Avoiding and Mitigating Delay and Disruption Claims Conflict: Role of Precontract Negotiation

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Abstract: Delay and disruption claims often generate conflict and contract dispute in the delivery of building and civil engineering projects. If construction delay claims conflict can be avoided or mitigated, there could be substantial financial savings on projects. This study explores the effect of precontract negotiation as a means of avoiding or mitigating delay and disruption claims conflict. The data collection instrument was a structured questionnaire administered face to face on 41 contractors’ personnel on 41 completed projects in Singapore. The data were analyzed using structural modeling with partial least squares estimation approach. The results indicate that when the contractors received an unfavorable outcome from the contract administrator’s decision on their claims for delay, the intensity of conflict was lower when there was precontract negotiation and precontract agreement regarding the rules for quantifying and assessing the impact of anticipated delays than when there was none. It was also discovered that the higher the level of precontract negotiation and precontract agreement on the rules for quantifying and assessing delays, the higher the contractors perceived the quality of the decision-making process for delay claims during the construction phase. Further, the higher the contractors perceived the quality of the decision-making process for delay claims, the lower the intensity of conflict. At the time of entering into contracts, owners and their project management team need to pay more attention to precontract negotiation and agreement with their contractor to clarify and agree on the rules for quantifying and assessing the impact of anticipated delay and disruption. Aspects that require precontract negotiation, agreement, and clarification include: the rules of evidence for claims, the record requirements for claims and the procedure for keeping the records, form of construction program including the software for the preparation of the program and the procedure updating the program, the methodology for analyzing delay claims, formula for quantifying unabsorbed head office overhead component of prolongation cost, the method for quantifying disruption cost, the handling of concurrent delays, profit—whether claimable and the rate of profit to be paid, acceleration—circumstances under which it will be compensated and basis of compensation, and the question of who owns the float. These are, typically, not adequately covered by most standard forms of contracts. The agreements on these matters may be incorporated as part of partnering agreement or as a supplement to the contract agreement. Precontract negotiation, clarity, and agreements could produce instrumental and noninstrumental (social psychological) effects, which could facilitate delay and disruption claims assessment and their resolution. It could mitigate conflict even when the outcomes are unfavorable to a party.

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Introduction

Delay and disruption claims are a major source of problem in the construction industry. Conflict and dispute often arise when a contractor perceives a lack of fairness in the contract administrator’s decision or approach used in the assessment of delay claims (Spittler and Jentzen 1992). A dispute could also arise from what Zack (1993) described as “claimsmanship,” which involves “claims game” by the contractor. Whether actual or perceived, “claims game” and lack of fairness, could reduce the transparency during the resolution of claims (Zack 1993). It could generate distrust and create tension between the contractor, owner and the owners’ project management team. It could also reduce the ability of the parties to resolve the claims expeditiously.

Despite the volume of research work on construction claims, conflict, and dispute, delay and disruption continue to be a major subject of construction litigation. To exacerbate the problem, there appear to be differences and clash of legal principles when courts decide the many aspects of a delay and disruption claims dispute. Rules for resolving delay claims are often uncertain and confusing. The seriousness of the problem led to the Society of Construction Law Delay and Disruption Protocol (SCL 2002) in the United Kingdom (hereinafter referred to as “the SCL Protocol”). The protocol aims to provide useful guidance and means by which delay and disruption claims could be resolved to avoid unnecessary disputes (SCL 2002). Still yet, delay and disruption claims continue to be an area of uncertainty and a potential area for dispute in the construction process (Critchlow et al. 2005). For instance, Scott et al. (2004) observed that there are some good agreements among U.K. professionals regarding some of the critical problem issues addressed by the SCL Protocol, and how they deal with them in practice, but their findings also showed that there are other areas of disagreements between the different groups of industry participants surveyed. Apparently, there is
need for more effort directed at finding ways of reducing the problem (Critchlow et al. 2005).

Precontract negotiation between project participants to clarify and agree on problematic aspects of delay claims could reduce the potential for conflict and dispute during the construction phase (SCL Protocol). The conceptual basis is found in social psychology literature, which suggest that early participation of the parties involved in any conflict resolution process could mitigate the intensity of conflict and increase the potential that the parties would defer to the decision outcome arising from the process (Sheppard et al. 1988; Sheppard 1984; Thibaut and Walker 1978). In construction delays claims, early participation of parties could be achieved by precontract negotiation and agreements on rules for quantifying and assessing the impact of anticipated delay and disruption (Aibu 2006). However, the mitigating effect of precontract negotiation on conflict has not been empirically tested in the construction literature; hence, the aim of this study is:

To explore whether precontract negotiation could reduce and mitigate delay claims conflict during construction and how.

Addressing this research problem should inform practice and advance the development of theory in construction project management research. Understanding how precontract negotiation influences delay and disruption claims conflict at the construction stage should provide useful information for professionals (engineers, architects, quantity surveyors, project managers) and those who administer construction contracts on behalf of owners and who have control over claims assessment process. It should provide them with vital information on how to manage delay and disruption claims to lessen project owners’ exposure to disputes with contractors. If conflict and disputes could be avoided or resolved expeditiously on site, the efficiency of construction project delivery could be improved. This can lead to reduction in the total cost of projects and can increase returns for all parties.

Why Delay and Disruption Claims Are Contentious

The conflictual nature of delay and disruption claims may be discussed around four themes:

1. The complex nature of delay and disruption claims.
2. The inconsistency of the available techniques/methods for quantifying and analyzing delay and disruption claims.
3. The position of the owner-appointed contractor administrator in the traditional contracting system.
4. The nature of the conflicts in delay and disruption claims.

Complex Nature of Delay and Disruption Claims

Most delay and disruption claims are complex. Delay costs are difficult to quantify with precision. Depending on the contract conditions, specific aspects of delay and disruption claims can include the following: (1) overhead; (2) loss of productivity; (3) subcontractors’ delay cost; (4) escalation of labor; (5) escalation of plant; (6) escalation of material; (7) loss of profits/profit earning capacity; (8) finance charges; (9) off-site storage charges; (10) on-site storage charges; and (11) claims preparation costs (Bramble and Callahan 1992). Most of these heads of claims are ambiguous and sensitive and cannot be calculated with any degree of accuracy (Smith 2002). The rates of compensation, quantity of the impacts of delay events, and especially the composition of the cumulative effects of delay, loss of productivity, disruption, and indirect costs are among the issues that could generate disagreements.

