The Asymmetric Benefits of Relational Governance: Evidence from Software Development Outsourcing

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ABSTRACT

We examine the interacting effect of formal contracts and relational governance on vendor profitability and quality in the software outsourcing industry. We argue that the *use* of relational governance is driven by perceptions of exchange hazards but in a departure from extant literature, we propose that the *benefits* accruing from relational governance are asymmetric and depend on how the exchange risks are apportioned by the formal contract. Formally, we hypothesize that relational governance provides benefits to an exchange partner only in those contracts in which they are exposed to greater risk and on those performance dimensions that is of importance to them. We test our arguments on 105 software projects completed by a software outsourcing vendor for multiple clients. We show that relational governance positively affects profitability in only Fixed Price contracts where the vendor is at greater risk while positively affecting quality only in Time and Materials contracts where the client is at greater risk. We thus provide evidence for the asymmetric benefits from relational governance, thereby arguing for a more contingent and limited view of the value of relational governance based on risk-exposure rather than the more expansive view prevalent in the literature that relational governance provides benefits for all parties under all contexts. We conclude with a discussion of the research and managerial implications of our findings.

Keywords: Software Development, Relational Governance, Contracts, Software Development Outsourcing, Exchange Hazards, Regression Analysis

INTRODUCTION

In recent years, relational governance of inter-organizational relationships has emerged as a dominant perspective in vendor-client relationships. Situating the vendor-client relationship in the center of a series of economic and social interactions between organizations (Macneil, 1980; Dyer and Singh, 1998), the relational view emphasizes non-contractual elements of the relationships such as trust (Gulati, 1995), reciprocity and flexibility (Heide, 1994) as safeguards against opportunism. Many researchers (Poppo and Zenger, 2002; Goo, at al 2008) have argued that the effectiveness of these relational mechanisms depends on the level of exchange hazards in the relationship. As the level of exchange hazards increase in the relationship, formal contracts have to be more complex to effectively govern them (Mesquita and Brush, 2008; Poppo and Zenger, 2002; Ring and Van de Ven, 1992). However, such complex formal contracts are still limited in their ability to rein in opportunism owing to their incompleteness (Williamson, 1979). It is only in these contexts that relational governance plays an important role by augmenting formal contracts.

In this paper, we explicitly address three critical gaps in this literature that limit our understanding of the relationship between formal and relational contracting. First, much of the literature has conflated the *use* of relational governance with its observed performance *benefits*. Thus, while several researchers have empirically established the existence of relational governance in the presence of exchange hazards, very few have examined whether the use of relational governance actually result in material benefits to the exchange partners (for exceptions see Poppo and Zenger, 2002). It thus remains an open question as to how relational governance may benefit exchange partners. Second, most researchers appear to implicitly assume that the benefits of relational governance are symmetric for all partners in the exchange. In contrast, we argue that the under the observation that relational governance is designed to mitigate risk in the exchange, the benefits of relational governance are more likely to flow to the partner who faces greater risk in the exchange. Since vendors and clients in an exchange typically face differential risks, this implies differential benefits to the parties based on risk exposure. Since the formal contract at its core is primarily a risk-sharing instrument, particularly in the outsourcing domain (Gopal, et al 2003), the benefits from relational governance will be driven in part by the formal contracting regime in place. Formally, we hypothesize that the formal contract

moderates the value provided by relational governance to the specific party by varying risk exposure. We propose a more contingent view for relational governance benefits based on risk exposure in contrast to a more expansive view seen in the literature that relational governance provides benefits under all contexts.

Finally, we examine a related question – how is value accruing from relational governance captured for different parties in an outsourcing project? If the benefits of relational governance are moderated by the risk-sharing put in place by the formal contract, it follows that these benefits will likely manifest themselves along different dimensions of outcomes. There is broad consensus in the literature that outsourcing outcomes are multi-dimensional (Davis et al, 2006; Lacity and Willcocks, 1998) and that different outcomes are of importance to the different parties. Service quality is observed to be critical to clients (Couto et al, 2006) whereas profitability is important to vendors (Gopalakrishnan et al, 1996). We argue that the benefits to contracting parties from relational governance under different conditions of risk will materialize differently across outsourcing outcomes; specifically, relational governance will add value to clients by enhancing quality in formal contractual regimes that expose it to greater risk. Conversely, relational governance will benefit the vendor's project profitability in the contractual regime that exposes it to greater risk.

Our paper thus provides a more nuanced understanding of the relationship between formal and relational contracting by first, contending that relational benefits are contingent on how risk is apportioned by the formal contract and second, that these benefits will be higher, on the margin, on those dimensions that are of key interest to the exchange partner. As prior research has indicated, there are two primary types of contracts used in software outsourcing – Fixed Price (FP) and Time and Materials (T&M) (Banerjee and Duflo, 2000). FP contracts specify a fixed amount to be paid to the vendor in exchange for completion of a specified project. T&M contracts, on the other hand, are cost plus contracts where the vendor's services are bought at a specified billing rate. FP contracts are riskier for the vendor since cost and schedule over-runs are borne by the vendor, while T&M contracts are riskier for the client (Banerjee and Duflo, 2000).These two contract types impose differential risk structures that favor the client (FP) and the vendor (T&M), allowing us to test arguments about differential effects of risk sharing and relational governance on project outcomes.

We test our hypotheses on a dataset of 105 software development outsourcing projects completed by an Indian software vendor. The software outsourcing industry is characterized by high uncertainty, ambiguous performance measurement and high asset specificity and is thus, highly suitable for testing the use of relational governance (Poppo and Zenger 2002; Goo et al 2008). In addition, most contracts used are incomplete due to the high level of risk and uncertainty inherent in them, thereby enhancing the salience of risk-partitioning through the formal contract. Our results show that on the margin, the effect of relational governance on vendor profitability is higher in FP contracts where the vendor bears the greater level of risk. In contrast, relational governance's impact on quality is higher in T&M contracts where the client bears the greater portion of risk. In the next section, we develop our research hypotheses in more detail after briefly reviewing the literature relating relational governance and formal contracts.

THEORETICAL BACKGROUND

Relational Governance and Formal Contracts in Vendor-Client Relationships

The importance of formal contracts in governing complex economic exchanges has been well established in the literature (Ghoshal and Moran, 1996). Rarely ever are economic exchanges such as offshore outsourcing, initiated without some form of a formal contract in place. The formal contract enables the exchange relationship by specifying the expectations and obligations of the contracting parties. In complex economic exchanges, it is however not possible to devise complete contingent contracts since the costs of identifying every contingency that may arise during the course of the exchange and specifying suitable payoffs is too high. Factors such as performance ambiguity, measurement issues and limited observability, true of many complex exchanges such as offshore software development, make most formal contracts incomplete (Hart and Moore, 1999). In such contracting environments, the residual incompleteness manifests itself through differential risk structures that benefit one party more than the other. In other words, the formal contract partitions the risk between the contracting parties based on their individual propensity to bear risk and relative bargaining power (Banerjee and Duflo, 2000; Holmstrom and Milgrom, 1991) whereby one party bears greater risk in the relationship. Typically two primary types of contracts have been used in this context – Fixed Price (FP) and Time and Materials (T&M) (Banerjee and Duflo, 2000). FP contracts specify a fixed

amount to be paid to the vendor in exchange for completion of a specified project. They are therefore riskier for the vendor since cost and schedule over-runs are borne by him. T&M contracts, on the other hand, are cost plus contracts where the vendor's services are bought at a specified billing rate. They are therefore riskier for the client (Banerjee and Duflo, 2000) since the client is responsible for project cost over-runs.

While these two broad types of contracts are observed in all outsourcing arrangements (Banerjee and Duflo, 2000), both these contract types remain incomplete because the underlying complexities of software development cannot be captured entirely through the contracting process. It is precisely in these complex exchanges that relational governance assumes importance through its role in mitigating risk arising from contract incompleteness. Specifically, relational governance theory holds that dyadic relationships are embedded in a broader context of inter-organizational relationships that binds firms (and individuals) into industry-wide networks (Granovetter, 1985; Macneil, 1980; Uzzi, 1997). Such networked relationships provide parties with mechanisms that can be used to reduce exchange hazards, manage disputes and equitably distribute surplus from the exchanges – these mechanisms include trust (Gulati, 1995; Zaheer and Venkatraman, 1995; Nooteboom et al., 1997; Poppo and Zenger, 2002), joint action and reciprocity (Zaheer and Venkatraman, 1995; Heide, 1994), expectations of continuity and fairness (Artz and Brush, 2000; Heide and John, 1990), reputation and repeated interactions (Kalnins and Mayer, 2004; Dyer, 1997) and relational flexibility (Heide, 1994). These mechanisms enable the exchange partners to work through the issues arising out of the exchange that may otherwise subject them to opportunism. Thus while formal contracts set the stage for the relationship and the associated risk-sharing, relational governance provides for flexibility by enabling shared interpretation, renegotiation and modifications in contract parameters. In effect, relational norms complement the presence of formal contracting in allowing parties to better *manage* the exchange hazards. More formally, relational governance is relevant in contexts where exchange hazards arising from uncertainty, ambiguous outcome measurement and asset specificity are high since it is precisely in these contexts that formal contracts are inadequate.

