Responsibility, power and construction conflict

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Responsibilities in construction projects are not entirely predetermined by construction contracts. Many emerge arbitrarily from the resolution of power struggles between opposing interest groups who are trying to minimize their exposure to an unexpected resourcing demand. These struggles contain the seeds of conflict because those with relatively little power tend to emerge with relatively high levels of responsibility. For the weak, this inequality causes financial strain, anxiety, resentment, frustration and malevolence.

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Introduction

Ashley (1977), Porter (1981), Barnes (1983), Abrahamson (1984), Perry and Hayes (1985) and Thompson and Perry (1992) have developed the basic principles which should govern risk allocation in construction projects. One such principle is that a risk should be given to the party who can best control it, if it occurs. Not adhering to this principle increases the likelihood of conflict. The interdependence of construction project participants ensures that, to a large extent, controlling a risk involves the exercise of power over many people. In other words, this principle of risk allocation requires that a party's power be commensurate with their responsibilities. The aim of this paper is to investigate the extent to which this is achieved in practice.

Organizational power

Controversy surrounds the issue of organizational power, and attempts to produce precise definitions have been fraught with difficulty. However, if one commonly accepted notion has emerged, it is that power is about making things happen by influencing the behaviour of another social unit, be it an individual, group, organization or group of organizations (Lee,

1987). The most obvious source of power in construction projects is the formal contract which binds contributing organizations together. Loosemore and Hughes (1998) argue that traditional construction contracts are grounded in the philosophy of scientific management, since they seek coercively to control project members, primarily through monetary means. Furthermore, they are underpinned by the assumption that people's actions can be controlled accurately by those who have the legitimate authority of the contract behind them, that there is one best way to manage, that people cannot be trusted and that contract drafters know best. In terms of power, such contracts reflect the early 'power elite' theories of Weber (1947), Mills (1956) and Parsons (1960). These theories saw formal authority as the primary source of power in organizations and conceived the exercise of power as a process of overpowering or domination where one person prevails over another and thereby is able to carry out his or her will despite resistance. Despite little change in the philosophy underlying construction contracts since their inception (Barnes, 1989), conceptions of organizational power have advanced considerably.

The first to question the early power elite theorists were the 'pluralists', who criticized the view of one group dominating an organization. They argued that power is exercised by informal coalitions which become temporarily united for a specific purpose (Polsby,

1963; Thompson,1967; Mokken and Stokman, 1976). They also challenged the view that formal authority was the only source of power in organizations by arguing that it was relatively impotent in comparison with other sources (bases) such as: the capacity to reward another (reward power); the capacity to punish another (coercive power); the ownership of special knowledge, experience or information (expert power); and the existence of charismatic personality and leadership style (referent power) (French and Raven, 1960). This view was rooted in the study of formal decision-making which led to criticisms from 'conflict-theorists' such as Lukes (1974), who argued that formally prescribed decision-making processes often mask the real, covert struggles, manipulations and exercises of power within organizations. A lack of open dispute or protest does not necessarily indicate harmony, since there may be underlying tensions hidden from the disguise of power in an atmosphere of discretion, and often secrecy is the best means of securing its maintenance (Mokken and Stokman, 1976). Loosemore (1996) has detected these underlying tensions indicating a potential deviation between the reality of power structures on construction projects and those which are formally prescribed by governing contracts.

Risk and responsibility

From a construction project's perspective, responsibilities relate to specific events during its life which require the investment of resources. During the course of a project there are many such events which vary in their predictability, for which resourcing responsibilities must be allocated. It is the uncertain nature of construction activity which ensures that unpredictable resourcing demands exist and these represent the project risks for those who accept the responsibility for them. If construction contracts did not allocate responsibility for these uncertainties, then projects would quickly grind to a halt because the responsibility for each unexpected resource demand would have to be negotiated separately during the course of a project.