Disruption costs are essentially production related and, as such, are often difficult to prove. Controversial issues may also include: how to account for risks that the contractor has taken on board in preparing his tender and, in particular, estimating the productivity level of his resources, poor workmanship, inclement weather, poor supervision, plant breakdowns, and poor quality or damaged materials (Smith 2002). Given that all these factors could affect construction output, it could be difficult for a contractor to demonstrate that his reduced productivity resulted from events that were the responsibility of the owner, or relevant event specified in the contract agreement. Smith (2002) observed that contractors themselves often find it difficult to ascertain the actual impact of a delay. The complexity of delay and disruption often compel parties to use assumptions and subjective judgment when substantiating and assessing them during construction (see John Barker Construction Limited v. London Portman Hotel Limited). Hence there may be a high potential for conflict and protracted dispute since parties could differ in their views.

Inconsistency of the Available Techniques/Methods for Quantifying and Analyzing Delay and Disruption Claims

Another major problem in delay claims resolution is that there is lack of uniformity and consistency in the techniques for analyzing delays. When delay claims have to be analyzed retrospectively after completion of the project or after the delay event have ceased to operate, there is a variety of methodologies that the contractor may use to substantiate its claims for extension of time, upon which the claims certifier then assesses the claims, also using one or more of the variety of methods (Kumaraswamy and Yogeswaran 2003).

Some methods for analyzing delays include (Alkass et al. 1995; Kumaraswamy and Yogeswaran 2003; Farrow 2001): (1) global impact technique; (2) net impact technique; (3) collapsed as-built critical path method (CPM); (4) as-planned “but-for” technique; (5) as-planned impacted method; (6) as-planned versus as-built method; (7) snapshot technique; and (8) time impact technique. These techniques are controversial and have been criticized for their inability to generate an objective result (Williams 2003). Alkass et al. (1995) determined a contractor’s entitlement using the various delay analysis techniques. The techniques generated markedly different results ranging from 2 days to 38 days. Further, sophisticated delay analysis techniques, using software, involve subjective judgments of the person conducting the analysis. Thus, they would yield different results when different software is used and different assumptions are made (Marrin 2005).

The SCL protocol identified four major categories of methodology for the analysis of delay: (1) as-planned versus as built; (2) impacted as planned; (3) collapsed as built; and (4) time impact analysis. However, in their paper “The great delay analysis debate,” Critchlow et al. (2005) used hypothetical construction scenario to demonstrate the problematic nature of using different methods on a single claims. In that scenario, using “as-planned impacted” method, the contractor claimed for 7 days extension of time. On the other hand, using “as-planned versus as-built method,” the owner contends that the contractor is not entitled to any extension of time. Using “collapsed as-built method,” the engineer (contract administrator) reached a similar conclusion. However, using the “time impact” method, the expert witness
concludes that the contractor is entitled to 3 days extension of time. Clearly, when parties use a different method for analyzing a delay in question, there would be a high potential for conflict and dispute. Although the SCL protocol recommends the use of time impact analysis as the preferred method for assessing extension of time claims, Scott et al. (2004) showed that it is not commonly used in practice.

In more recent years, researchers proposed the use of the system dynamics model and causal mapping for delay analysis (Williams 2003). However, the two approaches involve the use of subjective judgment in that information needed to identify the causes of project delay and its impact is based on interviews of project participants, which could be biased.

Further, methods for calculating some aspects of delay claims and disruption costs are also controversial. For example, the use of Eichleay, Emeden, and Hudson’s formulas in estimating the unabsorbed head office overhead component of delay claims (prolongation cost) remains an area of controversy in practice and in the research community (Zack 2002; SCL 2002). Similarly, methods for quantifying the lost labor productivity component of disruption claims such as “measured mile,” “total cost,” and “modified total cost methods” are often subjects of disagreement.

Position of the Owner-Appointed Contract Administrator in the Traditional Contracting System

The position of the owner-appointed contractor administrator in the traditional contracting system is another fundamental reason for the conflictual nature of delay claims. Although the contract administrator is normatively (under the common law) required to assess and decide claims fairly, impartially, and independently, the impartiality and fairness of his/her role is very difficult to attain or prove in practice. The reason is that the contract administrator plays a dual role—first, as owner’s agent and, second, as independent claims certifier. On top of that, the contract administrator is paid by the owner and represents the interest of the owner and may also have to represent his/her own interests when dealing with the contractor’s claims since he/she may also be responsible for the event leading to the delay (Nicklisch 1990). Thus, the acceptability of the contract administrator’s decision by the contractor would depend on how the contract administrator exercises the claims certification duty in practice. Whether or not the contract administrator would assess and decide claims fairly, impartially, and independently may be an area of concern to a contractor and, therefore, a source of tension and conflict.

Nature of the Conflicts in Delay and Disruption Claims

Another fundamental problem with delay and disruption claims is that they involve a high degree of “cognitive conflict” and strong underlying “conflicts of interest.” Cognitive conflict occurs when people interpret data relating to issues of facts differently. Cognitive conflicts arise from inadequate information, misinformation, different views on what is relevant, and differences in the approach and procedures used to assess claims and conflict (Moore 2003). When parties use different information and assumptions to assess claims, or interpret information differently, they arrive at different results. This is typical of delay and disruption claims where poor record keeping has been identified as a major source of the problem (Vidogah and Ndekugri 1998).

Further, delay claims involve a strong underlying conflict of interest. Conflict of interest occurs where the respective interests of the parties are perfectly opposed and divergent because a particular decision may maximize the outcome and favor the interest of one of the parties while reducing the outcome for the other party (Thibaut and Walker 1978). For instance, a decision of the contract administrator validating a contractor’s claims for delay could entitle the contractor to an extension of project completion time. It may also lead to payment of additional money by the owner to the contractor (depending on the contract agreement). The effect is that the project will be completed late and at an additional cost to the owner. However, a decision invalidating the contractor’s claims for delay would imply that the contractor has to accelerate the progress of works at its own expenses. Should the project be completed beyond the agreed contract completion time, the contractor would be liable to payment of liquidated damages to the owner. This may reduce the contractor’s profit margin on the project.

Apparently, any decision of the contract administrator on delay claims would be incompatible with the interest of either the owner or the contractor. Under the circumstances, the owner and contractor are likely to be less willing to accept an unfavorable decision by the contract administrator as correct.

