CAUSAL MODELLING OF CONSTRUCTION DISPUTES

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Disputes have become an inherent feature of the construction industry. A plethora of studies have been undertaken to identify the causes of disputes so as to determine the most appropriate prevention and resolution strategies. While it is widely known what the main causes of dispute are, they still remain prevalent in the Australian construction industry. This is because there is a need to better understand the complexity and interplay between causal variables. Using data derived from the literature a conceptual causal model of construction disputes is developed. The model identifies the key causal variables and pathogens that can contribute to disputes.

Keywords: acceleration, causal modelling, disputes, pathogens, scope changes.

INTRODUCTION

During the last two decades the Australian construction industry has been in an intense period of introspection, specifically examining how it can improve its performance and productivity as well as reduce the incidence of disputes (London and McGeorge, 2008). While a number of improvements have been made in areas such as occupational health and safety (Mohamed, 2002), relationship contracting (Hauck *et al.*, 2004; Davis, 2008), and technology adoption (Peansupap and Walker, 2005; 2006), the industry still continues to be plagued with cost and schedule overruns (Love *et al.*, 2005). Blake Waldron and Dawson (2006) found that cost and schedule overruns are the two most significant contributing factors to disputes. The main factors that were identified as contributing to cost and schedule overruns were scope changes, incorrect design and incomplete documentation, and late authority approvals.

There has been considerable research undertaken that has sought to determine the causes of disputes (e.g., Semple *et al.*, 1994; Kumaraswamy, 1997; Yiu and Cheung, 2007) and the most appropriate dispute resolution process (e.g. Steen, 1994; Treacy, 1995; Cheung, 1998; Ndekugri and Russell, 2006). Research into determining the causes of disputes has reached saturation point; consistently the same causal variables are identified. Because most of the studies undertaken have been based upon questionnaires (e.g., Kurmaraswmy, 1997) or derived from case law (e.g., Watts and Scrivener, 1995), the factors identified lack contextual meaning. For example, poor communication has been identified as a cause of disputes (Kumaraswamy, 1997). Yet problems do not arise because X does not communicate Z to Y, but the way Y interprets Z in light of some prior experience (or lack of), which X does not know

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about. Thus, X fails to make allowances for Z, and Y does not realise X does this because Y thinks both that their experiences are representative (Busby, 2001). Simply improving communication practices by improving information flow with technology or using Computer-Aided-Design will not reduce per se the incidence of disputes in construction (Love *et al.*, 2008). Fundamentally, work processes, policies, and procedures as well behaviours need to change in tandem if disputes are to be reduced in construction.

It is proffered that to reduce the incidence and consequential impact of disputes, an ameliorated understanding of why and how they arose is needed. Once an understanding is derived then strategies and processes can be put in place to prevent them from arising in the first instance. It is suggested that disputes arise as a result of pathogens within a project system. Such pathogens contribute to unworkable relationships, procedures and design and construction deficiencies. Pathogens are latent conditions and lay dormant within a system until a dispute comes to light (Busby and Hughes, 2004). Before the dispute becomes apparent, project participants often remain unaware of the impact upon project performance that particular decisions, practices or procedures can have. Pathogens can arise because of strategic decisions taken by top management or key decision-makers. Such decisions may be mistaken but they need not be. Latent conditions can lay dormant within a system for a considerable period of time and thus become an integral part of everyday work practices. In this paper a conceptual causal model derived from the literature is presented. The model demonstrates the complex array of variables that contribute to the occurrence of a dispute.

NATURE OF DISPUTES

A plethora of definitions as to what constitutes a dispute can be found in the normative literature (e.g., Brown and Marriott, 1993). The terms dispute, conflict and claim are often used interchangeably, but their meanings are very different (e.g., Al-Tabtabai and Thomas, 2004). Examples of how each of these terms has been defined include:

- Dispute – "any contract question or controversy that must be settled beyond the jobsite management" (Diekmann and Girad, 1995).
- Conflict – "serious disagreement and agreement about something important" (Collins, 1995). Similarly, Leung *et al.* (2005) define conflict as a "functional or dysfunctional element in the management process". Willmot and Hocker (1998), on the other hand, provide a detailed definition of conflict as "an expressed struggle between at least two independent parties who perceive incompatible goals, scare resources, and interference from other achieving those goals".
- Claim – "for the assertion of a right to money, property or remedy" (Powell-Smith and Stephenson, 1993). Likewise, Semple *et al.* (1994) define a claim as "a request for compensation for damages incurred by any party to a contract".

