasonably effective team in terms of members' collaboration. However they could not enforce the required level of team member's performance. The nature of the task, in terms both of structure - the division of execution and control between Construction Co.'s and FinOp Ltd's design teams, respectively - and significance - disproportionate rewards for the level of effort required, seems to have acted as a demotivator or a disincentive particularly for Design Associates and Services Co.. The Project Manager's position power has already been discussed. The team members' compatibility and physical proximity had a positive influence upon their communication and interaction.

The construction group did not appear to act as a team and were not encouraged to do so by any efforts on the part of Construction Co.'s management team to forge them into a team.

4.4 CONFLICT

The previous section established the existence of power disparity in the interorganisational relations of the contracting parties and identified the power strategies implemented by each party in order to achieve their aims. It moreover demonstrated that despite the seemingly collaborative nature of the design team members' interpersonal relations, Design Associates and Services Co. failed to deliver their inputs on time. This section examines the implications of power disparity and power strategies for the emergence of both overt and covert conflict in the participants' interorganisational and interpersonal relations. It then goes on to examine the emergence of conflict in the building production process and the way it was handled and/or resolved.

4.4.1 CONTRACTUAL/INTERORGANISATIONAL CONFLICT

Chapter 2 defined conflict as any divergence of interests, objectives, or priorities between individuals, groups, or organisations; or nonconformance to requirements of a task, activity, or process (Gardiner and Simmons, 1992: 111). It moreover identified two forms of conflict, functional or creative; and dysfunctional and destructive. The former, arises from competition between the contracting parties and when managed is claimed to increase the parties' potential for success (Smith, 1992: 29, 30). The latter, emanates from non-resolution of functional conflict and leads to animosity or disagreements limiting the parties' potential for success (Stephenson, 1996: 27).

Based on the above definition, both forms of conflict occurred in the interorganisational relations of FinOp Ltd and Construction Co., and the latter and Services Co.. They may be attributed to the contractual framework, the building project environment, the project

coalition structure, culture and technology, and low levels of trust in the parties exchange relations.

Conflict attributed to contractual framework

Although FinOp Ltd selected the design and build method of procurement, they implemented it as a traditional method (see Chapter 2: 61-4). That is, rather than allowing Construction Co. to organise the design development and information production activities under the Interfacing Project Manager's supervision, FinOp Ltd and their design team restrained Construction Co.'s activities by their stringent control mechanisms. This led to dysfunctional conflict between FinOp Ltd and Construction Co., and between their respective design teams. Conflict was manifest in the form of objections by FinOp Ltd' design team to design decisions of Construction Co.'s design team, and delayed response by the latter to those objections.

Conflict attributed to building project environment

FinOp Ltd's requirement to lower the construction cost of the facility together with intense competition in the industry, prompted Construction Co. to engage in a cost cutting exercise to their own detriment. This gave rise to creative conflict between the parties which resulted in a more economical facility for FinOp Ltd and gave Construction Co. a competitive advantage that secured them the contract. A similar argument may be applied to creative conflict arising between Construction Co., who demanded a lower tender price from Services Co., and the latter, who cut costs to achieve it.

The outcome of the cost cutting exercise was limitation of resources allocated to the project by Construction Co., the most significant aspect of which was elimination of a

design co-ordinator. This was contrary to the requirements of the project, representing conflictual behaviour on the part of Construction Co., and led to problems concerning co-ordination of construction with the services, thus causing a degree of dysfunctional conflict between Construction Co. and Services Co.'s subcontractors.

The reductions in Services Co.'s tender price and installation programme resulted in under-resourcing of the installation design, and selection of cheaper, less durable materials and components for the installation. The under-resourced design process slowed down the information production and threatened to delay the construction works. Lowering the specification of the installation will probably increase the maintenance cost of the installation and lower the life cycle of the facility. Therefore reductions in Services Co.'s tender price led to conflictual behaviour on the part of Services Co..

Conflict attributed to project coalition structure

The Cold Store project coalition had a hierarchical structure of subcontracting relations, discussed in the previous section, which denied the Project Manager the power to make decisions according to need and disallowed the consultants and Services Co. to decide based on their expertise. This created discord between FinOp Ltd's and Construction Co.'s representatives. The discord manifested itself in the 500 or so queries raised by FinOp Ltd's design team members, and their unwillingness to approve information. It was moreover evident in late production of information by Construction Co.'s design team members, which could not always be approved prior to construction.

Ironically the subcontracting relation of Services Co. to Construction Co. did not necessarily empower the Project Manager to make services related decisions according to

need, either. Services Co. could not keep the mechanical installation within programme and the Project Manager could not do much about it other than raise the issue of delays at every site meeting, query the reasons for the delays, and praise the progress of the rest of the installation. Thus conflict between him and Services Co.'s Project Engineer tended to be covert rather than overt. Construction Co. were dependent on Services Co. not only for the services installation, but also for timely completion of the works. The Project Manager was aware of Services Co.'s financial difficulties and suspected that financial threats would not achieve the desired outcome.

The hierarchical structure created communication problems between Construction Co.'s design team and the construction group and, in conjunction with the slow rate of information production, gave rise to conflict between the Site Manager and the trade contractors' foremen. At times, conflict was creative and led to joint problem-solving, discussed in the previous section. At other times, it was dysfunctional and was manifested in comments like: 'consultants' drawings are set aside almost as soon as they are received because they do not bear any resemblance to the way the building is constructed or the services are installed (Electric Co.'s Foreman, see Decision-making processes).

Conflict attributed to project coalition culture

The culture of Construction Co.'s design team organisation appeared to convey the features of a smoothly functioning team, in terms of members' collaborative effort and few incidences of threats. For example, Construction Co. warned Services Co. of withholding payment if certain milestones were not achieved on no more than one or two occasions. However, failure of design team members and the Project Manger to undertake minuted actions and to produce information assigned to them within the time allocated

was a common occurrence. It is anticipated that no participant was satisfied with their organisation's engagement criteria and probably felt coerced into accepting them owing to the competitive pressures of the industry that have already been discussed.

Although the observations conducted did not include the meetings between FinOp Ltd and Construction Co., impressions of the nature of these meetings were gleaned from discussions between the design team members and the Project Manager. Accordingly, there appeared to be a sharp division between the two organisations and between their respective design teams which created distinct notions of 'us' and 'them' as far as the Project Manager and Construction Co.'s design team members were concerned. This gave rise to destructive conflicts of interests, value conflicts, and relationship conflicts between the aforementioned organisations. It is anticipated, however, that this division strengthened the cohesion of Construction Co.'s design team despite the poor performance of Design Associates and Services Co..

The one area where the Project Manager, with the aid of Construction Co.'s management team, decidedly directed the concerted effort of the construction group, was site safety and observation of Health and Safety regulations. This effort was allegedly successful as no reportable injuries were recorded.

Conflict attributed to project coalition technology

The design team members produced their information on different software packages that were not compatible. Therefore readily accessible computerised information of one team member, was not available to the other for co-ordination purposes. The conversion of computerised information to compatible form did not take place until mid-way in the

project life cycle. The absence of co-ordinating measures, be they electronic or in the guise of a design co-ordinator, created data conflicts. The site conditions at times necessitated deviations from the design information. These deviations were communicated to the design team members and had to be approved by FinOp Ltd's design team, via the formal communication structure. If approval took long, or if deviations from the design required urgent action, they were carried out prior to being incorporated in the information production systems, creating conflicts between the design information and the constructed form. This, in turn, caused conflicts of relationship between the trades' foremen and the Site Manager - who was seen as the link between the site and the design team, between the construction group and Construction Co.'s design team and between FinOp Ltd and Construction Co..

Low trust in project participants' exchange relations

Examination of the contracting parties' seemingly trust based co-operation, presented in the previous section, indicates that the parties' exchange relations did not incorporate trust as reliability or calculated risk. FinOp Ltd's monitoring mechanism was put in place because they did not know Construction Co. and the nature of the risk they presented, and did not feel they could rely on them. In a similar vein, Construction Co.'s monitor - the M&E Advisor - was appointed because Services Co. was not known to Construction Co. and because the latter lacked knowledge of services. Services Co., in turn, appeared to rely on Construction Co. because they had no other choice.

The parties' exchange relations did not incorporate trust as predictability, based on the risk reducing mechanism of the contract. The punitive legal sanctions in Construction Co.'s and Services Co.'s contracts were used to ensure conformance to the contract

documents and to prevent the companies from behaving opportunistically. Furthermore, they were used to reduce risk by passing it on to the subordinate party in the relationship. Therefore the sanctions did not prevent opportunistic behaviour by Construction Co. and Services Co.; did not eliminate Construction Co.'s fear of unpredictable behaviour by FinOp Ltd; and disguised Services Co.'s lack of choice with the appearance of decided choice.

FinOp Ltd conveyed impressions of trusting Construction Co. by appointing them on the basis of a design and build procurement method and behaving in a manner suited to the traditional method. Construction Co. both capitulated to and resisted FinOp Ltd depending on circumstance. Services Co., however, mostly capitulated.

4.4.2 OPERATIONAL/INTERPERSONAL CONFLICT

Creative and dysfunctional conflict characterised the operations of the project, the interpersonal relations of FinOp Ltd and Construction Co., and those of the latter and Services Co.. Manifestations of conflict may be attributed to latent conflict at brief preparation, design and construction stages, and the project management and control systems implemented.

Latent conflict at brief preparation stage

Although the brief preparation stage was not included in the investigation, the inductive use of the evidence collected during the later stages pointed to the emergence of latent conflict amongst the three elements of physical form of the facility, its construction cost, and construction period. The physical form of the facility, conceived by Design Co. and Structure Co., had aesthetic qualities that the consultants and FinOp Ltd valued and

wished to retain. The cost at which Construction Co. offered to build the facility was much higher than Finance Co. were prepared to allocate to the project. The date by which Operation Co. required the facility to be handed over was too short for the construction work involved.

Latent conflict at design stage

The contradictions amongst the physical form of the facility, its construction cost, and construction period, were reconciled in the following way. Construction Co.'s design team members collaborated to simplify the facility's structure and construction. Construction Co. saved costs by lowering the specification of drainage and eliminating a member of site staff. They moreover overlapped activities to shorten the programme.

FinOp Ltd's design team members were unhappy with the simplifications in design which they considered as lowering the aesthetic quality of the facility. The Project Manager and Construction Co.'s design team members, regarded the facility as basically a 'shed', and thought that it ought to reflect its function and be treated as a shed. Thus extensive negotiations ensued regarding the design issues, the nature of which may be summarised in the Project Manager's comment: '[FinOp Ltd] are paying for a Ford and expecting a Rolls Royce'.

Latent conflict at construction stage

The design changes initiated by FinOp Ltd were generally considered by Services Co.'s Project Engineer willingly. However, when these designs were discussed at site level with Services Co.'s subcontractors, they were not received as positively. Because on the one hand, the full implications of the changes were not always clear to the Project Engineer,

and on the other, the progress of the installation at times implied dismantling some parts of the installation in order to accommodate the changes.

Conflict arising from project management and control systems

The Project Manager succeeded in creating and maintaining a cohesive design team that collaborated smoothly and harmoniously. As far as could be detected during the investigation, he moreover succeeded in leading a united site management team. The only management related conflict arose from the Project Manager's relationship with the Interfacing Project Manager, the nature of which has already been discussed.

The control system implemented by FinOp Ltd was ineffective as far as achieving their project goals and objectives were concerned. The control of design inputs was ineffective as far as the production of timely and accurate design information was concerned. The information flow and monitoring mechanisms proved inefficient in reducing uncertainty throughout the project. The control of construction inputs was only effective as far as achievement of site safety requirements was concerned. It was ineffective terms of attaining Construction Co.'s project targets. The project overran its budget and was completed 11 weeks later than scheduled. The design and

4.4.3 MANAGEMENT OF CONFLICT AND ITS IMPACT ON PERFORMANCE

Chapter 2 related the management of conflict to project planning and response to conflict (see p. 74-5). Project planning was linked to risk management, carried out through the three phases of identification, analysis, and response to risk (Lewis, Cheetham and Carter, 1992: 80-1). Response to conflict was categorised as passive and active similar to negotiations. The criteria are presented in Table 4.7.

Table 4.7: Criteria governing management of conflict

PROJECT PLANNING	RISK MANAGEMENT	Risk identification	Risks that present most serious threat to project success
		Risk analysis	Quantification of effects of anticipated risk
		Response to risk	Avoiding, reducing, retaining, or transferring risk
RESPONSE TO CONFLICT	PASSIVE RESPONSE	Conflict denial	Withdrawal of co-operation
		Conflict avoidance	Shallow commitment to project goals
		Capitulation	Suppression of conflict
	ACTIVE RESPONSE	Aggressive response	Domination of weaker party: • Stifling future initiative
			Distributive bargaining: • Withdrawal of co-operation
			Compromise: • Over inflation of future demands
		Creative response	Integrative bargaining: • Co-operative and joint problem solving

Based on the above Table, Construction Co.'s risk management was wanting. They did not identify the most serious risks like the roof. Their quantification of the effects of anticipated risk was substantially reduced during the bargaining process at tender stage. Their response to risk was to retain or transfer it to the trade contractors. The Project Manager's response to conflict between Construction Co. and FinOp Ltd appeared to be co-operative at the start of the bargaining process. However, as FinOp Ltd's demands grew, he tended to compromise, at best, or withdraw co-operation, at worst. On occasions, for example in the case of the roof, he capitulated. The Project Manager's response to conflict between Construction Co. and Services Co., based on the observations, tended to be creative and co-operative, and compromising.

Services Co.'s risk management had shortcomings too. They did not identify the extent of some risks well enough. For example, they did not anticipate the implications of cutting down their installation programme by almost a quarter. Their contingencies were seriously reduced, if not eliminated, during the bargaining process at tender stage. They tried to reduce their design risk by keeping the design of the mechanical installation in-house, which according to the Project Manager proved to be a mistake. They tried to avoid some of their risk by refusing to pay for them at the end of the contract, according to the Project Manager, but failed to succeed. The response of Services Co.'s Project Engineer to conflict between Services Co. and Construction Co., based on the observations, tended to be either creative and co-operative, or passive and capitulative.

4.5 SUMMARY

This chapter has provided The Cold Store project scenario to facilitate the interpretation of the project participants' interorganisational and interpersonal relations, to link them to the occurrence of conflict, and to interpret the impact of conflict handling and resolution methods on the performance of project participants.

Section 4.2, presented a descriptive account of the organisations participating in the project, the engagement criteria of the design team members, the main contractor, the M&E contractor, and the conception, history, design and construction of the facility. The account established the nature of the main contracting organisation in terms of size and

financial strength. The engagement criteria of the design team members indicated on-going interorganisational relationships between the client and its design team members and between the main contractor and its design team members, except for the M&E contractor. The engagement criteria of the main contractor imparted the onerous and punitive nature of their conditions of engagement, which were passed on to the M&E contractor through the imposition of similar conditions in their engagement criteria. The conception, history, design and construction of the facility described the processes and procedures involved in the production of the facility. They moreover created a sense of the functional complexity and interdependence of these processes, which contradicted their fragmented organisation.

Section 4.3, interpreted the implications of the contracting parties' engagement criteria for the parties' relations, as establishing a hierarchy of subcontracting relations. These relations were indicated to give rise to power disparity and various forms of power strategies, rather than trust, in the interorganisational relations of the client, the main contractor and the M&E contractor. This section moreover interpreted the Project Manager's and the Site Manager's leadership, motivation, participation, and team building strategies as reasonably effective in achieving collaboration within the main contractors' design team and between the main contractor's site personnel and those of the M&E contractor, respectively. However, these strategies were found to be ineffective in enforcing or enhancing the participants' performance.

Section 4.4, traced the occurrence of conflict in contractual and interorganisational relations of the contracting parties, and in operational and interpersonal relations of the project participants. Conflict was attributed to the contractual framework and the

stringent control mechanisms imposed by the client. The bargaining process emanating from the competitive conditions in the building project environment was indicated to give rise to creative conflict at the start of the project and to create the conditions for dysfunctional conflict. The project coalition structure, by denying the Project Manager and the main contractor's design team members the power to make decisions according to need and based on expertise, respectively, created dysfunctional conflict between the main contractor's and the client's representatives. The project coalition culture reflected the divisions between the client and its design team and the main contractor and its design team. This division reinforced the relations between the Project Manager and the design team members. The inadequate technological methods of information production and dissemination were used to political advantage by the main contractor and exacerbated the conflict between the Project Manager and the Interfacing Project Manager.

Conflict arose amongst the three elements of physical form, construction cost and construction period of the facility at the brief preparation stage. It reflected divergence between the client's conceptual expectations and the main contractor's conceptual interpretations at the design stage. It was the outcome of divergent perspectives as well as the inconveniences caused by design changes at the construction stage. The project management and control systems gave rise to conflict between client's and the main contractor's representatives because they did not secure the latter's compliance and failed to achieve the client's goals and objectives. The management of conflict was found to be wanting in terms of risk assessment. It proved inadequate in terms of handling conflict and limited in terms of enforcing or enhancing the performance of the M&E contractor.

CHAPTER 5 CASE STUDY 2: THE CULTURAL CENTRE

5.1 INTRODUCTION

This chapter presents the second example of the construction project coalitions selected for in depth, longitudinal study of the main and mechanical and electrical (M&E) contractors' behaviour, building production management processes, and interpersonal relations and interactions of the contracting organisations' representatives. The design and build (D&B) method of procurement implemented to realise this project constitutes its common characteristic with the previous one. The Japanese ownership of both the client and the main contracting organisations, on the other hand, creates the potential for contrasting the coalitions' management processes with those of the previous case.

A descriptive account of the main participants' characteristics, their engagement procedures, and the properties of the project is provided as the context for events, processes and interactions being investigated. The contractual and operational frameworks, which govern the main and M&E contractors' interorganisational and interpersonal relations, respectively, are then considered. This is followed by identification of the salient features of these relations and of the building production management processes. Subsequently the impact of the main contractor's management processes on

the performance of the M&E contractor is examined. The chapter comprises four sections:

Section 5.2, provides outline profiles of the main participants; sets out the pre-contract processes establishing the roles and responsibilities of the design team, the main and the M&E contractors; and describes the conception, history, design and construction of the project.

Section 5.3, examines the nature of the project participants' interorganisational relations arising from the contractual framework; and assesses the nature of their representatives' interpersonal relations vis-à-vis the operational framework.

Section 5.4, identifies conflict as a dominant feature of the relations discussed in the previous section. It establishes the types and manifestations of conflict and considers the management processes implemented to handle or resolve conflict and their impact upon the behaviour and performance of the main and the M&E contractors.

5.2 CONTEXT

This section provides a brief description of organisational characteristics of the client, the design team, the main contractor, and the M&E contractor. It defines the selection processes, the appointment criteria, and the roles and responsibilities of the design team

members, the main contractor, and the M&E contractor. It then recounts a précis of the project's conception, history, design development and construction process.

5.2.1 CHARACTERISTICS OF MAIN PARTICIPANTS

Client organisation

The Client organisation was a Japanese educational establishment (Japcol) who own the lease of the development under investigation, for a period of six years. At the end of this period, the building reverts back to an English educational establishment (Encoll) who are the landowners. The relationship between Encoll and Japcol was rather complex. In return for financing the extension to Encoll's educational establishment, which is not included in this investigation, Japcol was given the lease of the plot of land adjacent to Encoll's buildings for six years to build and operate a cultural centre.

The design team

The design team comprised an architectural firm (Architect Co.), a structural engineering firm (Structure Ltd), a services consulting firm (Services Design Ltd), an audio/visual consulting firm (AV Ltd), and an acoustics consulting firm (Acoustics Ltd). The team consulted with the Design Co-ordinator, who was Japanese, and the Project Manager, who was English. The latter two, in turn, consulted with the in-house M&E engineer (INME) and the in-house quantity surveyor (INQS). The Project Manager consulted with the Senior Project Manager, who was Japanese. The design team was organised as shown in Figure 5.1. The solid links represent lines of influence arising from the team member's position and role within the organisation.

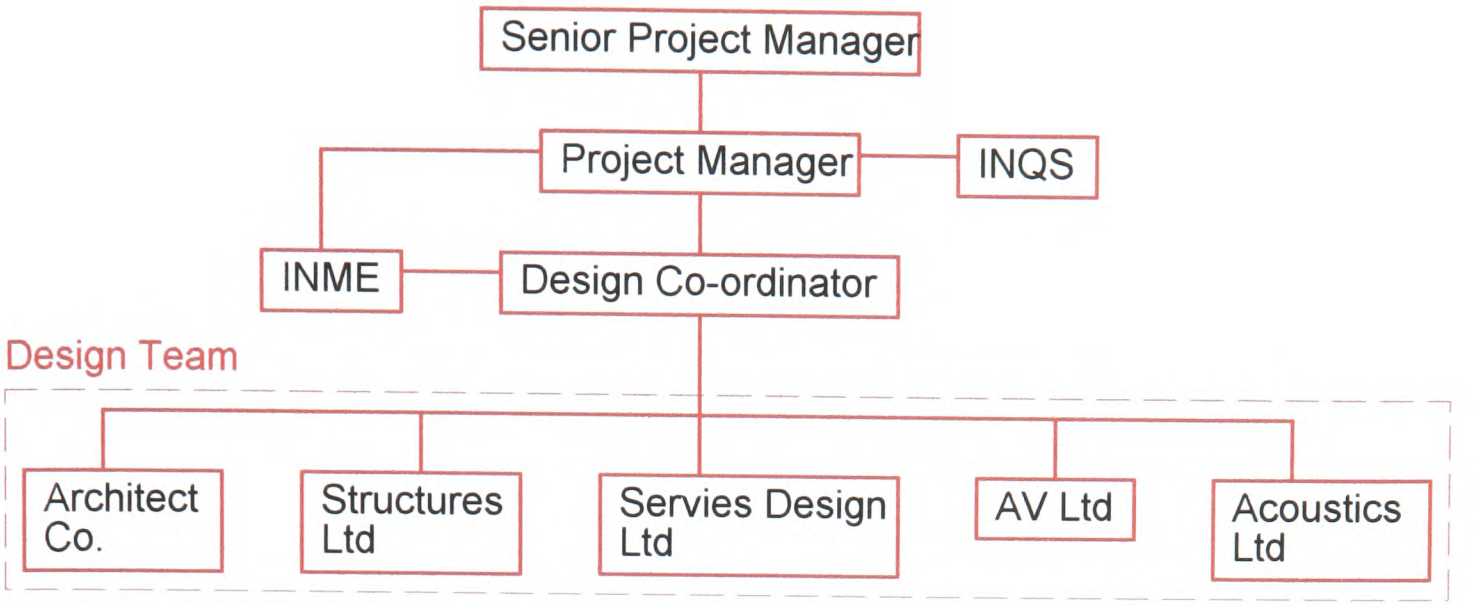


Figure 5.1: Organisation of design team

Main Contracting organisation

The main contracting organisation (Japan Construction) is a limited company and one of the two regional headquarters of its Parent, a leading Japanese international corporation established in 1840, which offers design, engineering and construction services in over 40 countries. Japan Construction has been operating in the UK since 1986 and undertakes a broad range of projects including business parks, corporate headquarters, research and development facilities, educational buildings, cultural centres and golf clubs. It has long-established experience in design and construction procurement, claims to place great emphasis upon quality in both design and construction, and has long-term 'dedication to its clients'. The latter policy is characteristic of Japanese contractual relations and featured prominently in the development of the project coalition's organisational framework.

M&E Contracting organisation

The M&E Contracting organisation (UK Services), is a limited company formed in the 1950s in Norwich as a branch of a London company. It has been owned by a number of

organisations since 1987 and has folded up three times. Since the beginning of 1995 it has been owned by the board of directors and has become totally independent. The size of the company has changed very little. There are 20-30 directly employed staff and operatives at a 1:1 ratio because a lot of work is subcontracted. The company has a mechanical engineering history, although an electrical engineering department was added recently by taking over an electrical engineering contracting firm.

UK Services provides building services in a wide range of refurbishment and new build works in both public and private sectors. Examples include work carried out for the MoD, in prisons, food companies in the process food industry, hospitals, schools, and offices. Work is obtained either on the basis of past experience with clients, or through main contractors. The company relies on the breadth of opportunities in the building services market rather than targeting a niche or specialist area within the market. The Technical Director attributed this policy to the limited nature of the building services market in East Anglia. At the time of writing the company's turnover is around £3 Million achieved through a large volume of work. The Technical Director considered this amount to be too low and stated the aim of the company as 'looking to increase the turnover at a possible 20% per annum to a more comfortable sum of £5 Million'.

Until two years ago the company would not have considered recruiting self-employed operatives. However, since then, due to the precarious nature of incoming projects, low turnover and reduced profits a number of them have been engaged either independently or through agencies. At the time of writing the company employed six labour-only subcontractors through an agency. The company's policy of training school leavers was abandoned a number of years ago and has not been reinstated. The only training course

that they send their operatives on is the 'Gas Safety' course which is a mandatory legal requirement.

Construction group

The construction group comprised Japan Construction's management team and the specialist and trade Contractors. The former consisted of the Senior Project Manager, the Project Manager, INME, a Site Manager, INQS, two Architectural Technicians, a Site Foreman, and a Control Engineer. The organisation of the construction group is presented in Figure 5.5. The solid links represent the lines of influence arising from the group members' position and role within the organisation.

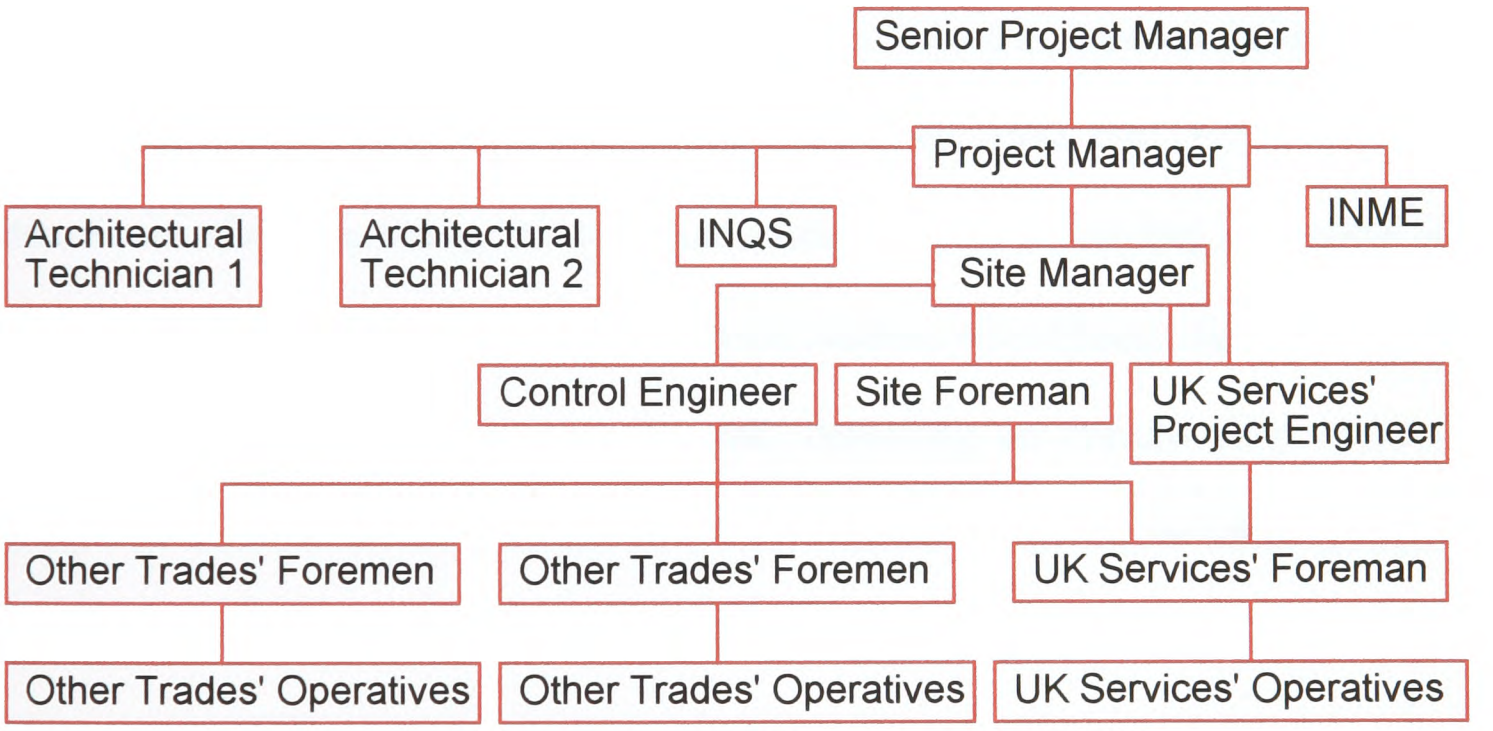


Figure 5.2: Organisation of Construction Group

5.2.2 ENGAGEMENT OF MAIN PARTICIPANTS

To establish the nature of the relationship between Japan Construction and UK Services, their respective selection processes, appointment criteria and roles and responsibilities

were investigated and are described at some length in this sub-section. Observations indicated that the parties' relationship was significantly influenced by the procurement method, Japan Construction's relations with their design team and UK services relations with members of the construction group. Therefore outlines of the procurement method, the engagement criteria of design team members and those of construction group members are also provided here.

Procurement method

As discussed in Chapter 2, design and build is the common method of procuring projects in Japan. Therefore Japanese clients merely exercise choice in selecting main contractors, not procurement methods. The former tend to communicate with the main contractor directly rather than through an agent as is the case in the UK. Japanese main contractors implement the D&B method in its pure form (Masterman, 1992: 60), i.e., they have an in-house core of design, management and construction expertise that they draw upon as the need arises. However, owing to UK's different business environment, Japan Construction have adapted their procurement policy and, depending on circumstance, operate the integrated form of D&B (Masterman, 1992: 61), i.e., they buy in different types of expertise whenever necessary. That is what they did on this project. The implementation of integrated D&B proved inappropriate because Architect Co.'s objectives of producing a high quality building of high specification diverged from Japan Construction's cost conscious approach to building production.

Selection, appointment, roles and responsibilities of design team members

Japan Construction had varying relationships with their design team members. Some were selected, based on previous working relationships, others were selected on the basis of

recommendations. All were appointed as service providing firms through a competitive fee bidding process. The Senior Project Manager, the Project Manager, INME and INQS were employees of Japan Construction.

The Senior Project Manager liaised between Japan Construction and Japcol and supervised the Project Manager. The Project Manager provided the link between the design team and Japan Construction, and between the former and the construction group. He was responsible for the design team's and the construction group's performance as well as the consequences of their performance. The Design Co-ordinator co-ordinated the consultants' design inputs. INME controlled Services Design Ltd's design input and supervised the installation works carried out by UK Services. INQS measured and valued the work undertaken by the specialist and trade contractors.

Architect Co. were a reputable, award winning architectural practice who had worked with Japan Construction before and approached the latter based on their previous knowledge of them. Japan Construction engaged Architect Co. both because the latter had effectively initiated the project, and because their price was lower than that of Japan Construction's in-house design department. The Project Manager and the architects in charge had not worked together before and, based on the evidence of their acrimonious relationship during the course of the contract, are not likely to do so again. Architect Co. were responsible for the scheme design and production of base details, according to the Project Architect, and were to leave the specialist and final construction details to the trade contractors. They, moreover, were the design team leaders, according to the Project Manager, in the sense that they had to produce the design drawings before other Consultants could add their information to them.

Structure Ltd were engaged based on Architect Co.'s recommendation who had worked with them previously. Architect Co. reckoned that Structure Ltd 'had a sense for aesthetic quality and appeal of structures'. Structure Ltd were responsible for the overall structural design of the building and detailing of structural members. Japan Construction selected Services Design Ltd on the basis of their previous experience, the experience of the personnel who were to be involved with the project and the price they submitted. As far as Services Design Ltd knew, they were not in competition with any other consultant. Services Design Ltd were responsible for outline design and specification/ sizing of services, feeding services information to Architect Co. and other consultants, monitoring services installation and commissioning, and assisting in handover procedures. They, moreover, acted as lighting consultants for the general lighting of the building. AV Ltd were engaged based on Architect Co.'s recommendation who were aware of the latter's reputation. AV Ltd were responsible for the provision of specialist services like the loudspeaker system, the design of stage lighting, the projectors and the dimming equipment. Acoustics Ltd were engaged based on Architect Co.'s recommendation. They were responsible for consultation on specialist features like the acoustic screens.

The Design Team members' conditions of appointment documents were specific to Japan Construction and were based upon the standard Conditions of Appointment published by the team members' corresponding professional bodies. Architect Co.'s conditions of appointment, for example, were an amplification of those of the RIBA in the sense that the type and the number of drawings had been scheduled in detail and agreed to by both Architect Co.'s Project Architect and the Project Manager. The nature of Japan Construction's relationship with their design team members is summarised in Table 5.1.

Table 5.1: Japan Construction's relationship with design team members

DESIGN TEAM MEMBER	ORGANISATION OF ORIGIN	NATURE OF ENGAGEMENT	RELATIONSHIP WITH JAPAN CONSTRUCTION
Senior Project Manager	Japan Construction	Appointment of individual	Employee of Japan Construction
Project Manager	Japan Construction	Appointment of individual	Employee of Japan Construction
Design Co-ordinator	Japan Construction	Appointment of individual	Employee of Japan Construction
INME	Japan Construction	Appointment of individual	Employee of Japan Construction
INQS	Japan Construction	Appointment of individual	Employee of Japan Construction
Architect Co.'s Project Architect	Architect Co.	Selection and appointment of firm	Previous work experience with Japan Construction
Structure Ltd	Structure Ltd	Selection and appointment of firm	Recommended by Architect Co.
Services Design Ltd's Project Engineer	Services Design Ltd	Selection and appointment of firm	Previous work experience with Japan Construction
AV Ltd	AV Ltd	Selection and appointment of firm	Recommended by Architect Co.
Acoustics Ltd	Acoustics Ltd	Selection and appointment of firm	Recommended by Architect Co.

Selection, appointment, roles and responsibilities of Japan Construction

Japan Construction's selection

Because Japan Construction approached Japcol about the development (phase 1) which led to this project (phase 2) (discussed in the next sub-section), their selection was based on the submission of a cost break down document for undertaking the project design, construction and management. Owing to their unfamiliarity with the UK construction market, Japcol required Japan Construction to have their construction cost estimate checked by an external firm of cost consultants. Consequently Japan Construction decided to engage the External Quantity Surveyor (EQS Co.) to provide cost planning and tender arrangement services. EQS Co. estimated the cost of the works at just over £9 Million; phase 1 costing around £4 Million, and phase 2, around £5 Million.

Japan Construction prepared their cost breakdown based on EQS Co.'s estimate and submitted it to Japcol. Shortly after this submission, the specialist and trade contractors, who had been invited to tender, returned their tender prices for the works, the sum total of the lowest of which far exceeded EQS Co.'s estimate - those for phase 2 works amounted to £8 Million; 60% higher than the estimate. Consequently Japan Construction suspected an error in EQS Co.'s quantity surveillance, demanded to see the Bill of Quantities based on which the latter prepared their estimate and notified Japcol of the error. EQS Co. failed to submit their Bill of Quantities [most probably because they had not prepared one; that is why they made substantial omissions resulting in a grossly underestimated cost of the works] and refused to accept negligence claiming that Japan Construction should have incorporated a reasonable contingency sum in their cost breakdown. Japcol refused to acknowledge the error and insisted that Japan Construction ought to honour their price in the 'Japanese tradition of doing business', claimed the Project Manager. Thus Japan Construction were coerced into standing by their price, for reasons of securing their good long-term relationship with Japcol.

Subsequently, Japan Construction fired EQS Co., attempted to lower the cost of phase 1 works through negotiations with the specialist and trade contractors selected, and held discussions with Japcol during the course of these works - which spanned a year - to try to renegotiate a bigger budget for phase 2. As phase 1 works progressed, it became increasingly difficult to procure them within the budget and delays began to occur. This phase was completed three months late and far exceeded its original price. Therefore prior to the start of phase 2, Japan Construction submitted a revised cost breakdown for the works in this phase, prepared by their INQS, and managed to secure Japcol's consent, in principle, to a larger budget. The latter, which constituted the contract budget, comprised

INQS's financial analysis plus Japan Construction's mark-up minus the amount negotiated by Japcol.

Japan Construction established the contract programme through project analysis in terms of the logical sequence of events, which made up the construction phases. They allocated time slots to each operation contained in every construction phase subject to contingencies. They provided financial cover against unforeseen risks and uncertainties by means of a contingency sum, which was a percentage of the contract value. This sum was divided on the basis of the cost plan, which contained a breakdown of the project into itemised materials and elements, and was distributed so that each of the latter was covered by a contingency amount.

Japan Construction's conditions of appointment, roles and responsibilities

Japan Construction entered into a contract with Japcol that was tailor-made to suit the Master Agreement between the latter and Encoll. It was adapted from the Design and Build Standard form - albeit the latter was no longer recognisable - and was developed to ensure that the buildings' appearance, and any changes that may occur during the course of design and construction, were agreed to by both Japcol and Encoll. Japan Construction's conditions of appointment, as set out by this contract, constituted their roles and responsibilities and stipulated their system of payment. According to these conditions, Japan Construction were responsible for the design and construction of the works described in the contract documents and the overall construction product within a fixed lump-sum price and a period of 15 months. They were to provide a direct Design Warranty to Encoll, with whom they did not have a contract. They were moreover to

require the provision of direct Warranties to both Japcol and Encoll by their trade contractors as part of the latter's conditions of appointment.

Japan Construction's payment system was based upon the achievement of milestones or work stages rewarded by a percentage of the contract sum - a partly Japanese system. Variations or savings were added to or subtracted from the following milestone payment. The onerous nature of these conditions is partly encapsulated in Japan Construction's responsibility for design and construction of the works within a fixed lump-sum price; and partly contained in the payment system. The works described in the contract documents were based on Architect Co.'s outline design - the only information available at the time of preparing the cost breakdown. This information lacked details providing clues as to how the building was to be constructed. As a result, the complexity of constructing some of the details had not even been envisaged let alone costed. Therefore commitment to a fixed price for an unknown entity put Japan Construction at a considerable financial risk. The payment system, on the other hand, implied that if the works were delayed by the trade contractors for reasons beyond Japan Construction's control, the latter would still not be paid. The Project Manager stated that the payment system was passed on to UK Services and other trade contractors.