Theoretical Framework and Hypothesis

When the decision of the contractor administrator on delay and disruption claims is unfavorable or tending to be less favorable, there could be a higher intensity of conflict. However, it is likely that precontract negotiation between the owner and contractor regarding a problematic aspect of delay claims could mitigate the intensity of the conflict. Thus, the primary hypothesis (interaction effect hypothesis) is set out as follows:

Precontract negotiation between the owner and the contractor on the rules of assessment and quantification for anticipated delays would moderate the relationship between the outcome favorability and the intensity of conflict on the delay claims such that when the contractor receives an unfavorable outcome from the contract administrator’s decision on the claims, there would be lower intensity of conflict when there is precontract negotiation, clarity, and precontract agreements on the rules of assessment and quantification for anticipated delay claims than when there is none.

Further, two secondary research hypotheses are also explored as follows:

- The higher the level of precontract negotiation between the owner and contractor on the rules of assessment and quantification for anticipated delay and disruption claims, the higher the contractor would perceive the quality of the decision making for the claims when they arise during construction.
- The higher the contractor perceives the quality of the decision making for delay and disruption claims, the lower the intensity of conflict.

Thus, the variables of this study are: (1) the favorability of outcome received by the contractor from claims (hereinafter referred to as outcome favorability—Ofavor); (2) the level of precontract negotiation, clarity, and agreements on rules of assessment and quantification for anticipated delay and disruption (Pnagree); (3) the contractor’s perceived quality of decision-making process (Qd-process); and (4) the intensity of conflict during delay claims resolution at the construction stage (conflict intensity—ClIntensity). The definition of these variables and the conceptual
basis of their hypothesized relationship are now examined in detail.

Conflict Intensity

Conceptually, a conflict is a difference between two or more beliefs, ideas, or interests (Conlin et al. 1996). March and Simon (1958) described conflict as a breakdown in standard mechanisms of decision making. The term “conflict” may also be used for contests, competitions, and tensions as well as for manifest clashes between social forces (Dahrendorf 1959). Pondy (1967) described conflict as a dynamic process consisting of the following stages: latent, perceived, affective or felt, and manifest stages.

Latent conflict is comprised of potential sources of conflict behavior such as bad communication. Perceived conflict is actual awareness or perception of being in conflict. Latent conflict may not reach the level of awareness. Affective or felt conflict is characterized by stress, tension, hostility, and anxiety. Manifest conflict is the activity dimension of conflict. It may include overt activity between two or more parties such as written or oral exchanges expressing disagreements. It may also involve passive resistance to aggressive behavior. Conflict in construction claims may include dissatisfaction, disagreements over contract administrator’s decisions, anger, hostility, and negative attitudinal propensities by parties [based on March and Simon (1958) and Pondy (1967)]. Intensity has been regarded as an important conflict characteristic (Bercovitch and Langley 1993). Following Bercovitch and Langley (1993), Kressel and Pruitt (1989), and Diekmann et al. (1994), conflict intensity is measured by combining the frequency and the severity of disagreements on claims, and the extent to which the disagreements negatively influence the working relationship among parties.

Outcome Favorability

People evaluate and react to decision making based on the extent to which the decision outcome favors or tends to favor them (Thibaut and Kelly 1959; Thibaut and Walker 1978). This is based on the self-interest seeking assumption of people (Homans 1961; Blau 1964; Williamson 1985). An unfavorable or less favorable decision outcome on delay claims could influence the intensity of conflict between the owner and contractor.

Quality of Decision Making

The perception of people about the quality of a decision-making process is a factor that could motivate their attitude and behavior toward the process and the decision arising out of the process (Tyler and Bladder 2000). It could influence their willingness to accept the decision outcome. Quality of decision-making process refers to the manner in which decisions are made or reached (Tyler and Bladder 2000). It involves formal or informal aspects of a procedure that improves the nature, quality, and fairness of decisions that are reached. It includes aspects such as neutrality and competence of the decision maker. Neutrality refers to the extent to which people feel that decisions are being made in an unbiased manner, based on facts and not on personal opinions or preferences (Tyler and Bladder 2000). Thus, neutrality may be influenced by the extent to which the decision-making process involves appropriate gathering and use of relevant evidence.

Quality of decision making also involves perceived or actual accuracy of a decision and consistency of the decision maker when applying rules for decision making across issues and across the different parties involved. An absence of these could influence the perception of the parties about the fairness of the decision making. It could reduce the potential that they would accept the outcome (Tyler and Schuller, unpublished manuscript, 1990). Further, efforts targeted at achieving accuracy in decision making are distinct from the actual evaluation of whether the decision reached is accurate or not (Tyler and Bladder 2000).

The complexity and ambiguity involved in the substantiation and assessment of delay claims coupled with a strong underlying conflict of interest suggest that the perception of the contractor about the quality of the decision-making process for claims could influence the intensity of conflict. Thus, it is likely that a higher quality of decision-making process (Qqprocess) would be associated with lower intensity of conflict intensity.

Role of Precontract Negotiation in Delay and Disruption Claims Resolution

Precontract negotiation between the contractor and owner’s project management team could facilitate the resolution of delay and disruption claims when they arise during the construction phase. The purpose of precontract negotiation is to clarify and reach agreement on problematic aspects delay and disruption claims assessment and quantification [SCL Protocol (SCL 2002)]. Precontract negotiation should essentially aim at the following:

1. Seek to enhance mutual understanding among parties regarding methodologies, techniques, and procedure for assessing and quantifying anticipated delay and disruption claims.
2. Seek to improve the quality of information needed for assessing the impact of anticipated delay and disruption.

These two aspects are now examined.

Precontract Negotiation on Methodologies and Approaches for Assessing Claims

At the precontract stage, parties might negotiate and agree on methodologies, techniques, and procedure for assessing and resolving different aspects of delay and disruption claims. This is likely to reduce uncertainties and potential areas of differences among the parties regarding how delays and disruption claims should be assessed when they arise during construction.

Precontract Negotiation and the Quality of Information for Assessing Delay and Disruption

The quality of information available when resolving delay claims would determine the correctness of the contract administrator’s decision on the validity of the claims and the amount of a contractor’s entitlements (a view accepted from an expert witness by His Honour Judge Richard Seymour Q.C in Royal Brompton Hospital NHS Trust v. Frederick A Hammond & others). The quality of information available would depend on the type and relevance of records kept during the construction process. It would also depend on the quality of the construction program and how frequently it has been updated. Heaps of records and facts with no specific linkage and relevance to alleged delay events are not helpful for resolving delay claims (Gibson 2003).