Reid and Ellis (2007) argue that there is no definitive meaning of a dispute and the existence of which is a subjective issue requiring a common-sense approach that relies on the facts, the law and policy considerations. Ndekugri and Russell (2006) and Reid and Ellis (2007) refer to the Halki Principle (Halki Shipping Corporation v Sopex Oils Ltd, [1998], 1 WLR CA) where a dispute does not exist until a claim has been submitted and rejected; a claim being a request for compensation for damages

incurred by any party to the contract. For the purposes of this paper, the definition of a dispute proposed under the Halki principle is adopted.

Causes of disputes

The literature is replete with studies that have examined the sources and causes of disputes (e.g., Watts and Scrivner, 1992; Kumaraswamy, 1997; Cheung and Yiu, 2006). Notably, the findings from such studies are similar in nature to those that have attempted to determine the causes of claims (Diekmann and Nelson, 1985; Heath *et al.*, 1994; Vidogah and Ndekugri, 2002), rework (Love and Smith, 2003), delays (Chan and Kurmaraswmy, 1995) and cost and schedule overruns (Chan and Kumaraswamy, 1995). For example, Onyango (1993) found that largest contributors to claims were post contract changes by clients, different site conditions, and unfilled duties of the architect/engineers. By the same token, Chan and Kumaraswamy (1997) revealed that the common causes of delay included client-initiated variations, necessary variations to works, unforseen ground conditions, poor site management and supervision, and low speed in decision making.

A number of studies have examined disputes causes (e.g Watts and Scrivener, 1992; Semple *et al.*, 1994; Rhys Jones, 1994, Heath *et al.*,1994; Bristow and Vasilopoulos, 1995; Conlin *et al.*1996; Mitropoulos and Howell, 2001; Killian, 2003; Cheung and Yui, 2006). There is a considerable degree of ambiguity and inconsistency with respect to the operationalisation and meaning of constructs within the literature. For example Sykes (1996) used the dispute construct of 'misunderstandings' and Bristow and Vasilopoulos (1995) 'unrealistic expectations', appear to have the same meanings but lack any form of theoretical underpinning. Many of the causes of disputes that have been identified can be anticipated and are specific to some degree. For example, weather, change of scope, payment, workmanship, and quality, documentation (Blake Waldron and Dawson, 2006). Kumaraswamy (1997) attempted to differentiate causes of claims and disputes into root causes and proximate causes. Kumaraswamy (1997) defined proximate causes as those that were immediately apparent and differentiated these from the underlying root causes. An example of a proximate cause is changes by client and the root cause being a lack of information for the client to make appropriate decisions.

The approach adopted by Kumaraswamy (1997) did not trace and isolate the causes that give rise to claims and disputes. In fact, Kumaraswamy (1997) suggested that the causes identified were all controllable to a certain extent. With this in mind, such causes are deemed to be 'special causes' (Deming, 1986) and therefore can be removed with the use of process management through the eliminating the conditions that initiate their occurrence. Once all the 'special causes' are eliminated then there will be a degree of process stability; that is, minimal claims and subsequent disputes. However, it is "unlikely that all potential causes can be adequately controlled simultaneously, given the multiple interacting subsystems and variables in any project" (Kumaraswamy, 1997).

Pathogens: Latent conditions

It is suggested that the determination of the underlying latent conditions that is pathogens, which contribute to disputes is the first step that is required to achieve a degree of process stability in construction. Pathogens have been defined by a number of qualities (Busby and Hughes, 2004:428):

- They are a relatively stable phenomena that have been in existence for a substantial time before the error occurs;
- Before the error occurs, they would not have been seen as obvious stages in an identifiable sequence failure; and
- They are strongly connected to the error, and are identifiable as principal causes of the error once it occurred.