Thus the concepts of risk and responsibility are inseparable, but in the construction management literature the latter has been relatively neglected. This is an important omission because it provides an alternative and potentially fruitful perspective from which to elaborate our understanding of risk management processes. Tannenbaum (1978) associates the concept of responsibility with the duty to look after something or someone, so that one can be blamed and can suffer loss if things go wrong. Gablentz (1972) points out that, philosophically, responsibility is a correlate of

freedom and that the opposite of responsibility is compulsion. Although this suggests that responsibilities are given and taken and enforced by the possibility of punishment or blame, Gablentz also distinguishes between moral, political and legal responsibilities, indicating that an organization's risks are wider than its contractual responsibilities. Moral responsibility is related to consciousness, society and culture, political responsibility is related to a vested right to use power and legal responsibility is simply that imposed by law. Each of these types of responsibility is discernible within construction project organizations; legal responsibilities are being imposed by the contracts of service and employment which bind parties together, legislation and common law; moral responsibilities are being imposed by the codes of conduct of professional institutions and society at large; and political responsibilities are imposed by the culture of the construction industry and the organizational structure of individual projects.

Risks have been described as unpredictable resourcing responsibilities which can occur during the course of a construction project. The uncertainty of construction activity ensures that these unpredictabilities manifest themselves in the form of unexpected problems and, in this sense, the patterns of responsibility on construction projects are continually changing. In accordance with the principle of risk allocation, which is the focus of this paper, it therefore follows that patterns of power should change to suit it. That is, there should be continual redistributions of power during the course of a construction project to ensure that participants can move in and out of the ascendancy as their patterns of responsibilities dictate. It is likely that no written contractual document could accommodate the need for such flexibility, and that without managerial intervention there is likely to be, other than by chance, a continual mismatch between the patterns of responsibility and power within construction projects. Managers who demonstrate complacency in letting contracts become a substitute for good management are in danger of preventing parties managing their responsibilities and therefore creating frustration and the potential for conflict. The methodological strategy which was employed to investigate the extent to which scenario occurs is described below.

Measuring power

As Gablentz (1972) and Dahl (1996) note, the measurement of organizational power poses major methodological challenges. The reason is that organizational power is related to social influence and is

measured by the extent to which one person induces a particular type of behaviour in another person. There are significant problems in measuring this at a dyadic level, not least due to the multitude of factors that influence people's behaviour outside the social setting. One alternative to measuring the 'effect' of power is to measure the 'sources' (bases) of power as defined by French and Raven (1960). However, this is equally problematical since it is difficult also to measure a person's capacity to reward and punish, their legitimate authority, their expertise and their charisma. A potentially viable solution was proposed by Hickson *et al.* (1971), who argued that organizational structure, as defined by the patterns of communication between people, provides the greatest insight into where power lies in organizations. In essence, Hickson *et al.* argued that a person's social positioning within an organization was a measurable and reliable indicator of their relative power. Indeed, it is a view which has had some influence upon subsequent empirical case studies by Pettigrew (1973), Wilson (1982) and Kenny and Wilson (1984). They have found that, although managerial expertise is also an important power base, if supported by favourable structural configurations then it is increased significantly. That is, power is a blend of individual person-based factors and structural factors.

Social network analysis (SNA) as a means of measuring organizational power

In parallel with the above developments, an interest in studying social structure as a means of explaining sociological phenomena began to emerge in sociology (Simmel, 1950) and anthropology (Mitchell, 1969; Boissevain, 1974). Over time, a vocabulary of social structure, supported by well tested and reliable measurement techniques, has been developed which is useful in the measurement of organizational power (Harary *et al.*, 1965; Scott, 1991; Wasserman and Faust, 1994). For example, Freeman (1979) argued that people in organizations with high centrality are relatively powerful compared with those in peripheral positions and he developed three sub-measures of centrality, related to the concepts of degree, closeness and betweenness. Degree centrality measures the extent to which a member receives (is a sink) or sends (is a source) information to its immediate neighbours in a social network. In-degree centrality measures the former and out-degree centrality measures the latter. Freeman has shown how a person's degree centrality indicates their control over others and the dependence of the rest of the network upon them. Closeness centrality measures the level to which a person is directly contactable (without intermediaries) by others in a network. A person with a high closeness centrality has great control over others by being able to closely monitor and rapidly communicate with them. Finally, betweenness centrality measures the extent to which a person controls information flow between others in a network. Cohen and Marriott (1958) point out that people with high betweenness centrality act like valves within an organization and are the glue that binds its differing parts together. In essence, they are the 'gatekeepers' which Pettigrew (1973) referred to in his study of power within a retail firm. Pettigrew's gatekeepers were to manipulate information flow and thereby exert considerable influence over a decision to benefit themselves.