While there seems to be consensus in the literature that relational governance and formal contracts are complementary in the presence of high exchange hazards, the empirical evidence for this relationship

however is relatively scanty. Most studies in this area have primarily focused on establishing that relational governance exists in relationships that exhibit high exchange hazards. For instance, Zaheer and Venkatraman (1995) showed that high uncertainty in the exchange was associated with increased use of relational governance in the insurance industry. Similarly, higher asset specificity was associated with greater reliance on relational norms (Nooteboom et al, 1997; Heide and John, 1990; Heide, 1994). Similar results have been observed in the relationship between exchange hazards and relational governance in Goo et al (2008), Dyer (1997), Poppo and Zenger (2002), Mellewigt et al (2007), Wathne and Heide (2004) and Chen and Bharadwaj (2008). A much smaller subset has studied the use of relational governance in the presence of formal contracts (Poppo and Zenger, 2002). Germane to our arguments, very few papers have examined whether the use of relational governance is truly *effective* in enhancing relationship outcomes (with some exceptions such as Poppo and Zenger (2002)). In other words, existing studies on relational governance have implicitly conflated the use of relational governance with its benefits**.** Consider the table of existing empirical research on relational governance. While many of these studies have explicitly studied the conditions under which relational governance may be used, there is little work addressing the actual benefits that accrue from their use in the exchange, particularly in terms of eventual outcomes that are arguably of primary importance to managers. Thus, while the use of relational governance in certain transactions is theoretically valid, the question of any evidence of value-creation from relational governance remains an open question.

Part of the reason for conflating relational governance use with benefits is that much of the literature has assumed that relational governance provides symmetric benefits to all parties in an exchange. By definition, relational governance is treated as a bilateral governance process (Ring and Van de Ven, 1992) and therefore, if all parties to an exchange jointly invest in this form of governance, the benefits from relational governance can be assumed to be symmetric to all parties. However, the formal contract as discussed earlier, allocates risks in the exchange differentially, whereby one party typically bears greater risks. Since the primary role of relational governance is its effect on mitigating exchange risks, we argue that relational governance should provide more benefits to the party who bears the higher risk in a given engagement, thereby explicitly arguing for asymmetric benefits from relational governance based on relative

risk-exposure. We therefore propose that the relationship between relational governance and its observed benefits depends on how the risk is apportioned, i.e. on the type of contract.

Finally, the issue of differential risk exposure makes salient the problem arising from different performance dimensions. Much of the contracting literature treats outsourcing outcomes as unidimensional (Baker, 1992). However, a related stream of work has studied the role of moral hazard and adverse selection when performance dimensions are multi-dimensional and more importantly, when the performance dimensions are of differential interest to the parties to the exchange (Dixit, 2002). One outcome dimension may be of particular importance to the client while the agent's actions are driven by his marginal cost of effort with respect to the other outcome dimension (Baker, 1992). Consider the commonly observed problem of incentivizing cost minimization for vendors by setting strict cost controls – one way for the vendor to minimize cost is by shirking on quality (Holmstrom and Milgrom, 1991). If the client is interested in high quality while controlling costs, this becomes a multi-dimensional contracting problem. To the extent that vendor effort along multiple dimensions are substitutes with respect to his payoff, the marginal cost of effort along one dimension increases as the vendor spends more effort along the second dimension (Dixit, 2002; Baker, 1992). The role of the formal contract is thus critical now; the risk-sharing induced by the formal contract emphasizes the extent to which contracting parties face risk along different dimensions in the economic exchange. In other words, in contracts where the vendor bears greater risk, on the margin, his incentives will be greater towards the dimension that dictates his payoffs than alternative dimensions that relate to client payoff and *vice versa*[1]. As the exchange hazards in the exchange increase, the benefits of relational governance will therefore be measurably higher *first*, for the contracting party that bears greater risk and *second*, along the performance dimensions that are of critical importance to that party. There is no work in the literature, to our knowledge, that has hypothesized or empirically shown the differential benefits from relational governance on multiple performance dimensions as we do in this paper.

Our work thus addresses these critical gaps in the literature in the context of the software development outsourcing industry by developing two theoretical models. We first hypothesize that the use of

[1] If one single dimension of performance accurately captures both their payoffs, this diverging incentive problem will not arise but this is unrealistic.

relational governance should be associated with high exchange hazards and the nature of the relationship. Second, we explicitly test for the benefits of relational governance contingent on the risk exposure of the two parties on two performance dimensions – service quality and vendor profitability. Extant literature in software outsourcing strongly argues that service quality is of critical importance as a performance measure for clients (Ethiraj et al, 2005; Couto et al, 2006) while project profitability is an important performance dimension for vendors (Gopal et al, 2003; Levina and Ross, 2003)[2]. We test whether the differential risk exposures induced in a project by the two archetypal contract types (FP and T&M) induce different payoffs from relational governance on these two performance criteria. Specifically, we test whether on the margin, relational governance in a project enhances quality more when the client bears greater risk (in a T&M contract) and profitability more when the vendor bears greater risk (in a FP contract). Through this analysis, we are able to provide a more fine-grained analysis of the interacting roles of relational governance, formal contracts and performance. In the next section, we outline our model of relational governance and subsequently present our research hypotheses.

A Model for *Use of Relational Governance* in Software Development Outsourcing

Information technology (IT) outsourcing refers to the use of external agents to perform IT activities or functions that were previously performed within the organization (Davis et al, 2006). In this paper, we focus on outsourced software development projects, contracted individually on a turnkey basis. Each project represents a separate and identifiable series of tasks or activities undertaken to achieve a specific information systems objective within certain technical specifications, with defined start and end dates and subject to funding limits and resource availability (Pressman, 2005). Outsourced software projects are characterized by many of the basic constructs that have been shown to increase exchange hazards within relational exchange theory (Ring and Van de Ven, 1992). First, there is considerable uncertainty in managing the project. Uncertainty emerges from the very nature of software development (Pressman, 2005) in that it is difficult to predict the interaction between client requirements, technical parameters, team/manager experience and technology platforms in the project ex ante. Second, significant measurement difficulties are associated with

[2] We do not claim that quality is not important to the vendor; rather, we argue that profitability is *more* important to the vendor and it is this difference that drives, on the margin, the observed benefits of relational governance.

outsourced projects (Alchian and Demsetz, 1972) due to the ambiguous and intangible nature of software services in general (Nayyar, 1993). For instance, it is hard to establish ex ante targets for quality or costs or measure them accurately ex post due to project uncertainty as well as ambiguity in their definition and measurement (Nayyar, 1993; Pressman, 2005). This highlights the incentive problems that are exacerbated in multi-dimensional contracting problems (Baker, 1992; Holmstrom and Milgrom, 1991). Third, vendors need to make asset-specific investments in the project. While technical knowledge per se may be acquired more easily in the market, the combination of technical knowledge and experience is not easily found in the market (Mata et al, 1995). Finally, outsourced software projects tend to be idiosyncratic in that no two projects within the same domain may be similar. The presence of these features in outsourced projects thus leads to considerable levels of exchange hazards, which may be manifested in different variables across projects.

Within the transaction cost framework, the response to exchange hazards has been to devise more complex contracts as safe-guards (Williamson 1985). However, prior research shows that for complex activities such as software outsourcing with its attendant difficulties in estimating contractual parameters ex ante and the high probability of risk materialization ex post, incomplete contracting is the only option (Hart and Moore, 1999). Even though contract types (FP versus T&M) may be selected as a response to risk in the project (Gopal et al, 2003; Kalnins and Mayer, 2004), the high levels of ex post uncertainty in these activities implies that all contracts are incomplete (Crocker and Reynolds, 1993). There is therefore considerable potential for opportunism for both parties in the project, even in the presence of formal contracts, thus necessitating relational governance. Researchers have argued that two broad sets of factors determine the use of relational governance in vendor-client relationships. The first set relates to exchange hazards. The second set relates to the nature of the relationship between the partners. We propose individual hypotheses around these two sets of factors next.