In practice, the information needed to assess the impact of delay and disruption is often left to the discretion of the contractor and a matter for the contractor to decide and make available (burden of proof). This practice seems to give the contractor absolute control over the type and the process of record keeping. Most standard forms of contract empower the contract administrator to request additional information if the contract administrator is dissatisfied with the information already submitted by the contractor.
Still yet, the origin and details of such information is in the control of the contractor. This could reduce the transparency of claims assessment and lead to distrust, thereby, disagreement and dispute (Aibinu 2006). In addition, parties may significantly differ in their views regarding the relevance and the sufficiency of information made available. Thus, they may find it difficult to reach a mutual agreement on the impact of delays.

The problem with “information” is evident in Bernhard Rugby Landscapes Ltd v. Stockley Park Consortium Ltd (1998). In that case, the contract administrator consistently rejected the contractor’s claims and did not give a decision on the claims on the ground that the information supplied by the contractor to substantiate claims was insufficient. The contractor argued that it had submitted sufficient and relevant information that should enable the claims certifier to form a view on the claims. The contract administrator was unable to demonstrate to the court what information was missing from the contractor’s submission. Apparently, differences in expectations and lack of clarity at the project outset regarding what information should be relevant and sufficient seemed to have contributed to the conflict. Thus, the question of what types of records should be used for assessing claims is an important aspect that the owner and contractor might need to negotiate, clarify, and agree upon at the time of entering into a contract.

Further, the question of whether or not a delay to progress falls on the critical path of the construction program is one of the most frequently disputed aspects of construction delay claims (Aibinu 2007). Contemporaneous maintenance and updating of the construction program so as to reflect the impact of any delay and to show the schedule for the remaining works could reduce such disagreements. Trickey and Hackett (2001) described a construction program as the best source of data when assessing and deciding extension of time, and when ascertaining a loss and/or expense claim. Thus, clarity regarding form of preparation of program, and procedure for updating of the program could avoid delay claims conflict or reduce their intensity.

From these viewpoints, precontract negotiation needs to address aspects such as software for preparation of program, the procedure for maintaining and updating the program, and procedures for gathering and keeping records and rules of evidence for claims (i.e., types of records to be kept for assessing claims).

Why Precontract Negotiation Could Reduce the Intensity of Delay and Disruption Claims Conflict

Conceptually, precontract negotiation could enhance the ability of parties to reach a mutually acceptable resolution of claims when they arise during the construction process. The reasons may be discussed around two themes: (1) effect of precontract negotiation on the quality of the decision-making process (instrumental effect); and (2) noninstrumental effect (social psychological aspect).

Influence of Precontract Negotiation on the Quality of the Decision-Making Process

Conceptually, perception about the quality of the decision-making process on a delay claims could influence conflict such that lower levels of perceived quality of decision making would be associated with a higher intensity of conflict. However, by reducing the potential areas of differences in expectation between parties, precontract negotiation at the time of entering into contract could improve the perceived quality of the decision-making process if claims are substantiated and assessed within the ambit of what has been mutually agreed upon. Additionally, by reducing the use of subjective judgment, discretion and personal opinions of the parties when substantiating and assessing claims, precontract negotiation could enhance transparency in the decision-making process, inadvertently reducing the intensity of delay claims conflict.

Further, the quality of information used for assessing delay claims could be improved when the parties negotiate, clarify, and agree on the form and the preparation of construction program, the procedure for maintaining and updating the program, types of records, and the procedure for keeping them (SCL 2002). The high quality of information is likely to enhance the perceived quality of the decision-making process and the potential that the contract administrator’s decision would be acceptable to the parties.

Put together, precontract negotiation could be beneficial in the following ways:

1. Enhance consistency in the assessment of claims and, thereby, enhance the parties’ perception of fairness of the assessment.
2. Ensure that the parties have clear and common understanding and similar expectations regarding how claims would be assessed.
3. Ensure that delay claims are assessed and quantified based on quality information and facts rather than personal opinion of the parties.
4. Ensure that high quality information is gathered and used for substantiating and assessing claims.
5. Reduce the potential that the contractor would submit spurious claims as spurious claims could be easily detected and rejected.
6. Enhance transparency of claims substantiation and assessment, thereby, reducing distrust between the parties.

Noninstrumental Effect of Precontract Negotiation

Thibaut and Walker (1978) proposed a control model of what influences peoples’ behavior in decision making. According to Thibaut and Walker (1978), people typically want to maximize their control over a decision making process that determines their outcome when interacting with others. Such control allows them to influence the decision making in a way that they feel will result in a fair outcome. When people have little or no direct influence on the decisions to be made, they would value indirect “decision control” by way of having control over the decision-making process (Kanfer et al. 1987). Thus, direct or indirect control is an important element of a fair claims and conflict resolution procedure because parties involved would wish to maintain a feeling of control over what will happen to them when the conflict issue is resolved (Brett 1986).

Precontract negotiation between the contractor, owner, and the owner project management team to clarify and agree on the rules, approaches, and methods for assessing the impact of anticipated delays claims is a form of indirect control by all the parties. It gives the parties an opportunity to voice and clarify their views on how delay claims should be assessed and quantified and the rules of evidence for the claims. Thus, precontract negotiation could be a significant procedural characteristic that could shape the parties’ views about the fairness of delay claims assessment during the construction phase. The psychology is that it is likely that parties would defer to decisions arising out of a process in which they had adequately and jointly participated regardless of the extent to which the outcome is tending to be unfavorable.
Research Method

Measurement of Variables, Data Collection, and Sample

A quantitative research method using data obtained from a questionnaire survey was adopted to test the research hypotheses. The constructs of the hypotheses were operationalized into measurable indicators based on the theoretical framework. The details are shown in Table 1.

Items relating to each construct were part of a questionnaire survey of a larger study, which investigated the antecedents of construction conflict and dispute. The items were developed in the form of statements to measure individual construct of the main hypothesis, namely, the favorability of outcome received by the contractor from claims (outcome favorability—OFA); the level of precontract negotiation, clarity, and agreements on framework for assessing anticipated delay and disruption claims (PNagreement); the contractor’s perceived quality of the decision-making process (QDprocess); and the intensity of conflict on delay claims (conflict intensity—CI). The statements draw upon some of the scales that have been previously used by researchers in other contexts (Tyler and Bladder 2000; Tyler and Schuller, unpublished).