Other socio-structural concepts which are useful to the measurement of a person's social power are regular equivalence and factionalism. Regular equivalence refers to the extent to which a person has identical social ties to others in an organization. In theory, similarity of social ties increases a person's power base by equalizing information differences between them and others. Factionalism refers to the extent to which a person is a member of factions within an organization. Factions are groups of people who communicate relatively more with each other than they do with others, and they provide an important source of security and support for people which reinforces their power base in negotiations. The frequency of interaction between the members of a faction indicates its strength and the relative power base it provides. People's roles in relation to factions also are important in measuring power. For example, a person who is a member of multiple factions is called a bridge, and is particularly powerful, whereas an isolate who is not affiliated to any faction is particularly weak.

The research method for measuring power

Based upon the above rationale, SNA was used to measure and compare people's relative power throughout the construction stage of four separate traditionally procured construction projects. A detailed description of the research method can be found in Loosemore (1996) but in essence, interactional data were collected by using diaries which were distributed to professional representatives of the main consultants and contractors at the start of construction. These diaries required people to record, for a predefined period (see next section), those with whom they communicated, when they communicated with them and what medium was used. By cross-checking the completed diaries, discrepancies were identified and resolved in retrospective interviews and an

adjacency matrix was constructed. This is a table which numerically represents the patterns of interaction between project members and facilitates analysis using software called 'UCINET' (Borgatti *et al.*, 1992). An example of an adjacency matrix is provided in a later section.

In addition to collecting data about people's inter-actional patterns, the diaries also required project participants to summarize what was said in each inter-action during the specified period. This was elaborated upon during retrospective semi-structured interviews and non-participant observation of meetings during the predetermined period. These data were valuable because an analysis of people's communication content can provide the reasons for a person's position within a social network and help to explain the manner in which power was exercised. As Mangham (1986) noted, the use of managerial language can reveal a number of aspects of power which are rarely made explicit in other ways within organizations. The com-munication content was analysed by the technique of content analysis, which involved categorizing its constituent parts using a model developed by Berelson (1971) and then quantifying them.

Measuring responsibility

Earlier, it was argued that construction project participants have an array of legal, moral and political responsibilities, some of which are more predictable than others. The contracts of employment which bound people together were the main mechanism by which they were distributed, and the unpredictable responsibilities represented the project risks to those who accepted them. Furthermore, it was argued that patterns of responsibility were continually changing within a construction project as risks manifested themselves in the form of unexpected problems. It follows that the best time to attempt to identify and measure responsibility patterns is during such a period, since an unexpected problem provides a well defined 'trigger event' around which responsibilities are focused. However, in practice it is not straight-forward to measure responsibility in this manner because it is difficult to identify the boundaries of problem periods, and responsibility can be measured only retrospectively.

Despite being a valid complication, the latter point posed no problem to this research since it was concerned primarily with how the perceived pattern of responsibilities changed throughout a problem solving period through negotiations, rather than with the end result of these negotiations. In relation to the first complication mentioned above, measurement

problems were overcome by focusing upon only serious and therefore relatively well defined problems within construction projects. These were problems which arose unexpectedly, posed significant threats to a wide range of project participants' goals and which had to be resolved within restricted time-scales.

Research results

Before moving onto the research results, it is impor-tant to reiterate that the concepts of power and responsibility cannot be measured accurately, and that the analytical processes described above do not claim to do so. Rather, they are designed to produce indica-tive indices which enable comparisons between the relative powers and responsibilities of various project members. Furthermore, within the confines of this paper it is not possible to provide the detailed data relating to each of the four case studies undertaken. The alternatives are to provide condensed descriptive accounts of all four case studies or to focus upon one case study in detail. The latter option is prefer-able because it can better illustrate the value of the research methodology and provide examples of events which, while specific to one problem, do illustrate general principles which characterized all the case studies.