Selection and appointment of construction group

The specialist and trade contractors were largely selected through tender processes and based on their prices, however, in certain cases their quality of work and speed of delivery took precedence over their price. One such example of trade contractor selection is provided in respect of UK Services.

Selection, appointment, roles and responsibilities of UK Services

UK Services' selection

INQS included Five M&E contractors on the tender list for the services works package. Services Design Ltd nominated two of them based the contractors' previous performance and work with the former. The Project Manager chose two from Japan Construction's 'Register of Subcontractors', who had performed well on previous jobs, and another based on their performance on Phase 1. The Project Manager claimed that services contractors were given four weeks to tender. UK Services claimed they were given a week. INQS controlled and conducted the tender process.

UK Services' tender documents contained Services Design Ltd's mechanical, electrical and public health drawings and specifications as well as Japan Construction's enquiry package. The latter contained the basic conditions under which UK Services were expected to operate including the contract programme, the time-scale involved, access to the works, instructions issued by Japan Construction, variations and Liquidated and Ascertained damages recoverable in case of delay. The tender documents required services contractors to provide a lump-sum tender price, their programme of installation, their Method Statements and the trades they were proposing to sub-let. For ease of comparison, the tender prices was required to broken down into priced items of component systems, for example, gas supply system, water supply system, heating system, etc.

UK Services' Estimating department prepared their tender submission. They calculated the tender price by measuring the quantity of materials and plant required off the drawings; pricing them in association with suppliers and based on their prices and on Services Design Ltd's specification; and adding to this price the estimated labour costs involved

with installation and commissioning. The tender sum breakdown included the price for the supply of each service system - though not their quantity - so as to provide a basis for calculation of variations.

Following UK Services' tender submission, the Project Manager tried to renegotiate their tender price through a bargaining process with the technical director that went on for six weeks. By the end of this period, the technical director had offered savings that amounted to nearly half of UK Services' tender price. Subsequently the Project Manager selected UK Services two weeks later. He attributed the selection to UK Services' quality of work on phase 1, which took precedence over their unsatisfactory organisation of services installation. He further stated that UK Services attempted to rectify their organisation problems on phase 2 by replacing their Project Engineer. UK Services' technical director ascribed their selection to the Project Manager's belief that they were capable of overcoming the shortcomings they were likely to encounter during the execution of the project. Whatever UK Services' selection was principally based on, it was not their price because their price was not the lowest.

UK Services' conditions of appointment, roles and responsibilities

Japan Construction appointed UK Services on the basis of a letter of intent. The conditions contained in the letter constituted UK Services' roles and responsibilities and stipulated their system of payment. According to these conditions, UK Services were to enter into a contract with Japan Construction that was a substantially altered version of the Domestic Sub-Contract Standard Form of Contract, adapted to suit the Master Agreement between Japcol and Encoll - UK Services considered this form of contract specific to Japan Construction. They were to provide, install and commission the

mechanical, electrical and public health services required on the project for the lump-sum fixed price agreed to and in accordance with Japan Construction's terms of contract, in particular, the preliminaries. They were responsible for co-ordinating these services with one another and with the building, and for conforming to instructions issued by Japan Construction. They were liable for Liquidated and Ascertained damages of £10,000 per week. They had to provide a direct Warranty to Japcol on request, that is when the latter demanded it. In addition to the above conditions, Japan Construction required UK Services to have an office on site. This requirement was communicated to the latter verbally.

5.2.3 PROJECT DESCRIPTION

Project conception and history

The project, which from this point onward is referred to as 'The Cultural Centre', was conceived serendipitously. Encoll, a well-known college in a long-established English university, commissioned Architect Co. to design the existing college building in the early 1960's. Shortage of funds at the time prevented the construction of the college entrance. Architect Co. kept in touch with Encoll throughout the ensuing period - carrying out small jobs as the need for them arose. In 1992, Encoll's Bursar, with the aid of a partner in Architect Co., identified the requirement for college accommodation and a new entrance. However, as Encoll lacked the requisite finance to carry out the works, both Architect Co. and the Bursar looked for possible sponsors.

Architect Co. had previously worked with Japan Construction and were aware of their developing capability. They therefore approached the latter with the development proposal for additions to Encoll's existing college building. Japan Construction

subsequently sought potential sponsors in Japan one of whom, Japcol, showed interest in a partnership with Encoll. Japcol agreed to finance the project conditional upon being leased a plot of land to build a cultural centre, which they considered beneficial to their business. Thus the contact between the two colleges was established through Japan Construction.

Japan Construction formulated and prepared Japcol's requirements, in conjunction with the latter, in their headquarters in Japan. They obtained Japcol's approval of the drawings, the finishes schedule and the outline of building services in design meetings in Japan and produced them in Britain.

The Cultural Centre comprises two blocks. One block, contains facilities for Japanese cultural functions and educational purposes; the other, provides residential accommodation and associated facilities for students studying at the centre or delegates attending the functions. It has a total area of 3,520 metre squares (approximately) and consists of:

- A five storey rotunda, of approximately 1,600 metre square overall floor area, accommodating a general purpose conference/lecture theatre providing multiple uses ranging from teaching to banqueting, a lecture theatre, a dividable space capable of providing up to four individual lecture rooms, a dining room, and a plant room.
- A two storey link, of approximately 220 metre square overall floor area, containing the entrance lobby, conference reception and display area, a computer room, an archive store, and ancillary spaces.

- A residential block, joined by the two storey link to the rotunda, of approximately 1,700 metre square overall floor area, housing 27 study bedrooms, a 3 room flat, a Tatami room (Japanese tea-room), a library, a kitchen, a dining room, an administrative office, a launderette, and a switchroom.

The development had an initial contract value of approximately £6 Million. The overall constructional cost of the building remained within the initial tender budget upon completion, however, the contract sum increased by 45% due to changes in Japcol's requirements and subsequent variations. The construction works began in April 1995, were scheduled for completion by the end of March 1996, and were completed by the end of August 1996.

The services installation had an initial contract value of around £640,000 and cost around £725,000. The installation began at the end of May 1995 and was due for completion by mid-January 1996. The mechanical services were installed by the end of June 1996 and the installation of electrical services was finally completed at the end of July 1996.

Managing project design

Statutory approvals

The Project Manager explained that the building design was subject to restrictions imposed by planners. The original proposed height of the building had to be reduced by four metres owing to the building's location within a conservation area. For financial reasons, Japcol were not prepared to lose one of the floors, therefore, Japan Construction had to reduce the floor to floor height of each storey by a metre instead. This had far

reaching consequences in terms of space availability for accommodation of services and their future maintenance.

Design development

At the scheme design stage, when Japan Construction discovered the error in their tender price, they made a number of changes to Japcol's brief in terms of reducing the overall size and lowering the specification of the project so as to save costs. Therefore a lot of re-design took place. Architect Co. claimed that from this stage onwards they had to produce at least one cheaper alternative at every design stage that followed. They were told, by Japan Construction, that Japanese Clients expected alternative designs as a matter of course. The changes in Japcol's brief gave rise to changes in the design programme; the latter had to be squeezed so as to keep the contract completion date constant. This implied that no lead-in time was allowed for the production of design details. Therefore, as soon as a construction work package was available to start on site, as per the programme of works, the corresponding detail design drawings had to be produced. The procurement method, as far as Architect Co. were concerned, effectively changed into fast track.

According to the Project Manager, there were few concept design variations, that is, additional work carried out outside the scope of the original contract within the same time frame. Variations that did occur were of three categories. One category was attributable to Japcol, for instance, the addition of audio/visual equipment fit out package, computer telephone wiring, and the furniture. The other, was brought about by difficulties associated with constructability of building details that occurred on site. The third category resulted from refinements by designers, particularly Architects Co., which

allegedly constituted 90% of design changes. The Project Manager explained that the alterations initiated by both Japan Construction and Japcol were necessary and to some extent unavoidable owing to the way the project was organised. However, the way these alterations were managed in terms of revisions made to the existing information, generation of new information and transmission of information within the design team and construction group was ineffective and as far as the Project Manager was concerned, unsatisfactory.

Architect Co. attributed the delays in revision of existing, and generation of new information to abortive work resulting from the production of alternative designs discussed previously. A/V Ltd's representative, however, was of the opinion that Architect Co. made inadequate use of the available technology. He claimed that the drawings were revised manually on drawing boards rather than on computer terminals, which equalled the boards in number, in Architect Co.'s offices. He accounted for this by the fact that the architects in charge of the project belonged to the older generation who felt more comfortable with drawing boards and less so with computers. The quality of Architect Co.'s computer generated drawings indicated that they must have had problems either with the software package they used or with the technician operating it. The Project Manager believed that Architect Co. were simply incapable of carrying out their duties and responsibilities. That probably explains why he engaged an Architectural Technician half-way through the project design and stopped communicating with Architect Co. altogether.

Variations of construction details were largely caused by UK Services' inability to carry out their installation within the limited space available and the considerable joggling of

services that this gave rise to. The Project manager attributed the spatial problem to Architect Co.'s *refusal* to allocate more space to services despite the Services Design Ltd's persistent demands[1]. He claimed that it was easier to explain the problems caused by inadequate space to Japcol at the construction stage than to demand extra space from Architect Co. at the design stage!! He did, however, qualify this statement by acknowledging that the production of co-ordination drawings by UK Services would have greatly alleviated the problems. These variations added two months to the programme of works.

Variations of design details through refinements were a consequence of time restrictions that hindered the natural evolution of the design process, on the one hand; and Architect Co.'s desire to produce an award winning building, on the other.

The design development process was marred by constant battles between Architect Co. and Japan Construction that contradicted the very essence of D&B procurement method. Japan Construction's endeavours to reduce the cost of the project were vehemently opposed by Architect Co.'s determination to produce an architectural gem and their inflexibility to compromise. The Design Co-ordinator described an instance of this in relation to phase 1. The design of the entrance, which had been developed over a six months period, was about to be approved by Encoll when Architect Co. suddenly produced an aesthetically superior design of greater cost - that they had not yet communicated to Japan Construction - in a design meeting with Encoll. The latter were fascinated by the new design and approved it. To avoid delays to the programme, Japan

1. Architects Co.'s obstinacy regarding this issue gave rise to a great deal of tension between them and Services Design Ltd in design Co-ordination meetings.

Construction paid for the extra construction cost of the new design but banned Architect Co. from future design meetings.

Services design

Japcol's brief established the scope of the services required. Architect Co.'s Project Architect claimed that they integrated these services in their scheme design by allocating space to them and ensuring that they co-ordinated and visually blended in with the building design. The Project Manager and Services Design Ltd found Architect Co.'s spatial allowance for the accommodation of services inadequate. Services Design Ltd's Project Engineer explained that they had to experiment with a number of design layouts in their attempts to fit the services within the allocated space. It is fair to comment that the schematic design of the services by Services Design Ltd was not managed effectively. The latter were appointed later than Architect Co., therefore the important communication and liaison between the two, which was crucial for the planning of adequate space for services, did not take place. This had the added disadvantage of putting the two consultants at loggerheads throughout the design process. Furthermore, Services Design Ltd underestimated the scope and the complexity of the services. They made design mistakes at the expense of UK Services which the latter had to rectify at the installation stage.

The detail design of services was initially based on the schematics produced by Services Design Ltd, however, these proved inaccurate and incapable of being developed into a functional system, according to UK Services' Project Engineer. The constructed plant room dimensions, for example, were much smaller that those conveyed on the drawings resulting in a re-design of the services layout within this room over a one week period.

The incorrect drainage design caused considerable problems both in terms of the drainage function and its co-ordination with the building construction, and took numerous weeks to resolve. There were major problems with the design of electrical services too. Some of these related to Japcol's additional works, referred to previously; others were caused by UK Services' mistakes regarding the flooring system. The latter had designed the wiring system to pass through the floor whereas the floor was solid. The design problems were allegedly compounded by lack of support from either Services Design Ltd or INME.

UK Services did not organise and manage the design of services effectively principally because they did not have an agenda for the production of information in terms of the quantity and type of drawings required. However, in the absence of a detailed specification and comprehensive drawings they moreover *underestimated* the amount of work they had to undertake. Their budgetary limitations, staff shortages, the draughtsman's unfamiliarity with the CAD package purchased at the start of the services works, as well as the inadequacy of information, further hampered the production of design information. UK Services' failure to produce detail design drawings to programme led to weekly revisions of the main programme and had a knock on effect on procurement and installation of services.

Flow of design information

The flow of design information generally took place in the following way:

- The Project Manager produced a design programme containing the type and number of drawings required from each team member at the beginning of the project and incorporated it into the programme of works.

- Architect Co. produced their design information, sent it to other design team members, the Design Co-ordinator, and the Project manager for comments/ approval.
- The other design team members subsequently produced their design information based on Architect Co.'s information and sent them to the latter to co-ordinate with the building design and to the Design Co-ordinator and the Project Manager for comments/approval.
- The Design Co-ordinator and the Project Manager checked and commented upon the design information and returned it to corresponding team members for revision.
- The design team members sent their revised design information to the Design Co-ordinator and the Project Manager.
- The Project Manager then sent the revised design information to Japcol through the Senior Project Manager.

Information relating to design variations required by Japcol flowed from the latter to the Senior Project Manager, by the latter to the Project Manager and through him to the design team. That relating to design alterations initiated by Architect Co. flowed from the latter to other team members, the Design Co-ordinator and the Project Manager. The discrepancies discovered by team members were either notified by them to Architect Co. and the Design Co-ordinator or raised in design co-ordination meetings. The flow routes for information relating to building design, alterations and revisions are presented in Figure 5.3. The black flow route represents information sent by the design team members to the Design Co-ordinator and the Project Manager; the blue flow route represents that sent by Japcol; and the pink flow route represents comments made and revisions required by the Design Co-ordinator and the Project Manager. The dashed line represents informal communication.

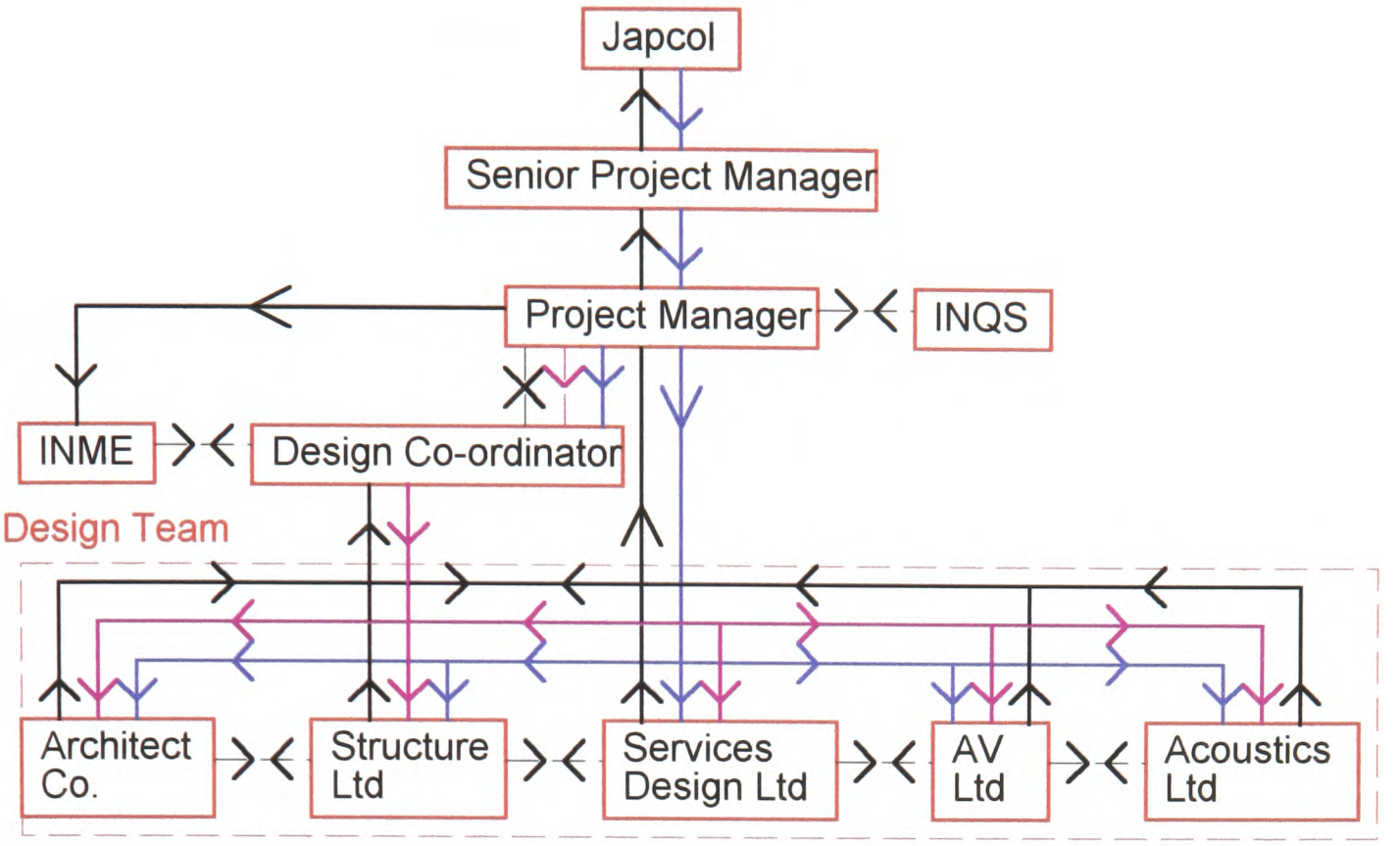


Figure 5.3: Building design information flow route

The flow of services design information was complicated too. UK Services' Project Engineer explained that they sent their installation drawings to INME for comments, who then sent them to Services Design Ltd for comments. UK Services revised their drawings in accordance with the comments received from INME and Services Design Ltd and sent them back to INME for approval. He moreover explained that UK Services oversaw the production of working drawings by their subcontractors and co-ordinated their inputs within the services package. The subcontractors produced their fabrication drawings from UK Services' installation drawings and specifications, sent them to the latter for comments, revised their drawings in accordance with the comments received and sent them back for approval. Once UK Services had approved the subcontractors' drawings, they would send them to Japan Construction for approval.

When queries arose involving services design matters, UK Services issued them on Information Request Forms to Japan Construction who, in turn, sent them to Services Design Ltd for comments. The latter included their comments on the form and sent them back to UK Services through the Project Manager. In urgent cases, Services Design Ltd sent a copy of the form containing their comments directly to UK Services.

The flow routes for information relating to services fabrication, installation and variation are presented in Figure 5.4. The blue flow route represents changes in Japcol's services requirements initiated by them. The black flow route represents information sent by UK Services to Services Design Ltd through Japan Construction. The green flow route represents queries raised by UK Services' subcontractors. The pink flow route represents comments made and revisions required by Services Design Ltd. The dashed line represents informal communication between UK Services and Services Design Ltd.

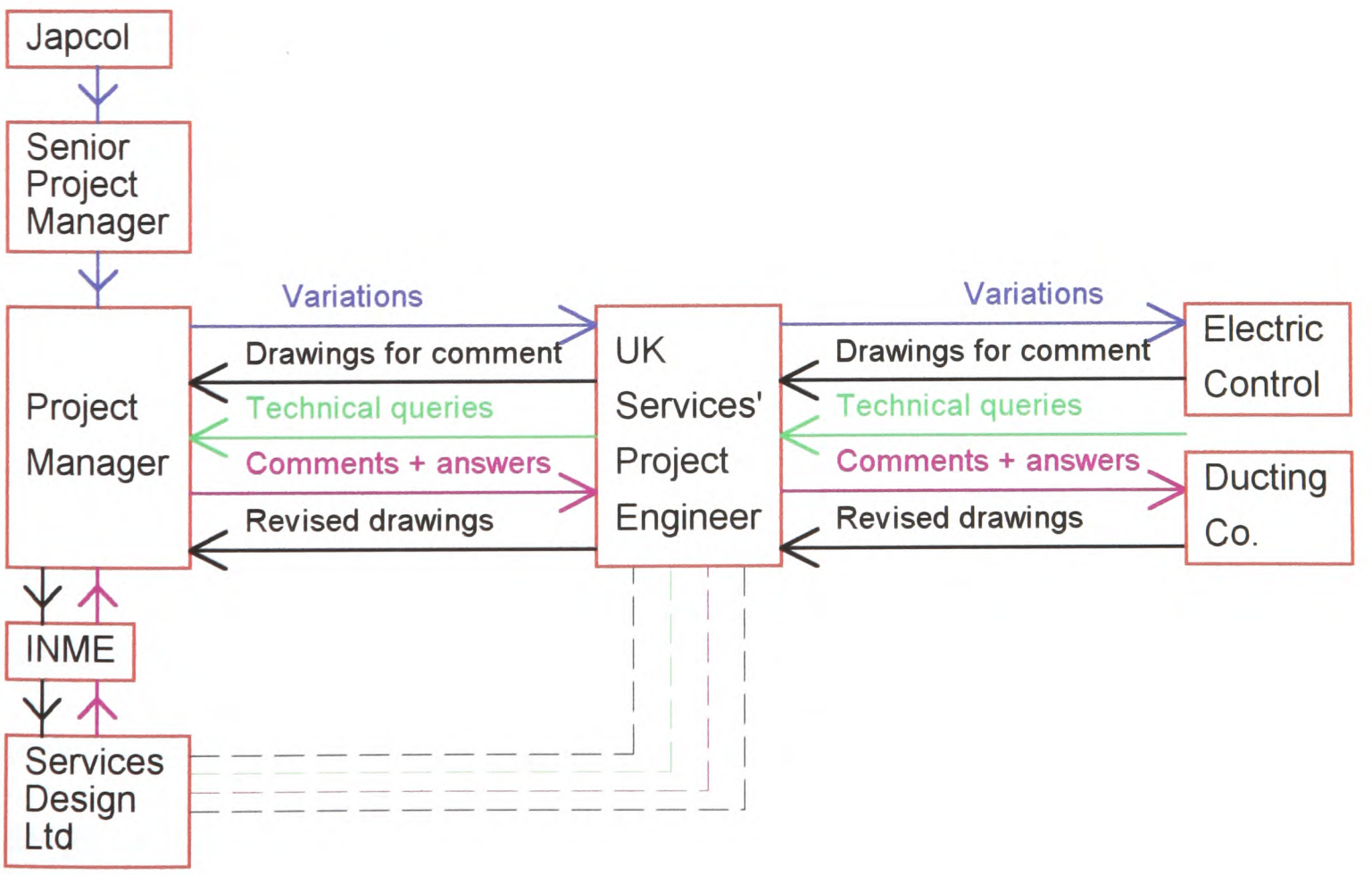


Figure 5.4: Services installation information flow route

The flow of information was subject to communication within the design team, and between UK Services and INME and Services Design Ltd. It was also subject to decision-making processes by the design team members, and by INME and Services Design Ltd in the case of services.

Communication

The design team communicated with one another both formally through letters, drawing approvals and design meetings in team members' offices, and informally by means of telephone and facsimile. They met formally with the Project Manager and the Design Co-ordinator, at design co-ordination meetings on site, and communicated with them informally by telephone and facsimile in the interim period. The formal mode of communication seemed primarily to serve the purpose of *recording* information generation and transfer. The informal mode of communication, though useful and indeed necessary when an urgent answer or decision was required, always needed confirmation by means of the formal method to secure the communicating parties' liability or their seal of approval.

Owing to the problems associated with Architect Co.'s information production, the Design Co-ordinator and the Project Manager often provided feedback to the other team members' queries. They moreover facilitated the members' communication with one another at design co-ordination meetings particularly when individuals' frustration impeded their constructive comments and productive discussions. The Design Co-ordinator and Project Manager were the only channels of communication between the design team and Japcol.

It is easy to imagine the difficulties experienced by UK Services' Project Engineer as the communication channel between Japan Construction and services subcontractors. He was inundated with paperwork in the form of drawings or queries. The situation deteriorated when INME left half way through the contract, as obtaining approval from Services Design Ltd, through the Project Manager, became more difficult and prolonged. It is no wonder that the services drawings could not be produced on time!

Decision-making processes

In the context of this project, Architect Co. appeared to make their design decisions based solely upon aesthetic judgements and oblivious of either the cost implications of these decisions or indeed the chain of consequences they gave rise to. This premise contradicted the Project Manager's cost-conscious approach and disregarded other team members' requirements. It more often than not resulted in the Project Manager's modification or outright rejection of the decision and led to disputes between him and Architect Co.'s Project Architect, which in turn slowed down the decision-making process.

Design co-ordination and control

Design co-ordination and control took place through meetings held at irregular intervals between Japan Construction and the design team and chaired by the Project Manager. The Design Co-ordination meetings provided a forum for identification of problems, attention to queries raised by team members and consideration of potential solutions and comments. In response to the discussions, the Project Manager and the Design Co-ordinator recommended courses of action to each member. The meetings were moreover utilised to monitor the progress of information production by team members.

Architect Co. were slow in the production of information and delayed the production of information by other team members. This weakness in leadership on the part of Architect Co. created acrimony between them and the Project Manager as well as other team members in design co-ordination meetings. Furthermore, information flow proved problematic and was ineffective. Very often in design co-ordination meetings, the team members seemed either not to have received updated information or not to have incorporated them in the production of their own information. They blamed this incoherence of information on the numerous design changes that had taken place and their inability to keep up with them. It is fair to assume that Architect Co.'s design changes had de-motivating effects upon the other team members. Architect Co.'s reasons for delays in the revision and production of information have already been discussed under design development, above.

In the Japanese tradition of D&B procurement, the onus of design co-ordination rests with the main contractor. Therefore in theory Japan Construction were responsible for co-ordinating the various design inputs, a task that was allocated to the Design Co-ordinator. However, one of the most prominent features of the project that often presented itself in the meetings was inadequate and, on occasions, non-existent design co-ordination. This was particularly manifest in the clashes between the structural elements and services. The Project Manager attributed the shortcoming to limitations imposed by both the budget and the business environment. He explained that the provision of a comprehensive design co-ordination service, similar to that provided in Japan, would have their price uncompetitive. He did, however, admit that compromise on the provision of this service was short-sighted and gave rise to 99% of the problems on site.

The Project Manager, identified two major problems with the co-ordination and control of design information, quality control of the design process and monitoring and enforcement of information production. He attributed the former problem to Architect Co. not quantifying their design proposal in terms of what scale drawings they intended to produce, how much detail each was meant to convey, and what each was meant to indicate. He related the latter problem to lack of control on his and the Design Co-ordinator's part. He moreover asserted that Architect Co. were conceptual designers with 'no head for details'. To these problems a third can be added involving the reactive and ineffective co-ordination of design inputs, discussed earlier.

The Project Manager stated that better control of information could have had significant benefits. 'Mistakes were made that should not have been made. Drawings were not sent to the right people; records were not kept, full impact of changes, in terms of the chain of consequences, were not anticipated, and problems were not foreseen. Moreover, the systems for the transfer of information were not integrated.' The latter comment refers to the three separate systems of information transfer within the design team, within the construction group and between these two entities, through the Information Request system. The Project Manager's solution to the problem of control was utilisation of pre-fabricated and thus pre-designed components.

Managing project construction

Planning the construction works

Prior to the commencement of construction, Japan Construction set out their aims and objectives in terms of time, cost, quality and safety; established their goals and targets; planned the construction works by mobilising the key specialist and trade contractors they

had already selected and selected those outstanding. Japan Construction's aims were to compensate for the losses incurred in phase 1 by getting the job done sooner than the contract completion date (end of June 1996), that is, by the end of March 1996; to carry out the works cheaper than the price they negotiated with Japcol; to achieve a high level of quality and workmanship in terms of the materials and finishes specified by Architect Co.; and to avoid accidents on site - a company safety policy.

To finish the job sooner than programmed, Japan Construction established a target programme through project analysis in an ideal situation with no contingencies. That is, the logical sequence of events carried out through smooth operations and on a reasonable resourcing level - avoiding over-manning to accomplish tasks. In other words, the target programme was an optimistic schedule of executing the works; and the trade contractors were required to fit their works within it as a condition of their selection. To carry out the works cheaper than priced, Japan Construction took a certain percentage off INQS's financial analysis of the project - reflecting the latter's market value - to arrive at the target budget. They then either selected those trade contractors whose prices matched the target work package estimates, or negotiated down the trades' prices to the levels of the latter.

To achieve a high level of quality, particularly in relation to key elements of the work, Japan Construction gave priority in their selection of trade contractors to those whom they considered capable of delivering good quality work within time rather than to the lowest tenders. This was especially the case towards the end of the contract when time became of the essence. The trades thus selected were then negotiated with in an effort to lower their price. For example, the Concrete Frame trade contractor was selected because of their satisfactory performance on phase 1, despite being more expensive than their

competitors. To avoid accidents on site, Japan Construction established a site-specific safety plan for the works which was targeted to site operations and provided guidance on material storage and circulation about the site, obtaining permits to work, etc. The Site Manager supervised the site safety policy enforcement.

Although Japan Construction had obtained Japcol's approval to the new negotiated contract budget in principle, they did not have their commitment and therefore effectively started the works at risk.

The Project Manager explained that it was their company philosophy to plan the works at stages corresponding to imminent tasks, near future tasks and overall tasks represented by fortnightly programmes, monthly programmes and the overall programme. When execution of a programmed task was hampered by some reason, another task - belonging to a later stage in the programme - that could be performed was brought forward to replace it and thus the works were re-programmed. Towards the end of the project the programming was reduced to schedules, action plans and individual tasks corresponding to snagging lists, issued on a daily basis. To accommodate the change in the scope of the works and in some cases to recover lost time where a trade contractor had been in delay, the construction programme was revised many times over the construction period. The works were by and large complete by the end of June 1996, although there were some outstanding items like the leaking roof as well as some aspects of the services system that required attention past that date.

According to the Project Manager, variations in building production were not substantial in terms of person-hours, however, they caused considerable delays in co-ordination by

holding up other trades. The original design underestimated the complexity of construction, therefore, building construction cost more than anticipated in the target budget. INQS attributed the increase in the contract sum to the additional fixtures and fittings required by Japcol.

Flow of production Information

The design team produced the building production information in a similar way to the production of building design information. In an attempt to speed up the production of information, a few months into the contract period Japan Construction engaged a technician to produce the necessary construction information on site. In practice, the Technician did not prove any more efficient than Architect Co., according to the Project Manager. The flow of production information during the construction process generally took place in the following way:

- The design team sent the production information to the Project Manager who checked, commented upon and returned it for revision.
- The design team revised and returned the information to the Project Manager who sent it to UK Services and other trade contractors through UK Services' Project Engineer and the Site Manager respectively.
- When queries relating to discrepancies between the production information and the construction works arose on site, UK Services' or other trade contractors' foremen recorded them on Information Request Forms, sent them back along the flow route to the design team who, in turn, provided their answers on the same sheets and forwarded them to the former through the Project Manager. To speed up the process, UK Services' Project Engineer sent the queries direct to Services Design Ltd.

The flow routes for information relating to building construction and that requested by trade contractors are presented in Figure 5.5. The black flow route represents information sent by the design team; the blue flow route represents that sent by Japcol; and the green flow route represents the queries raised on site. The dashed lines represent informal or direct communication which by passes the stipulated information flow route.

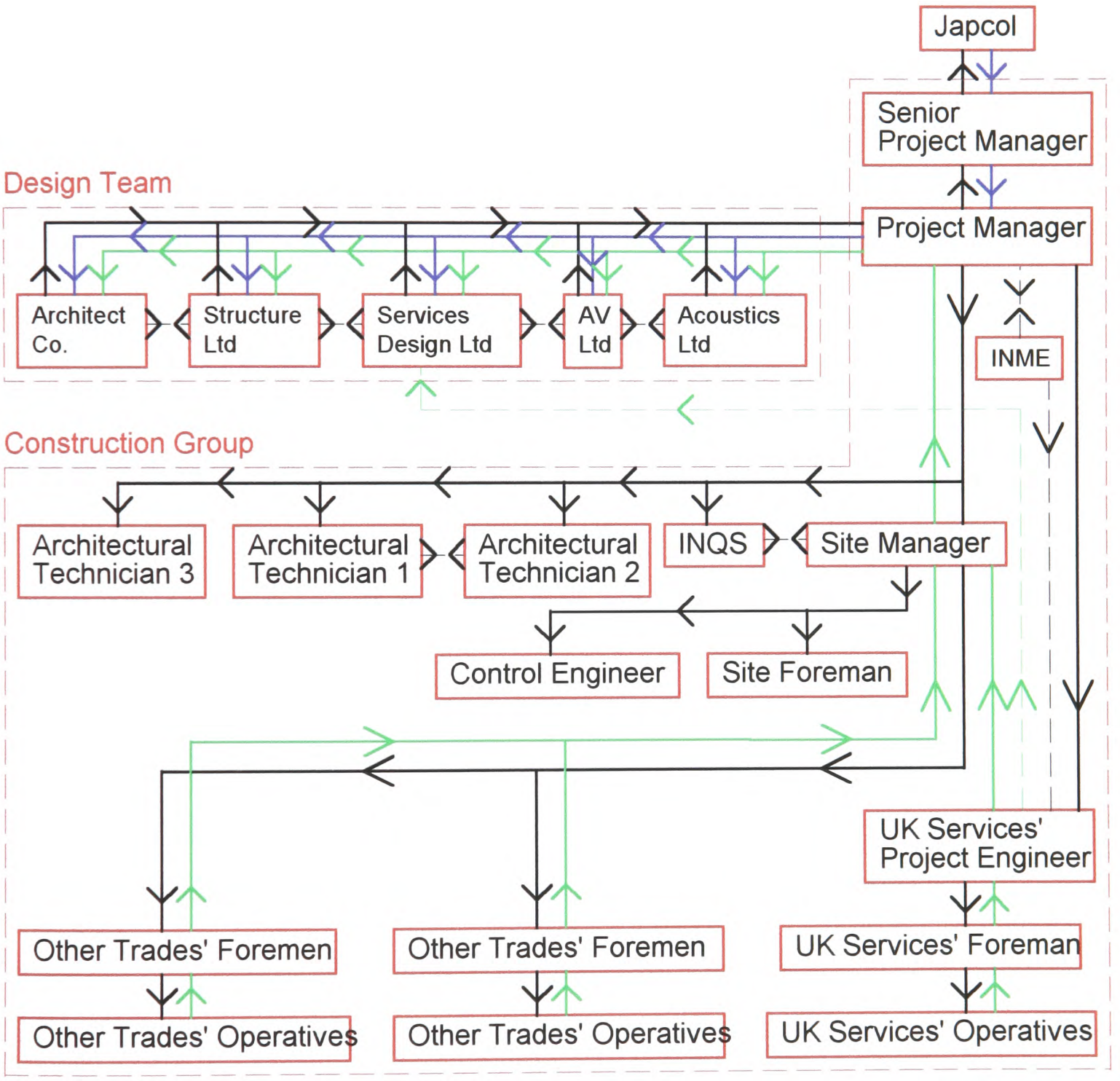


Figure 5.5: Building construction information flow route

At the start of the services installation, UK Services wrote their queries on odd pieces of paper rather than on the Forms Japan Construction provided. This created administration problems for the latter and led to hours of discussion in site meetings. In time, UK Services became accustomed to the Information Request system and the problem was overcome. The long delays in Japan Construction's response to each query were never overcome. The Project Manager admitted to problems with dissemination of information as well as with inefficient management of time because of the poor quality of production information. The dissemination of information was problematic for two reasons. Because information was recorded on paper, volumes of paper built up over time with the increase in the number of queries and clogged up the communication channels through which information had to travel for contractual reasons. Moreover, due to commercial pressures the consultants had limited human resources to devote to projects. This meant that individuals involved with the project were overloaded both in terms of the number of projects they had to attend to as well as the amount of work each demanded. It is no wonder that the quality of their information was 'poor', and their productivity, low.

Communication

The modes of communication within the design team remained the same at construction stage as they were at design stage. Japan Construction moved the Design Co-ordinator to another project. Further channels of communication, comprising the Site Manager, UK Services' Project Engineer and other trades' foremen, became operational to facilitate the flow of information between the design team and construction group.

Decision-making processes

The decision-making processes were largely delegated to the management team members in accordance with the authority that their job descriptions allocated to them. All the decisions that involved significant financial implications were made in Japan and were communicated to the management team through the Senior Project Manager. The Project Manager was ultimately responsible for all the decisions made on site that affected the performance of the trade contractors as he was responsible for the construction group's performance as well as the *consequences of their performance*. The Site Manager was authorised to make every day decisions, like builders' work and day work, that involved relatively minor cost implications, decisions regarding safety, alternative construction details on site - subject to the Project manager's confirmation - and alternative time targets. The other management team members merely carried out the decisions that the Site Manager made. Apparently the Senior Project Manager did suggest that the Site Management team members be given the opportunity of being creative - in the Japanese tradition of management. However, when this idea was put into practice it did not prove productive. Therefore the Project Manager and the Site Manager decided that it was quicker to make decisions and ask the management team members to carry them out than to devolve the decision-making process.

The building production was initially organised around the building works programme. However, half way through the contract, when problems associated with complexities of the services and the limited space available for their accommodation surfaced, the Site Manager reprogrammed the works and planned them around the services. He stated that this direction should have been adopted at the start of the works. The damage was already done. Towards the end of the project the most characteristic feature of the works was

their unfinished state portraying a piecemeal approach to their execution. A serious symptom of the approach was the extra work it gave rise to. For example, the delay in the kitchen extract's installation meant that rather than fitting it in the kitchen wall as the latter was being constructed, a new hole had to be made in the kitchen wall - after its construction - to accommodate the kitchen extract connection and then the area around the hole had to be made good. Or, the Steelworkers' failure to put up the steelworks on time had led to ducts sitting idle on site and having their installation fall behind programme when they could have been connected up.

Co-ordination and control of production inputs

Co-ordination of operations took place through structured co-ordination meetings held weekly between the Site Manager and the trades' project engineers or foremen. The site meetings between the Site Manager and UK Services' Project Engineer involved discussion of problems that frequently related to spatial restrictions, progress of the works, labour resources and safety issues. In response to these problems the Site Manager suggested solutions or recommended a course of action. In addition to structured co-ordination meetings, there were unstructured meetings held as the need for them arose, involving the Site Manager answering the queries raised by trade contractors. The Site Manager associated the frequency of these meetings with the complexity of the contractors' tasks. To ensure effective interaction between the trades, the Site Manager was strict about tidiness, cleanliness and completion of jobs and monitored the trades' performance closely.