Table 1. Operationalization of Constructs

<table>
<thead>
<tr>
<th>Construct</th>
<th>Item code</th>
<th>Description of measurement item</th>
<th>Response options</th>
<th>Cronbach alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome favorability</td>
<td>OFA1</td>
<td>Perceived level of favorability of cost claims allowed</td>
<td>1–7; 1=very unfavorable; 7=very favorable.</td>
<td>0.819</td>
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<tr>
<td></td>
<td>OFA2</td>
<td>Extent of satisfaction with losses and wins on claims</td>
<td>1–7; 1=very dissatisfied; 7=very satisfied.</td>
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<td></td>
<td>OFA3</td>
<td>Level/percentage of claims that were allowed</td>
<td>Measured on a % range scale in stages of 15% up to 90% and thereafter in 10% stages up to 100% (categorical scale 1–7).</td>
<td></td>
</tr>
<tr>
<td>Precontract negotiation, clarity, and agreement (Pncagree)</td>
<td>PN1</td>
<td>Extent of preagreement and clarity on technique, and methodology for analyzing delays and formula for quantifying claims</td>
<td>1–7; 1=not at all; 7=to a great extent.</td>
<td>0.781</td>
</tr>
<tr>
<td></td>
<td>PN2</td>
<td>Extent of preagreement and clarity on form of construction program, software for program, and updating approach and rules of evidence for claims (i.e., types of records to be kept and made available when substantiating claims)</td>
<td>1–7; 1=not at all; 7=to a great extent.</td>
<td></td>
</tr>
<tr>
<td>Conflict intensity (CI)</td>
<td>CI1</td>
<td>Frequency of disagreement with the handling of claims</td>
<td>1–7; 1=never; 7=very often.</td>
<td>0.682</td>
</tr>
<tr>
<td></td>
<td>CI2</td>
<td>Severity of disagreement with the handling of claims</td>
<td>1–7; 1=not severe; 7=very severe.</td>
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<td></td>
<td>CI3</td>
<td>Extent to which disagreements negatively influenced working relationship</td>
<td>1–7; 1=not much; 7=a lot.</td>
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<tr>
<td>Quality of decision-making process (QDprocess)</td>
<td>QDP1</td>
<td>Whether decision made on EoT claims was based upon facts, and not personal biases of the claim certifier</td>
<td>1–7; 1=strongly disagree; 7=strongly agree.</td>
<td>0.878</td>
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<tr>
<td></td>
<td>QDP2</td>
<td>Whether decision made on cost claims was based upon facts, and not personal bias of the claim certifier</td>
<td>1–7; 1=strongly disagree; 7=strongly agree.</td>
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<td></td>
<td>QDP3</td>
<td>Whether claims were decided without favoritism</td>
<td>1–7; 1=strongly disagree; 7=strongly agree.</td>
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<td></td>
<td>QDP4</td>
<td>Whether claims certifier showed consistency in deciding claims</td>
<td>1–7; 1=strongly disagree; 7=strongly agree.</td>
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<td></td>
<td>QDP5</td>
<td>Perceived level of claims certifier’s expertise in diagnosing and assessing claims</td>
<td>1–7; 1=very low; 7=very high.</td>
<td></td>
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<tr>
<td></td>
<td>QDP6</td>
<td>Perceived level of claims certifier’s expertise in diagnosing and assessing claims</td>
<td>1–7; 1=very low; 7=very high.</td>
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lshed manuscript, 1990; Lind and Tyler 1988; MacCoun et al. 1988; Lind and Lissak 1985); but the wording was modified to suit the context of this study.

The respondents were employees of randomly selected general building and civil engineering construction firms who are registered with the Singapore Building and Construction Authority (BCA) and are allowed to bid for projects above $30 million (≈US $20 million). These are big contractors who have technical and management expertise. The respondents were asked to complete the questionnaire based on their experience with claims on a completed project that they had been involved in. Depending on the nature of the question, respondents were asked to indicate their answers on a seven-point Likert scale. To anchor the Likert scale, relevant nomenclatures were assigned to the response options. Questions on the respondents’ companies’ demography and respondents’ profile were also asked. The questionnaire was administered face to face.

**Response Rate and Characteristics of the Sample**

Of the 200 contractors contacted, 41 responded representing a response rate of 20.5%. Thirty-two percent are foreign construction firms operating in Singapore while 68% are local firms. However, 40 respondents are Chinese (by race) and one is a German. Further, 41.5% are contract managers while another 41.5% are quantity surveyors. Seventeen percent are either project managers or site managers. Seventy percent of them have over 11 years experience in construction while 66% have been involved in over 11 projects in the past. Further, 63% of the projects upon which the responses were based are building projects while 37% are civil engineering projects. Fifty-one percent and 49% were public and private sector projects, respectively. Public projects were based on the public sector standard conditions of contract (PSS-COC) while private projects used the Singapore Institute of Architects standard conditions of contract (SIA). The average project value stands at $97.8 million. About 60% of the projects were commenced between 2000 and 2004 while 100% of the projects were completed between 2000 and 2005. Thus, the projects were awarded and completed within the same time frame and thereby were procured under a relatively similar market condition. This provides a similar basis for comparison and analysis.

**Hypothesis Testing**

In this study, the research problem is addressed by an interaction effect hypothesis and two secondary hypotheses. Interaction effect implies that the relationship between two variables changes as a function of the moderator variable. A moderator variable is one that affects the direction and or strength of the relation between an independent or predictor (exogenous) variable and a dependent (endogenous) variable (Baron and Kenny 1986). Moderator effect may also be said to occur where the direction of the relation between independent or predictor (exogenous) variable and a dependent (endogenous) variable changes as a result of the moderator. Thus, a moderator may increase, reduce, or reverse the relation between an independent variable and a dependent variable. Moderator variables specify when certain effects will hold. A path diagram (Fig. 1) shows a model for describing an analyzing interactive effect hypothesis.

The model has three paths that feed into the outcome variable: the impact of predictor variable (Path a), the impact of the moderator variable (Path b), and the interaction or the product of predictor and moderator (Path c). The moderator hypothesis is supported if the interaction (Path c) is significant. There may also be significant main effects for the predictor and the moderator (i.e., Paths a and b), but these are not directly relevant conceptually to testing interaction hypothesis (Baron and Kenny 1986).