A case study

This UK project was a £4M hospital extension pro-cured under traditional arrangements and contracted under the JCT Standard Form of Building Contract, 1980 Edition. The problem which became the focus of research involved a road-side excavation where the bill of quantities had enabled the contractor to price for only temporary earthwork support. The contractor argued that permanent earthwork support was required and demanded an architects instruction (AI) sanc-tioning extra payment. A dispute arose between the consultants and the contractor over responsibility for this problem.

The SNA data relating to this case study are presented in Figure 1. It should be read horizontally and is split into four rows, each representing one of four phases of behaviour which emerged during the problem-solving process. Figure 1 can also be read vertically to identify changes in communication patterns over time. The first column in each row contains the adjacency matrix associated with that phase, the numbers within it indicating the quantity of interaction between different project members. These are given identification numbers around the outside of

Figure 1 SDA data for hospital extension

Phase	Key	Degree Centrality Out (%)	Degree Centrality In (%)	Flow Betweenness Centrality (%)	Closeness Centrality (%)
Phase One	1 Client	3.51	3.51	7.62	36.00
	2 Estates Dept	3.51	3.51	2.59	36.00
	3 Project Manager	1.75	5.26	3.42	34.62
	4 Architect	21.05	17.54	25.00	45.00
	5 Client's Q.S.	22.81	15.79	34.38	42.86
	6 Engineer	7.01	15.79	11.76	40.91
	7 Clerk of Works	12.28	12.28	23.16	42.86
	8 Contractor's Q.S.	10.53	5.26	16.84	40.91
	9 Contractor's Proj Man	17.55	20.06	37.86	40.91
	10 Regional Q.S.	0.00	0.00	0.00	10.00
	Socio-Centric	**14.22**	**12.29**	**25.69**	**18.88**
Phase Two	1 Client	4.30	4.30	0.74	52.94
	2 Estates Dept	2.60	2.60	0.00	45.00
	3 Project Manager	9.48	8.60	7.76	52.94
	4 Architect	11.20	12.93	14.22	69.23
	5 Client's Q.S.	20.69	20.69	33.33	75.00
	6 Engineer	8.60	9.48	4.94	60.00
	7 Clerk of Works	17.24	13.79	31.38	58.00
	8 Contractor's Q.S.	4.30	4.30	0.74	52.94
	9 Contractor's Proj Man	16.38	18.10	35.06	81.82
	10 Regional Q.S.	5.20	5.20	4.53	56.25
	Socio-Centric	**11.87**	**11.87**	**24.22**	**46.53**
Phase Three	1 Client	0.00	0.00	0.00	10.00
	2 Estates Dept	6.98	6.98	6.76	21.95
	3 Project Manager	13.95	13.95	12.90	23.68
	4 Architect	18.60	25.58	29.51	23.68
	5 Client's Q.S.	13.95	16.27	14.75	10.00
	6 Engineer	0.00	0.00	0.00	21.95
	7 Clerk of Works	9.31	9.31	13.51	21.95
	8 Contractor's Q.S.	16.28	6.98	6.35	24.32
	9 Contractor's Proj Man	20.93	20.93	53.85	10.00
	10 Regional Q.S.	0.00	0.00	0.00	10.00
	Socio-Centric	**12.14**	**17.31**	**44.54**	**12.28**
Phase Four	1 Client	1.85	3.70	10.71	37.50
	2 Estates Dept	0.00	0.00	0.00	10.00
	3 Project Manager	20.37	20.37	37.29	45.00
	4 Architect	29.63	18.52	40.68	47.37
	5 Client's Q.S.	22.22	25.93	27.12	40.91
	6 Engineer	0.00	1.85	0.00	34.62
	7 Clerk of Works	0.00	1.85	16.95	34.62
	8 Contractor's Q.S.	16.67	18.52	8.11	40.91
	9 Contractor's Proj Man	7.41	9.26	0.00	40.91
	10 Regional Q.S.	1.85	0.00	0.00	33.33
	Socio-Centric	**21.81**	**17.70**	**29.55**	**25.62**