According to the Project Manager and the Site Manager, the payment system and the embarrassment of not finishing on time were motivators in their own right. The former

claimed that it was to the contractors' advantage to finish sooner than scheduled, to get paid sooner and to save on overheads. The latter claimed that there was a good relationship between Japan Construction and the trade contractors. The trades knew they had to perform. Japan Construction paid them well, on-time and regularly. In case of poor performance financial pressures, such as refusing payment, were used as threats. In the case of poor performance by labour-only subcontractors the threats included warnings that others would be employed to complete the task.

Despite good relations and use of threats problems with enforcement of trade contractors and getting them to complete their tasks occurred. The Project Manager explained that those trades who lacked the will or the resources to finish their jobs knew that engaging others to finish their work would cost Japan Construction more and would therefore not be the first option of the latter. Japan Construction knew that if the trades were in financial difficulty not paying them would make them go under and would not achieve anything. On the other hand if Japan Construction did pay them the probability existed that the trades might try to finish the work on other sites where they had not been paid for yet. Thus motivation of trades was not an easy problem to resolve. Neither was the issue of trades' productivity. The Site Manager stated that although he monitored the trade contractors' productivity levels, he did not have much control over them. 'Sometimes people's pride does not allow them to take the management team's suggestions regarding productivity improvements on board' (the Site Manager).

The Site Manager arranged safety inductions, carried out at intervals on site, when the works began. At their pre-contract meetings, the specialist and trade contractors were informed of their safety requirements, including submission of method statements and risk

assessments. The Site Manager monitored the observation of Health and Safety Regulations by the trade contractors, on a day-to-day basis, and reported deviations to the foremen or the project engineers concerned requiring conformance. One trade contractor's operative lost a day's pay due to lack of conformance with safety requirements.

The Project Manager emphasised the importance of the shift in the balance of power between pre-contract and post-contract phases. In the former phase, Japan Construction was the dominant party owing to the power vested in them by the selection procedure and the conditions of appointment of trade contractors. In the latter phase, the trade contractors became the dominant parties because they were in charge of the construction process and the success of the project depended on their performance and their contribution in terms of the product and the services supplied.

Services installation: organisation, co-ordination and control of services inputs

UK Services' need for greater volumes of work to enable them to make sufficient profits to carry on their business, lay behind their endeavour to secure this contract. Their objective, at the time of offering the discount on their tender price, was to cover their costs and make a small profit through variations, which their experience on phase 1 and their perceived shortcomings of the project deemed inevitable.

UK Services' ultimate goal at the start of the services installation was effective management, or at least, more effective management of the installation compared to that achieved on phase 1. This was manifest in their replacement of the Project Engineer responsible for overseeing the works on site. Their start date was end of May 1995, four

days after their selection during which period they had to familiarise themselves with the site and set up their site office. The commencement of services installation was programmed as four weeks after this date. In other words, UK Services had four weeks within which to produce detail design and fabrication drawings, to obtain approval and to organise the installation works. Their completion date, set by Japan Construction, was mid-January 1996; however, as the construction works were extended this date moved back to the end of March 1996.

Although UK Services' contingency provisions were bargained away during the tender price negotiations, their bulk figures for the supply of services systems provided them with some recourse to recover their costs when omissions made by Services Design Ltd or Japcol enabled them to claim for extras.

UK Services subdivided the services works into electrical, mechanical, and public health installations. Their newly-formed in-house electrical department supplied most of the electrical services, which were fixed by their labour-only subcontractors (Electrical LOSC), except for the electrical controls which they sublet to a supply-and-fix firm (Electric Control). The manufacture of mechanical ductwork was sublet, by UK Services, to a supply-and-fix firm (Ducting Co.) who also supplied ductwork associated equipment and controls. The ductwork insulation was sublet to a supply-and-fix firm (Insulation Co.); and chlorination, to a specialist (Chlorinate Co.). UK Services supplied the public health services, comprising plumbing and drainage, themselves and sublet their installation to two labour-only subcontractors (Public Health LOSC), engaged specifically for this job. They moreover sublet the commissioning of the services to a specialist firm

(Commission Co.). The subcontractors operated under the supervision and control of UK Services.

UK Services' management team controlled the services installation. The team comprised: the Project Engineer, responsible for overseeing the installation of services and resolving the day-to-day problems on site by liaising with Services Design Ltd; and the Foreman, responsible for supervising the subcontractors, answering their queries on a day-to-day basis, and reporting problems to the Project Engineer. The organisation of services installation is represented in Figure 5.6. The links represent lines of influence arising from the team member's position and role within the organisation.

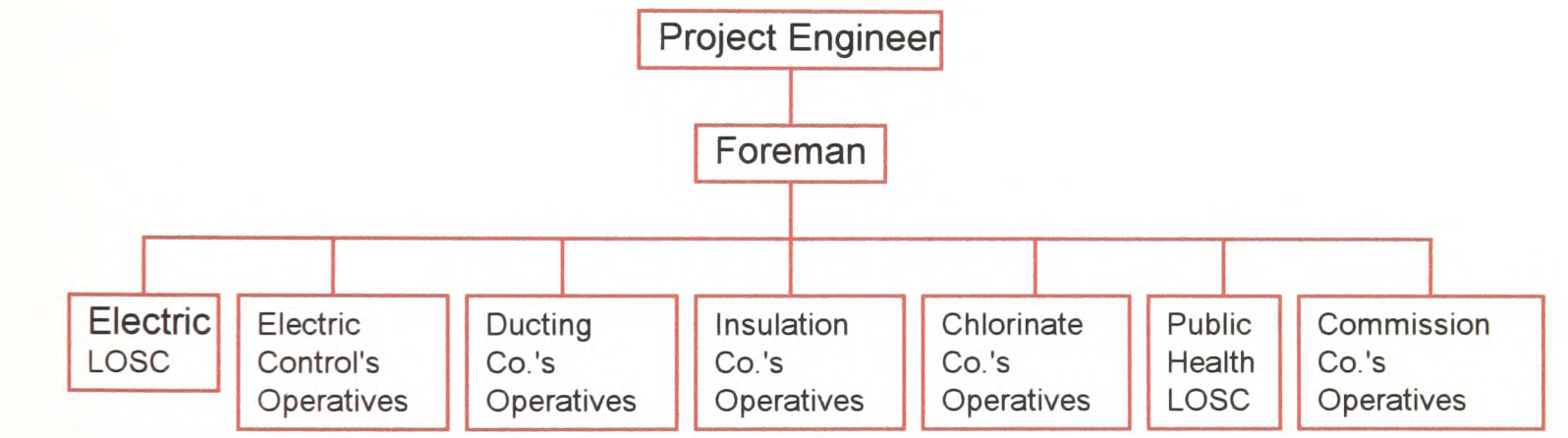


Figure 5.6: Organisation of services works package

UK Services had problems with deliveries and installation because they delayed the production of design information and because they did not have enough operatives nor did they pay them well, according to the Project Manager. They had problems with co-ordination of mechanical and electrical elements owing to their lack of experience, on the one hand, and the dearth of co-ordination drawings, on the other. They moreover had problems with co-ordination of services with the building primarily due to lack of space.

These problems were the major sources of delay in the installation of services, although the variations introduced by Japan Construction in response to Japcol's additional requirements contributed to them.

The services tender sum, according to INQS, fluctuated constantly from the early stages in the design process and was 'up-specified' and 'down-specified' throughout the construction process. This, coupled with Japcol's changing requirements, led to increases of £25,000 to the cost of mechanical services, and £60,000 to the cost of electrical services.

Services commissioning

Most of the services systems were commissioned satisfactorily. However, the air system indicated a ten percent loss of air volume between intake and outlet. The Project Manager attributed this problems to incorrect installation of the air conditioning controls. UK Services attributed it to the increased resistance of the system effected by the numerous bends that had to be applied to air ducts, because of the confined spaces through which they had to travel. Service Design Ltd rejected this claim but the Ductwork Specialist engaged by Japan Construction to act as independent adviser upheld it.

5.3 CONTRACTUAL AND OPERATIONAL FRAMEWORKS

This section interprets the implications of the contracting parties' engagement criteria for the nature of the parties' relations by establishing whether these relations express power disparity and power strategies or various forms of trust. It then goes on to interpret the impact of the Project Manager's and the Site Manager's leadership, motivation of participants, involvement of participants in decision-making and their formation into a team, on the participants' interactions.

5.3.1 CONTRACTUAL FRAMEWORK: INTERORGANISATIONAL RELATIONS

The interorganisational relations emanating from the contractual framework of the main project participants being investigated here, may be considered as a hierarchy of contracting and subcontracting relations. Japcol let the design, construction and project management functions to Japan Construction. Japan Construction sublet the design functions to the consultants, and the detail design, manufacture, installation and commissioning of the services to UK Services. The latter sublet the manufacture, installation and commissioning of electrical and mechanical services to subcontractors, and the installation of public health services to labour-only subcontractors. This hierarchical relationship is represented in Figure 5.7, and is explored below under subcontracting relations.

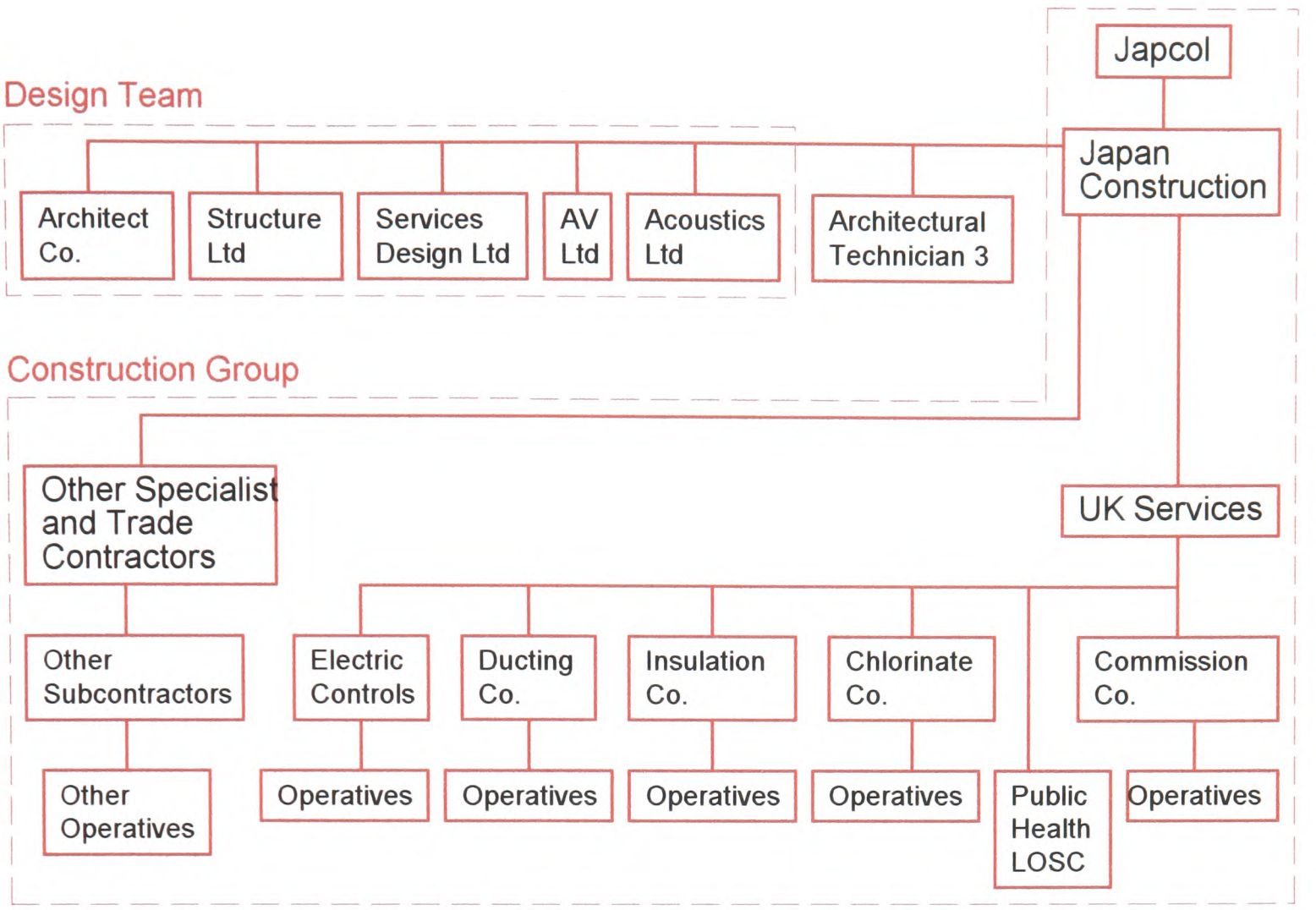
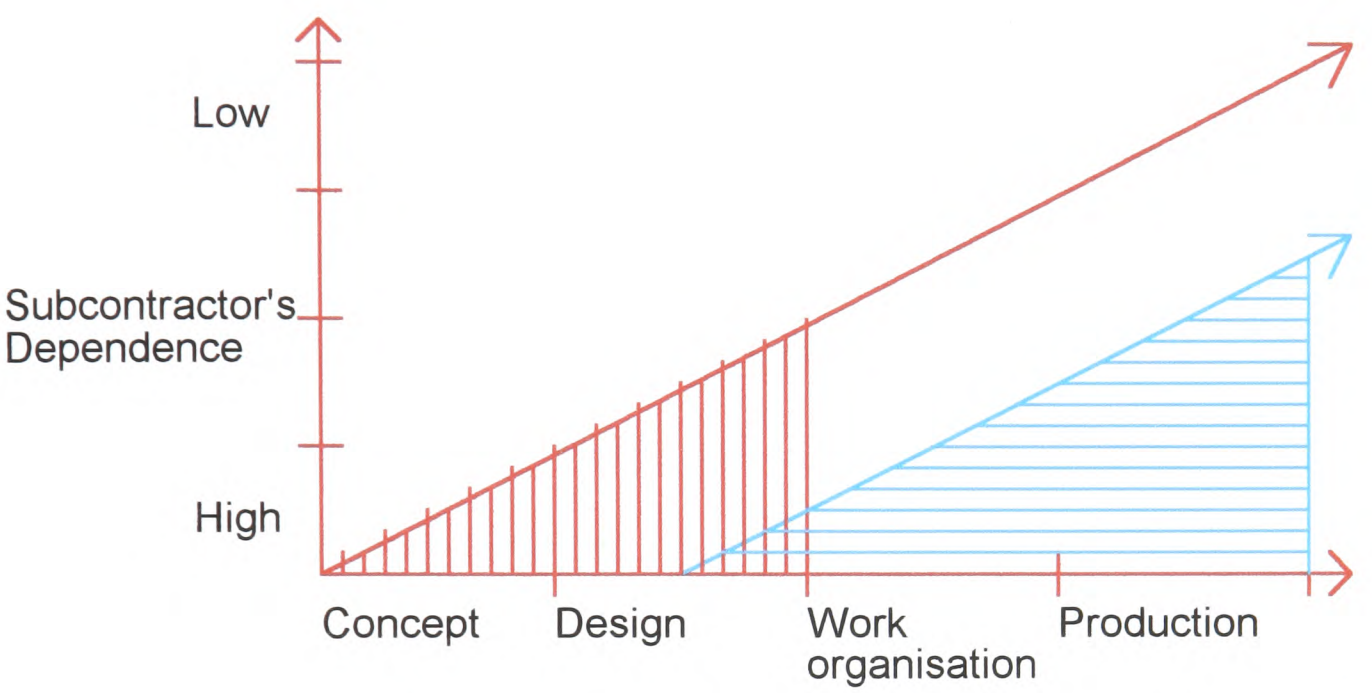


Figure 5.7: Participant organisations' contractual relations in The Cultural Centre

Subcontracting relations

Based on the nature of subcontracting relations, defined as subcontractors' relative independence from or dependence on the main contractor by virtue of their control over the four phases of work process (Druker and Macallan, 1995: 53, based on Chaillou, 1977; see Chapter 2: 66-7; Chapter 4: Figure 4.8), the consultants were semi-dependent upon Japan Construction (indicated as hatched area in red on Figure 5.8). Japan Construction provided the link with the client and their requirements, and organised the construction works and building production, whilst the consultants exercised control over the concept and design processes. UK Services, too, were semi-dependent upon Japan Construction who provided the link with Services Design Ltd. Although UK Services were in charge of detail design, organisation of installation and production of services,

they had no control over concept and outline design of services (indicated as hatched area in blue on Figure 5.8). Furthermore, by virtue of subletting the production, installation and commissioning of services, it may be fair to conclude that they were relatively dependent upon their subcontractors and operatives.



Subcontractor's control over phases of work process

Figure 5.8: Dimensions of subcontracting relations in the Cultural Centre

Power disparity

To examine the existence of power in the relationships between the contracting parties, power disparity is established based on the definition of power as a field of force between domination and resistance, or authority and illegitimate resistance (Pfeffer, 1981: 2-3; Clegg, 1989: 208; Fox, 1974: 98-9; Chapter 2: 16-17; Chapter 4: Table 4.3).

Japcol exercised power over Japan Construction by getting them to stand by their erroneous cost breakdown at the commencement of phase 1, which led to a protracted process of negotiations between the two parties for around a year, resulting in substantial

time and cost overruns on this phase. Japan Construction consented because they depended on Japcol. On the one hand, they wanted to preserve their thirty plus years relationship with Japcol, and on the other, they hoped that the natural course of events would prove Japcol wrong and convince them of the need to increase the contract budget. Japan Construction, in turn, exercised power over UK Services by substantially reducing their tender price and lead in period through negotiations, appointing them on the basis of a letter of intent, and getting them to redesign the services layout. UK Services consented because they operated in a competitive market and required the contract as a means of increasing their turnover. Therefore power disparity characterised the relations between the contracting parties being investigated. However, the nature of power relations changed during the project life cycle.

In the relation between Japcol and Japan Construction, the former dominated, on the strength of their position as funders of the project as well as a long standing client of Japcol. Japan Construction attempted to resist this domination by reducing the overall size and lowering the specification of the project, and by negotiating over the financial implications of variations. Lowering the specification of the project entailed requiring Architect Co. to produce a cheaper alternative at every design stage. This requirement had two implications for Architect Co.. On the one hand, it doubled their information production work load, squeezed their design programme, and left them with brief lead in periods for the production of design details prior to trade contractors' commencement on site. On the other, it lowered the quality of the building that they wished to design. Therefore Architect Co. had an inherent tendency to resist Japan Construction's requirements by either arguing over the design changes they were required to undertake, or not producing them on time. Thus Japan Construction's resistance to Japcol's

domination was hampered by their lack of discretion in the use of their knowledge. Based on Table 4.3 (Chapter 4), the nature of power relations between Japcol and Japan Construction was domination and resistance (Hardy and Clegg, 1996: 626; Fox, 1977; Friedman, 1977: Chapter 6), rather than authority and illegitimate resistance (Pfeffer, 1981: 4-6; Mintzberg, 1991(b): 372).

In the relation between Japan Construction and UK Services, the former both dominated the latter, by virtue of the contractual terms they had imposed upon them, and depended on their knowledge and discretion in the use of that knowledge. UK Services' resistance to Japan Construction was lowered by their lack of control over services concept design, on the one hand, and Japan Construction's role in acting as the link between UK Services and Services Design Ltd, on the other. Based on Table 4.3 (Chapter 4), the nature of power relations between Japan Construction and UK Services was domination and resistance (Hardy and Clegg, 1996: 626; Fox, 1977; Friedman, 1977: Chapter 6), rather than authority and illegitimate resistance (Pfeffer, 1981: 4-6; Mintzberg, 1991(b): 372).

Power strategy

The examination of power strategies implemented by the parties is based upon the two definitions of conflict prevention, and defeat of conflict identified in Chapter 2 (pp. 18-19) and referred to in Chapter 4. The former strategy may involve responsible autonomy or direct control (Friedman, 1977: 6-7); the latter, comprises resistance through acquisition, development, and use of power (Pfeffer, 1981: 7).

Japcol appeared to have implemented both strategies of conflict prevention and defeat of conflict. By requiring Japan Construction to have their cost estimate checked by an

external firm of cost consultants, Japcol used indirect control to limit Japan Construction's discretion over the contract budget. Once the cost of the works had been established in Japcol's favour, they granted Japan Construction discretion over the execution of the works. When Japan Construction informed Japcol of the error in the calculation of their cost breakdown, the latter resisted acknowledging the error and used their position power to assert their interest by stating that Japan Construction ought to honour their price in the 'Japanese tradition of doing business'. The time and cost overrun in phase 1 of the development provided Japan Construction with some bargaining power for negotiating a larger budget for phase 2.

In their relationship with UK Services, Japan Construction granted the latter discretion over their work whilst requiring them to have a drawing office on site and supervising their information production and installation through INME. UK Services used their power of discretion to act in their own interest when allocating resources to the project, when producing information, and when specifying materials and components.

The implications of the contracting parties' power strategies for the emergence, handling, and resolution of conflict are discussed in the next section. Having established power disparity in the parties' interorganisational relations and their strategies for its use, attention is now focused on examining whether trust featured in these relations and if so, in what form and to what extent.

Trust-based co-operation

To examine whether the contracting parties co-operated on the basis of trust as reliability, predictability or power-induced predictability, the nature of their co-operation is

scrutinised on the basis of a few simple questions and the information provided in the Table 4.4 (see Chapter 4).

Co-operation of Japcol and Japan Construction

Did Japcol rely on Japan Construction? Japcol's indirect control mechanism over the estimation of Japan Construction's contract cost on phase 1, coupled with their refusal to modify the contract sum subsequent to the discovery of EQS Co.'s error, indicated Japcol's reluctance to take a calculated risk by relying on Japan Construction's claims. This was in spite of Japcol's expectation of their on-going relationship and repeated exchanges with Japan Construction. It was possibly a result of their inability to constantly monitor Japan Construction and consult with them face to face. Japcol's approval of a bigger budget at the commencement of phase 2 works indicated their willingness to rely on Japan Construction and accept a calculated risk after they had observed the evidence of poor performance on phase 1. Did Japan Construction rely on Japcol? They certainly took risks by undertaking the works on phase 1 within an unrealistic budget, by starting the works on phase 2 based on Japcol's verbal commitment to a larger budget, and by committing themselves to a fixed price for an unknown entity. These risks may have been based on Japan Construction's expectation of their on-going relationship with Japcol; they may, on the other hand, have been based on Japan Construction's fear of jeopardising their thirty year plus relationship with Japcol. In other words, they may have been based either on trust or on fear.

Did Japcol depend on Japan Construction's predictable behaviour? Japcol were aware of Japan Construction's capabilities and standards of performance based on their previous working experience with the latter. They reinforced this knowledge by the business

contract they entered into with Japan Construction, which in turn was supported by design warranties and a payment system based on achievement of milestones. They moreover put in place mechanisms for the flow of information and monitoring. Therefore Japcol appear to have depended on Japan Construction's predictable behaviour. Did Japan Construction depend on Japcol's predictable behaviour? To the extent that Japan Construction started the works on both phases at risk, they either depended on or hoped for Japcol's predictable behaviour of accepting a bigger financial commitment on phase 1, and honouring their verbal commitment on phase 2.

Did Japcol employ power-induced predictability? Japcol did not appear to have created impressions of a high discretion role for Japan Construction; the latter did have a high discretion role in their working relationship with Japcol. Japcol, did however, manipulate Japan Construction into co-operation on the basis of EQS Co.'s erroneous cost estimate on phase 1 but not on phase 2. Did Japan Construction capitulate? They did so on phase 1 based on the hope that the poor performance of their specialist and trade contractors would convince Japcol of the inadequacy of the contract sum.

Co-operation of Japan Construction and UK Services

Did Japan Construction rely on UK Services? In so far that UK Services' tender price was not the cheapest, and their organisation of services installation on phase 1 was not satisfactory, Japan Construction took a relatively high risk in letting the services installation package on phase 2, to them. However, this risk was not based on the expectation of an on-going relationship or other conditions necessary for calculated trust. Japan Construction tried to control and limit this risk by putting INME in charge of supervising UK Services and by requiring the latter to produce their information on site.

Therefore Japan Construction did not rely on UK Services entirely. Did UK Services rely on Japan Construction? UK Services were aware of the nature of the potential problems, based on their experience on phase 1. However, they needed the contract for reasons discussed in the previous section and they therefore decided to take a risk. This risk was not based on the expectation of an on-going relationship or other conditions necessary for calculated trust. It was based, rather, on commercial necessity.

Did Japan Construction depend on UK Services' predictable behaviour? Despite entering into an agreement with UK Services that was supported by collateral, design warranties and penalty clauses, Japan Construction monitored UK Services' work through INME to reduce the uncertainty and therefore the risk associated with it. Therefore Japan Construction did not appear to depend on UK Services' predictable behaviour partly because they lacked the specialist knowledge required to ensure UK Services' compliance with the contract, and partly because they were aware of UK Services' weaknesses. Did UK Services depend on Japan Construction's predictable behaviour? They entered into an onerous agreement with Japan Construction because they would not have been appointed otherwise. Therefore it is difficult to know whether they co-operated because they chose to or because they had to.

Did Japan Construction employ power-induced predictability? Japan Construction appointed UK Services to detail design and install the services on the basis of their reduced price that was achieved through negotiations. In practice, UK Services had to redesign the layout of the services before designing the installation. That is their roles and responsibilities were expanded within their fixed price contract giving rise to a higher discretion role than the one prescribed in the contract documents. Therefore it may be

concluded that Japan Construction created the impression of a lower discretion role to manipulate UK Services into co-operation on a smaller budget. Did UK Services capitulate? UK Services capitulated by accepting their enlarged role without committing themselves to the larger resources that this demanded.

5.3.2 OPERATIONAL FRAMEWORK: INTERPERSONAL RELATIONS

The operational framework, comprising the communication channels, information flow routes and decision-making processes, was set up by the Project Manager. It both influenced and was influenced by the organisational representatives' interpersonal relations and interactions. The complexity of the framework demanded speedy production of information by Architect Co. to ensure its timely dissemination to other design team members. This would enable the approval of information by the Design Co-ordinator and the Project Manager, and its progress to subsequent stages of information production and translation into construction, to be carried out in appropriate time. Architect Co.'s failure to meet the demand placed strains upon the relations between the architects responsible for information production and other design team members, and the former and the Design Co-ordinator and the Project Manager. It moreover strained the relations between the Project Manager and UK Services' Project Engineer and the Site Manager and the Foremen of specialist and trade contractors. Consequently Services Design Ltd's Project Engineer gradually withdrew his co-operation and passed on the responsibility for design of services layout to UK Services' Project Engineer. The Project Manager's dissatisfaction with Architect Co.'s performance culminated in the exclusion of the latter from the project and the engagement of an architectural technician to produce the rest of the information required.

This sub-section assesses the impact of the Project Manager and the Site Manager on the interpersonal relations at the services installation/construction interface within the operational framework. To do so, their respective leadership of the design team and the construction group, the way in which they motivated the design team members and the specialist and trade contractors, the extent to which the design team and the construction group participated in decision-making, and the success or otherwise of the formation of the design team and the construction group into teams are considered.

The leadership behaviours

Based on the contingency theory of leadership and its relationship to leadership behaviour discussed in Chapter 2 (see Section 2.3: 32-7), the Project Manager's leadership behaviour towards the design team members corresponded to the 'telling' category presented in Figure 4.9. That is, high level of directive and low level of relationship behaviour which is appropriate for low level of group/team maturity. By virtue of his responsibility and role, the Project Manager placed a high emphasis upon team members' tasks and expressed limited support and encouragement to them throughout the project. He therefore adopted a high task/low relationship leadership style. The unwillingness of Architect Co.'s Project Architect, and the increasing reluctance of Services Design Ltd's Project Engineer to follow the Project Manager's guidance and instructions were decidedly manifest during the design development and early construction stages. These behaviours may be ascribed partly to the divergent objectives of the representatives' respective organisations, partly to absence of an established working relationship between these organisations, and partly to the clash of representatives' personalities. Consequently, despite the prescribed structure of their tasks and the authority of the Project Manager to influence their selection on future projects, the above design team members could not be

motivated to co-operate. Their lack of co-operation had a demotivating effect upon the other team members and delayed the production of information by the latter. Therefore the Project Manager's leadership behaviour, though theoretically appropriate to the situation, failed to positively influence the inputs of the design team members.

The Site Manager's leadership behaviour towards the specialist and trade contractors corresponded to the 'telling' and the 'delegating' categories in Figure 4.9. When the trades required high levels of direction necessitated either by the project complexities or by their failure to meet the Health and Safety regulations, the Site Manager provided them with prescriptive guidance or instructions (see Co-ordination and control of production inputs, above). When the trades were willing and capable of carrying out their tasks with low levels of direction and support, the Site Manager provided limited guidance and let them get on with their work. One of the problems associated with telling behaviour related to the unwillingness of trade contractors' foremen to follow the Site Manager's lead or suggestions owing to the low level of authority they ascribed to him. Thus the Site Manager had problems with influencing the trade contractors' inputs.

Motivation of project participants

The Project Manager's success or otherwise to motivate the design team members is examined in relation to the effectiveness of the motivational strategies implemented. The latter include control mechanisms corresponding to the motivator's sources of power, and manifested as reward and punishment; and fulfilment of individual values relating to motivatee's attitudes to work and demonstrated as job satisfaction (see Section 2.3: 32-7; Table 4.5).

The Project Manager did not appear capable of motivating Architect Co. to produce information more quickly than they did because the latter did not want to produce cheaper alternative designs. They wanted to design an award winning building of high aesthetic quality in keeping with their organisation's award winning track record. Their designs constantly evolved because they were striving for perfection. In this strive they were uncompromising and unaccommodating because it would lead them to rewards that far exceeded the fees they were to receive for their services. Consequently they alienated others, particularly Services Design Ltd's Project Engineer, who could not or were not prepared to keep in pace with the design changes and who felt their needs were being ignored. That is why the Project Manager could not motivate Services Design Ltd's Project Engineer to co-operate. The latter probably felt that the rewards his company received did not justify the level of effort they were required to put in and that, in relation to Architect Co., they were being unfairly treated.

Lack of co-operation on the part of Services Design Ltd's Project Engineer had repercussions for the motivation of UK Services' Project Engineer and their site staff. Observations indicated that the high level of difficulty of UK Services' task coupled with limited support offered by Services Design Ltd's Project Engineer lowered UK Services' level of performance. This was probably attributed to the level of required effort for the task far exceeding that which UK Services were prepared to dedicate to the job, and to their perception of being unfairly treated. The financial incentives and penalties did not appear to have been adequate motivators for some of the other specialist and trade contractors either (see Co-ordination and control of production inputs, above).

Participation in decision-making

To assess the level of participation of design team and construction group members in decision-making, the extent of their involvement in decision-making and control processes through collective problem-solving is examined (see Chapter 2: 36). As is the consequences of this involvement for their interpersonal relations.

The design co-ordination meetings, where collective problem-solving could potentially have taken place, were dominated by disagreements, arguments and apportionment of blame amongst the design team members and between them and the Design Co-ordinator or the Project Manager. The divergent objectives of the organisations involved coupled with discrepancies amongst the information produced often constituted the causes of the problems. In this climate the guidance, directions and at times instructions of the Design Co-ordinator and the Project Manager, although superficially agreed to, went unheeded. Therefore the Project Manager's ultimate authority in decision-making could not address the team members' lack of commitment to project objectives and secure their collaboration (see Decision-making processes and Design co-ordination and control under Managing project design, above).

The construction related decision-making was largely delegated to the Site Manager although the latter consulted with the Project Manager in relation to major decisions. The devolvement of decision-making further down the management team hierarchy was abandoned shortly after its introduction because of control problems (see Decision-making processes under Managing project construction, above). The decision-making related to services installation and co-ordination with the construction works was delegated to UK Services. In the light of the services design problems discussed

previously, this responsibility proved to be onerous. Therefore UK Services' involvement in problem-solving was reluctant and, to a degree, constituted enforced co-operation.

Team building

To assess the effectiveness of the design team, their team building criteria in terms of the team characteristics, nature of the task, the environment in which the team functioned, and the conditions on which their effectiveness depended are examined (see Section 2.3: 37-8; Chapter 4: Table 4.6). The size of the team, whilst allowing for the required diversity of skills and knowledge, was too big to facilitate the participation of individuals in problem-solving and decision taking. The incompatibility of members' characteristics and their unwillingness to follow the Project Manager's lead gave rise to a heterogeneous team which was dominated by overt conflict. The individuals' diverse objectives were manifest in their unco-operative approach to problem-solving, and in the absence of reconciliation, gave rise to in fighting amongst the team members. The forming phase had taken place prior to the commencement of the investigation. It seemed that the members did not move far beyond the storming phase throughout the design development stage. Therefore the norming and performing phases did not follow on smoothly and did not result in an effective collaborative team. The nature of the task, in terms of the allocation of task associated roles to members, was ambiguous; the significance of the task, in terms of rewards for the level of effort required, was greater for some, like Architect Co., than others. The Project Manager's position power had little influence upon the team members. The dispersed physical locations of the team members' organisations had a negative impact upon their communication and interaction; this was reflected in their reluctance to attend design co-ordination meetings on site.

The construction group did not appear to act as a team and were not encouraged to do so by any efforts on the part of Japan Construction's management team to forge them into a team.

5.4 CONFLICT

The previous section established the existence of power disparity in the interorganisational relations of the contracting parties and identified the power strategies implemented by each party in order to achieve their aims. It moreover demonstrated the uncollaborative nature of the design team members' interpersonal relations and discussed the reasons for design team members' failure to deliver their inputs on time. This section examines the implications of power disparity and power strategies for the emergence of both overt and covert conflict in the participants' interorganisational and interpersonal relations. It then goes on to examine the emergence of conflict in the building production process and the way it was handled and/or resolved.

5.4.1 CONTRACTUAL/INTERORGANISATIONAL CONFLICT

The occurrence of conflict in the interorganisational relations of the contracting parties is investigated based on the definition and forms of conflict, discussed in Chapter 2 and referred to in Chapter 4. Thus conflict is considered as any divergence of interests, objectives, or priorities between individuals, groups, or organisations; or non-conformance to requirements of a task, activity, or process (Gardiner and Simmons,

1992: 111). Manifestations of conflict are regarded as functional or creative; and dysfunctional or destructive (Smith, 1992: 29, 30; Stephenson, 1996: 27). According to these definitions, both forms of conflict were observed in the interorganisational relations of Japcol and Japan Construction, the design team members, and Japan Construction and UK Services. They may be attributed to the contractual framework, the building project environment, the project coalition structure, culture and technology, and low levels of trust in the parties exchange relations.

Conflict attributed to contractual framework

The integrated form of D&B implemented by Japan Construction gave rise to poor teamwork arising from poor communication amongst design team members, design uncertainty attributed to design changes, and disagreements amongst design team members and between them and the Design Co-ordinator and the Project Manager. There was ineffective co-ordination of design inputs too despite the presence of the Design Co-ordinator. Therefore the integrated D&B procurement method resulted in dysfunctional conflicts of interest within the design team organisation (see Chapter 2: 61-4). Japcol wished to have their four storey building condensed into a three storey space. Japan Construction wished to simplify the construction to save costs and improve their profit margins. Architect Co. wished to design an award winning scheme of high aesthetic quality, oblivious of cost and sacrificing functional requirements for dictates of form. The other design team members wished to accommodate their requirements in a practical and convenient way. Conflict was manifest as unco-operative behaviour discussed in the previous section.

The divisions between the services design and installation processes gave rise to poor communication between Services Design Ltd and UK Services. The discrepancy between spatial dimensions contained in the design information and those measured by UK Services within the constructed spaces created data conflicts the resolution of which was left to the discretion of UK Services. The execution of this task, which fell outside the scope of UK Services' responsibilities, created relationship conflicts between Services Design Ltd and UK Services and between the latter and Japan Construction. This conflict was manifested as delays in the production of services design drawings to programme, by UK Services, which was contrary to project requirements.

Conflict attributed to building project environment

The negotiations between Japcol and Japan Construction over the contract cost during phase 1, coupled with planning restrictions on the height of the building contained in phase 2, gave Japan Construction the impetus to engage in a cost cutting exercise involving the reduction of the overall size and lowering the specification of the project. This amounted to creative conflict between the parties which may have benefited both Japcol and Japan Construction, by providing the former with a four storey building as per the original brief, and saved on construction costs for the latter.

The cost cutting exercise, which needed to be led by the Project Manager and implemented by Architect Co. in conjunction with the other design team members, failed to succeed mainly due to conflictual behaviours of Architect Co. and Services Design Ltd discussed in the previous sections. These conflictual behaviours led to problems concerning the co-ordination of construction with the services, thus causing dysfunctional conflict between Japan Construction and UK Services.

It is doubtful as to whether the negotiations between Japan Construction and UK Services gave rise to creative conflict. The negotiations went on for weeks and resulted in a considerable reduction in UK Services' tender price, which led to under-resourcing of the installation process. This in turn slowed down the information production and had a knock on effect on both the installation of services and the main construction programme, thus contradicting the requirements of the project. Therefore the reductions in UK Services' tender price led to conflictual behaviour on the part of UK Services.

Conflict attributed to project coalition structure

The Cultural Centre project coalition had a hierarchical structure of subcontracting relations, discussed in the previous section. Within this hierarchy, the design team did not function smoothly and creatively. This was attributed to low levels of mutual adjustment amongst the team members - particularly Architect Co. and Services Design Ltd, caused in part by the ineffectiveness of the Design Co-ordinator's and the Project Manager's liaison functions. The lack of subsequent co-operation within the design team denied the Project Manager the power to make design decisions according to need and prevented the consultants making decisions based on their expertise. This created discord between Japan Construction and Architect Co. and the former and Services Design Ltd. The discord manifested itself in Japan Construction engaging Architectural Technician 3, half way through the contract, to produce the construction information, and delaying the payment of Services Design Ltd's invoice for fees.

The subcontracting relation of UK Services to Japan Construction did not necessarily empower the Project Manager to make services related decisions according to need, either. Although UK Services were coerced into broadening the range of their

responsibilities, they could not keep their information production and installation within programme and the Project Manager could not do much about it. INME's efforts in structuring and itemising the types of drawings UK Services needed to produce to facilitate the installation went unheeded. The Project Manager raised the issue of delays at every site meeting, queried the reasons for the delays, and praised the progress that was made. Thus conflict between him and UK Services' Project Engineer tended to be covert rather than overt. Japan Construction were dependent on UK Services not only for the services installation, but also for timely completion of the works. The Project Manager was aware of UK Services' resource problems and suspected that financial threats would not achieve the desired outcome.

