AN EMPIRICAL TEST OF THE THEORY OF RELATIONSHIP CONSTRAINTS

Completed Research Paper

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Abstract

Agency theory has long been a stalwart of IS research and is one of the most commonly used lenses to study the relationship between a principal and an agent. The Theory of Relationship Constraints (TRC) has recently been recommended as an information-oriented alternative to agency theory. TRC suggests that three attributes (i.e., the level of information asymmetry, levels of tacit and explicit knowledge) affect the perceived efficacy of a relationship constraint. As the first empirical test of TRC, this study uses scenario analysis to show that, as these attributes change, so do the constraints that are perceived as effective. No single constraint, as predicted, is perceived to be universally effective. Under certain conditions, social versus legal constraints have greater perceived efficacy, but this varies with the three attributes. This research provides support for TRC and suggests insights for future research and current practice.

Keywords: Theory of relationship constraints, agency theory, legal constraints, social constraints, IS consulting, empirical research, theory testing, scenario research

Introduction

"...there is a degree of depravity in mankind which requires a certain degree of circumspection and distrust...." (James Madison, Federalist No 55)

Opportunism, defined as self-interest seeking with guile, is rife within business (Williamson 1993b), and opportunistic individuals knowingly make promises that they do not intend to keep (Williamson 1975). Opportunism includes lying, cheating and stealing as well as "calculated effort to mislead, distort, disagree, obfuscate or otherwise confuse" (Williamson, 1975, p 47). Individuals engage in opportunism with an expectation that, as a result of their chicanery, they will gain an advantage over those who voluntarily comply with the rules (Ghoshal and Moran 1996). In the absence of opportunism, complex contracts and constraints are not needed because individuals and organizations can be counted upon to willingly disclose all relevant information in a timely manner. Opportunism reflects a basic human desire to triumph and the "ruthless selfishness" of successful genes (Dawkins 1967). Even inherently honest people might have a point in which the net benefits of opportunism are sufficient to induce opportunism (Williamson 1979).

Information asymmetry, a critical antecedent to successful opportunism, occurs when one party has information that is needed by the other party. If both parties have fully symmetric information, either party can successfully enact controls that cancel out the benefits of the other being opportunistic. In the absence of a net advantage, opportunism is controlled (Miller 2003; Ramaswami et al. 1997; Richmond et al. 1992; Sharma 1997; Tan et al. 2003).

Agency theory (Eisenhardt 1989; Kirsch 1997; Kirsch and Cummings 1996; Kirsch et al. 2002) argues that opportunism can be controlled by the development and enforcement of a contract that aligns the interests of the agent to those of the principal. Such contracts implicitly assume fully symmetric information and the ability of the contract to fully codify the information necessary to specify either the outcomes of the contract or the behaviors used in performing the contract (Kirsch 1997; Kirsch et al. 2002). However, these assumptions are doubtful when tacit knowledge or highly detailed explicit knowledge is used (Dawson et al. 2011). Indeed, tacit knowledge is not easily codified, whereas highly detailed explicit knowledge is so voluminous that contracts will necessarily be incomplete (Williamson 1975).

The Theory of Relationship Constraints (TRC) has been proposed as an information-oriented revision of agency theory (Dawson et al. 2011). TRC considers the level and type of information that are used in a relationship, the level of information asymmetry, and the specificity of the contract in predicting the constraint mechanism that will be employed by parties in the relationship. As such, this is a policy capturing study that examines how decision makers use the information available to them when making evaluative judgments; in our case, selection of constraint mechanisms. As a new theory, TRC has not yet been subjected to rigorous empirical testing and this hinders its usefulness. The objective of this study is to examine the efficacy of TRC in predicting the choice of constraint mechanisms under a variety of conditions. Specifically, we seek to understand if the level of information asymmetry, level of tacit knowledge, and level of explicit knowledge produce variation in the constraint mechanism that is perceived as most effective. If supported, TRC offers a valuable and timely update to agency theory and responds to calls to address its known shortcomings.

This study uses the information systems (IS) consulting domain as the basis for testing the perceived efficacy of TRC in predicting the choice of constraint mechanisms. IS consulting falls into an oft-ignored "gray area" of IS research (Whinston and Geng 2004), which is surprising giving the size (USD 5b per year) and annual growth (8 percent) of the domain. Because IS consulting uses tacit and explicit knowledge and makes use of legal and social constraints, it is a hospitable environment to test TRC.

In the next section, we review the relevant literature and use TRC to develop our proposition. Then, we present our method, followed by our analysis and findings. Last, we summarize our analysis, identify the limitations of our research and offer suggestions for future researchers.

Research Proposition Development

Opportunism by IS Professionals

Early economic views of man were *homo economicus* (fully rational) or *homo psychologicus* (boundedly rational) (Williamson 1993a). Consequently, opportunistic behavior was viewed as fixed and was often ignored to simplify managerial and economic analyses (Chen et al. 2002; Wathne and Heide 2000; Williamson 1993a). However, opportunism is now seen as being present in numerous relationships and is viewed as a variable that requires explanation rather than exclusion (Wathne and Heide 2000). Opportunism can either be active (lying) or passive (withholding relevant information), and opportunism is readily seen in a variety of disciplines.