Drawing on the literature that has looked the causes of errors, pathogens can be categorized as (Busby and Hughes, 2004):

- Practice – arising from people's deliberate practices;
- Task – arising from the nature of the task being performed;
- Circumstance – arising from the situation or environment the project was operating in;
- Organization – arising from organizational structure or operation;
- System – arising from an organizational system;
- Industry – arising from the structural property of the industry; and
- Tool – arising from the technical characteristic of the tool.

Many of the above pathogens are interrelated in nature and the identification of a single underlying condition is a subjective and arduous task considering the complex array of interacting variables that can contribute to a dispute. But the identification of the pathogen(s) that influence disputes could enable the identification of process changes in construction that have not been considered. Despite attempts to reduce the incidence disputes in construction, they still remain even though there have been a plethora of reports suggesting strategies to reduce their incidence. While many of the solutions that have been propagated were deemed to be pragmatic (e.g., NPWC/NBCC, 1990), they were not based on any form of empirical research that sought to determine the underlying conditions that contributed to the problem being addressed. As such the recommendations that have emerged from many of the Government initiated reports are simply band-aid solutions.

The allocation and management of risk is considered to be a key underlying factor that leads to disputes (Cole, 2002). When a contractor enters into a contract with a client they are well aware of the risks they are undertaking and price for these risks accordingly. However, there may be a degree of uncertainty for parties at the time a contract is signed (e.g., the degree of error contained within contract documentation, and changes in scope), which can later contribute to a claim and dispute (Mitropoulos and Howell, 2001). Under a traditional lump sum contract, for example, such uncertainties should not arise, particularly under a traditional lump sum contract. This approach should provide a client with a firm, fixed price for construction but in practice very few projects are actually completed within the tendered price (Rowlinson, 1999). Complete drawings and bills of quantities are generally not available when a projects goes to tender. Rowlinson (1999) therefore asks why do clients' continue to use this method when it can be argued that it leads to: a lack of flexibility; a price to pay in terms of claims-conscious behaviour; the fallacy of cost certainty; and a release of control by the client organisation. This has lead Cheung and Yiu (2006) to suggest that certain forms of procurement method are more prone to disputes than others because of the underlying allocation of risk. Having an ameliorated understanding of how risk is allocated and managed throughout a project's life-cycle is pivotal to reducing disputes. Simply focusing on the contract is

not an appropriate way to address the issue of risk, as ambiguous interpretations can always arise if a party believes they are entitled to compensation.

Diekman *et al.* (1994) suggests that the key constructs influencing claims are people, process and product. An alternative view is that the project management strategy juxtaposed with the organisational management practices and the behaviour of people (POP) are the constructs that will influence disputes (Figure 1). The status of the economic climate within which the construction industry operates will influence the form of project management strategy adopted and the organizational management practices implemented.