The hierarchical structure in conjunction with the design team's collaboration problems created communication difficulties between the design team and the construction group. These difficulties, coupled with the slow rate of information production, gave rise to conflict between the Site Manager and the trade contractors' foremen. At times, conflict was creative and led to joint problem-solving, at other times, it was dysfunctional and led to delays discussed in relation to UK Services' installation in the previous section.

Conflict attributed to project coalition culture

The culture of the design team organisation was conflictual because the design team members were not appointed at the same time at the beginning of the design process. Therefore they did not have the opportunity of contributing to the design, based on their expertise and requirements. Architect Co., as the first design team member, pursued their goals and interests independently and irrespective of those of others. The Project Manager's inability to convince Architect Co. to compromise is conveyed in his remark:

'... it was easier to explain the problems caused by inadequate space to Japcol at the construction stage than to demand extra space from Architect Co. at the design stage!!' (see Design development, above). That is why a collaborative team effort never got established. Instead, apportionment of blame is what characterised the design co-ordination meetings.

The culture of the services installation organisation was conflictual too, based on the observations and the Project Manager's comments. Failure of UK Services to undertake minuted actions and to produce information assigned to them within the time allocated was a common occurrence. As were their problems with deliveries and operatives. UK Services were obviously not satisfied with their engagement criteria and felt coerced into accepting them owing to the competitive pressures of the industry that have already been discussed.

Production quality and site safety were the only areas where the Project Manager, with the aid of Japan Construction's management team, decidedly directed the concerted efforts of the construction group. Production quality was incorporated in Japan Construction's philosophy of demanding 100 percent, in terms of materials, finishes and workmanship, from their specialist and trade contractors, and formed an important criteria in the selection of the latter (see Selection and appointment of construction group). Site safety was reflected in the creation, maintenance and enforcement of the site specific safety plan (see Co-ordination and control of production inputs).

Conflict attributed to project coalition technology

The design team members produced their information electronically and transferred it largely in hard copy format by mail or courier and occasionally, to speed up the process, on floppy discs. Therefore readily accessible computerised information of one team member, was not generally available to the other for co-ordination purposes. That is why the Design co-ordinator could not carry out his task of design co-ordination effectively. Thus data conflicts occurred. The site conditions often necessitated deviations from the design information. These deviations were communicated to the design team members and had to be approved by them, via the formal communication structure. If approval took long, or if deviations from the design required urgent action, they were carried out prior to being incorporated in the information production systems, creating conflicts between the design information and the constructed form. This, in turn, caused conflicts of relationship between the trades' foremen and the Site Manager - who was seen as the link between the site and the design team, and between the construction group and the design team.

Low trust in project participants' exchange relations

Examination of the contracting parties' seemingly trust based co-operation, presented in the previous section, indicates that the parties' exchange relations may have incorporated trust as reliability or calculated risk to a degree. Japcol implemented a cost control mechanism over Japan Construction's proposed activities prior to commencement of phase 1 because the risk of building in the UK construction market was unknown to them. Their inability to consult with and monitor Japan Construction regularly made their thirty years plus relationship with the latter inadequate collateral for relying on the latter's cost breakdown unquestioningly. However, once they had acquired some experience of

construction during phase 1, Japcol were more prepared to take heed of Japan Construction's claims. Japan Construction's selection of UK Services on phase 2, on the other hand, was based on their knowledge of UK Services' strengths and weaknesses. The quality of UK Services' installation, which constituted their strength, outweighed their weaknesses discussed in the previous section. However, it did not provide Japan Construction with the grounds for trusting or relying on UK Services, as the presence of INME and UK Services site drawing office testify.

Japan Construction's onerous payment system was used to ensure their conformance to the contract documents. Thus Japcol depended on Japan Construction's predictable behaviour. Japan Construction, on the other hand, could only hope for Japcol's predictable behaviour in the absence of a written agreement to their financial commitment at the start of phase 2. Japan Construction imposed punitive legal sanctions on UK Services to ensure their conformance to the contract documents. These punitive measures were supported by direct supervision indicating Japan Construction's lack of dependence on UK Services' predictable behaviour. Therefore the onerous payment systems and legal sanctions were used to reduce risk by passing it on to the subordinate party in the relationship. They did not prevent opportunistic behaviour by Japan Construction and UK Services; did not eliminate Japan Construction's fear of unpredictable behaviour by FinOp Ltd; and disguised UK Services' lack of choice with the appearance of decided choice.

Although Japcol manipulated Japan Construction into co-operation only on phase 1, the repercussions of this manipulation reverberated throughout phase 2. One example is provided by Japan Construction's manipulation of UK Services into accepting a higher discretion role than the one they had tendered and were appointed for. Therefore Japan

Construction's capitulation to Japcol resulted in their manipulation of their specialist and trade contractors including UK Services. UK Services capitulated to Japan Construction by accepting the roles but they did not resource their installation adequately.

5.4.2 OPERATIONAL/INTERPERSONAL CONFLICT

Creative and dysfunctional conflict characterised the operations of the project, the interpersonal relations of Japan Construction and the design team members, and those of the former and UK Services. Manifestations of conflict may be attributed to latent conflict at the brief preparation, design and construction stages, and the project management and control systems implemented.

Latent conflict at brief preparation stage

Although the brief preparation stage was not included in the investigation, the inductive use of the evidence collected during the later stages pointed to the emergence of latent conflict amongst the four elements of physical form of the facility, its function, construction cost, and construction period. The physical form of the facility incorporated a four storey rotunda, which the planners required to be reduced to a three storey building and Japcol required to be maintained as a four storey building. The multi-functional nature of the rotunda required substantial suspended ceiling space for the accommodation of services, which the height reduction would take away. Japan Construction's target cost necessitated a reduction in the overall size of the building which contradicted Japcol's wishes and the services' spatial requirements. Their target programme required smooth operations unhindered by surprises or delays, which the achievement of the target cost was not likely to facilitate.

Latent conflict at design stage

The contradictions amongst the physical form of the facility, its function, construction cost, and construction period, were handled in the following way. The Project Manager required Architect Co.'s Project Architect to squeeze the four storey rotunda into a three storey high building by reducing the floor to ceiling height of each level. This reduced the available space for the accommodation of services demanded by the multi-functional nature of the building and gave rise to the redesign of services layout by Services Design Ltd. The redesign of services layout created overlaps in Services Design Ltd's and Architect Co.'s technical and spatial requirements, respectively, that were never resolved as part of the design process (Baden Hellard, 1992: 38; 47), thus giving rise to relationship conflicts between the organisations' representatives.

Latent conflict at construction stage

The problems associated with constructability of design details constituted one of the sources of conflict between the Project Manager and Architect Co.'s Project Architect. The discrepancies between the design information and the built form gave rise to further redesigns of services layout, the responsibility for which was assigned to UK Services, and comprised a source of conflict between UK Services' Project Engineer and the Project Manager. The complications associated with the redesigns were increased by conflictual changes in Japcol's services requirements and contributed to the slow production of services installation information. Delays in the production of installation information had a knock on effect on the main construction programme, on the one hand, and resulted in reworks, on the other. They constituted the source of conflict between the services installation and building construction, which according to the Site Manager should have formed the basis for the construction programme.

Conflict arising from project management and control systems

The Project Manager did not succeed in creating a cohesive design team that collaborated through joint problem solving. However, as far as could be gathered during the investigation, he succeeded in leading a united site management team even if he did abandon the Senior Project Manager's initiative regarding devolved decision-making to lower ranks of the team.

The control of design inputs was ineffective as far as the production of timely, accurate and co-ordinated design information was concerned. The information flow and monitoring mechanisms proved inefficient in reducing uncertainty throughout the project partly because of the physical separation of Japcol and Japan Construction, and partly because of the changes in Japcol's requirements. The control of construction inputs, in the guise of the Site Manager and the Foreman, was effective as far as the achievement of quality and site safety objectives were concerned. It was ineffective, however, in terms of achieving the cost and time targets set by Japan Construction. The contract sum increased by 45% - even if most of this increase was due to changes in Japcol's requirements and subsequent variations, and the construction works were completed four months later than scheduled.

5.4.3 MANAGEMENT OF CONFLICT AND ITS IMPACT ON PERFORMANCE

To assess Japan Construction's conflict management, their project planning in terms of risk management through the three phases of identification, analysis and response to risk is examined (Lewis, Cheetham and Carter, 1992: 80-1; see Chapter 2: 74-5; Chapter 4: Table 4.7). To assess the impact of Japan Construction's conflict management on the performance of project participants, the former's response to conflict, whether passive or active, and the type of behaviour this engendered in the participants is examined (Ibid.).

Japan Construction's risk management proved to have been inadequate. They did not foresee the nature and extent of risk posed by the services installation. Although they identified contingencies and allocated sums of money to them, changes in the scope of works, complexities of the construction process, and delays by trade contractors eroded the contingencies and led to target cost and programme being exceeded. Japan Construction's response to risk was to either retain it, as in the case of the risk contained in Japcol's design changes; or to transfer it, as in the case of the risk contained in the services installation design, and reduction of the trade contractors' prices through negotiations. The Project Manager's response to conflict between Japan Construction and Architect Co. and between the former and Services Design Ltd was to compromise at the start of the bargaining process. However, as Architect Co. and Services Design Ltd failed to deliver their part of the bargain, Japan Construction withdrew co-operation. Architect Co.'s and Services Design Ltd's response to conflict between them and Japan Construction was shallow commitment to project goals. The Project Manager's response to conflict between Japan Construction and UK Services arising from the enlargement of UK Services' responsibilities, tended to be dominating at the start of the installation. However, as the oscillation of Japcol's requirements began, the Project Manager's response to conflict became more creative and oriented towards co-operative and joint problem solving.

UK Services' risk management had inadequacies too. They did not identify the extent of the risks well enough. Their contingencies were seriously reduced during the bargaining process at tender stage. They failed to reduce their design risk by producing the required design information. They either retained the risk or transferred it to their subcontractors. The response of UK Services' Project Engineer to conflict between UK Services and

operative, or passive and capitulative.

5.6 SUMMARY

This chapter has provided the Cultural Centre project scenario to facilitate the interpretation of the project participants' interorganisational and interpersonal relations, to link them to the occurrence of conflict, and to interpret the impact of conflict handling and resolution methods on the performance of project participants. Section 5.2, presented a descriptive account of the organisations participating in the project, the engagement criteria of the design team members, the main contractor, and the M&E contractor, and the conception, history, design and construction of the facility. Section 5.3, interpreted the implications of the contracting parties' engagement criteria for the parties' relations, in terms of establishing power disparity and giving rise to various forms of power strategies, rather than trust, in their interorganisational relations. The existence of trust as predictability was acknowledged on the part of the client in their relation with the main contractor, although the reciprocity of predictability on the part of the main contractor remained questionable. Section 5.3 moreover interpreted the Project Manager's and the Site Manager's leadership, motivation, participation, and team building strategies as theoretically appropriate to the project situation. However, it recognised the ineffectiveness of these strategies in achieving collaboration and co-operation within the design team, or in enforcing or enhancing the participants' performance.

Section 5.4, traced the occurrence of conflict in contractual and interorganisational relations of the contracting parties, and in operational and interpersonal relations of the project participants. Conflict was attributed to the contractual framework, the building project environment, the project coalition structure, culture and technology, in the former relations. It was related to latent conflict at the brief preparation, design and construction stages, and to project management and control systems, in the latter relations. This section further interpreted the way conflict was managed and the impact this made on the performance of the main and the M&E contractors.

CHAPTER 6 CASE STUDY 3 - THE POLICE STATION

6.1 INTRODUCTION

This chapter presents the third and final example of the construction project coalitions selected for in depth, longitudinal study of the main and mechanical and electrical (M&E) contractors' behaviour, building production management processes, and interpersonal relations and interactions of the contracting organisations' representatives. The traditional method of procurement implemented to realise this project, the large proportion of refurbishment works it entails, and the public sector status of the client constitute the contrasting characteristics of this case with the previous two. The separation of design and construction processes and the consequent separation of the design team from the main contracting organisation meant that only limited insight into the design process and associated problems was possible. This limitation arose from the focus of research being directed at the interface between the main and the M&E contractor.

Similar to the previous cases, a descriptive account of the main participants' characteristics, their engagement procedures, and the properties of the project is provided as the context for events, processes and interactions being investigated. The contractual and operational frameworks, which govern the main and M&E contractors' interorganisational and interpersonal relations, respectively, are then considered. This is

followed by identification of the salient features of these relations and of the building production management processes. Subsequently the impact of the main contractor's management processes on the performance of the M&E contractor is examined. The chapter comprises four sections:

Section 6.2, provides outline profiles of the main participants; sets out the pre-contract processes establishing the roles and responsibilities of the design team, the main and the M&E contractors; and describes the conception, history, design and construction of the project.

Section 6.3, examines the nature of the project participants' interorganisational relations arising from the contractual framework; and assesses the nature of their representatives' interpersonal relations vis-à-vis the operational framework.

Section 6.4, identifies conflict as a dominant feature of the relations discussed in the previous section. It establishes the types and manifestations of conflict and considers the management processes implemented to handle or resolve conflict and their impact upon the behaviour and performance of the main and the M&E contractors.

6.2 CONTEXT

This section provides a brief description of organisational characteristics of the client, the design team, the main contractor, and the M&E contractor. It defines the selection processes, the appointment criteria, and the roles and responsibilities of the design team members, the main contractor, and the M&E contractor. It then recounts a précis of the project's conception, history, design development and construction process.

6.2.1 CHARACTERISTICS OF MAIN PARTICIPANTS

Client organisation

The client organisation (City Police), who was the operator and end-user of the project, was the civil law and order enforcing body of a metropolitan city. It comprised 190 police stations employing over 27,000 police officers, and 17,000 civilian staff. However, the project was financed by the Home Office.

The design team

The design team comprised a building design and project management firm (Surveyor Co.), a structural consulting firm (Structures), and a services consulting firm (Services Associates). The team was led by the Project Administrator who represented Surveyor Co. organisation. The latter consulted with three external consulting firms, namely, a party wall specialist (PW Co.), a quantity surveyor (QS Ltd), and a claims specialist (Claims Co.). He moreover consulted with four City Police in-house consultants, namely, the public health engineer (PHE), the Information Technology group (IT Group), the security consultant (Security), and the estates branch of City Police (Estates). The design

team was organised as shown in Figure 6.1. The solid links represent the lines of influence arising from the team members' position and role within the organisation.

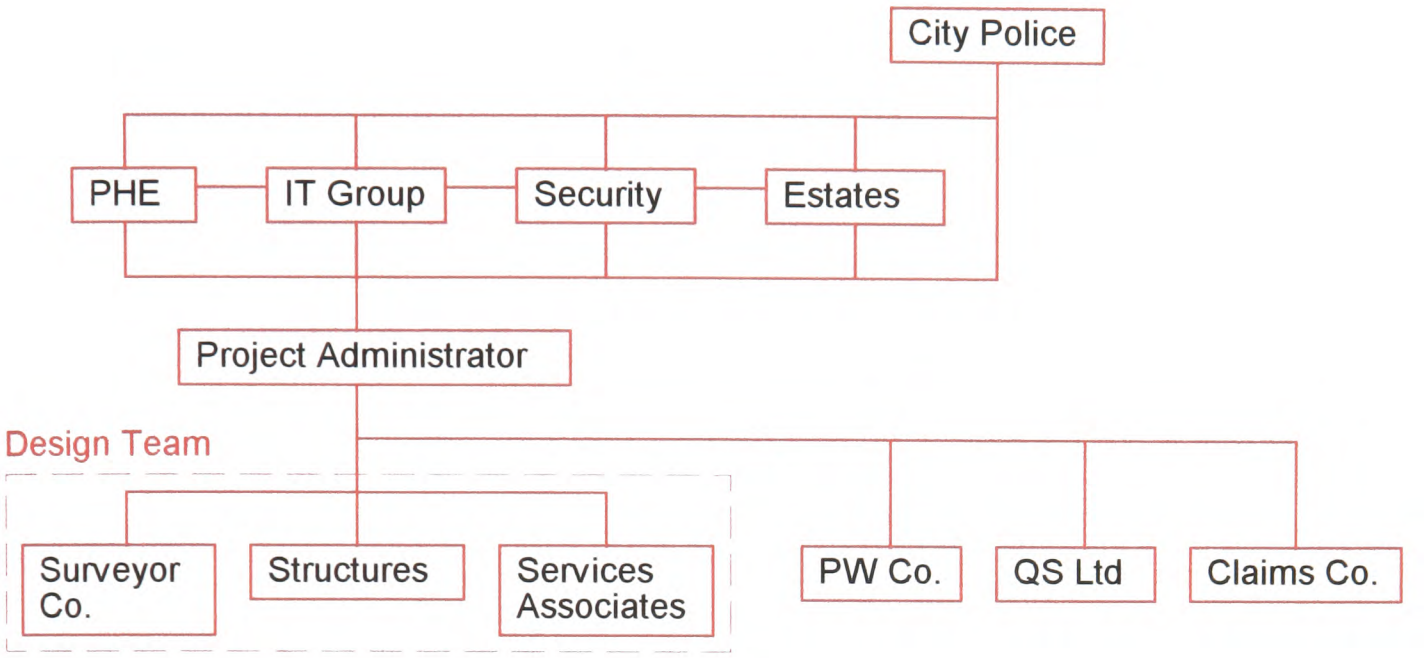


Figure 6.1: Organisation of design team

Main contracting organisation

The main contracting organisation (Construction Plc) is the UK subsidiary of a large international parent company. It is a national contractor and operates through a network of eight regional establishments. Construction Plc was established in 1996 as a result of the acquisition, by their parent company, of a long-established UK construction group. The latter was established in 1810, and the parent company, in 1844. Construction Plc operates in a wide spectrum of sectors spanning commercial, government and civic, through refurbishment and residential to industrial and civil engineering. They have experience in a number of procurement methods including traditional, design and build, construction management and private finance initiative. They also form strategic alliances with individual clients.

M&E CONTRACTING ORGANISATION

The M&E contracting organisation (M&E Co.) is a member of one of Europe's largest construction groups. It is a national mechanical and electrical engineering contractor and operates through a network of 16 regional offices. They operate in the commercial, industrial, health and public sectors and offer a range of services from mechanical and electrical installations in buildings, through process engineering and energy and maintenance technology, to voice, data and video communications. The organisation was restructured in January 1997. The resulting management change had repercussions for the management of services installation which is discussed below.

Construction group

The construction group comprised Construction Plc's management team and the specialist and trade contractors. Construction Plc's management team consisted of the Project Manager, the Project Planner, the M&E Co-ordinator, the Works Planner, the quantity surveyor (QuanSurv), and the Site Agent. The specialist and trade contractors were largely selected through tender processes. The organisation of the construction group is presented in Figure 6.2. The solid links represent the lines of influence arising from the group members' position and role within the organisation.

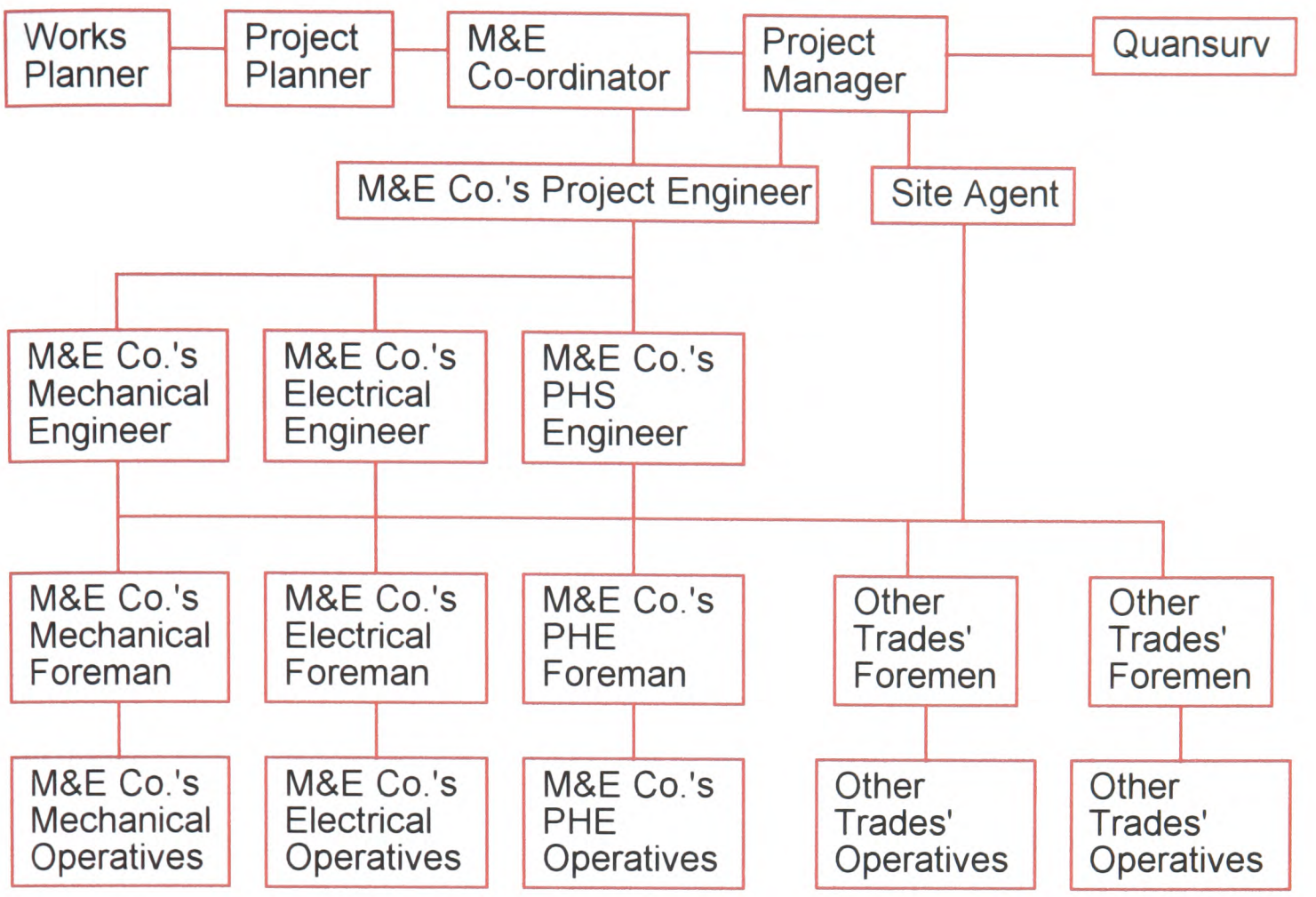


Figure 6.2: Organisation of construction group

6.2.2 ENGAGEMENT OF MAIN PARTICIPANTS

To establish the nature of the relationship between Construction Plc and M&E Co., their respective selection processes, appointment criteria and roles and responsibilities were investigated and are described in some detail in this sub-section. Observations indicated that the parties' relationship was significantly influenced by the procurement method and by Construction Plc's relations with City Police and their design team. Therefore outlines of the procurement method and the engagement criteria of the design team members are also provided here.

Procurement method

City Police adopted the traditional method of procurement as a matter of course. The Project Administrator doubted the appropriateness of this choice on the grounds that it

did not place the onus of services design on M&E Co.. He was of the opinion that a Local Authority form of contract would have been a more effective way of administering this project. In view of the high proportion of refurbishment work and associated uncertainties involved in the project, together with the absence of accurate survey information, the traditional procurement method was indeed inappropriate in terms of providing inadequate flexibility to negotiate the variations which inevitably arose during the course of the project.

Selection, appointment, roles and responsibilities of design team members

City Police had varying relationships with their design team members. They selected Surveyor Co. principally on the basis of the latter's competitive fees, as well as their past experience and eight years plus working relationship with City Police. Surveyor Co.'s responsibilities included designing the spatial configurations, producing the construction information, managing the project at construction stage, making recommendations for the approval of extensions of time and claims to the Home Office and administering the contract. They were moreover responsible for allocating the team members' design tasks, through the production of a schedule of information indicating interaction on various tasks by each member, and co-ordinating the consultants' inputs at design stage. Surveyor Co. had no input into either recommending or selecting any of the other design team members.

Services Associates had carried out commissions for City Police on four previous occasions. They were therefore known to the latter and were considered to have sufficient resources and expertise to carry out the commission on this project. They were one of three firms invited to tender for the outline design of services and were selected on the

basis of their competitive fee. Services Associates' responsibilities included outline design and specification of the mechanical and electrical services - excluding the telecommunications and security systems which were designed by City Police themselves - and supervision of the services installation.

According to the Project Administrator, because City Police were a public body and accountable for their expenditure, their decision regarding the selection of the design team members was carefully considered prior to the members' appointment and no negotiations followed their selection. City Police appointed the design team members on the basis of their own 'Consultant Briefing Document and Conditions of Appointment'. These conditions, according to the Project Administrator's claims, were more elaborate and more onerous than the standard Conditions of Appointment published by professional bodies. For example, Services Associates had to provide a Warranty which guaranteed that the services installation was carried out in accordance with City Police's requirements.

Selection, appointment, roles and responsibilities of Construction Plc

Construction Plc's selection

Construction Plc's selection involved two stages of prequalification and tender. During the first stage, Surveyor Co., City Police and QS Ltd interviewed six main contractors chosen on the basis of their previous experience, and selected four to submit tenders. The main contractors were given approximately ten weeks to prepare a tender price based on the tender documents containing drawings, specifications, bill of quantities, performance specification, services requirements and the form of contract to be entered into with City Police.

Construction Plc's tender submission comprised a priced bill of quantities, a programme of works, Method Statements for carrying out the construction works, Health and Safety provisions, and their Quality Assurance (QA) system. They prepared their programme of works on the basis of the bill of quantities. The latter provided bulk figures for the amount of work contained in every stage of the works. These figures, together with Construction Plc's production rates for various elements of the works as well as their experience, determined the duration of work phases.

To arrive at the tender price, the cost of carrying out each element of the bill of quantities was either based on the trade contractors' quotes, or estimated on the basis of the human hours involved - as determined for the programme - and Construction Plc's hourly rates. The overhead, the profit and the contingency sum were then added to the total of these costs.

Construction Plc's conditions of appointment, roles and responsibilities

Four to six weeks after their tender submission, Construction Plc were selected on the basis of their low price. No negotiations took place with City Police beyond this point. The latter engaged Construction Plc on the basis of a letter of intent. Nine months after their appointment, Construction Plc entered into the JCT Standard Form of Building Contract with Design Supplement and Amendments, 1980 with City Police.

Construction Plc's conditions of appointment, set out in their letter of intent, constituted their roles and responsibilities and stipulated their system of payment. According to these conditions, Construction Plc were responsible for the refurbishment and construction of the new works described in the contract documents within a fixed lump-sum price and a

76 weeks period. They were to provide a Performance Bond to City Police. They were moreover to require the provision of direct Design Warranties to City Police by their trade contractors responsible for design, as part of the latter's conditions of appointment. The Works Planner considered the design aspects of the contract onerous.

Construction Plc's payment system was based upon monthly valuations carried out by QS Ltd. Variations or savings were added to or subtracted from the following valuation. The onerous nature of these conditions was partly attributed to Construction Plc's responsibility for construction of the works within a fixed lump-sum price; and partly attributed to the payment system. The works described in the contract documents contained high levels of uncertainty associated with the unknown conditions of the existing building, the true extent of which was only revealed during construction. Therefore commitment to a fixed price for an unknown entity placed Construction Plc at considerable financial risk. The nature of the payment system added further financial burdens because delays by trade contractors, or for reasons beyond Construction Plc's control, still resulted in non payment. Construction Plc passed on the payment system to M&E Co. and other trade contractors.

Selection and appointment of construction group

The specialist and trade contractors were largely selected through tender processes and based on their prices. One example of trade contractor selection is provided with regard to M&E Co..

Selection, appointment, roles and responsibilities of M&E Co.

M&E Co.'s selection

Services Associates named a selected panel of M&E contractors from which Construction Plc invited six organisations to a pre-tender interview. Two M&E contractors were then selected to tender for the services installation on this project, one of which was M&E Co.. The M&E contractors were given six weeks to tender. Their tender documents contained services drawings, specifications, bill of quantities for public health services but not the mechanical and electrical services, the contract programme, performance specification, Liquidated and Ascertained damages recoverable in case of delay and the form of contract to be entered into with Construction Plc. QuanSurv controlled and conducted the tender process.

M&E Co.'s tender submission comprised price breakdowns for the mechanical and electrical services and the priced bill of quantities for the public health services, their programme of works, labour histograms, and materials and equipment procurement schedule. Their tender price was based on measurements taken off the drawings and the specification document. Following M&E Co.'s tender submission, Construction Plc negotiated a lower price with them prior to their selection. Two weeks after the submission of their tender, M&E Co. were selected. M&E Co.'s Mechanical Engineer attributed their selection to a combination of their low tender price and their capability.

M&E Co.'s conditions of appointment, roles and responsibilities

Construction Plc appointed M&E Co. on the basis of a letter of intent which specified M&E Co.'s roles and responsibilities and established their system of payment. According to the conditions contained in the letter, M&E Co. were to enter into a JCT Standard

Form of Building Contract with Amendments, 1980: Dom/2 with Construction Plc. They were to design certain aspects of the services, such as the fire alarms and the generator. They were to provide, install and commission the mechanical, electrical and public health services in accordance with the contract documents, for the lump-sum fixed price agreed within a 49 weeks period. They were to be responsible for co-ordinating these services with one another and with the building, and for conforming to instructions issued by Construction Plc. Finally, they were to provide a direct Warranty to City Police. M&E Co. entered into a contract with Construction Plc six months after their appointment.

According to M&E Co.'s Mechanical Engineer, the specification document was onerous. It comprised clauses extracted from the National Engineering Specification that were put together poorly, and constituted vague and contradictory descriptions of procedures and performance criteria. The vagueness of the document implied that the clauses were open to interpretation, which meant that 'City Police won every time they demanded conformance' (M&E Co.'s Mechanical Engineer).

6.2.3 PROJECT DESCRIPTION

Project conception and history

The project was instigated by City Police's need for a new police station around 5 or 6 years ago. They originally intended to demolish the existing premises, to sell the site and to relocate. However, alternative location could not be found. Moreover, the cost of re-development proved far in excess of the available funds. Therefore City Police decided to part-refurbish and part-extend their existing premises. During the gestation period of the project, City Police's requirements were established fairly comprehensively. The corporate nature of City Police and the standardisation of the criteria on which their

requirements were based, aided the brief preparation process. However, the funding limitations imposed restrictions on the realisation of their requirements. The Home Office grants funding on the area use basis, that is, each area designated in the 'Technical Requirements' handbook - produced by City Police - is allocated £X/m sq. Therefore, any additional funds can only be granted upon approval of revised user requirements by the Home Office.

The Police Station comprises major refurbishment of an existing five storey block and a new build extension. The refurbishment covers two thirds of the total floor area of the building. The new build consists of a nine storey high extension in the original light well and a new sixth floor level constructed on the roof. It covers one third of the total floor area of the building. The accommodation comprises: offices, interview rooms, IT section, administration, training facilities, kitchen, canteen, sector rooms, secure areas, male/female cells, detention suites, locker rooms, storage, a plant room, a parade room and a gymnasium.

The development had an initial contract value of £6.5 Million and cost in excess of £8.6 Million upon completion. The construction works began in April 1995 and were scheduled for completion in 76 weeks, that is, in November 1996. However, completion did not take place until October 1997. At the time of writing, Construction Plc had started arbitration proceedings against City Police.

The services installation had an initial contract value of around £2.2 Million and cost around £4.5 Million upon completion. The installation began in July 1995 and was scheduled for completion in 49 weeks, that is, in June 1996. However, the completion of

installation took place in October 1997. At the time of writing M&E Co. had started arbitration proceedings against Construction Plc.

Managing project design

Statutory approval

The Project Administrator explained that the design proposal was subject to planning restrictions, therefore City Police's spatial requirements could not be realised in full. The two-storey extension on top of the building had to be reduced to a single-storey due to the building's location within a conservation area. This omission led to the need for some redesign at the scheme design stage, which was postponed, owing to budget limitations, until the period leading up to the issue of tender documents to prospective main contractors.

Design development

The nature of the refurbishment and new build design development is not known comprehensively, because direct observation on this project was limited to the site meetings between Construction Plc and M&E Co.. However, the discussion with the Project Administrator and the inductive use of information provided by the observations have shed some light on the way project design developed. City Police's briefing document comprised space zoning, space allocation to various operations and activities, and specification of technical requirements. Owing to time and budget limitations referred to previously, the building enabling works contract comprising a survey of the building, was foregone. This function was instead passed on to Construction Plc and, particularly, to M&E Co. through incorporation of clauses in their performance specification documents.

The delay in the redesign of the top storey extension resulting from planning restrictions, together with City Police's desire to have the building operational by the original completion date, posed restrictions on the design programme. Thus the re- design was carried out in parallel with the detail design of the project and the construction of the works. This led to some replanning when the works started on site. The detail design stage included some minor revisions to City Police's requirements. However, most of the revisions arose from the installation and co-ordination of services discussed below.

Services design

City Police's brief established the scope of the services required. Surveyor Co., in liaison with Services Associates, agreed suitable plant locations and plant co-ordination requirements and tried to ensure that sufficient riser cores were allowed for the distribution of services. Services Associates designed the services layout in accordance with the technical requirements contained in the brief and the spatial dimensions indicated on Surveyor Co.'s drawings. It is understood that the time restrictions imposed by City Police's design programme limited the thoroughness with which Services Associates designed the services both in terms of layout and sizing of components, according to Services Associates' Site Engineer.

M&E Co. initially based their detail design on the schematics produced by Services Associates. However, when they surveyed the building in order to produce the co-ordination drawings they discovered the inaccuracy of the schematics and the need for redesigning both the services layouts and the sizing of the components. In other words, they discovered the true extent of their responsibility under the contract and the fact that

their price did not allow for this expansion in responsibility, nor did the contingency sums allow any financial cover for the resources required to undertake the redesign.

M&E Co. initially attempted to resist the redesign by requesting design information from Services Associates. This gave rise to weeks and eventually months of delay in the production of design information because Services Associates were reluctant to alter the contract drawings. Their warranty to City Police implied that any alterations to the contract had to be applied for by Services Associates in the form of an easement which had to go through appropriate channels and departments in City Police. Delays in the production of services installation information alarmed Construction Plc. Therefore the M&E Co-ordinator encouraged M&E Co.'s Project Engineer to proceed with the redesign of services, in the first instance, to prevent delays to the project, and then to recover the extra expense involved through the claims procedure outlined in the contract. The latter part of this course of action was not supported by the Project Manager and the Project Planner who pointed out that M&E Co.'s responsibility for the redesign of services was spelt out in the services brief and documentation.

M&E Co.'s refusal to acknowledge their contractual responsibility, which denied them the possibility of recovering the extra costs of redesign, led to managing director level meetings between M&E Co. and Construction Plc. Following this meeting M&E Co. accepted to redesign and re-size the services components technically but not in spirit. That is, they maintained the resource level originally allocated to the information production task and refused to increase it. Consequently, the combination of inadequate resources and scant information hampered the production of installation information, led to regular

revisions of the main and services programmes and delayed the procurement of the works and installation of services.

Flow of design information

The flow of design information generally took place in the following manner:

- Surveyor Co. produced the design information, sent it to the design team members, the external consultants involved, City Police and their in-house consultants.
- The other design team members subsequently produced their design information based on Surveyor Co.'s information and sent them to the latter to co-ordinate with the building design and to comment upon/approve.
- The latter checked and commented upon the design information and returned it to the corresponding team members for revision.
- The design team members sent their revised design information to Surveyor Co..
- The latter then sent the revised design information to City Police and their in-house consultants.

Information relating to design variations required by City Police flowed from the latter to the in-house consultants, the Project Administrator, and through him to the design team. The flow routes for information relating to building design, alterations and revisions are presented in Figure 6.3. The black flow route represents information sent by the design team to the Project Administrator; the blue flow route represents that sent by City Police; and the pink flow route represents comments made and revisions required by the Project Administrator.

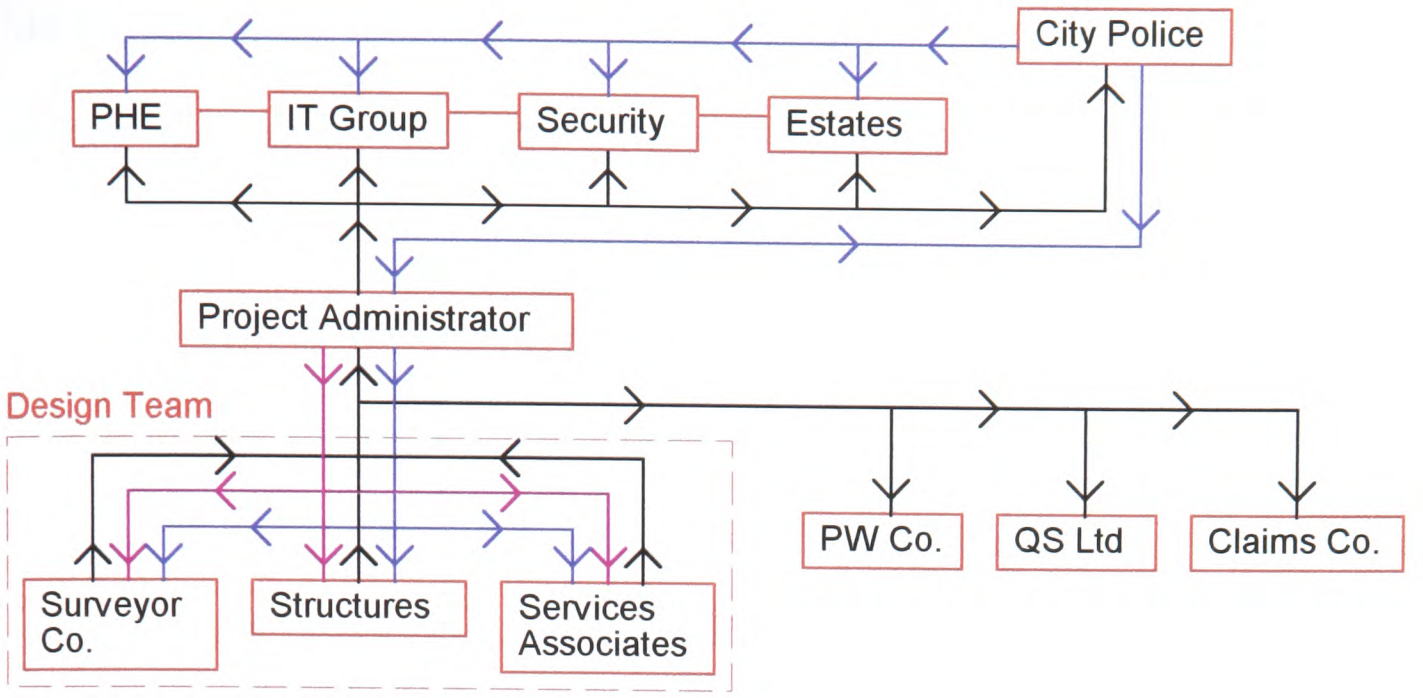


Figure 6.3: Building design information flow route

The flow of services design information was much more convoluted. At the start of the services installation, M&E Co. sent their installation drawings to Services Associates, with the ambiguous areas of design clearly marked, and requested clarification. The latter provided answers to the minor queries slowly, over a period of weeks, and inefficiently. Services Associates' Site Engineer, who occasionally attended the site progress meetings with a client representative, did not know how many queries had been answered and how many were outstanding. Services Associates refused to resolve the major queries relating to the services layout or component sizes and pressed M&E Co. to propose solutions themselves. M&E Co. declined to do so and increased the number of queries directed at Services Associates. Four months after the back and forth game between M&E Co. and Services Associates, and following a director level meeting between the former and Construction Plc regarding the slow production of services information, M&E Co. accepted to redesign the services.