To test interaction effect hypotheses, there is the need for statistical analysis to measure and test the differential effect of the independent variable (outcome favorability) on the dependent variable (conflict intensity) as a function of the moderator (precontract negotiation) (Baron and Kenny 1986). The differential effect may be measured using multiple regression analysis or structural equation modeling (SEM) technique. SEM was selected as a preferable technique for measuring the differential effect. Some construction management research using SEM include Molenaar et al. (2000), Jin et al. (2007), Wong and Cheung (2005), Sarker et al. (1998), Leung et al. (2005), Islam and Fani ran (2005), and Mohamed (2002).

Three procedures were considered for testing the interaction effect hypothesis (Jöreskog 1998; Chin et al. 1996):
1. Multigroup procedure;
2. Two-step constructs score procedure; and
3. Product indicator approach using SEM with partial least squares (PLS) estimation (PLS-SEM).

Product indicator with PLS-SEM was selected as a preferred approach for the following reasons.

**Multigroup Approach**

Multigroup approach involves splitting the sample into subgroups of cases based on different levels (e.g., low and high) of the suspected interaction variable (precontract negotiation). The differences in model fit when the model is restricted to the resulting groups of cases are then assessed. In this study, splitting the data into groups (for multigroup analysis) is problematic in that there would be a need for a large sample size to enable the division of data into two groups). Each group must have enough sample size to enable meaningful analysis. Given the sample size of 41 cases, the multigroup approach was considered unfeasible.

**Two-Step Constructs Score**

In the two-step constructs score approach, the first step is to create an interaction variable “Predicator*Moderator” (i.e., Ofavour*Pncagree) by multiplying the variable score of predictor variable (Pncagree) and moderator variable (Ofavour) for each of the sample. Multiplying the variable scores in this way assumes that

![Fig. 1. Moderator model](image-url)
the variances in the measures of both predictor and moderator variables are the same. In this study, this is unlikely since the measurement items are perception based. Additionally, the two-step approach makes use of moderated multiple regression, which assumes that the predictors of “CIntensity,” namely, “Pncagree” and “Ofavour” are without error. Data obtained through perceptive rating are more than likely to be measured with error and with differences in variance and would violate the regression assumption. These could bias the result and could have a substantial impact on the conclusions drawn from the result (Chin et al. 1996). Thus, this method was not used.

Product Indicator Approach Using SEM with Partial Least Squares Estimation

Product indicator is an approach in which variables of the interactive effect hypothesis are specified in a structural model in the form shown in Fig. 1 (Chin et al. 1996; Chin 1998). However, rather than multiplying the variable score of predictor variable (Pncagree) and moderator variable (Ofavour) for each of the samples as in the two-step construct score approach, the multiplicative interaction effect “Ofavour*Pncagree” is specified in the model by multiplying values of all items measuring “Ofavour” with values of all items measuring “Pncagree” (OFi,PNi) (see Fig. 2) (Chin et al. 1996).

Thereafter, component-based SEM with partial least squares (herein referred to as PLS-SEM) is employed to estimate the model. PLS-SEM was developed by Wold (1975, 1980) and Jöreskog and Wold (1982). PLS is a structural path estimation approach (Chin 1998) that is becoming a tool of choice in the social sciences as a multivariate technique for nonexperimental and experimental data (Mcintosh et al. 1996). Similar to covariance-based SEM (as implemented in LISREL and AMOS software), PLS may be used to model the relationships among multiple latent variables (LVs). It has the capability of working with unobservable latent variables and can account for measurement error in the development of latent variable constructs (Chin 1998) [see Mohamed (2002) for application of PLS to a construction management research]. The PLS approach is distribution free, hence, it is suitable for the data from nonnormal or unknown distributions. This study employed PLS-Graph 3.0—a software package that applies the PLS technique (Chin 2001).

Data Analysis

Reliability of Constructs

Prior to hypotheses testing, the convergent validity of the constructs was estimated using Cronbach’s alpha value. Convergent validity is a way to ensure the internal consistency of the items measuring each construct so that the items assumed to measure a particular construct actually measure it and are not measuring another construct. The minimum Cronbach’s alpha value is set at 0.60, following Churchill (1979) and Chin (1998). The calculated Cronbach’s alpha values, as shown in Table 1 are all above 0.6, indicating that there is internal consistency.

Discriminant Validity of Constructs

Analysis of cross-loadings was used to assess discriminant validity (Chin 1998) of the constructs. It indicates the extent to which a given construct is different from other constructs (Hulland 1999). To achieve this, the scores of the items were standardized and latent construct scores (in form of regression scores) were generated with PLS Graph 3.0 software and SPSS 13.0. Thereafter, the Pearson’s correlation coefficients (r) were computed for all questionnaire items against the latent construct scores. “The result (Table 2) shows that the loading of the items were highest on the construct that they were theoretically specified to measure.” This demonstrates the discriminant validity of the constructs.

Correlation Analysis

The results of the Pearson correlation analysis (Table 3) shows that the higher the levels of precontract negotiation, clarity, and

### Table 2. Analysis of Cross-Loading

<table>
<thead>
<tr>
<th>Construct</th>
<th>Ofavour</th>
<th>Pncagree</th>
<th>Qdprocess</th>
<th>CIntensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>OF1</td>
<td>0.851</td>
<td>0.278</td>
<td>-0.076</td>
<td></td>
</tr>
<tr>
<td>OF2</td>
<td>0.850</td>
<td>0.280</td>
<td>-0.074</td>
<td></td>
</tr>
<tr>
<td>OF3</td>
<td>0.824</td>
<td>0.370</td>
<td>-0.333</td>
<td></td>
</tr>
<tr>
<td>PN1</td>
<td>0.350</td>
<td>0.919</td>
<td>-0.234</td>
<td></td>
</tr>
<tr>
<td>PN2</td>
<td>0.349</td>
<td>0.892</td>
<td>-0.156</td>
<td></td>
</tr>
<tr>
<td>QDP1</td>
<td>0.407</td>
<td>0.228</td>
<td>0.758</td>
<td>-0.229</td>
</tr>
<tr>
<td>QDP2</td>
<td>0.553</td>
<td>0.390</td>
<td>0.848</td>
<td>-0.513</td>
</tr>
<tr>
<td>QDP3</td>
<td>0.290</td>
<td>0.127</td>
<td>0.763</td>
<td>-0.472</td>
</tr>
<tr>
<td>QDP4</td>
<td>0.474</td>
<td>0.142</td>
<td>0.757</td>
<td>-0.292</td>
</tr>
<tr>
<td>QDP5</td>
<td>0.444</td>
<td>0.336</td>
<td>0.795</td>
<td>-0.410</td>
</tr>
<tr>
<td>QDP6</td>
<td>0.514</td>
<td>0.325</td>
<td>0.868</td>
<td>-0.441</td>
</tr>
<tr>
<td>CI1</td>
<td>-0.180</td>
<td>-0.173</td>
<td>0.743</td>
<td></td>
</tr>
<tr>
<td>CI2</td>
<td>-0.202</td>
<td>-0.233</td>
<td>0.885</td>
<td></td>
</tr>
<tr>
<td>CI3</td>
<td>-0.173</td>
<td>-0.106</td>
<td>0.706</td>
<td></td>
</tr>
</tbody>
</table>