Tabu Factional Data Fit: Phase One = 0.567; Phase Two = 0.782; Phase Three = 0.561; Phase Four = 0.675

Regular Equivalence Data: Phase One = 47.13; Phase Two = 86.82; Phase Three = 45.31; Phase Four = 37.96 (real = 91.33)

that matrix, a key to which is provided in the second column. The next three columns provide data relating to people's individual centralities, the socio-centric index relating to the network as a whole (the degree to which the whole network is centred around one person). The next column provides the factional data, the original adjacency matrix having been reorganized by a logarithmic process known as 'Tabu', so that actors in factions are grouped along its diagonal. Cells outside the diagonal, indicate the strength of connections between actions. The relative strength of a faction is represented by the average number of interactions between its members. The 'fit' index relates to the network as a whole and represents the degree to which the organization is split into factions, fewer factions indicating a higher level of fit. The final column provides the regular equivalence data, identical networks being indicated by an index of 100. The socio-centric index indicates the extent to which the whole membership of the organization have similar communication networks.

The research results

Phase one

The Tabu factional data indicate a relatively low level of fit (0.567) and thus a fairly divisive period of activity. Most noticeably, the architect (4) and client's QS (5) are in separate factions. This does not contradict the content analysis, which pointed to the architect's tendency to distance himself from the problem and see the client's QS as responsible for handling it. Despite this, the client's QS and architect maintained strong links between their respective sub-groups, the architect primarily acting in a receiving role. This is further evidence of his tendency to rely upon the advice of the client's QS in making decisions. Indeed, the architect, being in the strongest faction (4,9) with the contractor's project manager, appears to use this advice to perform an important bridging role between the consultants and contractor. This powerful social positioning would have enabled him to maintain control over the outcome of the problem-solving process, but at the same time avoid responsibility for the problem. While the architect (4) and contractor's project manager (9) form a faction, the limitation of SNA is that it does not show the negative nature of their communications which was highlighted by the content analysis. The members of the second strongest faction in phase one (5,6,8) were primarily involved in the technical aspects of the problem, the engineer (6) being the weakest member of this group, having contact only with the client's QS (5). This is surprising

because his knowledge was critical to the problem solution. However, an explanation was provided by the content analysis, which pointed to the attempts of the client's QS to retain ownership of this information as a source of power in bargaining with the contractor.

The socio-centric degree centrality data show a low level of out-degree centrality, and in-degree centrality, which indicates no clear source or sink of information. However, individually, the architect (4) and client's QS (5) had the highest out-degree centrality, indicating the key roles they played in driving this phase forward. It is also noticeable that the engineer (6) had a greater in-degree centrality than out-degree centrality. This supports the content analysis, which pointed to pressure being exerted upon him by his fellow consultants, to generate counter arguments to the contractor's. It also reflects his discomfort in doing so, because of sympathy with the contractor's case. In interviews, it was openly admitted that this was a deliberate tactic to test the contractor's resolve in pursuance of their claim. In essence the consultants sought to avoid responsibility by increasing their power-base through the imposition of group-norms to oppose the contractor at all costs.

The betweenness data show the high betweenness centrality of the contractor's project manager (9) and client's QS (5), indicating that they were powerful people in being able to control information flow. This made the organization vulnerable to their suspicious and distrustful relationship and, in this sense, the communication structure may have exacerbated the difficulties which characterized this initial phase of the problem-solving process. Although the architect (4) also had a high betweenness centrality, his presence as an alternative communication route for the contractor did not reduce the network's vulnerability, because he treated the contractor with equal if not more disdain. This arose from an acrimonious dispute on a previous project. In essence, the data suggest that in phase one the social structure of the project ensured that the reaction process was vulnerable to and dominated by the negative perceptions and attitudes of a few powerful individuals.