M&E Co. sent their installation drawings to Services Associates for comments. The latter sent the drawings back with comments. M&E Co. revised the drawings in accordance with the comments and sent them to Services Associates for approval. Often, Services Associates made further comments before approving the drawings, therefore the process of back and forth was repeated at least twice before drawing approval was granted. M&E Co. then issued the approved drawings to Construction Plc for the purpose of co-ordination with construction works, and to their subcontractors for fabrication. The information flow for each drawing took several weeks. The delay was attributed to the slow process of query resolution as well as M&E Co.'s limited resources. Sometimes the queries took longer to get to the person concerned in Services Associates' organisation, sometimes they got lost in the post and never reached their destination, sometimes they were inadequately answered and had to be sent back for elaboration and clarification.

M&E Co. oversaw the production of working drawings by their subcontractors and co-ordinated their inputs within the services package. The subcontractors produced their fabrication drawings from M&E Co.'s installation drawings and specification, sent them to the latter for comments, revised their drawings in accordance with the comments received and sent them back for approval. Once M&E Co. had approved their subcontractors' drawings, they would send them to Services Associates for approval.

The flow routes for information relating to services fabrication, installation and variation are presented in Figure 6.4. The blue flow route represents changes in City Police's services requirements initiated by them. The black flow route represents information sent by M&E Co. to Services Associates through Construction Plc. The green flow route represents queries raised by M&E Co.'s Subcontractors. The pink flow route represents

comments made and revisions required by Services Associates. The dashed lines represent informal communication between M&E Co. and Services Associates.

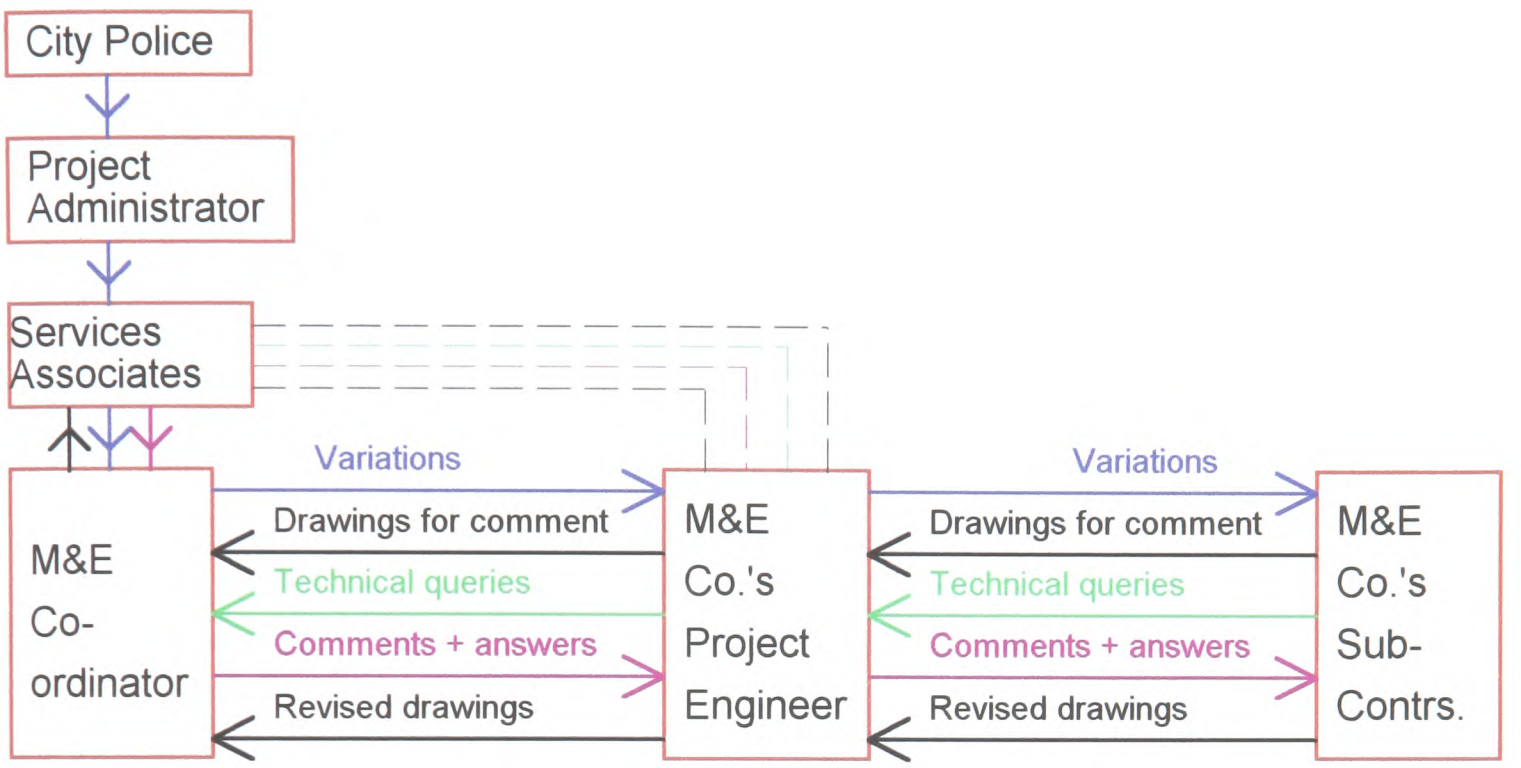


Figure 6.4: Services design information flow route

In view of the problems discussed above, it is easy to imagine the complications arising in the information flow as a result of queries raised by M&E Co.'s subcontractors. The flow of design information was subject to communication within the design team, between them and City Police, between the design team and Construction Plc, between the latter and M&E Co., and between M&E Co. and Services Associates. It was also subject to decision-making processes by the design team members, by Construction Plc, and by M&E Co., in the case of services.

Communication

The design team communicated with one another principally through correspondence and regular design team or management meetings. Although the informal modes of

communication like telephone and facsimile were not ruled out, the complex structure of the coalition and the numerous consultants involved necessitated the formal mode of communication as a means of recording information production and dissemination. The monthly management meetings provided the forum at which general policy and management issues relating to the project were discussed.

In the light of the problems associated with services design, information production and dissemination, it is not hard to visualise the difficulties experienced by M&E Co.'s Project Engineer as the communication channel between M&E Co. and Services Associates, and the latter and M&E Co.'s subcontractors. On the one hand, he was instructed by his company's managing director to negotiate over the scope of M&E Co.'s roles and responsibilities; on the other, his performance was restricted by his limited resources and the myriad of paperwork in the form of drawings and queries. A year into the contract the Project Engineer was moved to another project and was replaced by a part time Project Engineer.

Decision-making processes

The design related decision-making processes appeared to be closely governed by City Police and the restrictive conditions imposed by their requirements. They were moreover subject to the financial limitations posed by the Home Office. The design decisions were therefore made top down rather than bottom up or laterally amongst the team members.

Design co-ordination and control

Design co-ordination and control took place through design meetings, held once a month, at one of the team members' offices and chaired by the Project Administrator. The design

meetings provided the opportunity for the team members to discuss ongoing design matters and queries, and to comment on or resolve the problems identified.

Managing project construction

Planning the construction works

Prior to commencement of the works, Construction Plc set out their aims and objectives in terms of time, cost, quality and safety; established their goals and targets; and planned the construction works. Construction Plc's aims were to finish on time and within budget, to achieve good quality work, to have as few accidents on site as possible, and to retain good public relations with City Police. To achieve these aims, Construction Plc elaborated the programme of works to include detailed activities and their corresponding durations, in the first instance. They then tried to obtain the lowest possible tender prices for the work packages through negotiations prior to selection of trades in order to improve the margin they had allowed against the job. Furthermore, they deployed a rigorous health and safety policy throughout the project life cycle.

In order to secure the contract, Construction Plc incorporated a very small contingency sum in their tender price which proved to be totally inadequate in relation to the risks associated with the refurbishment portion of the project. The refurbishment works presented too many surprises as the work progressed, particularly in so far as the installation of the services was concerned, according to the Works Planner.

The works were planned at stages corresponding to near future tasks and overall tasks and were represented by monthly programmes and the overall programme. The purpose of the monthly programme, in theory, was to allow a degree of flexibility in the execution

of activities so that delays in one activity could be compensated by early commencement of another. However, in reality the delays were so widespread that what little compensation could be achieved did not make any real impacts on the overall scheme of activities.

Some of the delays were caused by variations initiated by City Police which totalled to around 250 by the end of the contract. The Works Planner did not consider these excessive in relation to the refurbishment nature of the job. The fundamental delays were brought about by M&E Co. in response to the problems presented by the inaccurate design of services.

Flow of production information

The design team produced the building production information in a similar way to the production of design information. The flow of production information during the construction process generally took place in the following way:

- Surveyor Co. produced the production information, sent it to the design team members, the external consultants involved, City Police and their in-house consultants.
- The design team sent their production information to the Project Administrator who checked, commented upon and returned it for revision.
- The design team revised the information and sent it to the Project Administrator, who sent it to City Police and the Project Manager.
- Upon receipt of the information, the Project manager sent it to M&E Co. and other specialist and trade contractors through their Project Engineers.

- When queries relating to discrepancies between the production information and the construction works or services installation arose on site, M&E Co.'s or other trades' foremen recorded them on specific forms, sent them along the flow route to the design team who, in turn, provided their answers on the same sheets and forwarded them to the former through the Project Manager. Because the survey data on the basis of which the design team produced their construction information was inaccurate and the queries were numerous, Construction Plc's M&E Co-ordinator advised M&E Co.'s Mechanical, Electrical and Public Health Engineers to send their queries direct to Services Associates in order to speed up the process.

The problem with the above query system was that one complex query could and did hold up the answers to the others included on the same form. Therefore M&E Co. were advised to send each query on a separate form. This proliferated the amount of paperwork going through the system and soon clogged it up. Nine months before the end of the project - when observations ended - there were around 600 queries relating to installations. Furthermore, the flow routes proved too long. There were occasions during site meetings when M&E Co.'s staff would complain that their queries had not been answered; whilst Services Associates' Site Engineer would claim that the answers were sent back a while ago and were in Construction Plc's system! The flow routes for information relating to building construction and that requested by trade contractors are presented in Figure 6.5. The black flow route represents information sent by the design team; the blue flow route represents that sent by City Police; and the green flow route represents the queries raised on site. The dashed lines represent informal or direct communication which by passes the stipulated information flow route.

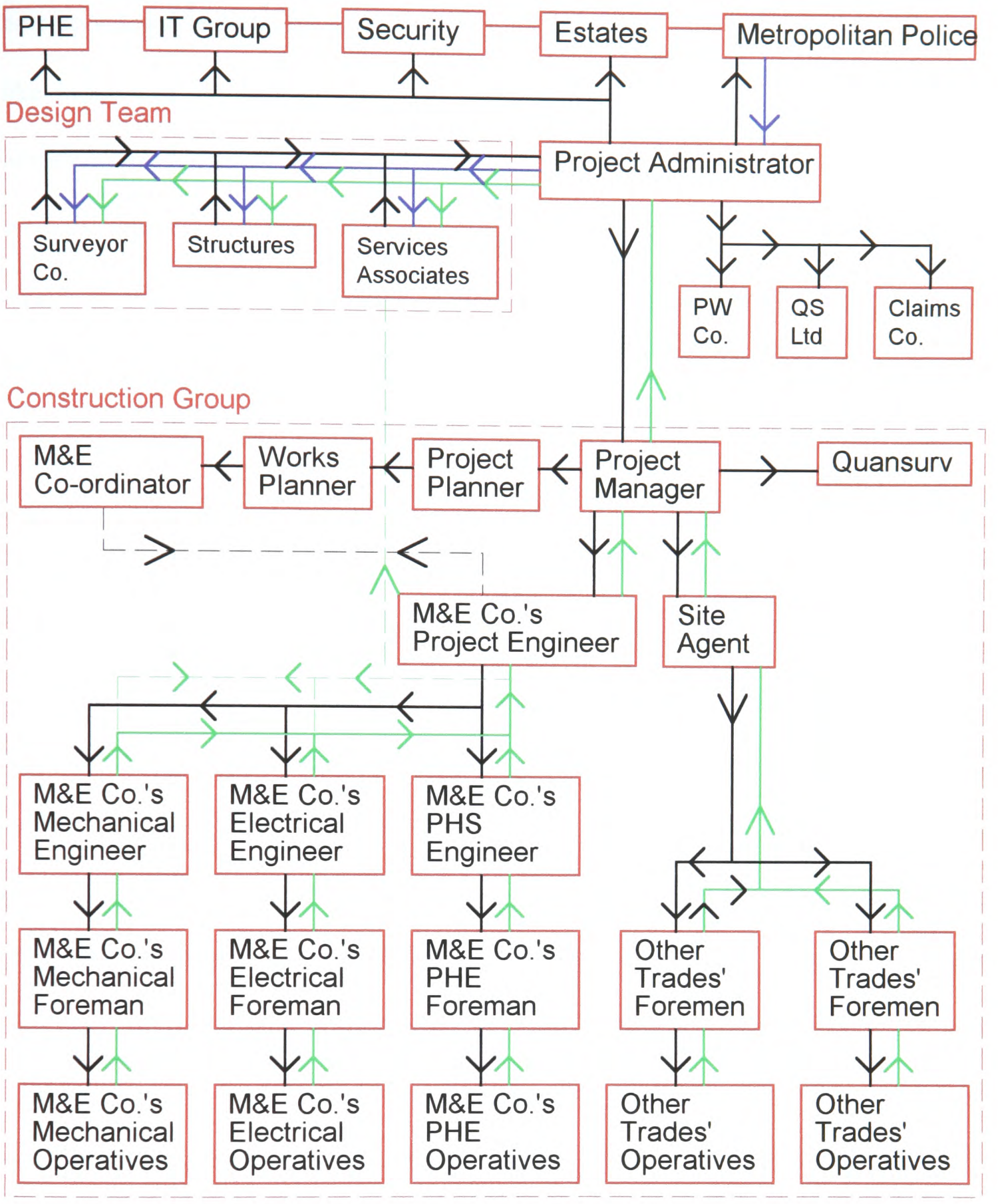


Figure 6.5: Building construction information flow route

Communication

The modes of communication within the design team remained the same at the construction stage as they were at the design stage. The modes of communication within the construction group were similar to those in the design team. They comprised

correspondence and regular progress meetings, held every fortnight, with the key trades, like M&E Co., as well as telephone and facsimile. Owing to the complexity of the construction problem and the services installation as well as the enormous risks involved with the works, the emphasis of the communication was on the formal methods as a means of recording information production and dissemination and allocating liability. The construction group communicated with the design team and through them with City Police by correspondence and at the monthly management meetings.

Further channels of communication, comprising the Site Agent, M&E Co.'s and other trades' foremen, became operational to facilitate the flow of information between the design team and construction group, and between Construction Plc and the trades. However, reliance upon and adherence to formal means of communication in conjunction with the frequent revisions made to construction works' and services installation's programmes, led to poor understanding and awareness on the parts of both Construction Plc and M&E Co. of each other's operational activities. This was often manifest in site meetings when arguments ensued regarding both parties wanting to work in the same rooms at the same time! The Contracts Manager, who attended site meetings from time to time, expressed concern on one occasion that Construction Plc and M&E Co. did not work together as a team in spite of working two doors away along the corridor.

Evidence of poor communication within Construction Plc's management team was also observed. For instance, the Project Manager seemed unaware of the progress of all aspects of the works when relevant problems were brought to his attention by M&E Co.'s Engineers. On occasions, he appeared uncertain about which programme of works was

being implemented by admitting that he had worked to so many programmes he did not know which the current one was.

Decision-making processes

The decision-making processes were largely delegated to the management team members in accordance with the authority that their job descriptions allocated to them. The decisions that involved financial implications were communicated to City Police, through the Project Administrator, for approval before implementation. The Site Manager was authorised to make every day decisions that involved relatively minor cost implications, as well as those regarding safety, alternative construction details and time targets. The Project Manager was ultimately responsible for all the decisions made on site. However, the Works Planner was of the opinion that he lacked adequate experience to manage the works successfully. That is why a contracts manager visited the site and attended the site meetings on a monthly basis to monitor the progress of the works.

The devolution of decision-making was extended down to M&E Co. in relation to the redesign of services. This was an authority that M&E Co. did not want and never fully accepted or committed to. Subsequently, the services redesign became the Achilles heel of the project. It led to delays in the services installation and the main works programmes and a piecemeal approach to both services installation and construction and refurbishment works. It resulted in excessive amounts of extra work arising from out of sequence working, poor co-ordination and poor workmanship. For example, holes had to be cut in finished and painted walls for ductwork. Radiators had to be installed in rooms within two weeks when they had not even been ordered. Ductwork, fan coil units, etc. had to be repaired or changed because they had been damaged by being left in spaces where

construction work was going on, or by having their protective covers removed. The financial consequences of the redesign were of such magnitude that M&E Co.'s Project Engineer threatened to leave the site, on one occasion, and refused to distribute all the 15 copies of drawings to the project participants on a number of occasions.

Co-ordination and control of production inputs

Co-ordination of services installation and construction operations took place through structured co-ordination meetings held fortnightly between Construction Plc's M&E Co-ordinator, Project Planner, Project Manager, and occasionally Contracts Manager, and M&E Co.'s Project, Mechanical, Electrical and Public Health Engineers. These meetings were chaired by the M&E Co-ordinator. They involved discussion of services installation problems which frequently related to poor design information, spatial restrictions, progress of the works, labour resources and safety issues. In response to these problems the M&E Co-ordinator and others from Construction Plc suggested solutions and recommended a course of action to M&E Co.'s Project Engineer and others. In addition to structured co-ordination meetings, there were unstructured meetings held as the need for them arose, involving the Site Agent and the trade contractors' foremen. The frequency of these meetings was associated with the complexity of the trades' tasks. For example, about three months before the observations ended the site meetings between the Site Agent and M&E Co.'s mechanical and electrical Foremen had become a regular occurrence.

The participants' discussions in site meetings presented evidence of poor interaction between Construction Plc's trades and operatives and M&E Co.'s subcontractors and operatives. For example, M&E Co.'s Mechanical Engineer often complained about ducts

being damaged because Construction Plc's operatives treaded on them or fan coil units being damaged because the operatives used them as supports to stand on, and so on. The discussions moreover provided examples of the Site Agent's and the Project Manager's shortcomings in enforcing tidiness, cleanliness and close monitoring of the trades' performance as the above examples portray.

There was no evidence of positive motivators implemented by Construction Plc to prompt M&E Co. into action. On occasions the M&E Co-ordinator attempted to bring M&E Co.'s Project Engineer on side. He did so by encouraging the latter to prepare and submit claims for extra costs, or by requesting him to produce information indicating variations between Services Associates' design drawings and the existing site conditions as 'bullets that he [the M&E Co-ordinator] could fire back at City Police's representative in management meetings'. However, these tactics did not produce results because what M&E Co. wanted was additional rewards for the additional responsibilities that were imposed on them. Construction Plc had made it clear on a number of occasions and in no uncertain terms that additional rewards were not forthcoming. Therefore M&E Co. demonstrated their *demotivation* by under resourcing the installation and declaring their preparedness to argue their case against Construction Plc in court because, they claimed, they could not justify their losses to their directors and shareholders.

Construction Plc's policy of involving the managing directors of trade contractors when the latter do not perform, did not appear to work in the case of M&E Co. because the decision to resist acceleration of the installation was made at director level. Indeed there were occasions when M&E Co.'s Project Engineer claimed that 'his hands were tied behind his back', that he could not hire additional labour because that would amount to

'acceleration' and acceleration had become a 'political issue', and that he worked for M&E Co. and had to do what he was told.

In addition to M&E Co.'s poor performance resulting from labour shortages and other management shortfalls discussed below, their productivity levels were adversely affected by Construction Plc's poor performance. For example, in one of the site meetings, M&E Co.'s Electrical Engineer complained that his welders were only 50% productive due to fluctuating power on the floor they were working. The Project Manager's response was that power had been provided for one welder only as per the initial estimate when the site was set up. Another example was provided by the same Engineer complaining that every time he brings his operatives on site they get interrupted by construction works. In actual fact there was glaring evidence of neither Construction Plc nor M&E Co. working to any programme. The latter openly admitted that they deliberately worked in an ad hoc basis so they could not be tied contractually.

The Site Agent arranged safety inductions on site at intervals corresponding to the commencement of trade contractors' work packages. At their pre-contract meetings the specialist and trade contractors were informed of their safety requirements, including submission of method statements and risk assessments. The Site Manager monitored the observation of Health and Safety Regulations by the trade contractors, on a day-to-day basis, and reported deviations to the foremen or the project engineers or to the Project Manager. The Project Manager's overzealous enforcement of these regulations manifested itself as the sacking of one of M&E Co.'s laggers. This caused considerable arguments between the Project Manager and M&E Co.'s Mechanical Engineer. Apparently the Site Agent's warning to the lagger in question, with regard to wearing his

hard hat, had gone unheeded because in the lagger's view the Site Agent was not authorised to instruct him. Therefore the sacking of the lagger had as much to do with not observing safety requirements as not paying attention to Construction Plc's site staff. M&E Co.'s Mechanical Engineer argued that the warning should have been given through M&E Co.'s Foreman rather than directly to the lagger.

Services installation: organisation, co-ordination and control of services inputs

M&E Co.'s aims were to execute the installation within the time allocated in their letter of intent, to the tender price agreed with Construction Plc, to the standards specified in the contract documents and safely. They moreover aimed to improve their profit margin by subcontracting the installation as packages and including a bonus system on labour. To ensure a high level of quality, they implemented Quality Assurance (QA) and Total Management Systems (TMS) on their procedures. However, as the project unfolded, the unforeseen events took place and the extra costs built up, M&E Co.'s aims, goals and targets were obviated and their focus shifted towards cost cutting and reducing their losses to the detriment of the installation and the project as a whole.

M&E Co. subdivided the services works into electrical, mechanical and public health installations. They carried out the ductwork, the plantwork, the controls, the insulations and the commissioning in-house because they had the capability and the resources. They sublet the remaining portions of the installation to ten mechanical subcontractors, ten electrical subcontractors and two plumbing subcontractors. Each of these subcontractors was selected through a competitive tender process involving three subcontractors. Therefore, the Mechanical Engineer, who organised the tender process, had to evaluate 66 tenders in order to select 22 subcontractors. The organisation of services installation is

represented in Figure 6.6. The links represent lines of influence arising from the team members' position and role within the organisation.

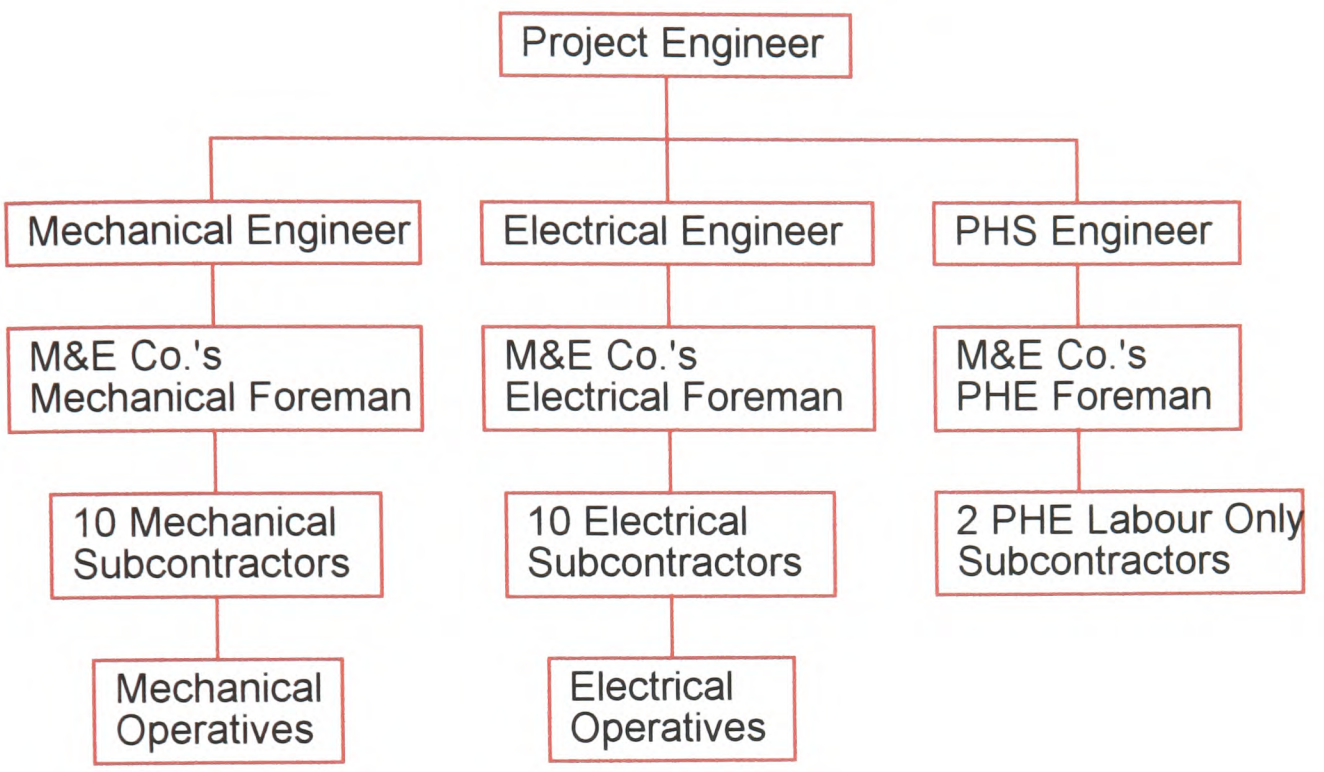


Figure 6.6: Organisation of services works package

The Mechanical Engineer claimed that they had problems with their subcontractors, which were attributable, on the one hand, to Construction Plc dictating the order in which the installation was carried out, and on the other, to M&E Co.'s financial problems with Construction Plc. Based on the observations, M&E Co. had managerial problems too. The full time Project Engineer was replaced with a part time engineer after a year, who was in turn removed from the project after about six months and not replaced. Thus the Mechanical Engineer had to both manage the installation, and deal with queries and paperwork. According to him, the management problems they experienced could have been improved by more resources and the devolvement of managerial role more evenly amongst the engineers involved.

Services commissioning

According to Construction Plc's Works Planner, the services system was commissioned satisfactorily and met City Police's requirements. This probably explains why City Police accepted all the problems experienced by M&E Co. that were attributable to services design, as alleged by M&E Co.'s Mechanical Engineer.

6.3 CONTRACTUAL AND OPERATIONAL FRAMEWORKS

This section interprets the implications of the contracting parties' engagement criteria for the nature of their relations by establishing whether these relations express power disparity and power strategies or various forms of trust. It then goes on to interpret the impact of the Project Manager's and the Site Agent's leadership, motivation of participants, involvement of participants in decision-making and their formation into a team, on the participants' interactions.

6.3.1 CONTRACTUAL FRAMEWORK: INTERORGANISATIONAL RELATIONS

The interorganisational relations emanating from the contractual framework of the main project participants being investigated here, may be considered as a hierarchy of contracting and subcontracting relations. City Police let the design functions to the consultants and the project management to Surveyor Co.. They let the construction and refurbishment works to Construction Plc. The latter sublet the detail design, manufacture, installation and commissioning of the services to M&E Co.. M&E Co., carried out a

portion of the installation in house and sublet the remaining portions to subcontractors, and the installation of public health services to labour-only subcontractors. This hierarchical relationship is represented in Figure 6.7, and is explored below under subcontracting relations.

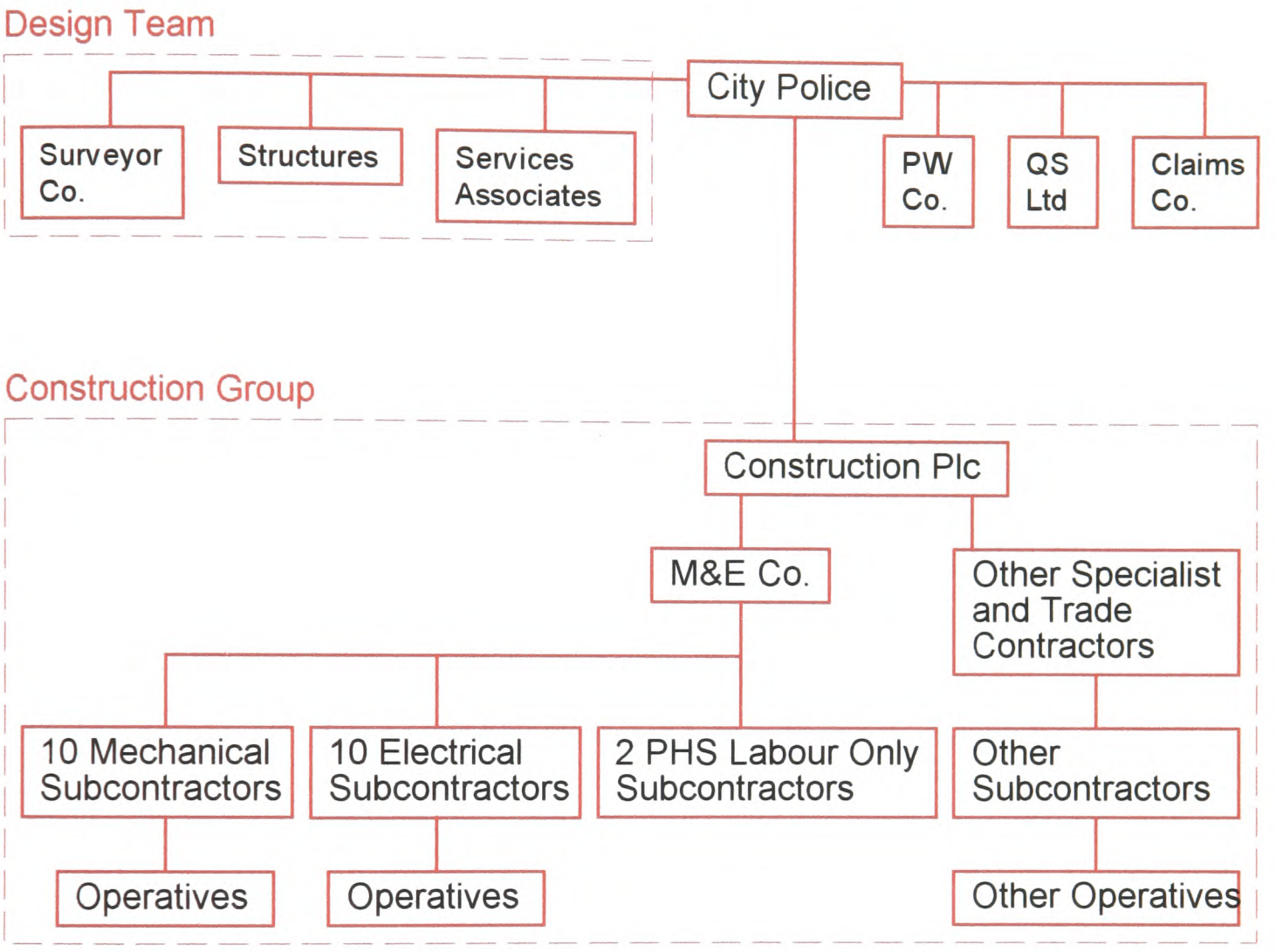


Figure 6.7: Participant organisations' contractual relations in The Police Station

Subcontracting relations

Based on the nature of subcontracting relations, defined as subcontractors' relative independence from or dependence on the main contractor by virtue of their control over the four phases of work process (Druker and Macallan, 1995: 53, based on Chaillou, 1977; see Chapter 2: 66-7; Chapter 4: Figure 4.8), M&E Co. were semi-dependent upon Construction Plc who provided an indirect link with Services Associates. Although M&E

Co. were in charge of detail design, organisation of installation and production of services, they had no control over concept and outline design of services (indicated as hatched area in blue on Figure 6.8). Furthermore, by virtue of subletting portions of production and installation of services, they were relatively dependent upon their subcontractors and operatives.

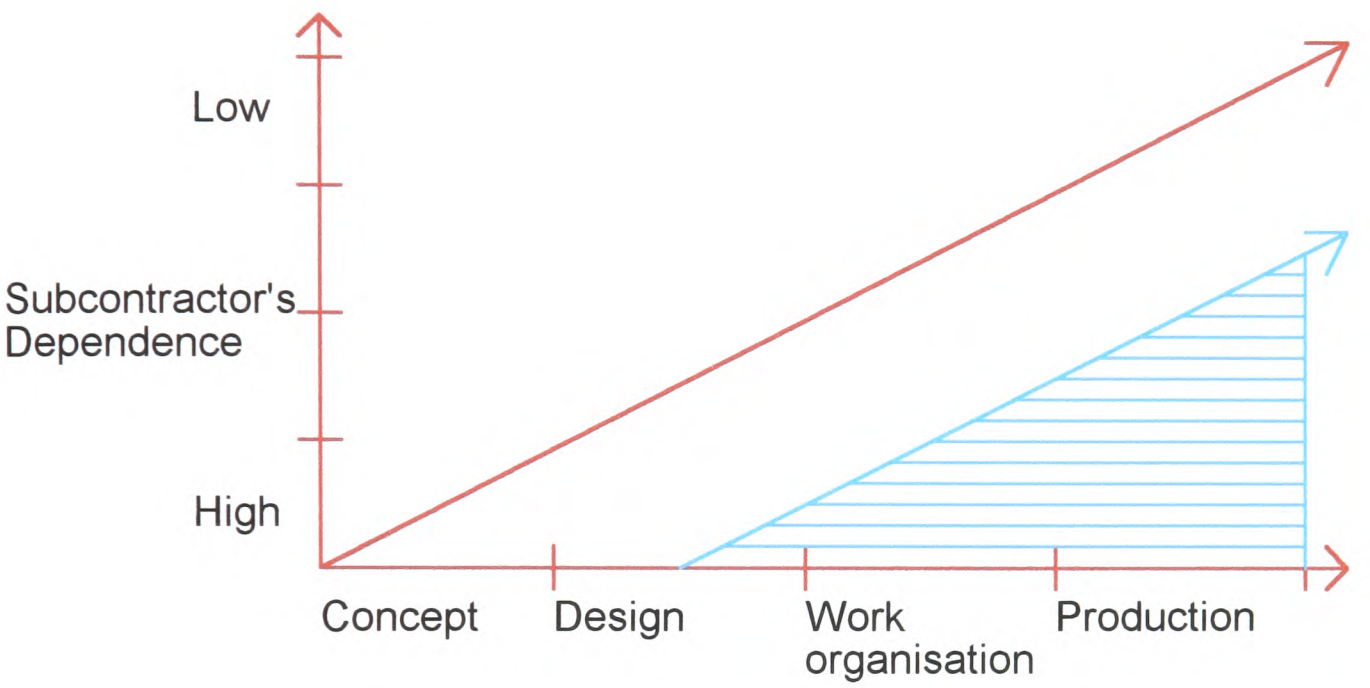


Figure 6.8: Dimensions of subcontracting relations in the Police Station

Power disparity

To examine the existence of power in the relationships between the contracting parties, power disparity is established based on the definition of power as a field of force between domination and resistance, or authority and illegitimate resistance (Pfeffer, 1981: 2-3; Clegg, 1989: 208; Fox, 1974: 98-9; Chapter 2: 16-17; Chapter 4: Table 4.3).

City Police exercised power over Construction Plc by getting them to accept a number of onerous conditions including the design conditions in the absence of enabling works, a

lump-sum fixed price paid at monthly intervals based on evaluation of work carried out, and appointment on the basis of a letter of intent. Construction Plc consented because they were in a subordinate position. They operated in a buyers market and as well as requiring the work to stay in business, they hoped to obtain further contracts from City Police. Construction Plc, in turn, exercised power over M&E Co. by requiring them to accept a reduced tender price through negotiations, appointing them on the basis of a letter of intent, and getting them to redesign the services layout. M&E Co. consented for the same reasons that Construction Plc had consented to City Police. Therefore power disparity characterised the relations between the contracting parties being investigated. However, the nature of power relations changed during the project life cycle.

In the relation between City Police and Construction Plc, the former dominated, on the strength of their position as funders of the project and on the basis of the wording of their specification document. Construction Plc tended to resist this domination by arguing that design changes constituted variations to the contract and by negotiating over their financial implications. Thus their resistance was based on their knowledge and their discretion in the use of that knowledge. In the relation between Construction Plc and M&E Co., Construction Plc's domination was curbed by their relative dependence on M&E Co.'s knowledge and by M&E Co.'s resistance based on their discretion in the use of their knowledge. M&E Co.'s resistance to Construction Plc's domination, on the other hand, was limited by their lack of control over services concept design and by Construction Plc's indirect link with Services Associates. Therefore, based on Table 4.3 (Chapter 4), the nature of power relations between the contracting parties was domination and resistance (Hardy and Clegg, 1996: 626; Fox, 1977; Friedman, 1977: Chapter 6),

rather than authority and illegitimate resistance (Pfeffer, 1981: 4-6; Mintzberg, 1991(b): 372).

Power strategy

The examination of power strategies implemented by the parties is based upon the two definitions of conflict prevention, and defeat of conflict identified in Chapter 2 (pp. 18-19) and referred to in Chapter 4. The former strategy may involve responsible autonomy or direct control (Friedman, 1977: 6-7); the latter, comprises resistance through acquisition, development, and use of power (Pfeffer, 1981: 7).