Exchange Hazards

In the outsourcing context, two significant sources of uncertainty pertain to unstable project requirements and asset specific investments on the project (Pressman, 2005; Nidomolu, 1995; Banerjee and Duflo, 2000). Changing requirements are an unfortunate consequence of the intangible nature of software

outsourcing; in some instances, requirements can only be expressed in an inexact form. Some projects exhibit greater requirements instability due to the domain or technological platform of the project. Changing requirements affect project outcomes such as service quality, cycle time and efficiency. Requirements instability on the project entails considerable costs for both clients and vendors on the project. High requirements instability necessitates considerable rework which adds to project costs. More importantly, it implies significant redesign while simultaneously affecting quality and potential delays in completion. It also affects the deployment of personnel as well as project schedules leading to significant impact on project management requirements for both vendors and clients.

In a similar vein, tight labor markets and a premium attached to skilled personnel make human asset specificity a significant hazard (Ethiraj et al, 2005; Lacity and Hirschheim, 1993). Software outsourcing depends on the extent to which the human resources are specifically invested in the project (Poppo and Zenger, 2002). These investments are built upon either hiring specifically trained personnel for the project or training existing personnel specifically for the project's needs. While this training may be leveraged in other projects, the extent to which this training is specific to the current project will limit alternative options for both clients and vendors. For clients, changing trained programmers for the project will entail a cost of retraining and possible delays on the project. For the vendor, the cost of replacing personnel trained or experienced for a project will be higher and possibly more damaging since it is responsible for replacing the personnel on the project.

A similar argument can be made for the presence of significant employee turnover from the project as well. Tight labor markets imply that these specialized resources are at a premium, resulting in potential employee turnover on the project (Ethiraj et al, 2005). Here again, the implications of high asset specificity and turnover affect the vendor's costs directly as it involves considerable training upfront and significant losses when trained personnel leave. However, even in contexts with little asset specificity, employee turnover affects project outcomes since frequent reshuffling of personnel on the project has adverse implications for quality of software developed and the delivery schedules (Lacity and Hirschheim, 1993).

Hypothesis 1a: Greater requirements instability is associated with greater relational governance in the vendor-client relationship.

Hypothesis 1b: Greater presence of employee turnover from the project team is associated with greater relational governance in the vendor-client relationship.
Hypothesis 1c: Greater vendor human asset specificity in the project team is associated with greater relational governance in the vendor-client relationship.

Relational Factors

While exchange hazards are seen as determinants of relational governance in the literature, other factors act as antecedents by enabling the development of appropriate norms between client and vendor- these are often referred to as relational norms. One of the primary antecedents of relational governance is trust between the client and vendor (Gulati, 1995; Zaheer et al, 1998). Trust is an important determinant of relational governance since it allows the contracting parties to go "beyond the contract" in establishing norms and practices built on expectations of reciprocity, fairness and future business. The presence of prior interactions between vendor and client has been shown to enhance trust in the exchange (Kalnins and Mayer, 2004; Sabherwal, 1999; Poppo and Zenger, 2002). Prior interactions result in greater understanding between the partners as to their motivations, goals and objectives.

Hypothesis 2a: The greater the number of completed projects for the same client, the greater will be the relational governance in the client-vendor relationship.

A significant factor that drives institutionalization of relational governance in the project is the client's capabilities (Ethiraj et al, 2005)[3]. There are several roles that the client plays in these settings. First, the client is vital in terms of knowledge-sharing that is essential for most projects. Software development outsourcing is an interactive process and the business domain knowledge resident in the client is critical in ensuring project success. Prior literature in knowledge-sharing and boundary spanning attests to the critical role that client abilities play in enabling successful projects (Levina and Vaast, 2005). Second, the client plays an important coordination and control role within the exchange (Kirsch et al, 2002; Mellewigt et al, 2007). This role pertains to the ability of the client to provide value-added input to the vendor on open issues in the project, act as a controller and provide feedback on various technical and project-related matters. Finally, the clients' experience is critical in terms of his/her understanding of the difficulties inherent in the software

[3] Since our research design is based on a single vendor, we essentially control for any vendor-level heterogeneity. However, similar arguments can be made for the role of the vendor's observed relationship management capabilities as a precursor to relational governance (Russell and Chatterjee, 2003, Heide and John, 1990)

development process and is thus a factor in predicting his/her willingness to be flexible in the interpretation of the contract terms. Thus,

Hypothesis 2b: Greater client MIS department experience with outsourcing is associated with greater relational governance in the vendor-client relationship.

The Moderating Effect of Formal Contract Type on the Value of Relational Governance

As noted earlier. FP contracts induce greater risk exposure on vendors while T&M contracts are riskier for clients, all else being equal (Gopal et al, 2003; Banerjee and Duflo, 2000). Similarly, profitability on the project is of primary importance to the vendor (Gopalakrishnan et al, 1996; Ethiraj et al 2005) while service quality as a performance dimension is important to the client (Couto et al, 2006; Nidomolu, 1995). We draw on these observations to hypothesize for the asymmetric benefits of relational governance on outcomes in each contractual regime.

Consider the FP contract, wherein the vendor's revenues are fixed (Gopal et al, 2003). Therefore, any materialization of unforeseen risks on the project is likely to endanger the vendor's bottom line, thereby inducing strong incentives on the vendor. The presence of relational governance thus allows the vendor and client together to mutually adjust project parameters ex post in spite of the presence of ex ante parameters that may not be attainable; indeed, this is one of the primary benefits of relational governance discussed in the literature (Dyer and Singh, 1998). Consider a situation where the requirements on the project change ex post due to changing business conditions; as the project unfolds, it is possible that these changing requirements will affect the profitability of the vendor on the project under the FP contract. Relational governance allows the vendor to work together with the client in ensuring that the vendor's profitability from the project does not suffer. In the absence of such flexibility, this is less likely to occur. Similarly, consider the warranty conditions that are specified ex ante during contracting. Again, information revealed during development could induce relatively high costs on the vendors to reach warranty conditions, affecting its profitability. Relational governance along this dimension will allow the vendor and client to jointly work together towards ensuring that the "spirit" of the contract is retained rather than the "letter" of the contract, thereby enhancing the vendor's dimension of importance, i.e. profitability, does not suffer. The effect of the strong incentives to protect profitability will direct, on the margin, the use of relational governance on the

project more towards exchange hazards that affect profitability, all else being equal (Baker, 1992; Holmstrom and Milgrom, 1991). If the formal contract held no risk for the vendor's profitability, there would be no expectation of relational governance's effect on profitability. However, in the riskier FP regime, relational governance will have a *greater* positive effect on vendor profitability.

We now consider the T&M contract. Within this contract, the vendor's risks are minimized since the client bears the bulk of the risk in the project (Lacity and Hirschheim, 1998). Indeed, the literature on managing outsourcing argues that in T&M contracts, the management of the project is contingent on the client's capabilities and skills. Lacity and Hirschheim (1998) argue that the client's ability to manage interdependencies on the project and evaluate progress on the project is critical in T&M contracts given the client's risk exposure. Higher risk exposure suggests that the clients face considerable risks of opportunism by the vendor. Opportunism in the T&M contract faced by clients takes two forms. First, prior research suggests that vendors tend to place their best resources and people on FP contracts since they face the most risk in those contracts (Arora and Asundi, 1999). Even when the client can specify skills that are required to be placed on their projects, these are hard to verify and hence, on the margin, can be manipulated by the vendor. Second, the vendor has a perverse incentive to extend the duration of the project indefinitely by adding functionality and rework to the project (Bajari and Tadelis, 2001; Banerjee and Duflo, 2000).

Both forms of opportunism have significant implications for the service quality on the project. The extent to which marginally less capable resources are deployed on a project, the quality of the software will suffer since there is considerable research to show that quality in software development is directly related to the capabilities of the team and the managerial resources used in the project (Ravichandran and Rai, 2000). The imperfect observability of these resources by the client adds to the risk of opportunism. In addition, additional rework and changing functionality on the project, which may increase the vendor's revenues on the project, could lead to considerable negative effects on quality (Harter et al, 2000). Even vendors point out that unnecessarily extending functionality on a project can have negative consequences on service quality (Gopalakrishnan et al, 2006). It thus follows that the use of relational governance in T&M contracts will be directed by the client, on the margin, towards reducing the occurrence of these forms of opportunism in the

project. Rather than sticking to the 'letter' of the contract, relational governance in such context may result in the vendor deploying higher qualified personnel (more than that specified by the contract) to the project, resulting in better software design, lesser rework and higher quality. Alternatively, the vendor may extend warranty beyond contract terms, enhancing confidence and reliability in the developed software. Relational governance thus adds significant value to the client in T&M contracts by allowing the client to better manage the risk of opportunism and its effects on quality. Thus, we propose:

Hypothesis 3: There will be a greater positive association between relational governance and vendor profitability in FP contracts than in T&M contracts. In effect, the contract type will moderate the relationship between relational governance and vendor project profitability.