### Table 3. Correlation between Constructs

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Ofavour</th>
<th>Pncagree</th>
<th>Qdprocess</th>
<th>CIntensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ofavour</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pncagree</td>
<td>0.385^a</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qdprocess</td>
<td>0.582^b</td>
<td>0.347^a</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CIntensity</td>
<td>-0.231</td>
<td>-0.218</td>
<td>-0.512^b</td>
<td>1</td>
</tr>
</tbody>
</table>

^aSignificant at 0.05.  
^bSignificant at 0.01.
agreements (Pncagree) on the framework for assessing and quantifying delay and disruption claims, the higher the contractors’ perceived the quality of the process for assessing and deciding the claims when they arise during construction (r = 0.347). The correlation is significant (p < 0.001). As conceptualized, it is likely that precontract negotiation enhanced the perceived neutrality and impartiality of the contract administrator, and ensured consistency in the assessment of claims. It could also be that the precontract negotiation enhanced the quality of the information used in assessing the impact of the delays, thereby, enhancing the perceived quality of the process used for assessing and deciding the claims.

There is also a significant negative relationship between the perceived quality of the decision-making process and the intensity of conflict (r = -0.512; p < 0.01). This means that when the quality of the process for assessing and deciding delay claims is perceived to be high, there would be lower intensity of conflict. It is likely that the contractors deferred willingly to the claims assessment when the contractors believed that the claims are being assessed using quality information and facts rather than personal opinion of the contract administrator.

Further, the result shows that the contractors received a higher level of favorable outcome (Ofavor) where they perceived a higher quality of decision-making process (Qdprocess) (r = 0.582; p < 0.01). Similarly, the higher the level of precontract negotiation (Pncagree), the higher the level of favorable outcome received by the contractors from the assessment of their claims (r = 0.385; p < 0.01) Thus, higher levels of precontract negotiation were associated with more favorable outcome for the contractor.

The result implies that precontract negotiation is likely to increase the level of favorable outcome received by the contractors from the contract administrators’ decision. It is possible that precontract negotiation, agreement, and clarity on methodology for substantiating and assessing claims, rules of evidence for claims and on construction program would motivate the contractor to present and substantiate claims within the preagreed framework. This potentially limits submission of unjustifiable claims. Further, the preagreements could motivate the contract administrator to assess claims within the preagreed framework, thus, limiting subjective decision making on the contractor’s entitlements. It may also be that transparency of claims assessment and high quality of information (brought about by precontract negotiation) led the contractors to submit only claims that are genuine and as a result obtained a more favorable outcome from the contract administrators’ decisions. Thus, it is expected that there would be a negative correlation between precontract negotiation and the level of claims requested by the contractor.

A simple correlation analysis shows that the higher the level of precontract negotiation, agreement, and clarity on methodology for substantiating and assessing claims the lower the level of cost claims requested by the contractor (r = -0.401; p < 0.009). In addition, the higher the level of precontract negotiation agreement and clarity on methodology for substantiating and assessing claims, the higher the contractor’s satisfaction with the losses and wins on arising from cost claims (0.346, p = 0.026). Further, the higher the level of precontract negotiation, agreement, and clarity on program, software for program, and updating approach and rules of evidence for claims, the higher the contractor’s satisfaction with the losses and wins on arising from cost claims (0.324, p = 0.039).

It could also be that clarity in the rules of quantifications and assessment of claims limited the submission of spurious claims as spurious claims could be easily detected and rejected. Thus, when the contractor submits only valid claims and the claims are assessed within the ambit of precontract agreement, it is likely that there would be a more favorable outcome for the contractor.

**Test of Interactive Effect Hypothesis**

To test the interaction effect hypothesis, the values of all items measuring each construct are standardized. This is to help avoid computational errors that may lower the correlation between the product indicators and their individual components (Smith and Sasaki 1979). Thereafter, the interaction effect model specified in Fig. 2 was estimated with PLS-Graph 3.0 software. The interaction effect was assessed by examining the significance of the path between “Ofavour*Pncagree” and CIntensity. The interaction effect hypothesis was supported if the path of the interactions Ofavour*Pncagree → CIntensity is significant (Baron and Kenny 1986). Fig. 1 indicates the result of the interaction effect model.

The results give a standardized beta (β) of 0.555 from Pncagree to CIntensity, 0.552 from Ofavour to CIntensity, and interaction effect of —1.201 with total R-square of 0.220. The result implies that one standard deviation increase in precontract negotiation (Pncagree) will not only impact CIntensity by 0.555, but it would also increase the impact of Ofavour on CIntensity from 0.552 to —0.649 (—1.201+0.552). This implies that when the contractors received an unfavorable outcome from claims, conflict intensity was lower when there was precontract negotiation on the rules for quantifying and assessing anticipated delay claims than when there was none. The path of the interaction effect is significant (z = 2.1635, p < 0.01). Thus, the primary hypothesis of the study was supported.

The results suggest that early participation of parties through precontract discussion, negotiation, and agreement on the rules for resolving anticipated delay and disruption claims could mitigate the parties’ reaction to an unfavorable decision on the claims when they arise during construction. Typically, self-interest may influence the parties’ strategies, behavior and activities during the claims process, such that parties would tend to justify their position, take advantage of one another (opportunism), and push for a decision that favors their interests rather than an objective and appropriate decision. However, by increasing the quality of decision making through precontract negotiation, the transparency of the claims process could be enhanced. This could temper the self-interest seeking behavior of parties and, thus, lower the intensity of conflict even when they receive an unfavorable outcome.