The contracting parties employed differing power strategies to achieve their aims. City Police used direct control to scrutinise Construction Plc's actions. By relying on the vague clauses incorporated in the contract documents, City Police limited Construction Plc's discretion over interpretation of the contract thus weakening their attempts at bargaining. However, the extensive nature of the changes in both building and services design provided Construction Plc with some bargaining power for negotiations on the basis of variations. Although the financial outcomes of these negotiations are not known, they could not have fulfilled Construction Plc's expectations thus prompting them to take legal action.

In their relationship with M&E Co., Construction Plc appeared to allow the former discretion over their work whilst supervising their information production and installation through the M&E Co-ordinator. In reality, Construction Plc adopted a contractual approach in passing on the onus of building survey to M&E Co., thus limiting their discretion over the installation of services and their ability to make a profit. In response,

M&E Co. used their power of discretion to act in their own interest when allocating resources to the project, when producing information, and when specifying materials and components.

The implications of the contracting parties' power strategies for the emergence, handling, and resolution or rather lack of resolution of conflict are elaborated in the next section. Having established the existence of power in the parties' interorganisational relations and their strategies for its use, attention is now focused on examining whether trust featured in these relations and if so, in what form and to what extent.

Trust-based co-operation

To examine whether the contracting parties co-operated on the basis of trust as reliability, predictability or power-induced predictability, the nature of their co-operation is scrutinised on the basis of a few simple questions and the information provided in the Table 4.4 (see Chapter 4).

Co-operation of City Police and Construction Plc

Did City Police rely on Construction Plc? They appear to have taken a calculated risk by appointing Construction Plc to undertake the project. However, this risk was not based on the expectation of an on-going relationship, repeated exchanges, or co-operation within a network formed around common interests. It involved high transaction costs associated with constant monitoring and consultation by the Project Administrator and Services Associates' Site Engineer. Therefore it is doubtful as to whether the risk taken reflected City Police's reliability on Construction Plc. Did Construction Plc rely on City Police? They certainly took risks by accepting the onerous design responsibilities included

in the contract documents and by committing themselves to a fixed price for an unknown entity. These risks may have been based on the potential for future work from City Police; they may, on the other hand, have been based on the commercial necessities of accepting the contract. In any case, they were not based on the conditions necessary for the development of calculative trust.

Did City Police depend on Construction Plc's predictable behaviour? City Police entered into a business contract with Construction Plc that was supported by bonds, collateral and penalty clauses. However, the quality and flow of information and the monitoring mechanisms were so ineffective as to result in uncertainty being compounded throughout the project rather than reduced. This led to unpredictable behaviour by Construction Plc who were unable to organise and manage the works in accordance with the programme. Therefore City Police could not depend on Construction Plc's predictable behaviour. Did Construction Plc depend on City Police's predictable behaviour? To the extent that Construction Plc entered into an agreement with City Police on the basis of a letter of intent, they appear to have either depended on or hoped for the latter's predictable behaviour. As the events unfolded, Construction Plc's *hope* for City Police's predictable behaviour most definitely took precedence.

Did City Police employ power-induced predictability? In so far that City Police selected the traditional method as the mode of procurement whilst imposing design responsibilities on Construction Plc, it is pertinent to conclude that they created impressions of a low discretion role for the latter. This was done so as to manipulate Construction Plc into accepting more responsibility for the same rewards. Did Construction Plc capitulate? They appeared to do so during the course of the contract by passing on most of the

responsibility to M&E Co.. However, at the end of the contract they seem to have had a change of tactic by deciding to take legal action against City Police.

Co-operation of Construction Plc and M&E Co.

Did Construction Plc rely on M&E Co.? In so far that Construction Plc did not have experience of working with M&E Co., they seem to have accepted the risk in the latter's performance by appointing them. However, the M&E Co-ordinator's supervision of M&E Co.'s work and the absence of other conditions necessary for calculated risk in the relationship indicate that Construction Plc's acceptance of risk did not manifest their reliability on M&E Co.. Did M&E Co. rely on Construction Plc? Although M&E Co. accepted a high risk by reducing their tender price on a refurbishment contract, they did so because they needed the contract for reasons discussed in the previous section. This risk was not based on the expectation of an on-going relationship or other conditions necessary for calculated trust. It was based, rather, on commercial necessity.

Did Construction Plc depend on M&E Co.'s predictable behaviour? Despite entering into an agreement with M&E Co. that was supported by Bond, Warranty and penalty clauses, and monitoring their work on a regular basis to reduce the uncertainty associated with it, M&E Co. behaved unpredictably by refusing to co-operate. Therefore Construction Plc could not depend on M&E Co.'s predictable behaviour. Did M&E Co. depend on Construction Plc's predictable behaviour? They entered into an agreement with Construction Plc based on a letter of intent, because they would not have been appointed otherwise. However, during the course of the contract Construction Plc's failure to behave supportively of M&E Co. led to the withdrawal of the latter's co-operation.

Therefore whether M&E Co. depended on Construction Plc's predictable behaviour at the start of the project or not, they certainly did not do so as the project progressed.

Did Construction Plc employ power-induced predictability? Construction Plc appointed M&E Co. to detail design and install the services on the basis of their reduced price that was achieved through negotiations. In practice, M&E Co. had to redesign the layout of the services and resize the components as part of the installation design in order to make them fit within the available spaces. That is, their roles and responsibilities were expanded within their fixed price contract giving rise to a higher discretion role than the one prescribed in the contract documents. Therefore it may be concluded that Construction Plc created the impression of a lower discretion role to manipulate M&E Co. into co-operation on a smaller budget. Did M&E Co. capitulate? M&E Co. capitulated in so far as conceding to the provision of the services required of them by the client based on the interpretations of the specification document. However, they did not commit themselves to the larger resources that this provision demanded.

6.3.2 Operational framework: Interpersonal relations

The operational framework, comprising the communication channels, information flow routes and decision-making processes, was set up by the Project Manager in consultation with the Project Planner. It both influenced and was influenced by the organisational representatives' interpersonal relations and interactions. The complexity of the framework demanded speedy production of design information by M&E Co. and its timely approval by Services Associates. This would enable the dissemination of design information to M&E Co.'s subcontractors, their production of fabrication drawings and manufacture of services components to take place in appropriate time. It would moreover enable

Construction Plc to either incorporate services installation within their programme of works or plan the works around the services installation. M&E Co.'s failure to meet the information production demand created tensions between M&E Co.'s Project staff and Construction Plc's Project staff, and between the latter and the Project Administrator as well as City Police's representative. Services Associates' failure to respond to M&E Co.'s queries and approve their information within stipulated or reasonable periods of time, placed strains upon the relations between M&E Co.'s Project staff, and Services Associates' Site Engineer.

The quality of information and the discrepancy between the drawings and the existing building created installation problems for the operatives of M&E Co.'s subcontractors. These problems, together with the financial difficulties that M&E Co. encountered, strained their relations with some of their subcontractors and operatives and led to the latter's contracts being terminated during the installation. Thus M&E Co.'s productivity problems, which began during the design of the services, were perpetuated during the installation phase.

This sub-section assesses the impact of the M&E Co-ordinator and the Project Manager on the interpersonal relations at the services installation/construction interface within the operational framework. To do so, their respective leadership of M&E Co.'s project staff at the levels of services design and installation, the way in which these staff were motivated, the extent to which they participated in decision-making, and the success or otherwise of the formation of M&E Co.'s and Construction Plc's project staff into a team, are considered.

The leadership behaviours

Based on the contingency theory of leadership and its relationship to leadership behaviour discussed in Chapter 2 (see Section 2.3: 32-7), the M&E Co-ordinator's leadership behaviour towards M&E Co.'s project staff, at the level of services design, corresponded to aspects of both 'telling' and 'selling' categories presented in Figure 4.9. This means that he had a high level of task orientation and used both high and low levels of relationship behaviour towards M&E Co.'s project staff, under different circumstances, in his efforts to secure their co-operation. By virtue of his role and responsibilities, the M&E Co-ordinator placed great emphasis upon M&E Co.'s prescribed tasks. To encourage M&E Co.'s project staff to carry out these tasks, the M&E Co-ordinator maintained two way communication with the former throughout the project and conveyed support when they complained about the quality of services design information or Services Associates' attitudes. However, when M&E Co.'s project staff failed to carry out their tasks, the M&E Co-ordinator withdrew his support and adopted a more directive attitude focusing on M&E Co.'s performance rather than the reasons for their performance.

Both strategies failed to produce results mainly because M&E Co.'s project staff were unwilling to follow the M&E Co-ordinator's guidance or instructions because his position power did not grant him high authority with respect to M&E Co.'s project staff. The latter had obligations to their managing director and their shareholders which evidently superseded their obligations to Construction Plc and the Police Station project, as M&E Co.'s Project Engineer spelt out on more than one occasion (see Co-ordination and control of production inputs, above).

The Project Manager's leadership behaviour towards M&E Co.'s project staff, at the level of services installation, corresponded to the combination of 'telling' and 'delegating' categories in Figure 4.9. When M&E Co.'s project staff required high levels of direction necessitated either by the project complexities, or by their failure to meet the Health and Safety regulations, the Project Manager attempted to provide them with prescriptive guidance or instructions (see Co-ordination and control of production inputs, above). There were problems with this leadership behaviour. On the one hand, the Project manager was not fully aware of the up-to-date progress of the works, programmed the works in an ad hoc way, and did not have extensive knowledge of services installation. On the other hand, M&E Co.'s project staff were unwilling to follow the Project Manager's instructions owing to the low level of authority they ascribed to him, and because they had discretion over the way they carried out their installation. Therefore during the latter half of the project, it seemed as though the Project Manager lost control over M&E Co.'s installation and, to some extent, over the works in general, leaving M&E Co. to get on with their installation as best they could.

Motivation of project participants

The success or otherwise of the M&E Co-ordinator and the Project Manager to motivate M&E Co.'s project staff is examined in relation to the effectiveness of the motivational strategies implemented. The latter include control mechanisms corresponding to the motivator's sources of power, and manifested as reward and punishment; and fulfilment of individual values relating to motivatee's attitudes to work and demonstrated as job satisfaction (see Section 2.3: 32-7; Table 4.5).

The M&E Co-ordinator did not appear capable of motivating M&E Co.'s engineers to produce information more quickly than they did for two reasons. Firstly, the resources that M&E Co. allocated to the project were based on the nature of the task conveyed by their contract documents. The magnitude of the increase in the level of difficulty of this task merited financial rewards that the M&E Co-ordinator recognised but could not award because Construction Plc's contingency sums had not allowed for them. Therefore in the absence of such rewards, M&E Co.'s engineers were told by their directors not to increase the resources associated with the production of services design information. Secondly, in view of the grave unfairness with which M&E Co.'s engineers perceived their company to have been treated, they were determined to leave the decision-making associated with the services design, as much as possible, to Services Associates. Services Associates' reluctance to make design related decisions that were going to change the contract documents - for reasons of guarantees they had warranted City Police (see Selection, appointment, roles and responsibilities of design team members) - further slowed down M&E Co.'s information production and demotivated M&E Co.'s engineers.

In addition to the above reasons, two further developments in the conditions governing the works hampered the Project Manager's efforts in motivating M&E Co.'s site staff. On the one hand, M&E Co.'s directors by accepting the project as a loss making one, appeared resolute to fight their case in the courts rather than concede to Construction Plc by accelerating the works and accepting political defeat. In this resolve they were uncompromising and unaccommodating either because they believed they could recover damages as well as their costs and thus be compensated, or because they hoped that the unfairness with which they felt they had been treated would be recognised, or both. On the other hand, the haphazard execution of the construction works and installation of

services, and the frequent clashes that occurred between them (see Co-ordination and control of production inputs, above), had demotivating effects on M&E Co.'s subcontractors and operatives and other trade contractors and operatives.

Participation in decision-making

To assess the level or lack of participation of M&E Co.'s project staff in decision-making, the extent of their involvement in decision-making and control processes through collective problem-solving is examined (see Chapter 2: 36). As is the consequences of this involvement, or lack of, for their interpersonal relations with Construction Plc's project staff.

The site meetings between Construction Plc's and M&E Co.'s project staff, where collective problem-solving could potentially have taken place, were dominated by disagreements, arguments and apportionment of blame. The divergent objectives of the two organisations coupled with discrepancies between the information produced by Services Associates and that resulting from M&E Co.'s building survey, often constituted the causes of the problems. In this climate the guidance, directions and at times instructions of the M&E Co-ordinator and the Project Manager, although superficially agreed to, went unheeded. Therefore the Project Manager's ultimate authority in decision-making could not address lack of commitment on the part of M&E Co.'s engineers to project objectives, and could not secure their collaboration.

The construction related decision-making was largely delegated to the Site Agent although the latter consulted with the Project Manager in relation to major decisions. The decision-making related to services installation and co-ordination with the construction

works was delegated to M&E Co., which in the light of the information discrepancy referred to above, was onerous. Therefore M&E Co.'s involvement in problem-solving at the level of installation was reluctant and enforced by the conditions of their contract.

Team building

To assess the ineffectiveness of the collective efforts of M&E Co.'s and Construction Plc's project staff, the reasons relating to why they did not form into a team are investigated. This is done by examining the group's characteristics, the nature of the task, the environment in which the group functioned, and the conditions on which their effectiveness depended (see Section 2.3: 37-8; Chapter 4: Table 4.6).

The size of the group allowed for the required diversity of skills and knowledge. However, the nature of the contractual framework, the division of responsibilities and the corresponding reward systems hampered the participation of individuals in problem-solving and decision taking. The M&E Co-ordinator's attitude reflected his preference for a practical, rather than a contractual, approach to project execution through teamwork. However, the decision by Construction Plc's directors to tender on very low contingency sums in order to obtain the contract, and their strategy of passing on the risks to M&E Co., eroded the basis for teamwork and necessitated a contractual approach in the absence of M&E Co.'s co-operation. The incompatibility of group members' organisational objectives and the unwillingness of M&E Co.'s engineers to follow the M&E Co-ordinator's lead gave rise to a heterogeneous group dominated by overt conflict. The diversity of objectives was manifest in the group members' unco-operative approach to problem-solving, which in the absence of reconciliation, gave rise to in fighting between the members of the two organisations. Observations indicated that the

development of the group did not progress much beyond the storming phase throughout the services design and installation stages. Therefore the norming and performing phases did not follow on and did not result in a collaborative team.

The nature of the task, in terms of the design, installation and co-ordination of services with the building construction and refurbishment works, was ambiguous. The task associated roles, particularly those of M&E Co., were not well defined in the contract documents and were interpreted on the basis of these documents as the project progressed. Therefore the significance of the task, in terms of the level of effort required in relation to the rewards allocated, was unclear. The M&E Co-ordinator's and the Project Manager's position power had little influence upon M&E Co.'s engineers and site staff. The dispersed physical locations of the group members' organisations had a negative impact upon their communication and interaction in so far that correspondence and drawings had to be sent to the respective headquarters from where they were disseminated to site. This created a perfect excuse for information getting lost in the post, or not being responded to because it was trapped in the system!

6.4 CONFLICT

The previous section established the existence of power disparity in the interorganisational relations of the contracting parties and identified the power strategies implemented by each party in order to achieve their aims. It moreover demonstrated the uncollaborative

nature of the interpersonal relations of Construction Plc's and M&E Co.'s project staff and discussed the reasons for their failure to deliver their inputs on time. This section examines the implications of power disparity and power strategies for the emergence of both overt and covert conflict in the participants' interorganisational and interpersonal relations. It then goes on to examine the emergence of conflict in the building production process and the way it was handled and/or resolved.

6.4.1 CONTRACTUAL/INTERORGANISATIONAL CONFLICT

The occurrence of conflict in the interorganisational relations of the contracting parties is investigated based on the definition and forms of conflict, discussed in Chapter 2 and referred to in Chapter 4. Thus conflict is considered as any divergence of interests, objectives, or priorities between individuals, groups, or organisations; or non-conformance to requirements of a task, activity, or process (Gardiner and Simmons, 1992: 111). Manifestations of conflict are regarded as functional or creative; and dysfunctional or destructive (Smith, 1992: 29, 30; Stephenson, 1996: 27). Based on these definitions, dysfunctional/destructive conflict dominated the interorganisational relations of City Police and Construction Plc, and the latter and M&E Co.. This form of conflict may be attributed to the contractual framework, the building project environment, the project coalition structure, culture and technology, and low or non-existent levels of trust in the parties exchange relations.

Conflict attributed to contractual framework

The traditional method of procurement implemented by City Police resulted in poor teamwork amongst the project participants due to poor communication, high levels of uncertainty, and disagreements. The poor communication was partly attributable to the

division between services design and installation processes undertaken by Services Associates and M&E Co. respectively, and partly attributable to Services Associates' unwillingness to resolve design problems, which would constitute changes to the contract. This gave rise to relationship conflicts between M&E Co. and Services Associates.

The high levels of uncertainty were associated with the quality of information produced by the consultants, particularly Services Associates, and vagueness in the participants' responsibilities, particularly M&E Co.'s. The discrepancy between the spatial dimensions contained in the design information and those existing, created data conflicts the resolution of which was allocated to M&E Co. based on their contract of engagement. The execution of this task, which as far as M&E Co. were concerned fell outside the scope of their responsibilities, reinforced the relationship conflicts between them and Services Associates, and created relationship conflicts between the former and Construction Plc. This conflict was manifested as delays in the production of services design drawings to programme, by M&E Co., which was contrary to project requirements.

Conflict attributed to building project environment

It is anticipated that prior to selecting Construction Plc, City Police negotiated down their original tender price. Consequently, Construction Plc reduced the resources allocated to the project, the prime example of which was the appointment of a site agent/manager to manage the project. This was contrary to the requirements of the project and represented conflictual behaviour on the part of Construction Plc. It led to considerable problems associated with organisation and management of construction and refurbishment works, on the one hand, and co-ordination of construction with the services installation, on the

other. Thus causing high levels of destructive conflict between Construction Plc and M&E Co.. Furthermore, the price reduction lowered Construction Plc's contingency sums to levels that were incapable of covering the cost of surprises revealed by the refurbishment works including the additional design work that M&E Co. had to carry out. This constituted another source of dysfunctional conflict between Construction Plc and M&E Co..

The reductions in M&E Co.'s tender price subsequent to negotiations with Construction Plc, placed a ceiling on the resources they could allocate to the installation design and execution. That is why when the extra design work was imposed on them, contrary to their wishes and expectations, they decided to undertake it within their existing budget contrary to the requirements of the project. This behaviour demonstrated conflict of M&E Co.'s objectives with those of the project which led to relationship conflicts amongst M&E Co., Construction Plc, and Services Associates.

Conflict attributed to project coalition structure

The Police Station project coalition had a hierarchical structure of subcontracting relations, discussed in the previous section. Within this hierarchy, co-operation between the design team members and Construction Plc and between Services Associates and M&E Co. was minimal. This was attributed in part to low levels of mutual adjustment amongst the corresponding organisations' representatives, and in part to the design team members' reluctance to vary the contract documents. The mutual adjustment of representatives was hindered by the contractual framework and the absence of liaison links. The design team members' reluctance to vary the contract documents was attributed to their protection of self interest. The low levels of co-operation between

Services Associates and M&E Co. denied the Project Manager the power to make decisions according to need and prevented M&E Co.'s engineers making decisions based on their expertise. This created discord amongst the Project Manager, M&E Co.'s engineers and Services Associates' Site Engineer.

Because M&E Co. were being coerced into broadening the range of their responsibilities, they did not keep their information production and installation within programme and the Project Manager could not do much about it. Director level meetings between the two organisations merely reinforced M&E Co.'s resolve not to submit to Construction Plc's demands for acceleration of the works. Construction Plc were dependent on M&E Co. not only for the services installation, but also for timely completion of the works. The Project Manager was aware of M&E Co.'s financial predicament on this project and knew that financial threats would not achieve the desired outcome.

The hierarchical structure of the subcontracting relations in conjunction with the project participants' collaboration problems created communication difficulties with the construction group. These difficulties, coupled with the slow rate of information production, gave rise to dysfunctional conflict between the Site Manager and the trade contractors' foremen and led to delays already discussed in relation to M&E Co.'s installation in the previous section.

Conflict attributed to project coalition culture

The culture of the services installation organisation was dominated by conflict, apportionment of blame, and threats. The M&E Co-ordinator's efforts in trying to sway M&E Co.'s Project Engineer from a confrontational, contractual approach to a co-

operational, practical approach to the project failed every time. This failure was attributed to the absence of incentives, such as financial rewards, that were required to persuade M&E Co.' Project Engineer or indeed M&E Co.'s directors into co-operation. The atmosphere of the meetings was charged with anger and the tone of arguments warned of potential arbitration action. The pattern of M&E Co.'s failure to produce information and execute installation within programme recurred in every meeting. As did the pattern of their communication problems with Services Associates, co-ordination problems with construction and refurbishment works, and shortfalls with the quality of services installed.

The Project Manager, with the aid of Construction Plc's management team, directed the concerted efforts of the construction group towards production quality and site safety. Installation quality constituted one of the sources of recurring conflict between M&E Co.'s and Construction Plc's project staff (see Co-ordination and control of production inputs). The importance of site safety was reflected in the creation, maintenance and enforcement of the site specific safety plan and, on occasions, the overzealous enforcement of safety requirements (see Co-ordination and control of production inputs).

Conflict attributed to project coalition technology

The discrepancies between the information produced by the consultants and that uncovered by M&E Co.'s building survey gave rise to data conflicts. These data conflicts necessitated substantial alterations to the layout design of the services and placed the onus of redesign upon M&E Co.. The negotiations concerning the redesign of services layout in conjunction with the data conflicts constituted the perfect opportunity for M&E Co.'s Project Engineer to assign only one person to the task of producing information per floor. Thus the slow production of information was always attributed to the poor quality of

available information and Services Associates' slow response to design related queries. Information production was carried out using automated draughting equipment rather than CAD. Although the appropriateness of this method of information production generated discussions between the M&E Co-ordinator and M&E Co.'s Project Engineer, these discussions were academic. The allocation of information production per floor to a single person was justified on grounds of better co-ordination and integration of data. The logic of a single person's responsibility for the production, co-ordination and integration of information resulting in better control over the information may hold true in an ideal world where time is not of the essence. On this project, however, it merely masked the conflictual behaviour of M&E Co.'s project staff.

The lack of Project Manager's control over services installation created relationship conflicts between Construction Plc and the trade contractors and, more specifically, between the Site Agent and trade contractors' foremen and operatives whose work was regularly disrupted owing to the clashes with services installation.

Low trust in project participants' exchange relations

Examination of the contracting parties' seemingly low trust co-operation, presented in the previous section, indicates that the parties' exchange relations did not incorporate trust as reliability or calculated risk. City Police's monitoring mechanism was put in place because they did not know Construction Plc and the nature of the risk they presented, and did not feel they could rely on them. In a similar vein, Construction Plc's monitor was put in place because the former did not know M&E Co. and lacked knowledge of services. M&E Co.'s apparent reliance on Construction Plc was a commercial necessity rather than a conscious choice based on calculated risk.

The parties' exchange relations did not incorporate trust as predictability, based on the risk reducing mechanism of the contract. Firstly, the onerous payments systems of Construction Plc and M&E Co. were supported by direct supervision. Secondly, the punitive legal sanctions in the organisations' respective contracts could not ensure conformance and did not prevent the companies from behaving unco-operatively. Thirdly, the contracts were used to reduce one party's risk by passing it on to the subordinate party in the relationship rather than by helping to reduce uncertainty. Fourthly, the acceptance of risk by the subordinate party resulted in their unpredictably confrontational behaviour.

City Police manipulated Construction Plc into accepting the terms and conditions of their engagement by creating the impressions that the design information was based on the 'as built' dimensions of the building. They thus concealed the true nature of the extent of the works involved. Construction Plc passed on these impressions to M&E Co.. As the works progressed, and the onerous nature of Construction Plc's and M&E Co.'s tasks became clear, the M&E Co-ordinator tried to create further impressions that M&E Co. would be able to claim additional rewards for the extra works they were undertaking. He thus tried to manipulate M&E Co.'s Project Engineer into co-operation. However, the Project Engineer, though capitulating to the contractual requirements, did not commit resources to the installation based on his instructions from M&E Co.'s directors.

6.4.2 OPERATIONAL/INTERPERSONAL CONFLICT

Dysfunctional conflict characterised the operations of the project, the interpersonal relations of Construction Plc and the M&E Co., and those of the latter and Services Associates. Manifestations of conflict may be attributed to latent conflict at the brief

preparation, design and construction stages, and the project management and control systems implemented.

Latent conflict at brief preparation stage

Although the brief preparation stage was not included in the investigation, the inductive use of the evidence collected during the later stages pointed to the emergence of latent conflict amongst the four elements of physical form of the facility, its function, construction cost, and construction period. The physical form of the facility incorporated a the two-storey extension on top of the building, which had to be reduced to a single-storey. Owing to time limitations the redesign associated with this reduction was deferred until the construction works began, therefore it could not be programmed or costed. The function of the building necessitated an extensive and complicated services system the effectiveness of which depended on the availability of adequate ceiling space. This could have been established by the building survey, however, time and cost restrictions prevented the survey. Time limitations further hampered the thoroughness with which the design of services should have been carried out.

Latent conflict at design stage

The contradictions amongst the physical form of the facility, its function, construction cost, and construction period, were handled in the following way. The Project Administrator rescheduled the design programme to include the redesign of the top storey extension. The building and services design drawings were based on an old set of survey drawings, which did not reflect the built state of the building. The tasks of building survey and a thorough services design were included in the services performance and

specification document. Therefore the latent conflict between building form, structure and services was left unresolved until a later date.

Latent conflict at construction stage

The conflicting elements of the brief preparation and those of the design led to problems of conformance to brief and conformance to design at the construction stage. The effect of these problems was compounded by the fact that resolution was left too late in the production process. Moreover because the problems were passed on to the contractors in an underhanded way, they created aggressive responses that had repercussions to the determent of every participant involved.

Conflict arising from project management and control systems

The M&E Co-ordinator did not succeed in creating a co-operative relationship with M&E Co.'s project staff. That is why collaboration and joint problem solving were distinctly absent from this relationship. Construction Plc's reduced tender price may not have accommodated risk sharing with M&E Co. or the provision of additional incentives to the latter. However, monitoring the hopeless performance of M&E Co. with no improvements in sight, and being aware of the root cause of their poor performance but not offering any realistic solutions, was hardly a proactive approach to the management of services installation/construction interface. It was almost as if higher level managers or directors of Construction Plc had recognised the problems as irresolvable and, despite gestures to the contrary such as director level meetings and angry or passionate site meetings, did not care how the project performed. They seemed to have decided to go to arbitration or litigation long before the project's completion was in sight. The fact that the

position of M&E Co-ordinator was filled by three different people during the course of the project, goes some way to supporting this speculation.

As far as could be gathered during the investigation, the Project Manager had problems in leading the site management team owing to his inadequate experience. He spent little time in the site meetings with M&E Co. because he attended to the work on site. Therefore he missed out on the perspectives and problems of M&E Co.'s engineers. He had problems keeping abreast of the changes in the construction programme as well as the progress of the works. All these factors contributed to the emergence of dysfunctional conflict between the Project Manager and M&E Co.'s site staff which, on one occasion, culminated in his dismissal of one of M&E Co.'s operatives. The haphazard and adhoc way in which the construction inputs were organised and managed proved ineffective and led to additional work and rework. It is hardly any wonder that the project overran its construction cost by 32% and was a year late.

6.4.3 MANAGEMENT OF CONFLICT AND ITS IMPACT ON PERFORMANCE

To assess Construction Plc's conflict management, their project planning in terms of risk management through the three phases of identification, analysis and response to risk is examined (Lewis, Cheetham and Carter, 1992: 80-1; see Chapter 2: 74-5; Chapter 4: Table 4.7). To assess the impact of Construction plc's conflict management on M&E Co.'s performance, the former's response to conflict, whether passive or active, and the type of behaviour this engendered in the project staff is examined (Ibid.).

Construction Plc's risk management proved to have been far too inadequate. They did not foresee the nature and extent of risk posed by the refurbishment works and the services

installation. Although they identified contingencies and allocated sums of money to them, changes in the scope of works, complexities of the refurbishment process, and delays by M&E Co. led to huge target cost and programme overruns. Construction Plc's response to risk was to either retain it, as in the case of the risk contained in the works; or to transfer it, as in the case of the risk contained in the services installation design, and reduction of the trade contractors' prices through negotiations. The Project Manager's response to conflict between Construction Plc and M&E Co. tended to be creative and oriented towards co-operative and joint problem solving at the start of the installation. However, as the problems persisted and enlarged, the Project Manager's response to conflict became more aggressive displaying a domineering attitude. Thus conflict between the two organisations escalated.

M&E Co.'s risk management was flawed. They did not identify the extent of the risks comprehensively at all. Therefore the contingencies assigned to the project were far too insignificant. They tried to transfer as much of the risk to their subcontractors as they could, and attempted to retain the rest. However, the scale of the risk was such soon they were consumed by it. The response of M&E Co.'s Project Engineer to conflict between M&E Co. and Construction Plc tended to be either passive, manifested as shallow commitment to the project goals, and capitulative, undertaking the works required of them by the specification document; or aggressive, displayed as withdrawal of co-operation, and compromising.

6.6 SUMMARY

This chapter has provided the Police Station project scenario to facilitate the interpretation of the project participants' interorganisational and interpersonal relations, to link them to the occurrence of conflict, and to interpret the impact of conflict handling and resolution methods on the performance of project participants. Section 6.2, presented a descriptive account of the organisations participating in the project, the engagement criteria of the design team members, the main contractor, and the M&E contractor, and the conception, history, design and construction of the facility. Section 6.3, interpreted the implications of the contracting parties' engagement criteria for the parties' relations, in terms of establishing power disparity and giving rise to various forms of power strategies, rather than trust, in their interorganisational relations. Section 6.3 moreover interpreted the Project Manager's and the Site Manager's leadership, motivation, participation, and team building strategies as theoretically appropriate to the project situation. However, it recognised the ineffectiveness of these strategies in achieving collaboration and co-operation with the M&E contractor, or in enforcing or enhancing the participants' performance.

Section 6.4, traced the occurrence of conflict in contractual and interorganisational relations of the contracting parties, and in operational and interpersonal relations of the project participants. Conflict was attributed to the contractual framework, the building project environment, the project coalition structure, culture and technology, in the former relations. It was related to latent conflict at the brief preparation, design and construction stages, and to project management and control systems, in the latter relations. This

section further interpreted the way conflict was managed and the impact this made on the performance of the main and the M&E contractors.

CHAPTER 7 ANALYSIS AND CONCLUSIONS

7.1 INTRODUCTION

This chapter analyses the findings of the three cases presented in Chapters 4, 5, and 6, by comparing and contrasting them, and proposes generalisable conclusions. It is organised in two sections. Section 7.2, compares and contrasts the findings of the cases thematically in relation to the secondary questions formulated in Chapter 2. It thus provides the premise for answering the three research questions posed in Chapter 1. Section 7.3, answers the research questions, establishes patterns based on the thematic analyses and draws generalisable conclusions with theoretical implications.

7.2 ANALYSIS

The comparison and contrast of the cases are carried out on the basis of the questions and hypotheses formulated in Chapter 2, and clustered thematically under: Conflict and its relation to behaviour and performance, contractual/interorganisational conflict,

operational/interpersonal conflict, and management of conflict and its impact on performance. Each question constitutes the heading or theme under which the analytical comparison and contrast are carried out.

CONFLICT AND ITS RELATION TO BEHAVIOUR AND PERFORMANCE

This theme contains the questions relating to the emergence of both creative and dysfunctional conflict in building project coalitions, and their impact on the behaviour and performance of project participants.

Q1) Why does conflict arise in building project coalitions?

Conflict in both its creative and dysfunctional manifestations is an outcome of procedures and attitudes. As the case studies demonstrate, procedures dominate the organisation and management of building project coalitions from inception to completion. They secure the business contract, thus governing the nature of the interorganisational relations based on the relative power they broker to each party. They determine the form, function, cost and production period of the building, and specify and realise its configuration and performance criteria. They facilitate the flow of information, communication, decision making, management authority and control of inputs. They thus direct the effectiveness with which the building production process is organised and managed. Procedures contain contradictions. They are driven by diverse interests. They attempt to reconcile conflicting elements and requirements. They are designed to accommodate or achieve opposing objectives. Therefore procedures within building project coalitions are inherently conflictual.

Procedures are carried out by human agents and are consequently subject to their attitudes. Human attitudes are formed by their respective organisations' goals and targets, on the one hand, and their personal aspirations and personalities, on the other. Therefore, they are likely to conflict either at the level of agents' organisational orientations, for instance during negotiations, or as a result of their personality clashes. Based on the above account, and in so far that the selection of human agents is carried out by their respective organisations and is rarely based on project oriented criteria, the propensity for the collision of attitudes on building project coalitions is high.

Q2) Why does conflict become dysfunctional?

Creative conflict that encourages collaboration on the basis of collective problem solving may become dysfunctional when the project participants resort to politics to pursue their aims, or when they lose motivation. The political strategies adopted by the participants, be they direct control, responsible autonomy, domination, or manipulation, are the direct outcome of distributive bargaining that characterises building project coalitions, on the one hand, and the absence of trust between negotiators, on the other. The decline in motivation may be associated with the onerous nature of reward and punishment. Parties may perceive that the rewards are too small and the penalties, too large; that high performance does not have a direct and positive bearing on the rewards obtained; and that the goal difficulty is disproportionately higher than the levels of performance achievable by the available resources. On the other hand, low motivation may be linked to levels of satisfaction. The parties may perceive that their requirements have not been fulfilled or have been ignored; that they have been unfairly treated; and that the project manager's leadership has been ineffective.

Q3) How does it affect the behaviour and performance of the parties in building project coalitions?

Dysfunctional conflict arising from distributive bargaining at the start of the project has a direct and adverse impact on the resources allocated to the project by the participants, as all three cases demonstrated. On the one hand, the participant organisations cannot assign adequate numbers or calibre of staff to the projects. This has a negative influence on the parties' ability to effectively organise and manage the works. On the other hand, they cannot pay their subcontractors and labour-only subcontractors adequately. This has an adverse impact of on their productivity.

Dysfunctional conflict arising from the decline in the parties' motivation has a direct and negative bearing on their levels of aspiration and willingness to apply initiative and expend effort. On the one hand, the participants' representatives feel that their contribution, be it at the level of the organisation or person, is not valued adequately or is undervalued. This results in their unwillingness to co-operate or collaborate in resolving difficulties and problems, as was the case in the Cultural Centre and the Police Station. On the other hand, the representatives feel that they are being discriminated against. This results in their deliberate withdrawal of co-operation to the detriment of the project, as the example of the Police Station project demonstrated.

The above questions correspond to the three research questions posed in Chapter 1. They are elaborated further under the themes of contractual/interorganisational conflict, operational/interpersonal conflict, management of conflict, and impact of conflict on performance below.

CONTRACTUAL/INTERORGANISATIONAL CONFLICT

This theme aggregates the questions relating to the emergence of conflict attributed to the contractual framework, the building project environment, project coalition structure, culture, and technology, on the one hand; and the questions relating to various forms of trust in the project participants' exchange relations, on the other. The questions address research questions 1 and 2 posed in Chapter 1.

Q4) What is the link between the procurement method implemented and intracoalition conflict?

The evidence from the cases demonstrates a direct, though subtle, correlation between the procurement method implemented and intracoalition conflict amongst services consultants, main contractors, and M&E contractors. The correlation is attributed firstly, to the division of responsibility between professional and commercial interests; secondly, to the contractual independence of these interests; thirdly, to the dilution of one party's control over the functions and activities of the other; and fourthly, to the functional dependence of the interests and the need for their integration. For example, the integration of service related professional and commercial interests in the Cold Store led to relatively less intracoalition conflict between the main and the M&E contractor, compared with the Cultural Centre and the Police Station. The contractual independence of the services consultants and the M&E contractors in the latter two projects meant that neither the professionals nor the commercial contractors were willing to fully commit to the project. The dilution of the parties' control over one another implied that neither could enforce the performance of the other. These factors led to high level of frustration and political activity on both sides, directed at standing their ground.

The impact of the nature and length of relationships between the participant organisations on the occurrence of intracoalition conflict is ambiguous. On the one hand, the well established relationships in the Cold Store appeared to contain conflict in sharp contrast to the almost non-existent relationships in the Cultural Centre which seem to have promoted conflict. On the other hand, the existence of a degree of relationship between the client and the main contractor on the Police Station project did not appear to make any difference to the occurrence or indeed the resolution of conflict.

Q5) Why do Japanese management methods succeed to avoid or contain conflict, or not as the case may be, in the context of the British construction industry?

Despite the Japanese ownership of the main contractor on the Cultural Centre, the management methods implemented in the organisation and execution of design and construction were not Japanese. That is, they were not the methods implemented in the design and construction of buildings in Japan. The main explanation that may be offered, based on the data gathered, is the differing context of operation. In Japan, the main contractor would use their in-house design team and would co-ordinate design inputs more effectively using CAD because that is what all the other contractors do. Therefore the additional cost associated with in-house design and co-ordination would not undermine the main contractor's competitiveness. Furthermore, the relationship between the main and the trade contractors are quite different in Japan as discussed in Chapter 2 (p. 68). That is why the management methods implemented by the main contractor did not succeed to avoid or contain conflict.

Q6) To what extent does the project environment contribute to the emergence of conflict between the project participants?

Based on the evidence presented by all three cases the project environment has a direct and significant impact on the emergence of conflict between the project participants. Economically, the disproportionate supply and demand conditions - in the case of this research, the excess of supply compared to the limited demand - create relative positions of dependence and power in business exchange relations. This economic power disparity is exploited in the process of bargaining and negotiations between the parties. Commercially, the gap between the knowledge and experience of the supply side compared to that of the demand side in the exchange relation also creates relative positions of power and dependence. This commercial power disparity is exploited, in the process of bargaining and negotiations between the parties, to counter the economic power disparity. Thus conflict emerges between the economic and commercial interests.

The history of the project participants' interorganisational relations constitutes another aspect of the project environment that contributes to the emergence of conflict between the participants. This was demonstrated in the case projects by the severity of dysfunctional conflict occurring between the project participants who did not have a history of working relationship. For instance, in the Cold Store, the rift between the client and the main contractor was the source of greatest relationship conflict, whereas in the Cultural Centre, the divisions between the main contractor and the design team members caused the most conflict. In the Police Station, the gulf between the main contractor and the M&E contractor correlated with high levels of dysfunctional conflict between them.