Professionals are expected to be able to control themselves from acting opportunistically, despite evidence (Dawson et al. 2011, Sharma 1997) that shows that professionals are as likely to be opportunistic as non-professionals. Several definitions of professionals have been provided. For example, Barley (1996) argued that, to be considered a profession, an occupation had to be granted and maintain a relative monopoly over its theories and procedures. Other conceptualizations hold that professionals apply a specialized body of abstract knowledge to problem solving and share "a relatively permanent affiliation, identity, personal commitment, specific interests and general loyalties" with other professionals (Sharma, 1997, p. 11). Professionals enjoy wide latitude in defining the nature of their work, the scope of the problems they address, and the style in which a problem is solved (Sharma 1997).

We embrace the notion that IS consultants are professionals, for many reasons: first, they use a highly abstract body of knowledge to solve problems; second, they share a relatively permanent association with other IS consultants; third, they specify the scope and process of work to be performed; and last, their clients are able to make only a gross evaluation of the success of a project, particularly for more complex projects (e.g., an IS strategy document or a complex enterprise-wide financial or customer application). Like other professionals, some IS consulting work requires only a low level of knowledge (e.g. installing software requiring little customization) while other work is highly complex and demanding (e.g. implementing an ERP). Numerous examples of opportunism have been seen in IS consulting (Dawson et al. 2011).

Constraining Opportunism

The problem of opportunism is not new and society has developed legal and social mechanisms to constrain it. Legal constraints are enforceable through a court (Richman 2004), and businesses can head-off many disputes by creating well-specified contracts. Social constraints are extralegal devices that exist outside of the rule of law but, in many cases, are even more powerful than legal constraints (Richman 2004) (see Table 1). Social constraints are seen in highly divergent societies, including modern Jewish diamond merchants, nineteenth century California cattlemen, and eleventh-century rug merchants (Richman 2004). Social constraints evolved because of a recognition that people did not so much need contractual but transactional protection, and it is widely recognized that social constraints can supplement or be superior to legal constraints (Richman 2004). Opportunism cannot be fully constrained by outcome and behavior-based legal contracts, and society has created nuanced methods to constrain opportunism. Thus legal and social constraints are commonly witnessed in many relationships, including those of IS consulting (see Table 1).

Table 1 – Legal and Social Constraints (Source: Dawson et al. 2011 and Sharma 1997)

Social Constraints	Legal Constraints
Handshake agreements * – Commonly used for low risk agreements between parties who share a common bond. Characterized by a lack of documentation but close social bonding.	**Firm fix price contracts (FFP)** – Specifies the amount of work to be done and establishes a generally immovable price for the work. Are often outcome based and generally highly detailed and lengthy.
Informal communities – Constraint is provided by a social group, which although lacking legal standing, has the ability to censor or "black ball" an opportunistic member of the community. This differs from Clan	**Time and materials contracts (T&M)** – Specifies the number of hours of work to be performed and the hourly rate to perform the

Control, which assumes no conflict of interest (Eisenhardt, 1989), while an informal community makes no such assumption. **Formal communities** – A formal body that can remove a person's ability to practice. Only perceived to be effective if the practitioners agree to the authority of the formal organization. **Third Party control** – Contracting with a third party to provide additional support. **Bureaucratic control** – Appealing to the higher management of the person performing the work. **Religious codes** *– Guidance by religious texts that spell out appropriate behavior. Usually only perceived to be effective if both parties share a common religion. **Self-control** – Argues that humans should have the will power to resist opportunism.	work. Are somewhat lengthy but not as lengthy as a FFP contract. **Purchase order** – Precisely specifies the product to be delivered, the means that it is to be delivered and the price for the product/service. Generally very concise. **Incentive based contracts** – Contracts that provide for some monetary incentive in terms of successfully performing the work and achieving certain milestones.

* Handshake agreements and religious codes are infrequently used in modern business relationships.

According to TRC, the choice of a constraint mechanism is contingent on several things, including the level of information asymmetry, the level of contract specificity, and the degree of tacit and explicit knowledge used for the engagement (Dawson et al. 2011). Thus, to understand the choice of constraint mechanism, we examine each predictor individually.

Information Asymmetry

Information asymmetry is a facilitating condition for opportunism (Wathne and Heide 2000) since a lack of suitable information limits the disadvantaged party's ability to detect (and ultimately deter) opportunistic acts (Kirmani and Akshay 2000). Without fear of detection, any opportunistically inclined individual can freely engage in deceit since there is little or no fear of being caught. Hence, the control of opportunism requires addressing and alleviating the problem of information asymmetry.