Hypothesis 4: There will be a greater positive association between relational governance and service quality in T&M contracts than in FP contracts. In effect, the contract type will moderate the relationship between relational governance and service quality.

RESEARCH METHODOLOGY

Research Site

The data for this paper was collected on projects completed by a leading software services firm in Bangalore, India. The firm employed around 5000 people at the time of data collection. Its primary area of expertise is software development and maintenance of business systems. Focusing on a single vendor enables us to control for geographical and cultural variations between projects which has been hypothesized to affect the dynamics between vendor and clients in the outsourcing context (Davis et al, 2006). A random sample of 120 projects from the projects completed by the firm over a two-year period was identified for cross-sectional data collection. From the 120 projects identified, we were able to collect data on 105 projects; the remaining project data was not complete due to the unavailability of project managers or business unit managers due to travel and attrition. Of the final sample of 105 projects, 61 were FP contracts and 44 were T&M contracts. Primary data was collected through two questionnaires that were developed based on prior research in software outsourcing and governance and pre-tested by members of the research site's quality assurance group. One questionnaire pertained to project-level information on technical and project-level variables while the second questionnaire included information on the business environment around the project as well as on

vendor-client relationships. Table 1 provides the summary statistics for the variables used in the study by contract type. Table 2 shows the correlation matrix while Appendix A shows the questionnaire items were.

We sought two sources of data for each project. The *project manager* in charge of development provided information on the technical variables from the project while the *business unit manager* was the source for data on relational governance and quality. Prior work in outsourcing has indicated that responsibilities for a project are split between different parties, given the business and technical domains that need to be managed (Gopalakrishnan et al, 1996; Ethiraj et al, 2005). Technical matters are handled by project managers while relationship and client management is handled by the business unit manager. The business unit manager is in the best position to provide data on relational governance from a key informant viewpoint. S/he is responsible financially for the project and is also usually the executive liaison between the vendor firm and the client (Gopalakrishnan et al, 1996). As the person responsible for the project, s/he understands the consequences of relational governance and is also intimately aware of project outcomes and how these outcomes are received by the client. Therefore, for our purposes, we collected project-level data from the project manager while quality and governance was provided by the business unit manager in two phases. In the first phase, data on the client and the specific engagement was collected; the second phase included information on project outcomes such as quality. Finally, we collected project-level quantitative data from company databases.

Variable Measures

The focal variable in this paper is *relational governance.* As discussed above, we measure the *use* of relational governance as an observed outcome rather than the presence of relational norms such as trust. In addition, by definition, relational governance represents post-contractual aspects of the exchange in that these are not contractually stipulated but represent what actually transpired during the length of the project. As Poppo and Zenger (2002) point out, relational governance involves the institutionalized adaptation to unforeseen circumstances that may arise within the economic activity. This suggests that parties are willing to negotiate adjustments to existing processes and procedures used in completing the task as environmental or organizational factors change (Heide, 1994). Willingness to make such adjustments post-contract requires

the existence of trust and forbearance between parties, which allows for protection of mutual investments made in the relationship (Macneil, 1978). Since there were few prior measures that captured this in the literature on software development outsourcing specifically at the time of data collection, through discussions with senior executives at the research site, we identified five specific areas where relational governance would be apparent if used in a typical software project. These areas pertain to payment procedures, warranty and liability conditions, installation and testing procedures, disputes resolution and project management. These factors match well with work in outsourcing (Lacity and Willcocks, 1998) that identified problematic aspects of outsourcing engagements. Therefore, relational governance was operationalized using five items that measured the extent to which flexibility was observed by the business unit manager along these dimensions (*Cronbach's alpha = 0.81*).

A second key variable in our analysis is project *profit*, measured as the difference of the revenue accruing to the project and the total costs allocated to the project. The cost of the project includes all project costs, including overheads and apportioned costs. This data was collected from company databases for each project and is used by the firm for their accounting purposes.

Service quality is the third important variable in our analysis and we use a set of 5 questionnaire items that have been tested in the software development context (Nidomolu 1995; Henderson and Lee 1992) and are concise enough to capture the relevant aspects of service quality. The items used are consistent with prior work in assessing quality through surveys (Ravichandran and Rai 2000, Tiwana 2004, Wallace et al 2004). While quality could be collected from the customer side, the literature is clear about the difference between service quality and customer satisfaction; these are distinct though related constructs. In addition, a significant intermediating variable in the link between customer satisfaction and quality is the ease of evaluating ex post quality (Anderson and Sullivan 1993, Taylor and Baker 1994). Given the credence good qualities of software outsourcing (Nayyar 1993), evaluating ex post quality for the client is difficult[4]. Therefore, from a face validity viewpoint, collecting service quality from the customer becomes even more

[4] The Servqual instrument is an option we considered in our setting. In the software services sector, researchers have consistently cautioned against the use of this instrument (Van Dyke et al. 1999). The primary concerns pertain to the use of difference scores and the ambiguous state of the "expectations" construct, especially in IT services outsourcing where these expectations are unformed through much of the project (Carr 2002).

problematic. Therefore, we use quality measures collected from the vendor-side business unit manager. (*Cronbach's alpha = 0.76*)

While an alternative measurement for quality used in the software development context is that of defect rates, this data is only available for 46 projects in our sample. As a robustness check, we compare the quality measure to defect rate data for the subset of projects. We use two sources of defect rate data. The first metric is the number of reported defects during acceptance testing (Ethiraj et al, 2005) and the second is the number of modification requests (MRs) (Herbsleb and Mockus 2003). We regressed quality on the two defect rate data and control variables and estimated the following model (t-statistics in parenthesis):

Quality = 3.578 + 0.262 Duration – 0.160 Effort + 0.376 Contract – 0.061 Defects - 0.299 MR
(6.68) (2.12) (-1.87) (2.48) (-2.54) (-2.61)
F-statistic = 3.40, $p < 0.05$, $R^2 = 0.299$

As can be seen, our quality measures are significantly and negatively correlated (high quality –low defects) with defect rate data, providing support for validity of our quality measure.

The *contract* type is a binary variable, with 0 for T&M contracts and 1 for FP contracts. *Prior projects* for the same client is measured by the number of projects completed and was extracted from company databases. *Requirements instability* (*Cronbach's alpha = 0.90*) was measured by four questionnaire items adapted from Nidomolu (1995) and was provided by the project manager. *Employee turnover* (*Cronbach's alpha=0.73*) is often difficult to measure accurately since personnel occupy different levels of importance in a team. Therefore, rather than using the number of members leaving the team during the project, we use two questionnaire items that were filled out by the project manager. *Human asset specificity* (*Cronbach's alpha = 0.77*) in the project was measured as the extent to which trained people were deployed in the project and is adapted from Lacity and Hirshheim (1993). Three questionnaire items were used in measurement and the data was provided by the project manager. Finally, *Client MIS Experience* (*Cronbach's alpha = 0.77*) was operationalized variable using four questionnaire items adapted from Lacity and Hirschheim's (1993) discussion of the importance of the client's experience.

In addition, we include some control variables from the software outsourcing literature. *Project size* is included as a control variable and is measured as the total effort on the project (Gopal et al., 2003; Ethiraj

et al., 2005). *Project duration*, in number of calendar days between start and finish of the project, is used as control since relational governance is more likely for longer projects, all else being equal (Dyer, 1997). *Team size* is included as a control; larger teams are harder to manage and represent risk in the project (Guzzo and Dickson, 1996). Finally, we control for *project type*, a binary variable denoting whether the project involved new development or re-engineering of existing systems. Development projects are coded 0 and re-engineering projects are coded 1.

Data Analysis

As a first step in our analysis, we established that the perceptual measures have construct and discriminant validity. The questionnaire items pertaining to the independent and control variables were subjected to a factor analysis with varimax rotation, shown in Table 3. The items loaded well on underlying constructs with factor loadings of over 0.60, while the cross-loadings were less than 0.35, indicating acceptable discriminant validity (Hair et al, 1998). In addition, in exploratory factor analysis performed separately on each construct, the set of items for the construct loaded well on one underlying factor with the first factor capturing between 55% and 75% of total variance. Each construct showed good reliability with Cronbach's alpha of over 0.70. We also calculated the internal consistency reliability indicator (Venkatraman, 1989), which captures the ratio of the latent construct variance to the construct plus error variance for our constructs. Venkatraman (1989) has indicated that composite reliability of at least 0.50 is acceptable, i.e. at least 50% of the measured variance is captured by the construct. As shown in Appendix A, all of the constructs display composite reliabilities of over 0.50. The construct variables were created by averaging the items pertaining to each construct for use in subsequent analysis.