Q7) What power strategies and tactics are adopted by the participants?

To pursue its interest, the economically powerful party adopts one or a combination of strategies of direct control, responsible autonomy, or use of power in its attempt to

dominate the dependent party by preventing or defeating conflict. In response, the economically dependent party defends its interest by relying on its knowledge and experience and discretion in the use of this knowledge and experience in its attempt to resist the former's domination. Thus the economically dependent party creates and encourages conflict towards its own ends.

The strategy of direct control is operationalised through systems of monitoring and approval, on the one hand, and supervision, on the other. The strategy of responsible autonomy is implemented through granting discretion in the organisation, management and execution of work. The strategy of using power is activated through tactics of enforcement and coercion. The above strategies are resisted by short-circuiting or bypassing systems of monitoring and approval, as the main contractor in the Cold Store project did; or under resourcing the project and not performing the tasks required, as the M&E contractors in all three projects did; or refusing to submit to coercion and pursuing one's own intentions, as the M&E contractor in the Police Station project did. The on going process of negotiations during the project life cycle is dominated by the power strategies and tactics of the parties and gives rise to circuits of power and resistance (Clegg, 1989: 207, 18; Chapter 2: 17).

Q8) How does the project coalition structure contribute to the emergence of conflict between the project participants?

The hierarchy of subcontracting relations, which based on the cases appear to be a feature of building project coalitions irrespective of the procurement method implemented, engender formalised systems of communication between the tiers. The primary function of these systems is to record the dissemination of information through the appropriate

channels for the purpose of Quality Assurance or future disputes. Therefore the communication systems appear to be designed to satisfy the contractual or auditing requirements of projects rather than the practical necessities of collaboration. Their corollary function appears to be to provide the opportunity for information not to get to its destination on time for reasons of 'getting lost in the post', or 'trapped in organisations' systems', etc. Thus the co-operation of project participants tends to be left to the facilitation capabilities of the project manager/co-ordinator or the discretion of the representatives. It is perhaps no wonder that smoothly functioning creative teams are not characteristic of building project coalitions.

The competitive fee bidding and tender processes followed by negotiations between the contracting parties, which underpin the formation of the subcontracting relations, create competitive conditions. As the uncertainties inherent to the project unfold during the project life cycle the competitive conditions give rise to further negotiations over the parties' inputs and outputs and encourage political activity on both sides. The nature of the political activity and its outcome depends on the power disparity and strategies adopted by the parties as discussed in Question 7, above. However, the structure of the project coalition and the formal system of communication that links the structural tiers together, reinforce the intracoalition politics and conflict amongst the project participants. All three cases provided good examples of conflicting parties using the ineffectiveness of communication systems to pursue their own objectives.

Q9) To what extent is a conscious attempt made by the project organisers to create cohesive cultures within building project coalitions?

The evidence from the case studies demonstrates that by putting in place systems for monitoring the quality of production and enforcing health and safety regulations, the project organisers made a conscious attempt to create collective consensus in relation to these aspects of the project. The extent to which shared values, shared meaning, and shared understanding were created in relation to production quality varied across the projects according to the importance the project organisers attached to it. For example, in the Cold Store the production quality was related to the budget, whilst in the Cultural Centre it took precedence over cost, and in the Police Station it was taken very seriously. The enforcement of Health and Safety requirements was treated stringently in all three cases because they were mandatory and the onus of accidents occurring as a result of failure to observe these regulations fell upon the project organisers.

Apart from quality and site safety no other attempts were made by the project organisers to create cohesion through the systematic application of procedures, or facilitation of aligning objectives and attitudes through team building. Where a history of co-operation existed between organisations, as in the case of the Cold Store's main contractor, architect and structural engineer, cohesion appeared to occur naturally. Where it did not, as in the case of the Cultural Centre and the Police Station, cohesion was never reached.

Q10) What impact does the technology implemented in the production, co-ordination, integration and control of information make on the occurrence of conflict?

The evidence from all three cases indicates that the available technology was not used optimally and effectively to produce, co-ordinate and integrate information. For instance, the design team members on both the Cold Store and the Cultural Centre projects used

incompatible CAD systems to produce their design information, on the one hand, and assigned inadequate CAD operators to information production, on the other. Therefore information was produced slowly and could not be disseminated swiftly through electronic transfers. This gave rise to a fragmented process of information production the co-ordination and integration of which was left to manual means and depended on the capabilities of the Project Manger on the Cold Store and the Design Co-ordinator on the Cultural Centre. The production of installation information on the Police Station project, though fundamentally flawed by virtue of being based on erroneous data, suffered from similar problems of non-existent central CAD system and human resource inadequacies.

It can therefore be concluded that the fragmented information production processes create problems of control over the quality and dissemination of information, which in turn lead to the failure to reconcile the functional interdependencies of the information producers. Thus conflicts arise between project organisers and information producers. The poor quality of information combined with its slow dissemination and conflicts amongst the functional requirements of the building, have adverse impacts on the progress of the works on site and create further conflicts between project organisers and producers.

Q11) To what extent does trust, as 'reliability', feature in the exchange relations of project participants? Is it underpinned by calculation?

Trust as reliability in the sense of one party's decision to accept the risk in the other party's performance (Gambetta, 1988: 217), did not feature in the exchange relations of the project participants. Firstly, the expectation of an on going relationship did not exist other than in the relation between the client and the main contractor in the Cultural Centre. Secondly, when it did exist it did not provide adequate collateral for trust.

Thirdly, the transaction costs in the form of 'self-protective' actions such as agents monitoring or controlling the subordinate party's actions were incurred as a matter of course and were included in the contract budget or main contractors' tender price. Fourthly, because the project participants were by and large selected on the basis of price rather than past performance in previous exchanges, the nature of their performance was unknown and could not be relied upon. Furthermore, even reputable companies did perform as well as was expected of them because their performance was linked to their resources and their resources were in short supply. Lastly and most importantly, governance structures incorporating constant monitoring and consultation by and between all project members were limited resulting in lack of commitment on the part of members. In the light of this discussion, the exchange relations of project participants appear to be underpinned entirely by calculation rather than trust.

Q12) To what extent does trust as predictability enter the project participants' relations? Is it underpinned by legal sanctions?

Trust as predictability in the sense of shared meanings and shared understanding created by the contract documents, and common expectations and beliefs conveyed by societal and business norms (Sydow, 1988: 36), was low in the project participants' relations. Firstly, codification of meaning in the contract documents was vague and open to interpretation by various project participants. Therefore it failed to constitute a universal message to all concerned. Secondly, the societal and business norms are oriented towards quick short-term gains. Thirdly the current norms in the construction industry have created the common expectations that tender prices, of both consultants and contractors, are negotiated down at tender stage and built back up during the project through claims for extra work. The common beliefs are that the clients drive a hard bargain, that

consultants have no practical understanding of construction or services installation, that contractors inflate their prices, and that each organisation is concerned with its own business or project objectives. Thus the conditions for contractual trust, namely, the effectiveness with which the contract promotes information flow, spreads the costs of conflict, monitors organisations, and reduces uncertainty (Deakin and Wilkinson, 1998: 155), are not satisfied. Based on this discussion, the project participants' relations appear to be underpinned by legal sanctions rather than predictability and the contractual trust it is supposed to engender.

Q13) To what extent are impressions of trust created through power-induced predictability and capitulation? Are these impressions based on domination and dependency, respectively?

There was ample evidence of impressions of trust created through power-induced predictability by dominant parties in the exchange relations, and degrees of capitulation by the more dependent parties. The practice indicated opportunism and low levels of trust on the part of the former, and dependence on the part of the latter. The varying degrees and patterns of capitulation appear to correlate with the size and financial strength of the organisations involved. For instance, the M&E contractor on the Cold Store project, who was a small firm in serious financial problems, capitulated most of all by accelerating the works and managing to finish within the time allocated - including the extension of time granted by the client. It is possible that the legal sanctions included in their contract provided the incentive for timely completion. It may also be possible that the potential for future work with a sizeable contracting company provided the impetus for their final effort. The M&E contractor on the Cultural Centre project, though also a small firm experiencing financial difficulties, did not capitulate as much and certainly contributed to

the two months delay in the completion of the project. Judging by their history and the project manager's comments, it is likely that they would have declared themselves bankrupt had the main contractor attempted to obtain liquidated damages from them. The M&E contractor on the Police Station project, who matched the main contractor in terms of size and financial strength, did not capitulate by accelerating the works as a matter of principle. Instead they chose to fight the main contractor.

OPERATIONAL/INTERPERSONAL CONFLICT

This theme combines the questions relating to the emergence of latent conflict at brief preparation, design and construction stages, on the one hand; and conflict arising from project management and control systems, on the other. The questions address research questions 2 and 3 posed in Chapter 1.

Q14) What types of conflict emanate from the brief preparation stage?

The conflict amongst elements of brief preparation appears to give rise to conflict amongst the project participants who's interests are closely associated with one or a combination of the elements. For example, the client is generally interested in all four elements of brief preparation, whilst the consultants tend to be more interested in the form and function of the building, and the contractors in construction cost and duration. Therefore conflicts tend to occur between the commercial interests of the client and the professional interests of the consultants, between the former and the commercial interests of the main contractor, and between the latter and the professional interests of the consultants. In other words, conflict tends to be associated with the differences in the parties' perspectives, perceptions, objectives and priorities.

Q15) How do they impact on the participants' level of aspiration, motivation, and willingness to apply initiative and expend effort?

The conflicts of perspectives, perceptions, objectives, and priorities amongst the project participants present them with the challenge of reconciliation; of how to arrive at a common solution to the problem of building design and construction that will meet the conflicting criteria. The participants' requirement to pursue their respective interests motivate them to apply initiative directed towards competing with the others in the first instance, then negotiating, and finally reaching a compromise. The nature of the compromise depends on the strength or persuasiveness of the dominant interest and may or may not secure the co-operation and commitment of the other parties.

Q16) What types of conflict emanate from the design stage?

The conflict arising from the project participants' differing requirements is potentially creative and may result in a better design achieved through co-operative and joint problem solving, as some of the evidence from the Cold Store project demonstrated. When the participants' requirements diverge widely, or when the creative conflict is not managed well, as was the case in the Cultural Centre project, the conflict becomes dysfunctional. It may take the form of denial manifested as withdrawal of co-operation; it may be avoided through shallow commitment to project goals; or it may lead to capitulation. When the requirements of the parties to the design process are irreconcilable due to restrictions imposed by the project criteria, as was the case in the Police Station, the conflict may remain unresolved, or be suppressed, or be passed on to another party.

Q17) How do they impact upon the participants' level of aspiration, motivation, and willingness to apply initiative and expend effort?

In so far that creative conflict involves integrative bargaining and a process of give and take, it motivates the project participants to apply initiative and reach a solution that integrates their objectives with those of the others. Dysfunctional conflict, on the other hand, involves distributive bargaining and a process of giving by one party and taking by the other during which one side's requirements are satisfied at the expense of the other side's. Dysfunctional conflict therefore challenges the organisational goals and objectives of some of the participants, motivating them to pursue their individual interests and objectives contrary to those of the others and the project.

Q18) What types of conflict emanate from the construction stage?

The conflict arising from the problems of conformance to design may be creative, leading to collective resolution of problems on site; and may be dysfunctional, leading to resistance by subcontractors' foremen or operatives. Resistance may take a number of forms. It may be passive and involve conflict denial, manifested as withdrawal of co-operation; or conflict avoidance represented by shallow commitment to project goals; or capitulation, denoting suppression of conflict. It may, on the other hand, be aggressive and involve refusal to show initiative; or refusal to co-operate; or over inflation of demands. Resistance may jeopardise the interests of the project participants and thus lead to problems of conformance to brief. These problems may prolong or escalate the conflict amongst the project participants.

Q19) How do they impact upon the participants' level of aspiration, motivation, and willingness to apply initiative and expend effort?

Creative conflict by virtue of accommodating the problem owners' perspectives, objectives, and interests creates good will amongst them, reinforces their relationships and

encourages future initiative. These qualities were observed on the Cold Store project. Dysfunctional conflict, on the other hand, acts as a demotivator and discourages co-operation, reduces commitment, and directs the participants' initiative towards maintaining their profit levels and protecting their individual interests. In extreme cases, dysfunctional conflict promotes confrontation, and leads it to the bitter end of arbitration or litigation, as demonstrated by the Police Station project.

Q20) To what extent does the project manager's leadership style cause conflict?

In so far that the project manager's leadership style is oriented towards achieving the commercial interests of the main contractor, i.e., project cost and programme targets, it may cause conflict with other interests, i.e., the client's, the consultants', or the trade contractors'. Examples of conflicts thus created are provided by all three cases. Furthermore, the ineffectiveness of the project manager's leadership style to enforce the performance of other project participants may cause conflict between the party whose requirements have been compromised and the party whose requirements have dominated. Examples of situations giving rise to this type of conflict are found in the Cultural Centre and the Polices Station projects.

Q21) How effective can leadership be in motivating group members, encouraging their participation in decision-making, forging them into a team, avoiding or managing conflict and having a positive impact on the participants' performance?

The effectiveness of leadership in motivating group members is limited. Because group members represent distinct and disparate organisations, their motivation is related to the extent to which their respective organisations' requirements and objectives are being met.

This is amply demonstrated by all three cases. Leadership can have considerable influence on encouraging group members' participation in decision-making, provided the appropriate mechanisms are in place. That is, provided all the group members are engaged at the same time and have the opportunity of partaking in the decision making process, and provided the decisions reached collectively are honoured by all members. Such a mechanism was in place on the Cold Store project and was definitely missing on the Cultural Centre project. Leadership can forge people into a team if, and only if, they are team players and the importance of team work has been emphasised at the start of the project. Team building cannot and does not evolve automatically during the course of the project, as the Cultural Centre and the Police Station projects demonstrated. It needs to be worked at.

Leadership may contribute significantly to management of conflict by way of leader's response to conflict. However, as the cases indicated, conflict may arise from factors over which the leader does not have much control. Therefore leadership alone cannot determine the management of conflict. Finally, although leadership may influence the participants' approach to joint decision-making and team work, and the way conflict is handled, it has a limited impact upon their performance. Because, as the cases demonstrated, performance is closely linked to the level of resources, which are in turn determined by the market transaction between the parties.

Q22) How do divisions within the flow of management authority give rise to conflict?

Divisions in the flow of management authority correspond to the divisions or interfaces between the influence of various interests. Consequently they represent the points at

which the two disparate interests clash. For instance, the management authority of the main contractor ends at the interface with the trade contractors' foremen. Therefore instructions given by the main contractor's site management team to the trade contractors' operatives are for all intents and purposes null and void because they have to be communicated to the latter through their foremen. Conflict arises when this communication channel is by passed.

MANAGEMENT OF CONFLICT AND ITS IMPACT ON PERFORMANCE

This theme groups the questions relating to the way interorganisational and interpersonal conflict is handled and/or resolved. The questions address research question 2, and 3 posed in Chapter 1.

Q23) How do the power strategies adopted by the participants impact on conflict handling, and on the resolution or escalation of conflict and the participants' performance?

Based on the evidence of the cases, power strategies orientated towards defeat of conflict give rise to the emergence of dysfunctional conflict (for example, the client's power strategy on the Cold Store project; the main contractor's power strategy on the Police Station project). The response to this conflict may be passive, particularly if the responding organisation is relatively dependent on the dominant organisation, as was the case on the Cultural Centre project. It may, on the other hand, be aggressive, particularly if the responding organisation is a match to the dominant organisation, as was the case on the Police Station project. Aggressive responses may lead to domination of the weaker party, distributive bargaining between the parties, or compromise. Passive response leads to poor performance by the weaker party, whilst aggressive response leads to both poor

performance and escalation of conflict. Superficially, the powerful parties appear as the winners of the bargaining process. However, the project delays and budget overruns tend to implicate all the participants in the losing process in one way or another.

Q24) What conflict management methods are implemented by project managers and how do they impact on the participants' performance?

The project managers on the case studies implemented a range of conflict management methods at different stages in the bargaining process, in relation to different participants, and under different circumstances. In the early stages they tended to engage in, or create the impression of wanting to engage in, co-operative and collective problem-solving with the project participants. As the bargaining process progressed and the clients' demands grew, they capitulated if they had to or if they could accommodate the demand; they compromised if they could get away with it; and they withdrew co-operation if they felt they were being unfairly treated. The withdrawal of co-operation was not observed in the Cultural Centre as the main contractor aimed to please the client almost at any cost.

In their bargaining process with the other participants, the project managers tended to compromise if the creative, co-operative and problem solving approach did not yield positive results. However, if the participants failed to deliver their tasks or their part of the bargain, the project managers responded aggressively by withdrawing their co-operation, as in the case of the Cultural Centre project, or trying to dominate, as in the case of the Police Station project. The co-operative approach was the most effective in terms of creating cohesion and commitment amongst the group members albeit it could not enforce effective performance. The compromising approach presented acknowledgement of reality and a degree of tolerance of the participants' predicaments.

Although it did not improve performance, it is likely that it prevented escalation of conflict. The aggressive approach of withdrawing co-operation was the least effective in terms of creating divisions and shallow commitment to project goals on the part of other project participants. It led to escalation of conflict and poor or very poor performance.

The above questions help the investigation of conditions on the basis of which the truth or falsity of the following hypotheses is asserted.

H1) '[C]ontractual documents provide the constitutional and constitutive grounds and framework within which the meaning of the contract is negotiated, contested, and sometimes contained' (Clegg, 1992: 135).

The evidence of changes in design and specification of the facility, during the project life cycle, suggests that the original contract documents - i.e., the concept design and specification - merely provided a framework for the construction of the facility. Within this framework, the nature of the facility - i.e., the meaning of the contract - was negotiated by the contracting parties, contested between them and sometimes contained. Thus this hypothesis is indicated to apply to this project.

H2) Conflict is an outcome of the 'functioning of power/knowledge relations on construction sites.' Manifestations of conflict represent 'the strategies of power of the participants in the site organisation seeking to maintain control over costs and profits' (Clegg, 1992: 139).

The evidence of the contracting parties' power relations manifested domination by one party, based on their power of reward and punishment, and resistance by the other, on the strength of their knowledge. This relation created conflict and gave rise to mobilisation of

the parties' respective powers. The ensuing political activity involved the dominant side's strategy of controlling the other's actions and therefore cost of the project, and the dependent side's strategy of resisting this action to secure their profit. Based on this evidence, this hypothesis is argued to apply to this project.

H3) The building project coalition is organised as a network at the start of the project but may be transformed into a political organisation during the project life-cycle (Mintzberg, 1991 (d): 374; Pfeffer, 1981: 27-9).

The project coalitions studied bear the hallmarks of network organisations (see Chapter 4: Figure 4.5). However, negotiations over the meaning of the contract and bargaining over project goals, resulted in decisions by the participants that were inconsistent with maximising the attainment of project goals. This reflects the inability of control devices to align the divergent objectives of the heterogeneous participants with those of the project. The participants' power strategies and tactics led to conflictual actions, the outcome of which was determined by the parties' relative power. Therefore the project coalitions portrayed features of a power model of organisation, or a political organisation (Pfeffer, 1981: 27-9; Mintzberg, 1991(d): 374). Thus this hypothesis is shown to be applicable to this project.

7.3 CONCLUSIONS AND RECOMMENDATIONS

This section concludes the investigation by discussing the research questions posed in Chapter 1, and further clustering the findings of the analysis into the four categories defined in Chapter 3, in order to reach generalisable conclusions with theoretical implications.

7.3.1 THE RESEARCH QUESTIONS

The discussion of the first research question, is based on the findings of the secondary questions 1, 2, 4, and 6 through to 13, discussed in the previous section.

1. Why do main contractors' interorganisational and interpersonal relations with M&E contractors in building project coalitions give rise to conflict between the two parties?

The main and M&E contractors' interorganisational and interpersonal relations are embedded in contractual and operational contexts that comprise conflictual processes, procedures and attitudes. The project environment creates economic and commercial power disparity between the parties to the exchange relation. The economically powerful party (the main contractor) promotes its interest at every stage of the negotiation process through imposition of onerous control mechanisms such as the payment system, legal sanctions, etc. The commercially powerful party (the M&E contractor) protects its interest and resists the former by limiting resources, putting in place a mechanism for renegotiation of the contractual terms and costs, etc. Thus the parties' exchange relations becomes political, underpinned by calculation, legal sanctions, domination and various degrees of capitulation.

Within the building project coalition, fragmentation of the information production process results in the division of responsibility between the professional interests of consultants and the commercial interests of M&E contractors. This division dilutes the parties' control over the others' functions and activities and, in the absence of adequate integrating mechanisms reconciling functional interdependencies, undermines the parties' commitment and propensity to co-operate. Thus cycles of power, resistance and conflict perpetuate through the on going negotiations.

The discussion of the second research question, is based on the findings of the secondary questions 3, 5 and 14 through to 24, discussed in the previous section.

2. How do main contractors' management processes facilitate or undermine their relations with M&E contractors?

Main contractors' management processes involve organisation of work, co-ordination and control of inputs, motivation of project participants, decision making and teamwork. All these processes include a degree of negotiations. These negotiations, based on the evidence of this investigation, tend to be distributive and are perceived by the M&E contractors to lead to unreasonable rewards in relation to the penalties, the performance levels required, and the M&E contractors' goal difficulty. They do not take account of the M&E contractors' needs and requirements and treat them unfairly. The decisions influencing M&E contractors' functions and activities are taken long before the contractors are engaged except for when the M&E contractor is involved in the design process, as was the case in the Cold Store project. No proactive method of team building seems to be engaged in by main contractors. Therefore main contractors' management processes tend to undermine their relations with M&E contractors.

3. **How do main contractors' management processes and interorganisational relations with M&E contractors affect the parties' productivity problems?**

The imposition by main contractors' management processes of a rigid framework on a fluid situation through the establishment and emphasis of precise procedures that link imprecise and vague functions and activities, restrain and stifle spontaneous and creative problems solving. It thus has a dampening effect on the performance of M&E contractors amongst other project participants. This fact, in conjunction with the resource limitations that the main and M&E contractors' interorganisational relations effect, adversely affect both the main and the M&E contractors' productivity.

7.3.2 CONCLUSIONS

The following thematic patterns emerge from the findings of the analysis and the discussion of the research questions.

Themes: The process of conflict

Conflict is the single, potentially most creative or destructive behavioural process that governs the nature and effectiveness of processes and procedures through which building products are conceptualised, conceived, designed and produced.

Conflict arises at the contractual and functional interfaces within these processes and procedures. On the one hand, it is the outcome of competition between economic power and professional/commercial knowledge. It represents 'the strategies of power of the participants in the site organisation seeking to maintain control over costs and profits' (Clegg, 1992: 139). On the other hand, it is the by product of the participants'

demotivation and indicates the failure of onerous control mechanisms as motivational strategies.

The processes and procedures constituting the contractual and interorganisational framework within which building production is organised, have a hierarchical configuration and therefore a vertical orientation. Those constituting the operational and interpersonal framework within which tasks are performed, have a sequential configuration and therefore a horizontal orientation. Conflict within the vertical and horizontal processes and procedures creates an adversarial web that engulfs the building production operations and dampens the performance of participant organisations' representatives.

Causes/explanations: Emergence of creative/dysfunctional conflict and its impact on performance

The processes and procedures constituting the conceptualisation, design and construction of building products are heterogeneous comprising disparate organisations transacting in a market based economic framework. The natural tendency of these organisations is to compete rather than co-operate. Competition is the means to their survival and prosperity often at the expense of others. Therefore the emergence of conflict within these processes is primarily linked to the economic and legal governance structures of exchange relations, the disaggregation of professional bodies and commercial associations, the behavioural theories of power, dependence, manipulation, and opportunism and the motivational theories of reward and punishment and job satisfaction.

The economic and legal governance structures in the wider business context of building production processes neither regulate nor legislate for the way exchange relations are to be governed in a fair, co-operative and non-confrontational manner. The absence of regulation and appropriate legislation combined with the market forces encourage the imposition of onerous business agreements by economically more powerful interests on those more dependent. However, in so far that the meaning of the terms and conditions of these agreements are imprecise and the functions and activities they describe are interdependent, they are open to opportunistic interpretation by both sides and cannot be enforced fully or effectively. Thus they reinforce conflictual behaviour.

The disaggregation of professional bodies and commercial associations perpetuate the divisions amongst the building project participants and their divergent perspectives, perceptions, values and beliefs. They thus contribute to a divisive culture both in the broader context of the construction industry and within building project coalitions. These divisions combined with the punitive orientation of rewards, the absence of incentives, poor or non-existent motivational strategies and ignorance of motivational theories form discordant attitudes amongst project participants. The absence of systematic procedures for selection of individuals assigned to projects in conjunction with their spatially, temporally, and functionally fragmented contribution to the project, increases their propensity for disagreements and confrontation.

Relationships among people: Management of conflict

The participants' interpersonal relationships are predominantly governed by the emergence, recurrence and escalation of conflict. Consequently, they are significantly influenced by the contractual framework, the coalition structure, and the intracoalition

politics, on the one hand; and the operational framework, the project environment, the coalition culture and the technologies used to produce, co-ordinate, integrate, and control information, on the other. Management processes have only a limited effect on the containment or resolution of interpersonal conflict because they cannot control or influence the root cause of conflict.

7.3.3 RECOMMENDATIONS

Emerging constructs

The concluding arguments to this investigation point to the need for some fundamental changes in both governance structures of building project coalitions as well as attitudes of project coalition representatives as the means by which productivity improvements may be carried out. Although such needs have already been identified to a degree and are currently being researched in the partnering and alliancing areas of knowledge, they are not taken to their logical extremes. The partnering and alliancing strategies tend to limit their process of relationship building to two or three key players in the project coalition. These strategies tend to be implemented in the context of team building workshops organised at the commencement of the project and are repeated a number of times during the project life cycle either as a matter of course or as the need for them arises.

A more fundamental approach to the integration of project participants and alignment of their interests and objectives with those of the project would require some degree of regulation and legislation. In the current low-trust business climate and low levels of propensity for trust-based business relationships, regulation and legislation are required to underpin the formation of lateral rather than vertical relations, across the entire supply chain, at the inception of the project. These relations would need to be supported by

incentive schemes that apportion both profits and risks equitably amongst all the project participants. Thus a fundamental culture change is anticipated across all sectors of the construction industry driven by legislation. Such changes are currently encouraged in some sectors such as social housing and the engineering process industry and are driven by the Housing Corporation and the ACTIVE initiative, respectively. The culture change is anticipated to permeate the building project coalitions through education and training of the new generation of professionals, and trades and crafts people, and re-education and retraining of the existing people.

REFERENCES

Abdel-Razek, R. and McCaffer, R. (1987) 'A Change in the UK Construction Industry Structure: Implications for Estimating', Construction Management and Economics, 5, pp. 227-242.

Bacharach, B. and Lawler, E.J. (1980) Power and Politics in Organisations: The Social Psychology of Conflict, Coalitions, and Bargaining, Jossey-Bass, London.

Bacharach, B. and Lawler, E.J. (1981) Bargaining: Power, Tactics, and Outcomes, Josey-Bass Publishers, London.

Bachmann, R. (1998) 'Trust- conceptual aspects of a complex phenomenon', in Lane, C. and Bachmann, R. (eds.), Trust within and between organisations: Conceptual issues and empirical applications, Oxford University Press, New York.

Baden Hellard, R. (1988) Managing construction conflict, Longman Group UK Ltd, Harlow.

Baden Hellard, R. (1992) 'Construction conflict', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Ball, M. (1988) Rebuilding Construction: Economic Change in the British Construction Industry, Routledge, London.

Banwell Report (Ministry of Public Buildings and Works) (1964) The Placing and Management of Contracts for Building and Civil Engineering Work, HMSO, London.

Barlow, J., Cohen, M., Jashapara, A. and Simpson, Y. (1997) Towards positive partnering - Revealing the realities in the construction industry, The Policy Press, Bristol.

Beardsworth, A.D., Keil, E.T., Bresnen, M, Bryman, A. (1988) 'Management, Transience and Subcontracting: The Case of the Construction Site', Journal of Management Studies, 25:6, 603-25).

Bell, J. (1987) Doing your research project: A Guide for First Time Researchers in Education and Social Science, Open University Press, Milton Keynes.

Bennett, J. and Ferry, D. (1990) 'Specialist contractors: A review of issues raised by their new role in building', Construction Management and Economics, 8, pp. 259-283.

Bennett, J., Flanagan, R. and Norman, G. (1987) Capital & Counties Report: Japanese Construction Industry, Centre for Strategic Studies in Construction, Reading.

Benson, J.K. (1983) 'Paradigm and praxis in organisational analysis' in Research in organisational behaviour, JAI Press Inc., London.

Bresnen, M. (1988) 'Insights on site: Research into construction project organisations', Bryman (ed.), Doing research in organisations, Routledge, London.

Bresnen, M.J., Wray, K., Bryman, A., Beardsworth, A.D., Ford, J.R. and Keil, E.T. (1985) 'The Flexibility of Recruitment in the Construction Industry: Formalisation or Re-casualisation', Sociology, Volume 19, No. 1, pp. 108-124.

Bryman, A. 'Introdution: 'Inside' accounts and social research in organisations', in Bryman (ed.), Doing research in organisations, Routledge, London.

Bryman, A., Bresnen, M., Beardsworth, A.D., Ford, J., Keil, E.T. (1987) 'The Concept of the Temporary System: The Case of the Construction Project', Research in the Sociology of Organisations, Vol. 5, pp. 253-83.

Buchanan, D., Boddy, D. and McCalman, J. (1988) 'Getting in, getting on, getting out, and getting back', in Bryman (ed.), Doing research in organisations, Routledge, London.

Chaillou, B. (1977) 'Definition et typologie de la sous-traitance', Revue Economique 28, pp. 262-285.

Cherns, A.B. and Bryant, D.T. (1984) 'Studying the client's role in construction management', Construction management and economics, 2, pp. 177-184.

Child, J. (1998) 'Trust and international strategic alliances: The case of Sino-foreign joint ventures', in Lane, C. and Bachmann, R. (eds.), Trust within and between organisations: Conceptual issues and empirical applications, Oxford University Press, New York.

Clegg, S.R. (1989) Frameworks of power, Sage Publications, London.

Clegg, S.R. (1992) 'Contracts cause conflicts', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Colledge, B. (1992) 'Construction contracts: towards a new relationship', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Creswell, J.W. (1994) Research design: Quantitative and qualitative approaches, Sage Publications, London.

Crompton, R. and Jones, G. (1988) 'Researching white collar organisations: Why sociologists should not stop doing case studies', in Bryman (ed.), Doing research in organisations, Routledge, London.

Dagupta, P. (1988) 'Trust as commodity', in Gambetta, D. (ed.), Trust: Making and breaking cooperative relations, Blackwell, Oxford.

Deakin, S., Lane, C. and Wilkinson, F. (1994) ''Trust' or Law? Towards an integrated theory of contractual relations between firms', Journal of law and Society, Volume 21, Number 3, September, pp. 329-349.

Deakin, S. and Wilkinson, F. (1998) 'Contract law and the economics of interorganisational trust', in Lane, C. and Bachmann, R. (eds.), Trust within and between organisations: Conceptual issues and empirical applications, Oxford University Press, New York.

Deal, T. and Kennedy, A. (1988) Corporate cultures: the rites and rituals of corporate life, Penguin Books, UK.

Dodd, J. and Langford, D.A. (1990) 'Construction management on one large project in London", Construction Management and Economics, 8, pp. 385-398.

Druker, J. and Macallan, H. (1995) "Power and persuasion: The management of inter-organisational relationships", British Academy of Management Annual Conference.

Druker, J. and White, G. (1996) Managing People in Construction, Institute of Personnel and Development, London.

Easterby-Smith, M., Thorpe, R. and Lowe, A. (1991) Management research: An introduction, Sage Publications, London.

Eccles, R.G. (1981) 'Bureaucratic Versus Craft Administration: The Relationship of Market Structure to the Construction Firm', Administrative Science Quarterly, No. 26, pp. 449-469.

Edwards, C.T. and Samimi, R. (1997) 'Japanese interfirm networks: exploring the seminal sources of their success', Journal of Management Studies, 34, 4 July, pp. 399-510.

Emmerson, R.M. (1962) Power-dependence relations, American Sociological Review, 27, pp. 31-41.

Fellows, R. (1992) 'Karming conflict', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Fells, R.E. (1993) 'Developing trust in negotiation', Employee Relations, Vol. 15, No. 1, pp. 33-45.

Fenn, P. and Gameson, R. (1992) Construction conflict management and resolution, E & FN Spon, London.

Fox, A. (1974) Beyond contract: Work, power and trust relations, Faber and Faber Ltd. London.

Friedman, A.L. (1977) Industry and labour: Class struggle at work and monopoly capitalism, the Macmillan Press Ltd, London.

Fukuyama, F. (1995) Trust: The social virtues and the creation of prosperity, Free Press, USA.

Gambetta, D. (1988) 'Can we trust trust?', in Gambetta, D. (ed.), Trust: Making and breaking cooperative relations, Blackwell, Oxford.

Gardiner, P.D. and Simmons, J.E.L. (1992) 'The relationship between conflict, change and project management strategy', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Glaser, B.G. and Strauss, A.L. (1967) The discovery of grounded theory: Strategies for qualitative research, Aldine de Gruyter, New York.

Good, D. (1988) 'Individuals, interpersonal relations, and trust', in in Gambetta, D. (ed.), Trust: Making and breaking cooperative relations, Blackwell, Oxford.

Gray, C. and Flanagan, R. (1989) The changing role of specialist and trade contractors, CIOB, Ascot

Grout, (1991) 'Battle Front', New Builder, 21 November, pp. 26-7.

Guirdham, M. (1990) Interpersonal Skills at Work, Prentice Hall, London.

Handy, C. (1976/1993) Understanding Organisations, Penguin Books, London.

Hardy, C. and Clegg, S. R. (1996) 'Some Dare Call it Power', in Clegg, S.R., Hardy, C. and Nord, W.R., Handbook of Organisation Studies, Sage Publications Ltd, London.

Hardy, C., Phillips, N. and Lawrence, T. (1998) 'Distinguishing trust and power in interorganisational relations: Forms and facades of trust', in Lane, C. and Bachmann, R. (eds.), Trust within and between organisations: Conceptual issues and empirical applications, Oxford University Press, New York.

Harrigan, K.R. and Newman, W.H. (1990) 'Bases of interorganisational co-operation: propensity, power, resistance', Journal of Management Studies, 27:4, July, pp. 417-434.

Haughton, E. (1994) Just good friends, Computing, 10 November, pp. 36-37.

Henderson, B. (1991) 'Competitive maneuvring', in Mintzberg, H. and Quinn, J.B. (eds.) The strategy Process, Prentice Hall International, USA.

Hillebrandt, P.M. and Cannon, J. (1990) The modern construction firm, Macmillan, London

Hindess, B. (1982) 'Power, interests and the outcomes of struggles', Sociology, 16, 4.

Hindess, B. (1986) 'Discourse, interests and subjects: 'interests' in political analysis', in Law, J. (ed.), Power, action and belief: A new sociology of knowledge, Routledge & Kegan, Paul plc, London.

Howell , G., Miles, R., Fehlig, C. and Ballard, G. (1996) 'Beyond partnering: toward a new approach to project management?', Proceedings of the Fourth Annual Conference of the International Group for Lean Construction, University of Birmingham.

Jacobson, W.D. (1972) Power and interpersonal relations, Wadsworth Publishing Company, Belmont, California.

Jankowicz, A.D. (1995) Business research projects, International Thomson business press, London.

Johnson, G. and Scholes, K. (1989) Exploring corporate strategy: text and cases, Prentice Hall, London.

Johnston, R. and Lawrence, P.R. (1988) 'Beyond vertical integration - The rise of the value-adding partnership', Harvard Business Review, July-August, pp. 94-101.

Kanter, R.M. (1989) When giants learn to dance: Mastering the Challenges of Strategy, Management, and Careers in the 1990s, International Thomson Business Press, Boston.

Kelman, H.C. (1972) 'Further thoughts on the processes of compliance, identification, and internalisation', in Tedeschi, J.T. (ed.), Perspectives on social power, Aldine Publishing Company, Chicago.

Kramer, R.M. and Tyler, T.R. (1996), Trust in Organisations: Frontiers of Theory and Research, Sage Publications, London.

Lane, C. (1998) 'Theories and issues in the study of trust', in Lane, C. and Bachmann, R. (eds.), Trust within and between organisations: Conceptual issues and empirical applications, Oxford University Press, New York.

Lane, C. and Bachmann, R. (1996), 'The Social Constitution of Trust: Supplier Relations in Britain and Germany', Organisation Studies, 17/3, PP. 365-395.

Lane, C. and Bachmann, R. (1998), Trust within and between organisations, Oxford University Press, New York.

Langford, D.A., Kennedy, P. and Smmerville, J. (1992) 'Contingency management of conflict', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Lansley, P. (1987) 'Corporate strategy and survival in the UK construction industry', Construction Management and Economics, 5, 141-155.

Latham, M. (1994) Constructing the team, final review of the government/industry review of procurement and contractual arrangements in the UK construction industry, HMSO, London.

Lavers, A. (1992) 'Construction conflict: management and resolution - analysis and solutions', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Legge, K. (1995) HRM: Rhetoric and Realities, Macmillan Business, London.

Lewis, J., Cheetham, D.W. and Carter, D.J. (1992) 'Avoiding conflict by risk management - the role of the client's project manager', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Liu, A.M.M. and Walker, A. (1998) 'Evaluation of project outcomes', Construction Management and Economics, 16, 209-219.

Loosemore, M. (1999) 'Bargaining tactics in construction disputes', Construction Management and Economics, 17, pp. 177-188.

Lorenz, E.H. (1988) 'Neither friends nor strangers: Informal networks of subcontracting in French industry', in Gambetta, D. (ed.), Trust: Making and breaking cooperative relations, Blackwell, Oxford.

Lukes, S. (1974) Power: A radical view, Macmillan, London.

Lynton (1993) The UK construction challange, Lynton Plc, London.

Marsden, D. (1998) 'Understanding the role of interfirm institutions in sustaining trust within the employment relationship', in Lane, C. and Bachmann, R. (eds.), Trust within and between organisations: Conceptual issues and empirical applications, Oxford University Press, New York.

Marshall, N. and Bresnen, M. (1998) 'Building trust? Shifting contours of power and control in the UK construction industry', Paper prepared for Sub-theme 13 'Trust and control in organisational relations' of the 14th EGOS Colloquium 'Stretching the boundaries of organisational studies into the next millennium', Faculty of Economics and Business Administration, Maastricht University, Maastricht, 9-11 July 1998.