The high regular equivalence of the client, estates department and clerk of works (1,2,7) is not surprising, and indicates their common isolation in the reaction process. However, the architect's (4) and the contractor's project manager's (9) relatively high equivalence (74.794) is surprising considering their exaggerated difference in interests during this phase. It shows that the contractor's project manager had access to the same information as the architect despite his attempts to maintain secrecy. The inter-

views and content analysis indicated that this resulted from the engineer's sympathies with the contractor, which led him to reveal weaknesses in the consultant's arguments. This was an act which compromised the consultant's power base and encouraged the contractor to pursue the claim with greater tenacity. However, this led to a spiralling escalation of the dispute and the contractor becoming increasingly frustrated. In an attempt to loosen the consultant's stranglehold on the communication structure of the project, the contractor then resorted to less legitimate means of obtaining the AI. The consultants, by their actions, had ensured that this was the only source of power left to the contractor and it involved coercion through issuing increasingly serious threats of escalation, such as stopping work on site.

The regular equivalence data also indicate the relative isolation of the client's project manager (3), something which coincides with the content analysis which pointed to his exclusion from discussions. Reference to the Tabu factional data suggests that the client's project manager's mistake was to make himself vulnerable to isolation by relying upon the architect as his main point of contact with the project team. The architect's interests were best served by not widely publicizing a problem in which he was implicated in blame.

Phase two

The second phase of the problem-solving process is marked by the sudden involvement of the contractor's regional surveyor, who makes direct contact with the client's project manager to complain of the consultant's obstructive tactics. In contrast to phase one, the Tabu factional data show the client's project manager in a very strong faction with the architect and client's QS (3,4,5). This supports the content analysis, which pointed to the consultant's tendency to become inwardly orientated to suppress the sudden escalation of the dispute. The contractor's project manager and regional surveyor are also in a relatively strong faction with the engineer (6,10,9), the contractor's project manager being the strongest member. In this sense, the organization splits into the two main power centres, the separation of the engineer from the consultant's faction reflecting the consultant's increased focus upon resolving the problem rather than upon generating alternative arguments. The engineer was the source of the technical expertise which underpinned these arguments. The isolation of the contractor's QS (8) reflects the minimal role he played during this phase of the reaction process, the regional surveyor having temporarily taken over his responsibilities.

The degree centrality data show a marginal fall in the level of socio-centric centrality from phase one. This suggests that the reaction process still lacked clear leadership. The individual centrality data shows the consultants particularly active as they discuss the validity of the claim and the process of justifying the issue of an AI to the client's project manager, who now has a more prominent role than in phase one. The architect has a relatively low in-degree centrality and out-degree centrality compared with phase one, and the client's QS a relatively high centrality. This confirms the content analysis, which pointed to the architect's desire to see the client's QS taking responsibility for the problem. The engineer's in-degree centrality also falls compared with phase one, which reflects the reducing emphasis upon generating counter arguments to the contractor's as a tactic to avoid responsibility. Finally, the role of the contractor's QS diminishes considerably in both in-degree centrality and out-degree centrality terms, the contractor's project manager increasingly becoming the main point of contact for the consultants. In comparison with the contractor's QS, he was less aggressive in his communications with the consultants.

The betweenness data remain similar to phase one except that the contractor's QS and engineer have less information control. While this indicates vulnerability at the same points as in the first phase, the content analysis indicated a change in attitudes brought about by the regional surveyor's involvement which meant that this phase of the process was much more positive. This demonstrates the dangers of using quantitative techniques in isolation, and also that those in powerful positions can have a disproportionately positive as well as negative impact upon project progress.

The closeness data show the general level of closeness increasing from phase one, a positive sign indicating more dense communications between those involved and a more closely integrated, tightly knit problem solving team. The contractor's project manager and the client's QS appear to be the points around which the network focuses.

The regular equivalence data show a large increase in the similarity of people's contacts compared with phase one. This is indicated by the much larger socio-centric index, which points to more widespread access to similar information and a greater sense of mutual understanding of relative positions in negotiations. In contrast, phase one was characterized by isolationism and power struggles.

Phase three

At the end of phase two, the AI was issued, but a further phase was initiated by the contractor serving a

formal claim for its late issue. This claim was met immediately by the architect's outright verbal rejection.

During this phase, the Tabu factional data show the level of fit falling from phase two, indicating greater division in the reaction process. The reaction process is split into two strong groups with little inter-communication. One faction includes the clerk of works, estates department and contractor's project manager (2,7,9), the content analysis indicating their role in resolving technical problems on site with the newly sanctioned permanent earthwork support system. The other faction includes the client's QS, architect and contractor's QS (4,8,5), the latter two members being its strongest contributors. The client's project manager was involved, albeit to a limited extent, through limited contact with both factions although primarily with the architect's (4,8,5).