**Discussion and Implications of Findings**

The results of the main hypothesis testing suggest that regardless of whether the contract administrator’s decision was favorable or unfavorable, the contractors reported a lower intensity of conflict when there was precontract negotiation, clarity, and precontract agreement with the owner and the project team regarding the rules for quantifying and assessing the impact of anticipated delay claims. Higher levels of precontract negotiation were also associated with a higher quality of decision making, while higher levels of the quality of the decision-making process were associated with a lower intensity of conflict. These finding have particular implications for managing claims.

In construction, critical problem issues that are known to be the sources of dispute on delay claims are, typically, not adequately covered in most standard forms of contract (SCL 2002). Such issues include methodology and software for preparing the program of works, the methods for analyzing the impact of de-
lays, the type of records required for assessing claims and the procedure for keeping them, the formula for quantifying unab-
sorbed head office overhead component of prolongation cost, and
methods for quantifying disruption cost. Among other things,
these issues have been known to be recurring sources of contract
disputes and litigation. There is also apparent confusion and in-
consistencies in the rule for resolving problematic aspects of de-
lays claims in the courts within and across many jurisdictions.
Thus, it could be helpful if parties negotiate, clarify, and reach
agreements upon these matters at the time of entering into the
contract. Such agreement may be supplemental to the standard
form of contract used on a project (SCL 2002).

According to SCL Protocol (SCL 2002) (Sec. 2.1), good
record keeping and good use of program could remove some
uncertainties surrounding delay claims. The SCL Protocol also
recommends a procedure for record keeping and for accepting
and updating program. Although this may place too much admin-
istrative burden on the parties in terms of programming and
record keeping, which will inexorably increase construction costs
(Henchie 2002), the SCL recommendations are similar to estab-
lished practices in the USA (Carmichael and Murray 2006).

Other aspects that may require precontract negotiation, clarity,
and agreements may include the following: (1) handling global
claims—whether acceptable or not and circumstances under
which they would be acceptable; (2) profit—whether claimable or
not and the rate of profit to be paid; (3) acceleration—
circumstances under which it will be compensated and basis of
compensation; (4) clarity on notice provisions in contract docu-
ments, including how, when, and to whom notice of problems
must be given; (5) the question of who owns the float; (6) notice
as a condition precedent to claims—whether failure to notify of
delay events would bar the contractor from claiming extension of
time; if agreed upon, the parties may agree on a rate in the form
of a reasonable percentage of contractor’s claims that would be
forfeited by the contractor per day of failure to give notice of
some claimable delays; (7) claim for payment of interest on
compensation—the rate of interest and the circumstances in
which it will be paid; cost of preparing claims—whether claim-
able or not; and (8) whether the employer could recover cost
expended as a result of contractor’s unreasonable pursuit of
claims and circumstances under which such cost is recoverable.
The SCL protocol (SCL 2002) recommends the preferred ap-
proach for handling some of these problematic aspects.

Further, when one considers the complex nature of delay and
disruption claims and the conflicting interest of contractor, owner,
and the contract administrator, the role of employer-appointed
contract administrator as employer’s agent and at the same time,
as independent claims certifier could continue to be an underlying
source of conflict. Contractors’ control over records and program
could also continue to be a source of lack of transparency and
tension. However, precontract negotiation could reduce these
problems by ensuring a more transparent substantiation and as-
ssessment of delay claims, thereby, reducing the scope for subjec-
tive judgment and discretion of all parties when resolving delay
claims. When claims substantiation and assessment are transpar-
ent and based on facts, parties may develop a higher level of trust
in one another and, thus, be less affected by unfavorable decision
outcome on claims.

Another implication of this study relates to the finding that
suggests that higher levels of precontract negotiation were asso-
ciated with a higher quality of decision making, while higher
levels of the quality of decision-making process were associated
with lower levels of intensity of conflict. The result suggests that
precontract negotiation could improve the process by which de-
cisions are made or reached on claims. However, this would de-
pend on the extent to which parties are committed to the
precontract agreements during the construction process. In order
words, the success would depend on how the agreements are
implemented when claims arise.

This study has practical implications for contract administra-
tors and owner’s project management team whose actions of re-
jecting invalid claims may be misinterpreted and disputed. One
way to minimize delay claims conflict and reduce potential for
dispute with contractors is to ensure that at the precontract stage
there is negotiation, clarity, and agreements with the contractor on
potentially problematic aspects of delays and disruption claims.
However, parties should not use such negotiation and agreements
to satisfy their individual commercial interest. Unreasonable im-
position of onerous agreement may be a source of dispute and
litigation. Onerous agreements may be challenged by a party and
invalidated by the court. Cases laws challenging unreasonable
liquidated damages amount are instructive. It is suggested that the
guidance provided by the SCL protocol may be a useful frame-
work that parties may wish to adopt when negotiating, clarifying,
and making agreement regarding rules for assessing and quantify-
ing anticipated delay and disruption claims at the precontract
stage. Further, the use of partnering might facilitate precontract
negotiation by encouraging open participation and transparency.

Conclusion

This study empirically demonstrates that precontract negotiation,
clarity, and agreements between the contractor, owner, and their
project team on potentially problematic aspects of delays and dis-
ruption claims is likely to mitigate delay claims conflict when
they arise during the construction phase. Details of how delay
claims would be handled are not thoroughly covered by most
standard forms of contract. Thus, at the time of entering into
contract, parties need to negotiate and agree upon how anticipated
delay and disruption claims would be handled when they arise
during the construction phase. Partnering may be used to facilitate
such negotiation and the agreement may be incorporated as part
of the partnering agreement. The agreement may also be incorpo-
rated as a supplement to the standard form of contract.

The study has several limitations. First, the data used were
cross-sectional. A longitudinal design may permit a more reliable
and accurate assessment of the hypothesis. The same source data
may have reflected an artifically high variance because of method
bias. However, this is unlikely to be serious as efforts were made
to reduce the problem. Second, the sample size (n=41) is rela-
tively small. However, this is more than the n>30, which is
required for statistical analysis to be carried out. The use of the
partial least squares estimation approach to test the interactive
effect hypothesis also eliminates the potential problem with a
small sample size (Chin 1998). However, in the future, more data
sets can be collected for testing the hypothesis.

Acknowledgments

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building and civil engineering project claims to reduce conflict
intensity and contractors’ potential to dispute,” conducted under
the National University of Singapore (NUS) Doctoral Research
Scholarship Award.
References