Marshall, C. and Rossman G.B. (1995) Designing qualitative research, Sage Publications, London.

Masterman, J.W.E. (1992) An Introduction to Building Procurement Systems, E&FN Spon, London.

Meek, V.L. (1988) 'Organisational culture: origins and weaknesses', Organisational Studies, 9(4), pp. 453-73.

Miles, M.B. and Huberman, A.M. (1994) Qualitative data analysis, Sage Publications, London.

Miles, R.E. and Snow, C.C. (1986) 'Organisations: New Concepts for New Forms', California Management Review, Vol. XXVIII, No. 3, Spring, pp. 62-73.

Mintzberg, H. (1991(a)) 'Who should control the corporation?', in Mintzberg, H. and Quinn, J.B. (eds.), The strategy process, Prentice Hall International, USA.

Mintzberg, H. (1991(b)) 'Politics and the political organisation', in Mintzberg, H. and Quinn, J.B. (eds.), The strategy process, Prentice Hall International, USA.

Mintzberg, H. (1991(c)) 'The structuring of organisations', in Mintzberg, H. and Quinn, J.B. (eds.), The strategy process, Prentice Hall International, USA.

Mintzberg, H. (1991(d)) 'Politics and the political organisation', in Mintzberg, H. and Quinn, J.B. (eds.), The strategy process, Prentice Hall International, USA.

Morgan, G. (1997) Images of Organisation, Sage, London.

Mullins, L.J. (1993) Management and Organisational Behaviour, Pitman Publishing, London.

NEDO (1970) Large industrial sites, HMSO, London.

NEDO (1983) Faster Building for Industry, HMSO, London.

NEDO (1988) Faster Building for Commerce, HMSO, London.

NEDO (1991) Partnering: contract withough conflict, NEDO, London.

O'Reilly, C.A. (1991) 'Organisational behaviour: Where we've been, where we're going', Annual Review Psychology, 42, pp. 427-58.

Ouchi, W.G. (1980) 'Markets, Bureaucracies, and Clans', Administrative Science Quarterly, Vol. 25, March, pp. 129-141.

Ouchi, W. (1981) Theory Z - How American business can meet the Japanese challange, Addison-Wesley Publishing Company, USA.

Pfeffer, J. (1981) Power in organisations, Ballinger Publishing Company, Cambridge, Massachusetts.

Pfeffer, J. (1991) 'The influential function of management', in Mintzberg, H. and Quinn J.B. (eds.), The strategy process, Prentice Hall International, USA.

Pfeffer, J. (1992) Managing with Power: Politics and Influence in Organisations, Harvard Business School Press, Boston.

Pfeffer, J. and Salancik, G.R. (1978) The external control of organisations: A resource dependence perspective, Harper and Row, New York.

Porter, M.E., (1990) The Competitive Advantage of Nations, The Macmillan Press Ltd, London.

Powell, W.W., (1990) 'Neither Market Nor Hierarchy', in Research in Organisational Behaviour, Vol. 12, pp. 295-336.

Powell, W.W., (1996) 'Trust-Based forms of Governance', in Kramer, R.M. and Tyler, T.R. (eds.), Trust in Organisations: Frontiers of Theory and Research, Sage Publications, London.

Rainnie, A., (1993) 'The Reorganisation of Large Firm, Subcontracting: Myth and Reality', Capital and Class, 49, pp. 53-75.

Raven, B.H. (1972) 'The comparative analysis of power and power preference', in Tedeschi, J.T. (ed.), Perspectives on social power, Aldine Publishing Company, Chicago.

Riker, W.H. (1974) 'The nature of trust', in Tedeschi, J.T. (ed.), Perspectives on social power, Aldine Publishing Company, Chicago.

Sako, M. (1998) 'Does trust improve business performance?', in Lane, C. and Bachmann, R. (eds.), Trust within and between organisations: Conceptual issues and empirical applications, Oxford University Press, New York.

Schein, E.H. (1992) Organisational culture and leadership, Jossey-Bass Publishers, USA.

Schein, E.H. (1994) 'Innovative cultures and organisations', in Allen, T.J. and Scott Morton, M.S. (eds.), Information technology and the corporation of the 1990s, Oxford University Press, Oxford.

Shammas-Toma, M., Seymour, D. and Clark L. (1998) 'Obstacles to implementing total quality management in the UK construction industry', Construction Management and Economics, 16, pp. 1771-192.

Sidwell, A.C. (1990) 'Project management: dynamics and performance', Construction Management and Economics, 8, pp. 159-178.

Smith, M.C.G. (1992) 'Facing up to conflict in construction', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Stake, R.E. (1995) The art of case study, Sage Publications, London.

Staw, B.M. (1984) 'Organisational behaviour: A review and reformulation of the field's outcome variables', Annual Review Psychology, 35, pp. 627-66.

Stephenson, R.J. (1996) Project partnering for the design and construction industry,

Sydow, J (1998) 'Understanding the constitution of interorganisational trust', in Lane, C. and Bachmann, R. (eds.), Trust within and between organisations: Conceptual issues and empirical applications, Oxford University Press, New York.

Tavistock Institute (1965) Communications in the building industry, London.

Tavistock Institute (1966) Interdependence and uncertainty: A study of the building industry, London.

Thoburn, J.T. and Takashima, M. (1992) Industrial Subcontracting in the UK and Japan, Avebury, Aldershot, England.

Turner-Wright, P. (1992) 'Construction management integration: an anlysis of the degree of integration between construction professionals and project performance', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Tyler, T.R. and Kramer, R.M. (1996), 'Whither trust?', in Kramer, R.M. and Tyler, T.R. (eds.), Trust in Organisations: Frontiers of Theory and Research, Sage Publications, London.

Williamson, O.E. (1993) 'Calculativeness, Trust, and Economic Organisation', Journal of Law and Economics, Vol. XXXVI, April, pp. 453-486.

Winch, G.M. (1989) 'The Construction Firm and the Construction Project', Construction Management and Economics, Vol. 7.

Winch, G.M. (1994) 'Notes and issues - The search for flexibility: the case of the construction industry', Work, Employment & Society, Vol. 8, No. 4, pp. 593-606.

Winch, G.M., Usmani, A., and Edkins, A. (1996(a)) 'Towards Total Project Quality: A Gap Analysis Approach', Bartlett School of Graduate Studies Paper.

Winch, G.M. (1996(b)) 'The Contracting System in British Construction: The Rigidities of Flexibility', Le Groupe Bagnolet, Working Paper No. 6.

Winch, G.M. (1996(c)) 'Thirty Years of Project Management, What Have We learned?', Paper presented at British Academy of management, Aston.
Yin, R.K. (1994) Case study research: Design and methods, Sage Publications, London.

Zikmann, R.V. (1992) 'Successful conflict management', in Fenn, P. and Gameson, R. (eds.), Construction conflict management and resolution, E & FN Spon, London.

Zuboff, S. (1988) In the age of the smart machine, Basic Books, New York.

BIBLIOGRAPHY

Bobroff, J. (1992) 'A New Approach to Quality Construction in France', Proceedings of the Bartlett International Summer School on the Production of the Built Environment, Vol. 12, pp. 176-186.

Booher, D. (1988) 'Quality or Quantity Communication', Quality Progress, June, pp. 65-68.

Clarke, L. (1992) Building Capitalism: Historical Change and the Labour Process in the Production of the Built Environment, Routledge, London.

Druker, J. (1993) 'Self-employment, Collective Bargaining and Work Organisation in the Construction Industry in Britain', Proceedings of the Bartlett International Summer School on the Production of the Built Environment, Vol. 14, pp. 84-93.

Druker, J. (1994) '"Someone Else's Problem": Sub-contracting and Change in Industrial Relations Management in the Construction Industry', Paper Submitted at Buira Conference, Worcester College, Oxford.

Druker, J and White, G. (1996) Managing People in Construction, Institute of Personnel and Development, London.

Galbraith, J.R. (1991) 'Strategy and organisation planning', in Mintzberg, H. and Quinn, J.B. (eds.), The strategy process, concepts, contexts, cases, Prentice-Hall UK Ltd, London

Hague, D.J. (1985) 'Incentives and Motivation in the Construction Industry: A Critique', Construction Management and Economics, 3, 163-170.

Handy, C. (1976/1993) Understanding Organisations, Penguin Books, London.

Lansley, P.R. (1994) 'Analysing Construction Organisations', Construction Management and Economics, 12, pp. 337-348.

Lorsch, J.W. and Mathias, P.F. (1987) 'When Professionals have to manage', Harvard Business Review, July-August, pp. 78-83.

Loveridge, J.M. (1992) 'Quality Assurance at East India Dock', Quality Forum, Vol. 18, No. 1, pp. 17-20.

Lowe, J.G. (1987) The measurement of Productivity in the Construction Industry', Construction Management and Economics, 5, 101-113.

Mitchel, J.C. (1983) 'Case and Situation Analysis', Sociological Review, No. 31, pp. 187-211.

Olomolaiye, P.O. (1990), 'An Evaluation of the Relationships between Bricklayers' Motivation and Productivity', Construction Management and Economics, 8, 301-313.

Piore, M.J. and Sabel, C.F. (1984) The Second Industrial Divide: Possibilities for Prosperity, Basic Books, USA.

Rubery, J. and Wilkinson, F. (1994) Employer Strategy and the Labour Market, Oxford University Press, Oxford.

Steiger, T.L. and Form, W. (1991) 'The Labour Process in Construction: Control Without Bureaucratic and Technological Means', Work and Occupations, Vol. 18, No. 3, August, pp. 251-270.

Storey, J. (1992) Developments in the management of human resources, Blackwell, London.

Tyler, A.H. and Frost, D.T. (1993) 'Implementation of a Construction Industry Quality Assurance System', International Journal of Quality and Reliability Management, Vol. 10, No. 4, pp. 9-18.

Walker, R. (1985) Applied qualitative Research, Gower, London.

Williamson, O.E. (1985) The Economic Institutions of Capitalism: firms, markets, relational contracting, Free Press, New York.

Winch, G.M. (1994) 'The Search For Flexibility: The Construction Industry', Work Employment and Society, 8(4), December, pp. 593-606.

APPENDIX: INTERVIEW QUESTIONNAIRES

CASE STUDY 1: THE COLD STORE

CONVERSATION WITH CONTRACTOR'S IN-HOUSE M&E ENGINEER (4.5.95)

1. **What do you base your subcontractors' selection procedure on?**
2. **What criteria do you use in formulating the terms of appointment of your subcontractors?**

QUESTIONNAIRE 1: INTERVIEW WITH CLIENT'S M&E CONSULTANT (14.6.95)

1. Why was there a joint venture between the project Financiers and the building Operators?
2. How was the joint venture established? What are the financial arrangements?
3. What is the project history? How was it conceived?
4. Is there a long-term relationship between the client and their architect?
5. When was planning approval granted?
6. Who selected the procurement method? Why?
7. Do you think that D&B was an appropriate method of procurement for this project?
8. Why do you, rather than the architect, act as the client's agent?
9. Who recommended you to the client?
10. Did you have to submit a competitive tender for your fees or did you negotiate them?
11. What do you think was the basis for your selection?
12. What were the M&E design requirements?

13. What are your roles and responsibilities?

14. What is your design input?

15. What is the extent/scope of your design responsibility and liability?

16. What is your personal role and responsibility?

17. Was your engagement based on standard conditions of appointment? Were these altered in any way?

18. Who recommended and selected the client's other consultants? Why?

19. What are the roles and responsibilities of the client's other consultants?

20. Why were they not novated to the D&B contractor?

21. Did you have an input into the nomination of the M&E contractors? What was the basis for your nomination?

22. How do you interface with and communicate to other consultants?

23. How different is your design input under a Design and Build method compared to your normal practice?

24. Was your detail design, if any, carried out prior to the M&E work stage/letting of the M&E work package?

25. Did you liaise with the M&E contractor at the design stage?

26. Do you communicate with the M&E contractor at the construction stage?

27. Did you agree to a design programme?

28. What was the basis upon which the contractor was invited to tender?

29. What were the criteria upon which the Main Contractor was selected?

30. What is the contractor's architects' design input?

31. At what stage did the structural design alterations take place?

QUESTIONNAIRE 2: INTERVIEW WITH M&E CONTRACTOR (6.7.95)

1. Were you invited to tender? By whom? Why?

2. What did the tendering process entail?

- What information did the tender documents contain?
- What information were you reqired to supply?
- How long was the tendering period?
- Did you know how many people you were competing against?
- How long after the submission of tender were you selected?

3. What was you lead-in period?

4. What do you think was the basis for you selection?

5. Did you have to negotiate your price after selection?

6. What is the form of contract between you and the Main Contractor?

7. Is it a standard form or has it been altered?

8. Were there any onerous conditions imposed by the contractual terms?

9. What are your conditions of engagement?

10. Are you required to provide any Collateral Warranties/Performance bonds to the client?

11. What do you base your tender prices on?

12. What are your (the firm's) role and responsibilities?

13. What is the extent/scope of your design responsibility and liability?

14. Do you liaise with suppliers and manufacturers in the production of your design?

15. What are your personal role and responsibilities?

16. What are the role and responsibilities of Ian?

17. How many subcontractors are involved with your work package?

18. How do you select and engage them?

19. Who selects them?

20. What is the relationship between you and the subcontractors? Are they engaged as specialists or employed as domestic subcontractors?

21. What is the form of contract between you and your subcontractors?

22. Do you use standard forms or do you alter them?

23. Do you impose onerous conditions on your subcontractors?

24. What are your subcontractors' conditions of engagement?

25. Do you require them to provide Collateral Warranties/Performance Bonds?

26. How do you manage your subcontractors?

27. How do you ensure that they are:

- motivated;
- working as a team, that is,carrying out their roles and responsibilities,
  interfacing effectuively with other trades,
  having reasonable social relations with other trades; and
- performing, that is, capable of carrying out their task,
  productive,
  satisfactory in terms of workmanship, and
  observing the health and safety regulations?

28. How many operatives does each subcontractor employ?

29. Who manages the operatives?

30. How do you manage the work package in terms of:

- information flow;
- communication channels; and
- decision-making?

QUESTIONNAIRE 3: INTERVIEW WITH THE PROJECT MANAGER [compiled through informal conversations] (6 and 20 July 95)

1. Why do you think you were invited to tender?

2. What did the tendering process entail?

- What information did the tender documents contain?
- How long was the tendering period?
- Did you know how many people you were competing against?
- What information were you required to supply?
- Who prepared the tender documents?
- How long after the submission of tender were you selected?

3. What do you think was the basis for your selection?

4. Did you have to negotiate your price after selection?

5. What is the form of contract between you and the client?

6. Is it a standard form of has it been altered?

7. Are there any onerous conditions imposed by the contractual terms?

8. What are the conditions of your engagement?

9. Are you providing any Collateral Warranties/Performance Bonds to the client?

10. What was your lead-in period?

11. What are your role and responsibilities?

12. What are your design responsibilities and liabilities?

13. Were you, as a Design and Build contractor, involved in formulating the client's requirements?

14. Is there a hierarchy within the design team?

15. What are your personal role and responsibilities?

16. Who organised the construction process in terms of breaking it down into work packages and inviting tenders for each work package?

17. Who prepared the tender documents for the work packages?

18. Did you select all the trade/specialist contractors?

19. What is the relationship between your firm and the various trade contractors; are the latter engaged as specialist contractors or employed as domestic subcontractors?

20. How do you manage your trade contractors?

21. How do you ensure that they are:

- motivated;
- working as a team, i.e., carrying out their roles and responsibilities, interfacing effectively with one another, having reasonable social relations, and
- performing, i.e., capable of carrying out their task, productive, satisfactory in terms of workmanship, and observing the Health and Safety Regulations?

22. Who manages the trade/specialist contractors' subcontractors?

23. How did you select the M&E Contractor?

- How many were included on the tender list and on what basis?
- Who prepared the tender documents?
- How long was the tender period?

24. Did you negotiate their price?

25. What is the form of contract between you and the M&E Contractor?

26. Is it a standard form or has it been altered?

27. Are there any onerous conditions imposed by the contractual terms, in terms of payment, say?

28. What are the M&E Contractor's conditions of engagement?

29. Are they required to provide any Collateral Warranties/Performance Bonds to the client?

30. How has/is the project been/being managed in terms of:

- information flow at design stage;
- information flow at construction stage;
- communication channels at design stage;
- communication channels at construction stage;
- decision-making processes at design stage; and
- decision-making processes at construction stage?

QUESTIONNAIRE 4: MAIN CONTRACTOR'S PERFORMANCE (MC'S VIEW) (23.7.96)

Contract

1. What were your conditions of appointment as set out in your letter of intent?
2. Where there any adverse consequences to working on the basis of a letter of intent rather than a form of contract?

Project Planning

3. How did you plan against risks/to cope with uncertainties?
4. What were your aims/objectives?
5. What were your goals and targets and how did you establish them?

Project Organisation

6. How long have you known/worked with your design team members?

7. What were their conditions of appointment?

8. To what extent did the building design change throughout the contract, and Why?

Project Execution

9. How many construction stages/work packages did construction process comprise?

10. Did you know/had you worked with any of the Trade Contractors before?

11. To what extent did the building construction vary throughout the contract, Why?

Project Management

12. How did you manage risks and uncertainties throughout the contract?

13. How did your goals and targets shift and why?

14. How does the final cost of the building compare to the initial/tender cost? What are variations attributable to?

15. What problems did you experience with management of design process?

16. What problems, did you experience with management of construction process?

17. How could your organisation/management have improved?

18. How effective or instrumental was the Safety Plan in preventing accidents?

QUESTIONNAIRE 5: SERVICES CONTRACTOR'S PERFORMANCE (MC'S VIEW)

Contract

1. What were the Services Contractor's conditions of appointment as set out in their letter of intent?

2. Where there any adverse consequences to working on the basis of a letter of intent rather than a form of contract?

Planning of Services Works Package

3. Did the Services Contractor plan against risks/to cope with uncertainties?
4. Do you know what their aims/objectives were?
5. What were their Programme of works?

Organisation of Services Works Package

6. How was the services works package organised?
7. What was the Programme for various stages of Services Works Package?
8. To what extent did the services design change throughout the contract, and Why?

Execution of Services Works Package

9. Are you aware of the nature of relationship between Services Contractor and their sub-contractors?
10. To what extent did the services supply vary throughout the contract, Why?

Management of Services Works Package

11. How did Services Contractor manage risks and uncertainties during the contract?
12. How did their goals and targets shift and why?
13. How does the final cost of Services Works Package compare to the initial cost? What are variations attributable to?
14. What problems, if any, did they experience with management of Services design?
15. What problems, if any, did they experience with management of services supply?

16. How could their organisation/management have improved?

17. How effective or instrumental was the Safety Plan in preventing accidents?

Quality of Services System Delivered

19. What was the outcome of the commissioning process?

20. Does the facility meet the performance criteria specified by Client's Services Consultant?

21. Is the Operator satisfied with the facility?

22. What does the Services Contractor's Warranty to the Client contain?

23. How could the Services Contractor's performance improve in terms of quality of the services system delivered?

CASE STUDY 2: THE CULTURAL CENTRE

QUESTIONNAIRE 1: INTERVIEW WITH THE DESIGN CO-ORDINATOR (22 MAY 1995)

Phase 1

1. How many floors did phase 1 contain? Was it completed on time?

2. What was the contract value?

3. Where did the main contractor fit in the project organisation?

4. Why was he engaged?

5. What was Japan Construction's role in phase 1?

Phase 2

6. What is the contract value?

7. Why did the client choose the turnkey method of procurement?

8. Who is/are the clients agent/s?

9. How many work packages does phase two contain?

10. What is the role and responsibilities of the in-house design team?

11. What is the role and responsibilities of the external architects?

12. Why did the external architects contact Japan Construction?

13. Do Japan Construction have a long-standing relationship with the Japanese client?

14. Why did Japcol agree to finance the project?

15. Why did financial arrangements inhibit the engagement of external architects by the client?

16. What were the bases upon which the architect selected the consultants?

17. Why is there no Bill of Quantities?

18. What do you mean by 'labour return' required with a breakdown of prelims?

19. Were all the consultants appointed at the same time?

20. How many construction stages are involved in phase 2? Do they correspond to work packages?

21. How many stages have been completed?

QUESTIONNAIRE 2: INTERVIEW WITH ARCHITECTS (26 MAY 1995)

Phase 1

1. Why was there a joint venture between the English and the Japanese clients in phase 1?

2. Was there a main contractor engaged in phase 1?

Phase 2

3. What is the nature of the Japanese client? Are they a financial institution?
4. What are the financial arrangements?
5. Who owns the land on which the cultural centre is being constructed?
6. What is the history of the project? How was it conceived?
7. Which one of the clients chose the Turnkey method of procurement and why?
8. What is the extent/scope of your design responsibility and liability?
9. What are your (you and Martin's) roles and responsibilities?
10. Were the RIBA Conditions of Appointment used? Have these been altered in any way?
11. What is your design input in terms of M&E services?
12. Did you recommend all the consultants - structural, M&E, audio-visual and acoustic - used? Why?
13. How do you interface with and communicate to other consultants?
14. How different is your design input under a Turnkey method compared to your normal practice?
15. Have you been involved with Turnkey contracts before? Will you get involved with this method of procurement again?
16. Is your detail design carried out in accordance with and prior to work packages?
17. Did you agree to a design programme? Why are you behind?

QUESTIONNAIRE 3: INTERVIEW WITH M&E CONSULTANTS (30.5.95)

Phase 1

1. Were you engaged on phase 1?
2. Who selected you?

3. Did you have to submit a competitive tender for your fees or did you negotiate them?
4. What do you think was the basis for your selection?
5. What were your roles and responsibilities?
6. What was your design input?

Phase 2

7. Do the above criteria apply to phase 2?
8. What is the extent/scope of your design responsibility and liability?
9. What are your (you and Richard's) roles and responsibilities?
10. Was your engagement based on standard conditions of appointment? Have these been altered in any way?
11. Did you have an input into the selection of the Audio/Visual consultant?
12. I was told that you nominated one of the M&E contractors for phase 2. What was the basis for your nomination?
13. How do you interface with and communicate to other consultants?
14. How different is your design input under a Turnkey method compared to your normal practice?
15. Have you been involved with Turnkey contracts before? Will you get involved with this method of procurement again?
16. Is your detail design carried out prior to the M&E work stage/letting of the M&E work package?
17. Do you liaise with the M&E contractor at the design stage?
18. Do you communicate with the M&E contractor at the construction stage?
19. Did you agree to a design programme?

QUESTIONNAIRE 4: INTERVIEW WITH THE PROJECT MANAGER (7.7.95)

Phase 1

1. What was the contract value on phase 1?
2. Was it exceeded? Why?
3. Why was the completion of this phase late?

Phase 2

4. In view of the fact that Japan Construction initiated the project, did the firm have to submit a tender for the works or was the contract sum negotiated?
5. If the firm tendered, who prepared the tender documents? How long was the tender period?
6. What is the form of contract used between Japan Construction and the client?
7. Is it a standard form or has it been altered?
8. Are there any onerous conditions imposed by the contractual terms?
9. What are Japan Construction's conditions of engagement?
10. Is Japan Construction providing Collateral Warranties/Performance Bonds to client?
11. What are Japan Construction's roles and responsibilities?
12. What are Japan Construction's design responsibilities and liabilities?
13. Were you, as a Design and Build contractor, involved in formulating the client's requirements?
14. Is there a hierarchy within the design team?
15. What are your personal role and responsibilities?
16. Who organised the construction process in terms of breaking it down into work packages and inviting tenders for each work package?
17. Who prepared the tender documents for the work packages?
18. Did you select all the trade/specialist contractors?

19. What is the relationship between Japan Construction and various trade contractors; are the latter engaged as specialists or employed as domestic subcontractors?

20. How do you manage your trade contractors?

21. How do you ensure that they are:

- motivated;
- working as a team, that is,carrying out their roles and responsibilities, interfacing effectively with one another, having reasonable social relations; and
- performing, that is, capable of carrying out their task, productive, satisfactory in terms of workmanship, and observing the health and safety regulations?

22. Who manages the trade/specialist contractors' subcontractors?

23. How did you select the M&E Contractor?

- How many were included on the tender list and on what basis?
- Who prepared the tender documents?
- How long was the tender period?

24. What was the basis upon which you selected the current M&E Contractor bearing in mind that their performance on the previous phase had not been satisfactory?

25. Did you negotiate his price?

26. What is the form of contract between Japan Construction and the M&E Contractor?

27. Is it a standard form or has it been altered?

28. Are there any onerous conditions imposed by the contractual terms?

29. What are the M&E Contractor's conditions of engagement?

30. Are they required to provide any Collateral Warranties/Performance Bonds to the client?

31. How has the project been managed in terms of:

- information flow at design stage;
- information flow at construction stage;
- communication channels at design stage;
- communication channels at construction stage;
- decision-making processes at design stage; and
- decision making processes at construction stage?

32. What, if anything, is particularly Japanese about the management of this project?

QUESTIONNAIRE 5: INTERVIEW WITH THE M&E CONTRACTOR (11.7.95)

Phase 2

1. Why do you think you were invited to tender?

2. What did the tendering process entail?

- What information did the tender documents contain?
- How long was the tendering period?
- Did you know how many people you were competing against?
- What information were you required to supply?
- How long after the submission of tender were you selected?

3. What was your lead-in period?

4. What do you think was the basis for your selection?

5. Did you have to negotiate your price after selection?

6. What is the form of contract between you and the contractor?

7. Is it a standard form or was it altered?

8. Are there any onerous conditions imposed by the contractual terms?

9. What are your conditions of engagement?

10. Were you required to provide any Collateral Warranties/Performance Bonds to the client?

11. What do you base your tender prices on?

12. What are your role and responsibilities?

13. What is the extent/scope of your design responsibility and liability?

14. Do you liaise with suppliers and manufacturers in the production of your design?

15. What are your personal role and responsibilities?

16. How many subcontractors are involved with your work package?

17. How do you select and engage them?

18. Who selects them?

19. What is the relationship between you and the subcontractors; are they engaged as specialists or employed as domestic subcontractors?

20. What is the form of contract between you and your subcontractors?

21. Do you use standard forms or do you alter them?

22. Do you impose onerous conditions on your subcontractors?

23. What are your subcontractors' conditions of engagement?

24. Do you require them to provide Collateral Warranties/Performance Bonds?

25. How do you manage your subcontractors?

26. How do you ensure that they are:

- motivated;
- working as a team, i.e., carrying out their roles and responsibilities,
  interfacing effectively with other trades,
  having reasonable social relations with other trades; and

- performing, i.e., capable of carrying out their task,

  productive,

  satisfactory in terms of workmanship, and

  observing the health and safety regulations?

28. Who manages the operatives?

29. How do you manage the work package in terms of: information flow; communication channels; and decision-making?

QUESTIONNAIRE 6: INTERVIEW WITH MANAGING DIRECTOR OF THE M&E CONTRACTING ORGANISATION (8.8.95)

1. Why do you think you were invited to tender?

2. What did the tendering process entail?

- What information did the tender documents contain?
- How long was the tendering period?
- Do you know how many people you were competing against?
- What information were you required to supply?
- What did you base you tender prices on?

3. How long after the submission of tender were you selected?

4. Why do you think you were selected?

5. Did you have to negotiate your price after selection?

6. What are your conditions of engagement?

7. How were these conditions established, through a letter of intent or a contract of appointment?

8. What is the nature of the contract between you and the contractor?

9. Are there any onerous conditions imposed by the terms of the contract or otherwise through requirement for provision of Collateral Warranties or Performance Bonds, for instance?

10. What are your role and responsibilities/liabilities?

11. What is the basis upon which you invite your subcontractors to tender?

12. What does the tendering process entail?

- What information do you include in your tender documents? Who prepares them?
- How long is the tender period?
- How many subcontractors are included on your tender list?
- What information are they required to supply?

13. How long after the submission of their tender do you select them? Who selects them?

14. What is the basis for their selection?

15. Do you negotiate their price after selection / before engagement as a condition of their engagement?

16. What are their conditions of engagement?

17. How are these conditions established, through a letter of intent or a contract of appointment?

18. What is the nature of the contract between you and your subcontractors?

19. Do you impose onerous conditions through the terms of the contract or otherwise by requiring the provisions of Collateral Warranties or Performance Bonds, for instance?

20. What are your subcontractors' role and responsibilities / liabilities?

21. How do you manage your subcontractors?

22. How do you motivate them?

23. How do you ensure that they work as a team, i.e.:

- carry out their roles and responsibilities;
- interface effectively with other trades;
- have reasonable social relations with other trades?

24. How do you monitor their performance, in terms of their:

- capacity to carry out their tasks;
- productivity;
- workmanship;
- observation of Health and Safety Regulations?

25. How do you manage the work package in terms of:

- information flow;
- communication channels;
- decision-making processes?

QUESTIONNAIRE 7: INTERVIEW WITH CONTRACTOR'S SITE MANAGER (3.10.95)

1. How long have you been with the present Contracting firm and in what capacity?

2. What is your training background and experience?

3. Were you trained as Site Manager by job rotation on-site?

4. Have you had any general management training? Did it concentrate on management and leadership skills and contract specific requirements?

5. Do you receive training in new management methods and in the use of computers?

6. Do you formulate your site organisation and operational procedures for every project or are these procedures set out by your company's Quality Assurance system?

7. Do you communicate these procedures to your trade contractors?

8. What are the organisational and operational procedures for this project?

9. Are you given clearly defined targets and the necessary authority to achieve them?

10. Is the site management team structure clearly defined? What does it comprise?

11. What are the duties, responsibilities and decision-making authority of site management team members? How are they defined? Are they respected?

12. Do you assist the Project Manager in preparing the construction programme?

13. What percentage of your time is spent in 'Tool Box Talks' (providing information, advice and instruction to your trade contractors)?

14. Is there a relationship between the amount of time thus spent, the experience/skill level of trade contractors' supervisors and/or the complexity of the project?

15. How do you motivate your trade contractors? Do you use incentives?

16. How do you ensure that they interface effectively with one another?

17. How do you monitor their performance in terms of:

- Do you hold regular meetings with trade contractors to review productivity?
- Would you make productivity improvement recommendations to your trade contractors?
- Do they work overtime? Are they paid for it?

Workmanship,

- Does your Company operate a Quality Management system?

Observation of Health and Safety Regulations,

- Does your Company have specific policies regarding Site Safety Management and procedures relating to employment terms and conditions of trade contractors/ operatives?
- Do you provide Induction Training in Site Safety Management to your trade contractors and operatives?

QUESTIONNAIRE 8: MAIN CONTRACTOR'S PERFORMANCE (MC'S VIEW) (17.7.96)

Contract

1. Where there any adverse consequences to working on the basis of a letter of intent rather than a form of contract?

Project Planning

2. How did you plan against risks/to cope with uncertainties?
3. What were your aims/objectives?
4. What were your goals and targets and how did you establish them?

Project Organisation

5. What were the conditions of appointment of your design team members?
6. To what extent did the building design change throughout the contract, and Why?

Project Execution

7. How many construction stages/work packages did construction process comprise?
8. Did you know/had you worked with any of the Trade Contractors before?
9. To what extent did the building construction vary throughout the contract, Why?

Project Management

10. How did you manage risks and uncertainties throughout the contract?
11. How did your goals and targets shift and why?
12. How does the final cost of the building compare to the initial/tender cost? What are variations attributable to?
13. What problems did you experience with management of design process?

14. What problems, did you experience with management of construction process?

15. How could your organisation/management have improved?

16. Were there any accidents?

QUESTIONNAIRE 9: SERVICES CONTRACTOR'S PERFORMANCE (MC'S VIEW)

Contract

1. What were the Services Contractor's conditions of appointment as set out in their letter of intent?
2. Where there any adverse consequences to working on the basis of a letter of intent rather than a form of contract?

Planning of Services Works Package

3. Did the Services Contractor plan against risks/to cope with uncertainties?
4. Do you know what their aims/objectives were?
5. What was their Programme of works?

Organisation of Services Works Package

6. How was the services works package organised?
7. What was the Programme for various stages of Services Works Package?
8. To what extent did the services design change throughout the contract, and Why?

Execution of Services Works Package

9. Are you aware of the nature of the relationship between Services Contractor and their sub-contractors?
10. To what extent did the services supply vary throughout the contract, Why?

Management of Services Works Package

11. How did Services Contractor manage risks and uncertainties during the contract?

12. How did their goals and targets shift and why?

13. How does the final cost of Services Works Package compare to the initial cost? What are variations attributable to?

14. What problems, if any, did they experience with management of Services design?

15. What problems, if any, did they experience with management of services supply?

16. How could their organisation/management have improved?

17. Were there any services-related accidents?

Quality of Services System Delivered

18. What was the outcome of the commissioning process?

19. Does the facility meet the performance criteria specified by Client's Services Consultant?

20. Is the Operator satisfied with the facility?

21. What does the Services Contractor's Warranty to the Client contain?

22. How could the Services Contractor's performance improve in terms of quality of the services system delivered?

CASE STUDY 3: THE POLICE STATION

QUESTIONNAIRE 1: INTERVIEW WITH BUILDING SURVEYORS (9.9.96)

1. What is the nature of the Client?
2. What are the financial arrangements?
3. Who owns the land?
4. What is the history of the project? How was it conceived?
5. What does the project comprise?
6. What is the basis for selection of the procurement method?
7. How many consultants are involved?
8. What were the bases for their selection?
9. Is there a long-term relationship between you and the Client?
10. Were the RIBA Conditions of Appointment used? Were these altered in any way?
11. What is the extent/scope of your design responsibility and liability?
12. How many people from your firm are involved with the project? What are your and their roles and responsibilities?
13. What is your design input in terms of Services?
14. How do you interface with and communicate to other consultants?
15. Did you agree to a design programme?
16. What was the basis upon which the Main Contractor was invited to tender?
17. What were the criteria upon which the Main Contractor was selected?
18. How do you interface with and communicate to the Main Contractor?
19. Did you have an input in the nomination/selection of the Services Contractor?

QUESTIONNAIRE 2: INTERVIEW WITH SERVICES CONSULTANT

1. What are the services design requirements?
2. Did you have to submit a competitive tender for your services or did you negotiate your fee?
3. What do you think was the basis for your recommendation and selection?
4. Who selected you?
5. Was your engagement based on standard conditions of appointment? Were these altered in any way?
6. What are your roles and responsibilities?
7. What is the extent/scope of your design responsibility and liability?
8. How many people from your firm are involved with this project?
9. What are their roles and responsibilities?
10. How do you interface with and communicate to other consultants?
11. Did you agree to a design programme?
12. Was your design complete before the services works package was let?
13. Did you have an input in the nomination/recommendation of the Services Contractor?
14. Did you liaise with the Services Contractor at detail design stage?

QUESTIONNAIRE 3: INTERVIEW WITH THE M&E WORKS PLANNER

Background information

1. What are the areas of refurbishment and new build portions of the development?
2. What is the final contract value? [If you cannot divulge the figure could you let me know by what percentage it over-ran the original contract value?]
3. When did the works begin and when were they completed?

Tender and selection processes

4. Why do you think you were invited to tender for this job?

5. What did the tender process entail?

- What information did the tender documents contain?
- How long was the tender period?
- Did you know how many people you were competing against?
- What information were you required to supply?
- What did you base your prices on?
- How long after the submission of your tender were you selected?
- Did you negotiate with the Client, regarding your price, after your selection?

6. What do you think was the basis for your selection?

Contract

7. What were your conditions of engagement?

8. What were your roles, responsibilities and liabilities?

9. Did you provide Collateral Warranties/Performance bonds to the Client?

10. Did you enter into a contract with the Client upon commencement or did you commence based on a letter of intent? If so, when did you enter into a contract?

11. Is the contract between you and the Client a standard form or has it been altered?

12. Are there any onerous conditions imposed by the contractual terms?

13. Were there disadvantages in working to a letter of intent, if you did so at all?

Project planning

14. What were your aims and objectives with regard to time, cost, quality and safety?

15. What were your goals and targets and how did you establish them?

16. How did you plan against risks/to cope with uncertainties?

17. What was your staff allocation to this project? What were their roles and responsibilities?

Project organisation and execution

18. How many construction stages/work packages did the construction process comprise?

19. How were the trade contractors, and particularly the M&E Contractor, selected?

20. To what extent did the building design change throughout the contract and why? Did this affect the construction process?

21. How did you manage the construction works and the Trades?

22. How did your goals and targets shift and why?

23. How did you manage risks and uncertainties throughout the contract?

24. How could your project organisation and management have improved?

QUESTIONNAIRE 4: PERSPECTIVES ON M&E CONTRACTOR'S PERFORMANCE

1. By what amount or what percentage did the cost of services installation exceed the original contract value?

2. When was the services installation completed?

3. What was the outcome of the commissioning process?

4. Does the facility meet the performance criteria specified by the Client's Services Consultant?

5. Is the Client satisfied with the facility?

6. How could the M&E Contractor's performance have improved?

QUESTIONNAIRE 5: PERSPECTIVES ON M&E INSTALLATION

Background information

1. What were the original and final contract values of the installation? [If you cannot divulge figures could you let me know what % of the original and final construction contracts they were, or by what % the final contract value exceeded the original?]
2. What were the start and the original and final completion dates for the installation?

Tender and selection process

3. Why do you think you were invited to tender?
4. What did the tender process entail?

- What information did the tender documents contain?
- How long was the tender period?
- Did you know how many firms you were competing against?
- What information were you required to supply?
- What did you base you prices on?
- How long after the submission of tender were you selected?
- Did you negotiate your price with the Main Contractor, after your selection?

5. What do you think was the basis for your selection?

Contract

6. What were your conditions of engagement? [Few key conditions will suffice]
7. What were your roles, responsibilities and liabilities?
8. Did you enter into a contract with the Main Contractor upon commencement or did you commence based on a letter of intent? If so, when did you into a contract?

9. Was the contract between you and the Main Contractor a standard form or was it altered?

10. Were there any onerous conditions imposed by the contractual terms?

Installation planning

11. What was your lead-in period?

12. What were your aims and objectives with regard to time, cost, quality and safety?

13. What were your goals and targets? [Did you try to improve on your aims and objectives?]

14. How did you plan against risks/to cope with uncertainties?

Installation organisation and execution

15. How many stages did the installation comprise? Were they all subcontracted?

16. Were the subcontractors selected through tender processes?

17. Did you experience problems in managing the subcontractors?

18. How did you manage risks and uncertainties throughout the contract?

19. How could your project organisation and management have improved?