Three generalized models were estimated to test our hypotheses, one each for relational governance, profitability and quality:

Rel Gov = f (Effort, Duration, Teamsize, Project type, Prior Projects, Requirements Instability, Employee Turnover, Human Asset Specificity, Client MIS Experience, Contract) + e1 *(1)*

Profit = f (Effort, Duration, Teamsize, Project type, Prior Projects, Requirements Instability, Employee Turnover, Human Asset Specificity, Client MIS Experience, Contract, Rel Gov) + e2 *(2)*

Quality = f (Effort, Duration, Teamsize, Project type, Prior Projects, Requirements Instability, Employee Turnover, Human Asset Specificity, Client MIS Experience, Contract, Rel Gov) + e3 *(3)*

We conducted the empirical analysis in stages. The OLS results for relational governance are reported in Table 4, column 1. Hypotheses 3 and 4 postulate a moderation model and we follow the recommendations provided by Baron and Kenny (1986) to test these hypotheses. In evaluating the significance of the moderation hypothesis, we follow directions provided by Carte and Russell (2003) who note that both significance of the interaction term as well as the difference in R^2 on adding the interaction variable needs to be taken into account. The results from the moderation model for profitability and quality are reported in the first two columns of Table 5 and 6 respectively. The first column estimates the base model while the second column contains the added interaction term *Rel Gov X Contract*. In order to reduce collinearity from the interaction variable, we centered all the variables in the model for profit and quality. The tables also report the difference in R^2 and the significance of the change in F-statistic upon adding the interaction term.

In subsequent analysis, we further test the robustness of the results reported above to increase confidence in our statistical analysis. We first examine contract endogeneity. The analysis above assumes that contract choice is exogenous; however, this may be unrealistic (Gopal et al, 2003; Carson et al, 2006). In order to address this, we use the Heckman two-stage correction for contract endogeneity (Maddala, 1983). The procedure involves estimating a first-stage contract choice probit model and calculating the Inverse Mills Ratios (lambdas), which are then introduced into the governance and outcome equations as an independent variable. We use the contract choice model estimated in Gopal et al (2003) to calculate the predicted probabilities. The results of the Heckman model are shown in column 3 of Table 4 for relational governance and column 5 of Tables 5 and 6 for profit and quality.

We observe two important points from the Heckman analysis. First, the results of the analysis are broadly consistent with those from the OLS models. While individual coefficients change in magnitude, the direction of influence in the Heckman results is similar to OLS, indicating robustness. Second, the endogeneity of the contract variable renders the interaction of contract and relational governance endogenous as well (Harrison, 2008a). Therefore, this coefficient cannot be estimated using the Heckman procedure. A simpler way to evaluate interactions is to use a switching regression framework (Maddala, 1983) where two

separate contractual regimes are estimated. The coefficients of relational governance in each regime can then be compared to gauge moderation. The results for this analysis, though not provided here, are discussed in the next section.

We now turn to the endogeneity of relational governance. It is possible that relational governance is chosen endogenously, which renders OLS coefficients biased. While 2SLS may be appropriate, the endogeneity of the interaction term again creates biased coefficients. Harrison (2008b) proposes a method to resolve this issue. The approach, called the non-interacted 2SLS (p.3), entails predicting relational governance (RG_{hat}) and estimating the following equations

Profit = f (Effort, Duration, Teamsize, Project type, Prior Projects, Requirements Instability, Employee Turnover, Human Asset Specificity, Client MIS Experience, Contract, Rel Gov, RG_{hat} X Contract) *(4)*

Quality = f (Effort, Duration, Teamsize, Project type, Prior Projects, Requirements Instability, Employee Turnover, Human Asset Specificity, Client MIS Experience, Contract, Rel Gov, RG_{hat} X Contract) *(5)*

Harrison (2008b) shows that in small samples with a categorical moderator, the above specification has reasonably low bias. In estimating equations (4) and (5), the first stage estimation of relational governance is used to generate RG_{hat} and the second stage profit and quality equations are estimated using a two-step estimation procedure. The results from this analysis are shown in column 4 of Table 5 and 6 for profit and quality respectively. While individual coefficients change when compared to the OLS results, the primary results of moderation are consistent with those from OLS. Specifically, with respect to both quality and profitability, the interaction coefficients using non-interacted 2SLS are similar to those from OLS, indicating the robustness of the results.

RESULTS AND DISCUSSION

Results of the Relational Governance Model

Table 4, our model of relational governance, shows that all models have significant F-statistics and high R^2 values, indicating model strength. Since the Heckman model is the most valid given the significance of the lambda, we discuss these results. Hypothesis 1a pertains to the effect of requirements instability on relational governance and is strongly supported (0.271, $p<0.01$). Similarly, Hypothesis 1b addressed the role of employee turnover and is strongly significant (0.268, $p<0.01$). Hypothesis 1c, with respect to asset specificity,

shows mixed results, with the OLS result highly significant while the Heckman result is less significant (0.223, $p<0.10$). While asset-specific investments in the project should enhance the use of relational governance, this relationship appears to be less robust in this analysis. In summary, the results support our thesis that relational governance is used in response to exchange hazards in projects.

Hypothesis 2a argued that prior interactions between client and vendor would increase the use of relational governance; this is supported in the results (0.025, $p<0.01$). As trust is built based on previous interactions, current exchanges feature relational norms that may not be present in early interactions with the client. Similarly, client MIS experience is significantly associated with relational governance, supporting Hypothesis 2b (0.64, $p<0.01$) as predicted. In sum, our results are consistent with the predictions from prior research, providing further support for the validity of our relational governance measurement.

It is noteworthy that the contract type does not affect the use of relational governance in this model. While counter-intuitive at first blush, this follows from prior literature on relational governance which argues that as exchange hazards increase in a project, the use of relational governance will correspondingly increase. The contract type would therefore only influence relational governance if the contract type was chosen based only on exchange hazards in the project. However, as Gopal et al (2003) show, bargaining power, prior relationships and the competitive environment also influence contract choice, which suggests that the correlation between exchange hazards and contract type is not perfect. This is borne out in our sample as well. Exchange hazards are not significantly different across contract types, as evidenced by the lack of significant differences in means between the two contract subsamples. Therefore, it is not surprising that contract type is not significant in predicting the use of relational governance.

Results of the Profitability and Quality Models

We first discuss the profitability model shown in Table 5. The Heckman model is consistent with the OLS baseline model. More pertinent to Hypotheses 3 and 4, we consider models with the interaction terms. All three models (the interaction model, SUR and the non-interacted 2SLS) are consistent in terms of the obtained coefficients, with varying levels of significance. We focus on the OLS results as they are consistent with Carte and Russell's (2003) recommendations. We observe that the contract variable is significant in the

baseline model (-54268, $p<0.05$), indicating higher profit in T&M projects (Ethiraj et al, 2005; Gopal et al, 2003). Amongst control variables, larger effort and larger teams are associated with higher profits, all else being equal, as expected. We also observe the negative effects of project attrition and requirements instability while an experienced client MIS team is associated with greater profitability, indicating the beneficial role of the client's liaison on the vendor's ability to maintain progress on the project and resolve open issues that may come up during development (Lacity and Hirschheim, 1998). Finally, prior interactions with the client lower vendor profit, again consistent with prior work (Gopal and Sivaramakrishnan, 2008).

Hypothesis 3 argued that the marginal effect of relational governance on profit would be higher in FP than in T&M contracts. We observe that the direct effect of relational governance on profitability is positive and significant (72816, $p<0.05$). From the interaction term in column 2 of Table 5, which is positive and significant (118635, $p<0.05$), we see that vendor profitability is indeed higher in FP than in T&M. The difference in R^2 is significant at $p<0.05$, showing further support for moderation. To understand the implication of this result, we plot the net effect of contract, relational governance and their interaction in Figure 1, with high (low) relational governance at mean + (-) one standard deviation (other variables held at their means). The resulting plot is surprising; in the FP regime, the net benefits from relational governance are clearly high. However, in the T&M case, the net benefits from relational governance on vendor profitability are negligible (the line's slope is insignificant). The direct effect of relational governance on profitability seems to be entirely driven by FP projects.

Switching our attention to the quality model shown in Table 6, we again see consistency between the two baseline models (OLS and Heckman) as well as models with interactions (interaction model, non-interacted 2SLS and SUR) with the same caveat on significance levels noted in the profit model. Focusing on the OLS results, we observe that contract type is significant (0.265, $p<0.05$), indicating higher quality in FP contracts, consistent with prior work (Gopal and Koka, 2008). With respect to control variables, the size of the project appears to have no significant effect. Longer projects appear to have worse quality, as suggested in the software engineering literature where project duration is treated as a risk (Pressman, 2005). The presence of repeat business between vendor and client aids learning and trust, leading to better quality

(Ethiraj et al, 2005) while requirements instability reduces quality, as expected. Greater asset-specific training increases quality (Ravichandran and Rai, 2000) as does the presence of an experienced client MIS department (Gopal and Koka, 2008). Thus, the results related to control variables in the quality model are in concordance with prior research.