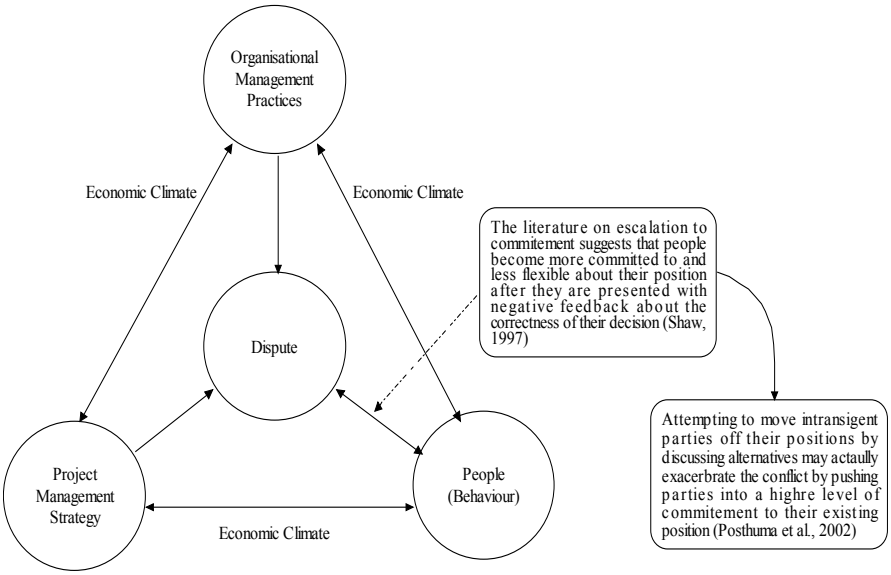

Figure 1: Constructs influencing disputes

Opportunistic behaviour occurs where one party to a contract takes advantage of their superior knowledge, in order to further their interests, by failing to disclose such information to the other contracting party. This would occur, for example, if a building supplier had information about a product which was deliberately withheld from a contractor, in the knowledge that such information would negatively affect the price of the product or the willingness of the buyer to purchase it. This type of opportunistic behaviour causes what is known as adverse selection, and generally takes place ex-ante the contract as a result of imperfect measurement. Opportunism also occurs ex-post, when one party, the client, to the contract is unable to monitor and enforce the performance in meeting contracted obligations of the other party, the agent (e.g., an architect). This is sometimes known as moral hazard and reduces the incentive for agents to fulfil their contractual obligations.

CAUSAL MODEL OF DISPUTES

Causal modelling, an inherent feature of system dynamics, is used to construct a conceptual causal model of disputes from the literature. Causal modelling can be used to provide managers with the necessary insights about the inter-dependencies and behaviour between key variables that can contribute to disputes so that learning and process improvements can be made to future projects (Love *et al.*, 2008). In Figure 2, conceptual causal model is presented. The boxes denote the proposed pathogens, derived from the literature, that are deemed to contribute to the occurrence of disputes. It can be seen that an array of variables contribute to the occurrence of a dispute.

Stating that 'design errors' (Killian, 2003) lead to disputes oversimplifies the complexity of the problem at hand.