This overall factional structure supports the content analysis, which pointed to the architect's refusal to acknowledge the claim and his deliberate policy of insulating his fellow consultants from the ongoing dispute.

Indeed, this is further supported by the degree centrality data, which show the architect and contractor's project manager having the highest in-degree centrality. This indicates that these two people were likely to have been considerably more knowledgeable about the ongoing dispute than other project members. Finally, the degree centrality data show the engineer's role falling away completely. This fall from power reflects a distinct change in the nature of the problem, which now becomes centred around the claim rather than around the technical aspects of alternative earthwork support systems.

The betweenness data show the architect and the contractor's project manager becoming highly dominant in information control. This meant that the reaction process was vulnerable to the poor relationship which the content analysis suggests they had. It is also an indication of their ability to insulate other project members from the ongoing dispute. The closeness data show a substantial loosening of the network ties. This reflects the success of the architect's tactics in isolating both the contractor and his fellow consultants, and thereby keeping attention away from the claim. The equivalence data show a fall in socio-centric level of equivalence compared with phase two. This indicates that people's personal communication networks varied considerably, as probably would their understanding of the reaction process. The most striking aspect of the data is the very low equivalence of the architect (4), the person most heavily involved in the reaction process during this phase (see centrality data). This indicates that his personal communication network and role within this phase was unique, and that his knowledge of the problem also would have been

unique. Again this supports the emerging picture of him manipulating the social structure of the project to maintain a widespread ignorance of the ongoing claim amongst the rest of the project team.

Phase four

The event which distinguished the commencement of phase four was the second involvement of the contractor's regional surveyor. He once again complained directly to the client's project manager about the architect's obstructive tactics and used coercive tactics in the form of threats of court action, the aim being to overcome the controlling position of the architect in the social structure which characterized the whole of phase three. This coercive action brought about a significant change in the social structure of the project because, in contrast to phase three, the Tabu factional data shows only one dominant faction consisting of the architect, client's QS, contractor's QS and client's project manager (3,4,5,8). This indicates that the final phase of the reaction process was dominated by a very tightly knit group who took control of the crisis, working closely to bring it to a conclusion. While the contractor's project manager (9) was excluded from this faction he was heavily connected to it. This coincides with the content analysis, which showed the contractor's QS taking back the responsibility to finalize the details of their claim. This is in contrast to previous phases where his influence had been marginal.

The degree centrality data show that the regional surveyor becomes involved as a source. The content analysis indicates that his involvement played an important role in breaking the stalemate that had developed in phase three. The contractor's QS becomes the main point of contact for the consultants, and there is a much healthier balance between what he receives and sends. This indicates that he is not being marginalized as he was in earlier phases. The heavy involvement of the client's project manager, architect and client's QS points to an injection of consultant effort to get the problem resolved. In contrast to phase three, the architect plays a far more dominant sending role, indicating that his policy of ignoring the contractor has ended and that he is driving the process towards a conclusion. The client's QS is the primary receiver on the consultant's team and the Tabu data indicates that he is the main point of contact for the contractor's QS. Collectively, these patterns of data indicate a far more positive period of activity than in phase three, with a good level of communication across the contractor–client team divide.

A further contrast with phase three is found in the betweenness data, which show that the client's project manager exerted greater control over communications than in previous phases. His sudden presence as an alternative route for the contractor's communications appears to have overcome the dominating effect of the poor relationships between the contractor's project manager and architect. The closeness data show a rise in the general level of closeness, indicating a more tightly knit group of people dealing with the problem. The architect's and client's project manager's closeness indexes are particularly high, mirroring the content analysis which pointed to the client's project manager's distrust of the architect and desire to keep him under close scrutiny.