Hypothesis 4 argued that the marginal impact of relational governance would be higher on quality in T&M contracts. Similar to the results on profitability, the direct effect of relational governance is positive on quality (0.021, $p<0.10$). As shown in Table 6, the interaction term is negative and significant (-0.262, $p<0.05$), supporting Hypothesis 4. The change in R^2 is also significant (at $p<0.05$) indicating strength for the moderation hypothesis. We plot the net effect of the interaction model on quality, shown in Figure 2, and the results mirror those from the profit model. In T&M, the net increase in quality from relational governance is observably higher but is negligible in FP.

DISCUSSION AND IMPLICATIONS

In this study, we examined how and when relational governance provides benefits to the exchange partners in the presence of formal contracts. We argued for a more nuanced understanding of the relationship between formal and relational contracting by contending, *first*, that relational benefits are contingent on how risk is apportioned by the formal contract and *second*, that these benefits will be higher, on the margin, on those dimensions that are of key interest to the risk exposed party. As reported above, we find strong support for our hypotheses. Relational governance strongly impacts profitability in the contract type (FP) where the vendor is exposed to higher risk and service quality in the contract type (T&M) where the client is more at risk. At its core, our analysis argues for and shows the asymmetric benefits that accrue from relational governance to different contracting parties in an outsourcing relationship. Our empirical results also hold under a wide variety of empirical models which further attest to the robustness and stability of the findings.

Our findings provide some clarity and insight to the existing literature. Much of the literature, as noted earlier, has conflated use of relational governance with its benefits. Additionally, the positive impact of relational governance on exchange outcomes is almost considered axiomatic in the literature. As our analysis shows, this assumption of symmetric positive benefits needs re-examination. When we limit our analysis to

the baseline model (column1 in Tables 5 and 6), we observe the direct effect of relational governance, which is positive as prevalent theory would suggest. However, when we consider the interaction models and the resulting graphs shown in Figures 2 and 3, we see signs of the asymmetric benefits accruing to different performance dimensions across the contracts. Our findings thus, highlight the need to first separate out use and benefits of relational governance and then examine which of the exchange parties benefits from relational governance and on which dimension. In other words, while the use of relational governance appears to be a dyadic, bilateral aspect of the relationship in that it is associated with exchange hazards perceived by both parties, benefits can be assessed only at the individual level of analysis, because the benefits are asymmetric and depend on who is exposed to more risk.

Our analysis, in addition, also highlights the implications of relational governance not just for the contracting parties but also for the performance dimensions of interest. Since relational governance perforce provides benefits by mitigating risk for the risk-exposed party, it perforce differentially affects the performance dimension that is most likely to be affected by the materialization of risk for the risk-exposed party. As a corollary of this reasoning, our analysis indicates that if a party experiences little or no risk even in a complex transaction, there is little value in relational governance on the dimensions of performance for that party. The contract type is thus front-and-center as the primary instrument that partitions risk and induces relative risk exposure in a project.

These findings however raise an interesting and important question – if relational governance benefits flow mostly to the party with the higher risk, why does the other party acquiesce to its use in the relationship? As our findings and the consensus in the literature seem to suggest, the use of relational governance is driven by uncertainty arising from exchange hazards. As noted earlier, the contract is a risk-partitioning mechanism. In other words while one party is exposed to higher risk by the contract, the other party still faces risk in the project, though at a lesser level than the partner. For instance, in FP contracts, where the vendor faces the greater part of risk in the project, the client is not riskless. Rather, the client faces the possibility that the vendor may behave opportunistically. Literature suggests that when the vendor's profitability is affected by the materialization of risk, especially in complex activities with low observability,

the vendor has a strong incentive to shirk on quality (Baker, 1992; Bajari and Tadelis, 2001). Note that quality is the client's performance dimension of importance. In order to reduce the risk of opportunism by the vendor through shirking on quality, we suggest that the client engages in relational flexibility within the exchange that allows the vendor to protect its profitability while providing the requisite quality to the client. Since the client's risks are protected within the FP contract relative to the vendor, the primary benefits from relational governance in the FP regime flow to the vendor through its effect on profit, ceteris paribus.

Similarly, in T&M contracts, the vendor might be motivated to cooperate with the client even though he bears relatively lower risk for two reasons. First, all projects carry within them the threat of client termination (Lacity and Hirshheim, 1998). Since the client carries the bulk of the risk, any sign of non-cooperation on the development of relational norms by the vendor can be seen as evidence of lack of commitment to the project (Gulati, 1995). Anecdotal evidence also shows that in many outsourcing relationships, clients possess considerable bargaining power and are often much larger than vendor organizations. Thus, project termination is always a credible threat if relational governance is not institutionalized on the project. Second, relational governance has also been associated with a high probability of repeat business, all else being equal (Artz and Brush, 2000; Heide and John, 1990; Poppo and Zenger, 2000). Investments in relational governance therefore, may pay off for the vendor in the form of greater future business rather than direct value in the current project, particularly in T&M contracts. In both cases, vendor investment in relational governance will be observed even when the vendor does not bear any risk (in T&M contracts) and experiences no tangible benefits. While we recognize that these arguments are speculative, they also point to an agenda for more research. What happens when relational governance is not instituted under high exchange hazards? Do clients get lower quality in FP contracts under such conditions? Correspondingly, will vendor profits be negatively affected in T&M contracts when there is no relational governance observed? Our work here raises many interesting questions regarding both the asymmetric benefits of relational governance under different risk-sharing paradigms as well as the focal performance dimensions that must be used to capture these benefits.

We recognize that our analysis is subject to some limitations. First, we use data from one vendor firm; while this helps control some heterogeneity, it is nevertheless subject to limits to generalizability. Second, our sample of 105 projects is small. However, the sample is similar to other papers like Ethiraj et al (2005), Goo et al (2008) and Carson et al (2006). Our dataset additionally provides objective measures and more fine-grained data that provides greater veracity to our analysis. Third, our measure of contract type is limited to the two extreme forms of contracts. However, new and hybrid forms of contracts can easily be devised for different settings. To the extent that risk-sharing is monotonically related to these contractual forms, our reasoning would apply to hybrid contracts as well. However, future research is needed to establish this empirically. Fourth, our measure of quality is perceptual and based on data from the vendor side. This is not unique to our paper (Ravichandran and Rai, 2000; Nidumolu, 1995) but nevertheless represents a limitation. Finally, while we measure the impact of relational flexibility, the literature has discussed several other mechanisms of relational governance such as joint action (Heide and John, 1990) and collaboration (Artz and Brush, 2000). More work is needed to extend the conceptualization of asymmetric benefits and performance dimensions to other mechanisms of relational governance.

While our theory and analysis examined the nature of complementarity between relational and formal contracts, we recognize that there is an alternative perspective in the literature that views them as substitutes. Given the context and objective of this research, we are skeptical as to the applicability of the substitute perspective in software development outsourcing. However, much of the arguments for the substitutive perspective have largely been theoretical and the empirical evidence has largely been in favor of the complementary perspective (Poppo and Zenger, 2002, Goo et al, 2008). We believe that this is because formal contracts are almost always in place in outsourcing engagements and provides the structure and framework within which relational governance is established. It is difficult to separate relational governance from formal contracts because relational mechanisms work in terms of facilitating the interpretation, renegotiation and modification of the formal contract. Obviously, the extent of such modifications depends on the context and could vary considerably across engagements, even within the same vendor firm. In other words, the relationship between relational governance and contracts is highly interactive and evolves during

the course of the engagement. It is difficult to conceive situations where relational governance dominates to the extent that formal contracts become obsolete, especially in relatively short-term agreements with well established timelines like software development outsourcing.

Even in longer-term outsourcing relationships observed for IT infrastructure and network management, formal contracts are always observed as precursors to the setting of relational norms over time (Gurbaxani, 2007). Thus, while the complementary view of relational and formal contracting appears to be gaining ascendancy, our work here provides a more nuanced view of this complementary effect. We speculate that the substitutive view of formal and relational governance may be valid in different contexts (alliances) and long term buyer-supplier relationships where the parties are willing to start beneficial projects without the structure of a formal contract because of their prior relationships and the potential benefits of the proposed project are too nebulous to be contracted. This remains a gap to be examined in future research.