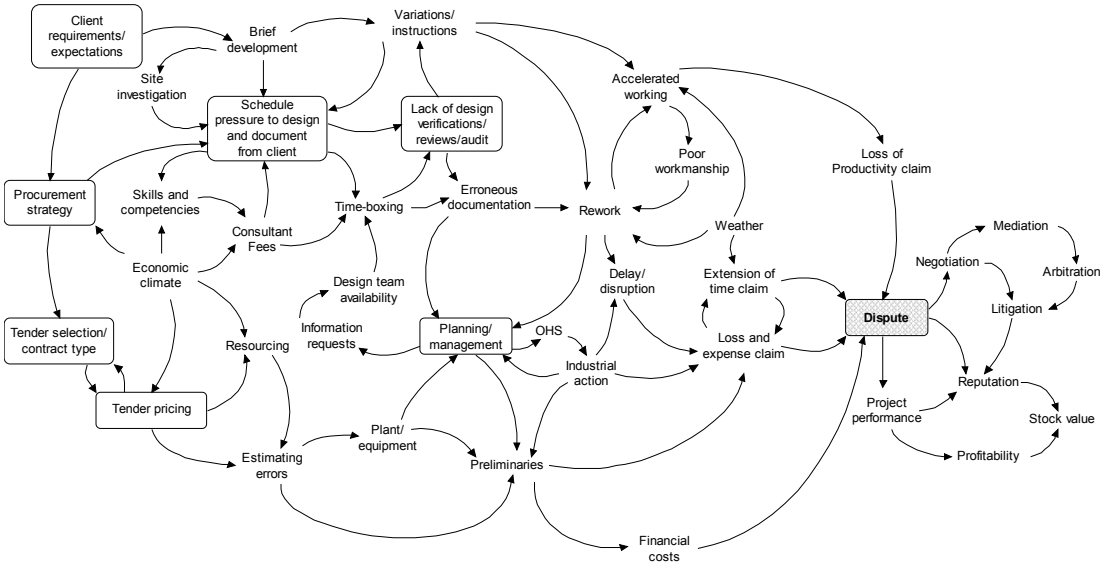

Figure 2: Conceptual causal model of disputes

The establishment of client requirements and expectations is required to develop the project brief and the procurement strategy. The economic climate will influence the procurement strategy that is adopted by the client. For example, speed of construction may be a requirement in times of high interest rates due to the cost of capital. It is appropriate that the adopted procurement strategy meets the needs of the client as well as matches the demands being imposed on the market place (i.e., skills shortages, high interest rates, inflation, and urgent demands for infrastructure investment). The margins of contractors and consultants are generally low due to the competitive nature of the industry. As a result, when additional work is undertaken or perceived to be outside the original scope, or information is not forthcoming and works are delayed, then a claim may be initiated as costs increase and profit for the project is jeopardised. Similarly, consultants regularly complain that they are given low fees for the work they have undertaken. Consequently, the standard of documentation that is produced is considered to be poor and in many instances erroneous (Tilley and McFallen, 2000). Such poor documentation can lead to rework, a delay, and claim for loss and expense by the contractor and subcontractor. Similarly, scope changes and rework can lead to accelerated working, and a claim for loss of productivity. Figure 3 denotes the factors that can lead the occurrence of acceleration. Accelerating works can lead to increased working hours, which requires changing shift patterns and can lead to increased stress which can translate into absenteeism and reductions in productivity. Construction methods may have to be changed and additional plant and equipment may be required. Because of the increased pressure to complete the works there is greater potential for people to commit errors, which can manifest as rework. Additional time is required to rectify the error, which may leads to de-motivation, reduce productivity and subsequently a claim and dispute.

Love *et al.* (2008) found that many pathogen orientated errors are based on practices (i.e. those pathogens from people's deliberate practices) that attempted to solve a particular problem. For example, reusing design details, specifications, and other contract documentation to reduce time and save money without giving due

considerations to the bespoke nature of construction projects. The practice of starting work on the basis of tentative information is often a consequence of working within the realm of non-traditional procurement methods (overlapping of activities) and therefore, short lead-times are often needed to meet a project's schedule.

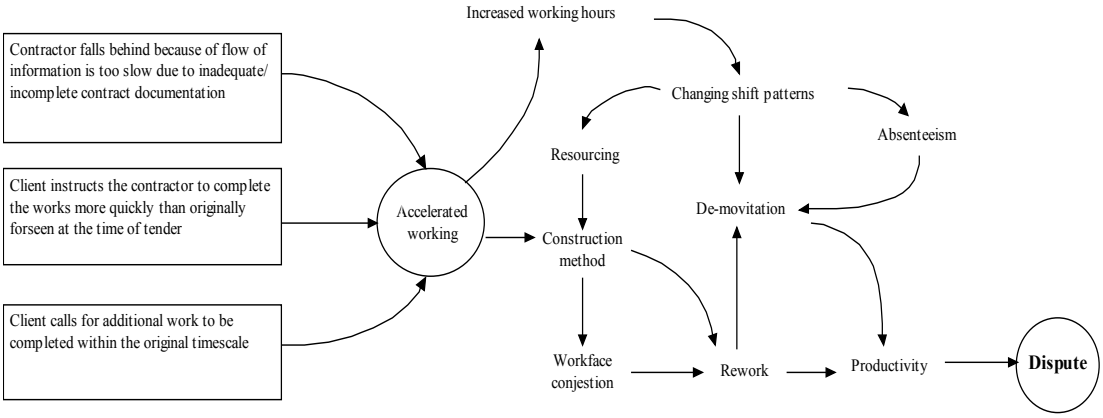

Figure 3: Acceleration and disputes

In some instances, individuals may repeat practices, such as taking short cuts and not following due processes. When a practice provides an outcome that is deemed to be satisfactory by the individual, then this practice is used on future projects even if it is unsuitable for that project. For example, the decision by designers to eschew audits, checks, verifications and reviews prior to releasing documentation for pricing or construction. Despite the importance of such activities, this practice has become a norm due to the financial and time pressures being imposed upon design firms by their clients (Love *et al.* 2008). Tilley and McFallen (2000) have suggested that there is a positive correlation between the demands imposed by clients for earlier completion of projects and the likelihood that designers produce erroneous contract documentation, and claims by contractors.

CONCLUSIONS

The causes of disputes in construction are numerous and simply trying to identify a specific cause is not possible given the complexity associated with the procurement of construction projects. Understanding the relationship between variables, and pathogens within project systems contribute to disputes is the first step that is required to reduce the incidence of disputes. A conceptual causal model, derived from the literature was proposed. Research is currently focusing on determining the pathogens that contribute to disputes. A number of industry focus groups and semi structured interviews are being conducted with clients, consultants, contractors and subcontractors so as to develop a rich causal model of disputes.

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