Finally, the regular equivalence data show a drop in socio-centric equivalence from phase three, which is surprising in the light of the positive movements in the other structural indices. However, when the key players during this phase are isolated, that is (3,4,5,8), the level of socio-centric equivalence rises dramatically to 91.33. Clearly the real picture is far more positive than the socio-centric index first suggests. This coincides with the content analysis, which pointed to a period of efficient communication between a restricted core of people who collectively converged upon a shared understanding of the issues and a mutually agreeable solution. This involved the project manager using his reward power base to reach a compromise by trading other outstanding claims against this one. The attractiveness of this solution, which cleared the project of all ongoing disputes, was its ability to provide a new start for the project team whose relationships had been damaged by this problem.

Discussion

Before embarking upon a discussion of this case study, it is important to place the results within the context of their day. The research took place within a deep recession when margins were particularly tight; there were considerable and particularly inflexible time and cost constraints imposed upon the project team; relationships had been soured before the project started by a dispute on a previous project where many of the project team had become familiar with each other; the case study was the first problem to arise on the project and was seen as an important 'battleground' to establish relationships for the rest of the project. It is possible that in another context the research would have highlighted different behaviour, and in this sense, generalizations are unreliable. However, within this restricted context, it is possible to say that when a problem arises, power struggles can develop between differing interest groups who seek to off-load responsibility for it. They do so because of a reluctance to accept

responsibility, differing interpretations of contractual clauses or a failure of the contract to cover an unexpected event adequately. During these struggles the legitimate contract had a surprisingly small influence in determining the power of individuals involved. Rather, people's power was more dependent upon their tactical use of informal and illegitimate sources of power and their positioning within the social structure of the project organization. Shrewd tacticians can accumulate a level of power which is far beyond the importance of their functional role within the project and the power attributed to them by the governing contracts.

Thus, in contrast to the clarity of coincident power and responsibility structures which the principles of effective risk allocation are designed to ensure, the reality of a construction project during problematical times (i.e. all times) is characterized by confusion, disorder and dispute, where the most powerful emerge with little responsibility and the weak with much responsibility. That is, responsibility and power are rarely matched in construction projects and, indeed, seem to move in opposite directions. It would seem that a party's responsibility is determined by their power rather than the opposite, as the principles of risk allocation dictate. The lessons are that managerial intervention is required to ensure that the balance is maintained and that it is too much to expect even the most thoughtful contracts to provide the flexibility that will ensure that people's powers will always match their continually changing responsibilities. All written documents, but in particular legal contracts, are inflexible, and complacency in letting them become a substitute for sensitive and responsive management is dangerous.

A further interesting point to emerge from this research was that power is not used in the way that contract drafters intended: that is, in the management of the problem solving process. Rather, it is used initially to resolve responsibilities, and only when this is achieved does attention turn to the problem itself. Unfortunately by this time the opportunity to mitigate the impact of a problem will have been reduced and the potential losses associated with a problem will have accumulated. Indeed, it is this prospect which contributes to the self-perpetuating momentum which appears to accumulate within the power struggles identified above and which contribute to the deepening of any dispute. The challenge facing project managers is to nip a problem in the bud by ensuring that the process of resolving a problem takes priority over the process of resolving responsibilities.

Conclusion

This paper has demonstrated that the behaviour of people on a construction project has the effect of

disturbing any intentions of the contract drafters in assigning responsibilities and powers in accordance with the established principles of risk allocation. It has shown that, despite what is written in a contract, it will not necessarily be the best person (in terms of expertise) who ends up with the responsibility for it. This, arbitrarily, seems to depend more upon the way in which informal power struggles between interest groups resolve themselves. There is every indication that expert and legitimate contractual power plays a minor role in these struggles. Thus, in construction projects, conflict emerges from the power struggles which are the mechanism by which responsibilities are resolved. It follows that by resolving responsibilities early on, a manager can avoid conflict. However, perfect resolution is unlikely and the important irony to emerge from this paper is that the party who eventually shoulders a responsibility, in this scenario, is more likely to have been selected on the basis of a lack of power than a level of expertise. On both counts, they will find it difficult to bear, and further conflict will be the result. In an interdependent organization such a construction project, where the interests of all participants are connected, everyone is a potential loser in this scenario. Therefore, managers must also attend to the balances between power and responsibility which emerge within their project organization.

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