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Table 1: Summary Statistics

	Variables	FP, N=61		T&M, N=44	
		Mean	Std Dev	Mean	Std Dev
1	Effort	1132.90	1610.21	744.28	780.05
2	Duration	352.50	271.32	342.75	278.51
3	Team-size	10.80	10.55	7.54	4.36
4	Prior Projects	10.5	16.10	4.35	6.15
5	Project Type	0.39	0.49	0.29	0.46
6	Requirement Instability	2.30	1.20	2.15	0.81
7	Turnover	1.86	0.80	2.008	0.79
8	Human AS	2.62	0.91	2.14	1.10
9	Client MIS Experience	2.88	0.82	2.76	0.85
10	Profit	246880.09	648641.86	102020.77	186143.08
11	Relational Governance	2.812	1.102	2.851	0.89
12	Quality	3.95	0.51	3.64	0.47

Table 2: Correlation Matrix, n=105

	Variables	Correlations											
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*
1	Effort												
2	Duration	0.52*											
3	Team-size	0.36*	0.30*										
4	Contract	0.132	-0.03	0.17									
5	Prior Projects	-0.02	-0.04	-0.19*	0.22*								
6	Project Type	0.05	0.03	0.09	0.10	0.32*							
7	Requirement Instability	-0.01	-0.08	0.01	0.05	0.01	0.09						
8	Employee Turnover	0.26*	0.18	0.22*	-0.09	-0.33*	-0.18	0.16					
9	Human AS	-0.08	-0.07	-0.06	0.24*	0.29*	0.12	0.24*	-0.38*				
10	Client MIS Experience	-0.10	-0.23*	0.33*	0.08	-0.18	0.12	0.28*	0.24*	0.42*			
11	Profit	0.71*	0.51*	0.42*	0.13	-0.05	0.08	-0.04	0.03	0.05	-0.17		
12	Relational Governance	-0.01	-0.05	-0.24*	-0.01	0.33*	0.03*	0.38*	0.14	0.34*	0.28*	-0.07	
13	Quality	0.02	-0.10*	0.05	0.30*	0.30*	-0.06	-0.24*	-0.14	0.57*	0.36*	0.07	0.21*

* - p<0.05

Table 3: Factor Analysis of Reflective Constructs with Varimax Rotation
N = 105

Items	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Flex1	**0.73**	-0.02	0.05	0.12	0.17	-0.18
Flex2	**0.88**	-0.12	-0.10	0.10	-0.08	0.14
Flex3	**0.76**	-0.13	-0.13	0.19	-0.19	-0.15
Flex4	**0.80**	-0.12	0.03	0.15	0.20	0.11
Flex5	**0.87**	-0.16	-0.05	-0.02	0.22	-0.02
Requn1	-0.08	**0.71**	0.14	-0.32	0.13	0.12
Requn2	-0.26	**0.85**	0.08	0.00	-0.11	-0.21
Requn3	-0.17	**0.91**	0.04	-0.09	-0.13	0.03
Requn4	-0.15	**0.91**	-0.02	-0.04	-0.03	-0.05
MISExp1	0.12	0.11	**0.75**	-0.39	-0.22	0.07
MISExp2	0.01	0.16	**0.79**	-0.20	-0.14	-0.09
MISExp3	-0.11	-0.11	**0.88**	0.02	-0.05	-0.09
MISExp4	-0.15	0.14	**0.70**	-0.01	0.17	-0.18
AssetSp1	0.08	-0.15	0.06	**0.84**	0.19	0.31
AssetSp2	0.23	0.03	-0.22	**0.72**	0.34	0.10
AssetSp3	0.11	-0.15	-0.14	**0.81**	0.32	0.21
Turnover1	0.02	-0.04	-0.05	0.06	**0.85**	-0.01
Turnover2	0.05	-0.13	0.02	0.13	**0.77**	-0.01
Quality1	0.19	-0.15	-0.16	0.14	0.07	**0.76**
Quality2	-0.14	-0.12	-0.14	0.23	-0.13	**0.80**
Quality3	0.26	-0.06	-0.15	0.16	-0.02	**0.70**
Quality4	-0.12	-0.02	-0.10	0.03	-0.01	**0.86**
Quality5	0.18	0.04	-0.11	0.12	-0.04	**0.81**
Eigenvalue	6.42	2.86	2.29	1.98	1.51	1.38
% Variance Cumulative	0.29	0.42	0.52	0.61	0.68	0.74
% Variance	*0.29*	*0.13*	*0.10*	*0.09*	*0.07*	*0.06*

Table 4: OLS and SUR Regression
Dependent Variable: Relational Governance
N = 105, standard errors in parenthesis

Variable	OLS	SURE	Two-stage Heckman
Intercept	1.330**	1.337**	0.811
	(0.634)	(0.63)	(0.85)
Effort (Logged)	0.118**	0.117**	0.219**
	(0.054)	(0.06)	(0.09)
Duration (Logged)	-0.164	-0.165	-0.153
	(0.11)	(0.11)	(0.117)
Teamsize (Logged)	-0.02***	-0.025***	-0.027***
	(0.009)	(0.009)	0.009)
Project Type	0.356**	0.357**	0.317*
	(0.169)	(0.16)	(0.182)
Contract (0 -T&M, 1 – FP)	-0.053	-0.053	-0.13
	(0.16)	(0.167)	(0.22)
Prior Projects	0.017**	0.018***	0.025***
	(0.007)	(0.006)	(0.009)
Requirements Instability	0.223***	0.226***	0.271***
	(0.073)	(0.073)	(0.102)
Employee Turnover	0.21**	0.217**	0.268**
	(0.106)	(0.10)	(0.108)
Human Asset Specificity	0.258***	0.259***	0.223*
	(0.092)	(0.093)	(0.146)
Client MIS Experience	0.548***	0.546***	0.640***
	(0.167)	(0.167)	(0.232)
Lambda			-1.311***
			(0.339)
R-Squared	0.55	0.61	0.61
Adjusted R-Squared	0.49		0.56
F-Statistic	10.05***		11.61***

* - p<-0.10, ** - p<0.05, *** - p<0.01

Table 5: Regression Analysis
Dependent Variable: Project profitability
N = 105, standard errors in parenthesis

	Hierarchical OLS				
Variable	Control + Hyp Variables	Interaction Variables	SURE	Non-interacted Estimation 2SLS[#]	Two-stage Heckman
Intercept	-9537.7	-11288	-10122	-16272.16	-4851.4
	(182998)	(199271)	(198221)	(19907.89)	(19319.7)
Effort	233.25***	231.66***	231.25***	234.16***	239.54***
	(32.006)	(31.89)	(31.88)	(32.50)	(32.68)
Duration	236.36	252.52*	242.27*	303.07**	237.65*
	(151.66)	(151.53)	(145.68)	(148.81)	(144.35)
Teamsize	12534**	13139***	13617***	11768.65**	12366.43***
	(4661.75)	(4664.96)	(4652.56)	(4756.88)	(4549.09)
Project Type	6849.51	8876.08	8925.93	29962.93	11219
	(31523)	(31430)	(31427)	(64388.02)	(63338.15)
Contract (0 -T&M, 1 – FP)	-54268**	-56541*	-55979.9*	-18978.98*	-39438**
	(27547.21)	(29758.4)	(29462.6)	(9876.24)	(19343.12)
Prior Projects	-3709.64*	-4282.90*	-4657.64*	-3586.81*	-2938.85
	(2005.21)	(2254.16)	(2477,12)	(1949.71)	(2283.54)
Requirements Instability	-21725*	-25432*	-29146.2*	-28520.3**	-17948.20*
	(11494.71)	(13527.7)	(15754.7)	(14866.15)	(9087.34)
Employee Turnover	-148025***	-140926***	-143417***	-168053.49***	-148509***
	(52276)	(52335)	(52332.57)	(53299.51)	(50848.77)
Human Asset Specificity	30326	32840	27118.5	17002.37	28112.03
	(47121)	(46964)	(46959)	(47000.96)	(43061.29)
Client MIS Experience	74360*	78707*	79645.3**	63465.4*	64144.32**
	(44261.9)	(47124)	(43820.21)	(37776.75)	(37710.18)
Relational Governance	72816**	110202*	117643**	116340.10*	68103.14**
	(36226.8)	(57598)	(53638.31)	(67557.10)	(29903.87)
Relational Governance X Contract		118635**	118332**	120161.32**	
		(60220)	(60123.5)	(47941.39)	
Lambda					-71603.23
					(133188.7)
R-Squared	0.61	0.63		0.60	0.61
Adjusted R-Squared	0.56	0.58	0.61	0.54	0.56
F-Statistic	12.82***	12.01***		11.20***	11.60***
∆ R-Squared		0.02**			

* - p<-0.10, ** - p<0.05, *** - p<0.01

- The estimation procedure is based on Harrison (2008), where the predicted value of relational governance is interacted with the contract variable to provide more unbiased estimates of the interaction effect. The procedure was run using the two-step estimation procedure in LimDep, which also corrects for the variance-covariance matrix in the profit equation based on the first-stage relational governance model.

Table 6: Regression Analysis
Dependent Variable: Project Quality
N = 105, standard errors in parenthesis

	Hierarchical OLS				
Variable	Control + Hyp Variables	Interaction Variables	SURE	Non-interacted Estimation 2SLS[#]	Two-stage Heckman
Intercept	4.086***	4.034***	4.026***	3.471***	3.880***
	(0.39)	(0.38)	(0.384)	(0.249)	(0.458)
Effort	-0.026	-0.032	-0.032	0.028	-0.025
	(0.045)	(0.044)	(0.044)	(0.026)	(0.049)
Duration	-0.138**	-0.154**	-0.152**	-0.208*	-0.049
	(0.066)	(0.065)	(0.065)	(0.11)	(0.065)
Teamsize	0.0168*	0.034	0.030	0.053**	0.023
	(0.010)	(0.070)	(0.070)	(0.024)	(0.064)
Project Type	-0.071	-0.056	-0.053	-0.074	-0.073
	(0.106)	(0.099)	(0.099)	(0.059)	(0.11)
Contract (0 -T&M, 1 – FP)	0.265**	0.270**	0.271***	0.309**	0.306**
	(0.097)	(0.094)	(0.094)	(0.13)	(0.141)
Prior Projects	0.008**	0.007**	0.007**	0.004**	0.006*
	(0.004)	(0.003)	(0.003)	(0.002)	(0.004)
Requirements Instability	-0.068**	-0.076*	-0.074*	-0.061**	-0.084*
	(0.036)	(0.045)	(0.040)	(0.031)	(0.050)
Employee Turnover	-0.069	-0.085	-0.088	-0.131*	-0.101
	(0.064)	(0.062)	(0.062)	(0.067)	(0.067)
Human Asset Specificity	0.150**	0.148**	0.144**	0.209**	0.313**
	(0.059)	(0.057)	(0.057)	(0.033)	(0.070)
Client MIS Experience	0.143**	0.155**	0.154**	0.053**	0.229**
	(0.058)	(0.056)	(0.056)	(0.024)	(0.059)
Relational Governance	0.021*	0.062*	0.052*	0.021*	0.083**
	(0.011)	(0.037)	(0.030)	(0.013)	(0.035)
Relational Governance X Contract		-0.262**	-0.261**	-0.43**	
		(0.108)	(0.108)	(0.184)	
Lambda					0.136
					(0.179)
R-Squared	0.43	0.46		0.29	0.41
Adjusted R-Squared	0.37	0.40	0.58	0.23	0.34
F-Statistic	6.08***	6.46***		3.76***	7.27***
∆ R-Squared		0.03**			

* - p<-0.10, ** - p<0.05, *** - p<0.01

- The estimation procedure is based on Harrison (2008), where the predicted value of relational governance is interacted with the contract variable to provide more unbiased estimates of the interaction effect. The procedure was run using the two-step estimation procedure in LimDep, which also corrects for the variance-covariance matrix in the profit equation based on the first-stage relational governance model.

Figure 1: Research Model

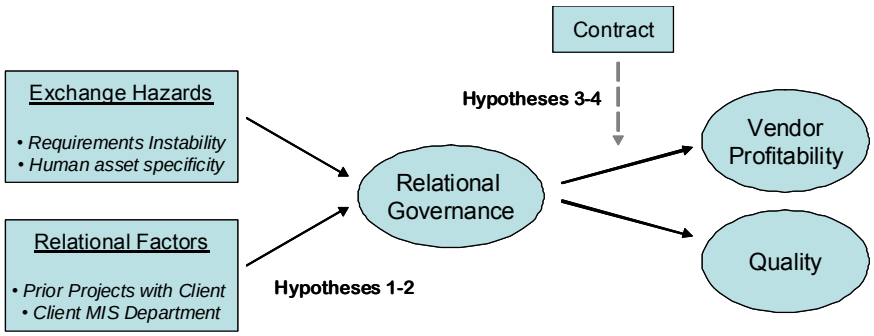


Figure 2: Interaction of Relational Governance and Contract Type on Profitability

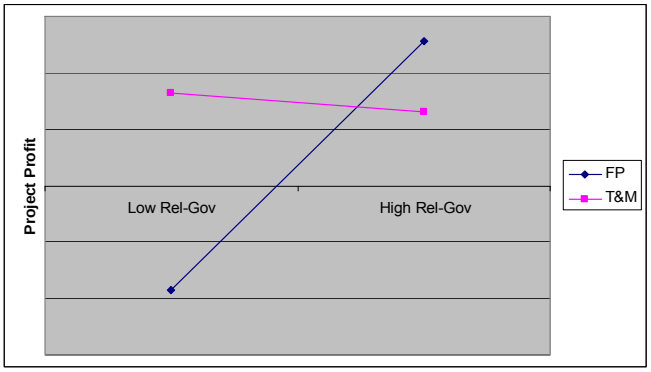
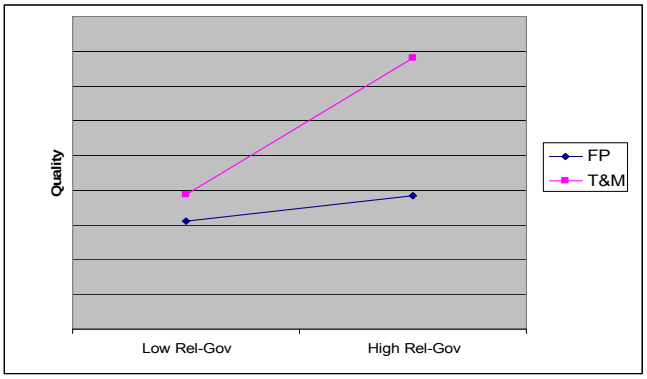


Figure 3: Interaction of Relational Governance and Contract Type on Quality



Appendix A: Questionnaire Items

Each of the following questionnaire items were measured on a 5-point Likert Scale, with 1 being a low score and 5 being the high score.

Requirements Uncertainty: To what extent was the following true for this project? (Adapted from Nidumolu (1995)) – Composite Reliability = 0.76

Req_un1	There was a clearly known way to convert client needs into requirements specification.
Req_un2	Established processes could be relied upon to convert client needs into requirements specifications.
Req_un3	There was a clearly known way to develop software that would meet these functional requirements.
Req_un4	There were established procedures and practices that could be relied upon to develop software to meet these requirements.

Human Asset Specificity: To what extent was the following true for this project? (Reverse-Scored) (Adapted from Lacity and Hirschheim (1993) and Gopal et al (2003)) – Composite Reliability = 0.79

TrainedPer1	It was difficult to hire trained people for this project in particular from the market
TrainedPer2	There was a shortage of trained people for this project in particular in our company
TrainedPer3	It was difficult to provide training to employees in skills required for this particular project

Employee Turnover: To what extent was the following true for this project? (Adapted from Lacity and Hirschheim (1993)) – Composite Reliability = 0.84

Turnover1	Employee turnover from the project team was a major problem during the execution of this project
Turnover2	It was difficult to retain people with the skills required for this project within the company

Client MIS Experience: To what extent do you agree with the following statements? (Adapted from Lacity and Hirshheim (1993) and Gopal et al (2003)) – Composite Reliability = 0.74

MISExp1	The client company had a very capable MIS department
MISExp2	The client's MIS department was very experienced with handling outsourcing projects
MISExp3	The client MIS department was technically capable of managing outsourced projects like <project name>
MISExp4	The project could have been as successfully executed by the MIS department in the client's organization

Quality: Please rate the project on the following criteria on the scale provided (Adapted from Nidumolu (1995) and Lacity and Hirschheim (1993)) – Composite Reliability = 0.72

Quality1	Reliability of final software
Quality2	Cost of software operations
Quality3	Response time performance of final software
Quality4	Ease of use of final software
Quality5	Ability to customize outputs to various user needs

Compared to a typical project at <Firm>, please indicate how flexible or binding the following aspects were for this project (where 1 is flexible and 5 is binding). (Reverse-scored) (Adapted from Heide (1992) and Lacity and Hirschheim (1993)) – Composite Reliability = 0.63

Flex1	Payment and financial procedures on the project
Flex2	Warranty and liability conditions for the project
Flex3	Software installation, acceptance and testing procedures
Flex4	Dispute resolution procedures
Flex5	Project management requirements. By project management, we refer to the quality and number of personnel on the project, reporting requirements, status reports, project schedules etc required by the client for the project.