Consider the purchase of software consulting services, where sellers (consultants) are generally thought to have an information asymmetry advantage because they know more about their ability to deliver the services than potential buyers. Because of their information asymmetry advantage, sellers can lie or omit key details about their delivery capabilities and can, by doing so, prey on the naivety of the buyer and induce the buyer to purchase low quality services. Buyers are aware of their information asymmetry disadvantage, but, lacking a way to reduce it, are often unable to distinguish between high and low quality consultants. High quality consultants are more expensive and, coupled with the buyer's inability to distinguish quality and the buyer's desire to pay the lowest price, high quality consultants are forced from the market, leaving only low quality consultants. As a result, if information asymmetry is not minimized or opportunism constrained (e.g., a warranty), the software market eventually deteriorates to having only low-quality consultants – a market of lemons (Akerlof 1970).

The level of information asymmetry faced by the disadvantaged firm will determine its choice of constraint mechanisms (Dawson et al. 2011). If the level of information asymmetry is low, the disadvantaged firm is likely to implement a low cost or free constraint since it has sufficient salient information to avoid opportunism by the other party. However, if the level of information asymmetry is high, the disadvantaged firm should seek a more powerful constraint because of the potential high loss resulting if the other party is opportunistic.

In both cases, we expect firms to balance the cost of constraints deployed against the foreseeable losses and to choose a constraint mechanism that best matches the level of existing information asymmetry. That is, a client should be expected to be boundedly rational in its choice of constraints and will perceive the most effective constraint to be one that best balances the risk that is faced in the deal with the cost of the constraint mechanism. As such, different constraint mechanisms would be chosen under varying levels of disadvantageous information asymmetry. In brief, in conditions of low information asymmetry, the client will select those constraint mechanisms that are the least costly to develop and administer. In

conditions of high information asymmetry, the client firm is forced to enact costlier constraint mechanisms.

Contract Specificity

TRC is a multi-part model. In the first part of the model, TRC proposes the use of signaling and screening to reduce the level of disadvantageous information asymmetry. In the second part, the levels of tacit and explicit knowledge determine the level of contract specificity. Finally, the level of contract specificity and the level of disadvantageous information asymmetry affect the choice of constraint mechanism. The authors point out that the relationship between signaling, screening and disadvantageous information asymmetry, because of their cyclic nature, should be tested with a process rather than variance model. Hence, we leave this set of relationships for other researchers to investigate.

Although the levels of tacit and explicit knowledge are fully mediated by contract specificity, we focus on tacit and explicit knowledge, along with the level of disadvantageous information asymmetry in predicting the choice of constraint mechanisms. That is, we omit contract specificity (and contract completeness – its related concept) to focus on its antecedents to ensure that the type of knowledge is not obscured in this analysis.

Types of Knowledge

According to TRC, the type of knowledge used in a relationships is critical to the choice of constraint mechanism (Dawson et al. 2011). Knowledge can be bifurcated into explicit and tacit dimensions (Polanyi 1967). Explicit knowledge can be easily captured, formalized and codified into documents, procedures, or databases and many people, with a modicum of effort, can learn explicit knowledge (Bassellier et al. 2001). For example, it is relatively easy to learn the syntax of a programming language, and any aspiring programmer can generally remember it. While explicit knowledge is a necessary step to being able to successfully program, it is not the only step.

To be a competent programmer requires acquiring and applying tacit knowledge, and it is only through practice that tacit knowledge can be gained. As such, tacit knowledge is viewed as the know-how that accompanies explicit knowledge (Bassellier and Benbasat 2004; Bassellier et al. 2003; Bassellier et al. 2001). A programmer needs both explicit knowledge (the syntax) and tacit knowledge (experience in applying the syntax) in order to achieve programming prowess.

The relationship between knowledge types and IS consulting work is well-established in the transaction cost economics (TCE) literature. According to TCE, human assets, which refer to the special knowledge held by IS consultants, have differing levels of specialized knowledge about the client. This client-specific knowledge refers to the degree that the consulting work requires a significant amount of understanding about the client's unique work procedures, work processes, and in-place technologies. If the client has a large amount of these, the consultant will need to invest substantial time to understand them in order to be successful. Hence, client-specific knowledge is a significant predictor of the consultant's ability to successfully deliver a project (Dibbern et al. 2008). Table 2 provides examples of the types of tacit and explicit knowledge used in IS consulting.

Table 2 – Consulting Services Typology (Source: Dawson et al 2011)

		Explicit IS Knowledge	
		High	**Low**
Tacit IS Knowledge	**High**	*Very complicated projects.* Implementation project: Complex enterprise-wide application spanning numerous divisions within an organization, which requires significant knowledge of systems development (explicit) and cognition (tacit). Strategy project: Development of	*Broad but not deep consulting projects. Classic domain of management consulting oriented projects.* Implementation project: Data quality oriented projects that are more highly focused on process/people rather than technology, which requires low knowledge of technology (explicit) but significant experience (tacit).

		an enterprise information security strategy, which requires significant knowledge of applications (explicit) and cognition (tacit).	Strategy project: Sweeping strategy projects that encompass the entire organization but are not technology centric, which requires low knowledge of technology (explicit) but significant cognition (tacit).
	Low	*Deep but not broad consulting projects.* Implementation project: Implementing security-based technology, such as a firewall, which requires high knowledge of applications (explicit) but low levels of cognition (tacit). Strategy project: Developing an upgrade plan for a current technology, which requires high knowledge of applications (explicit) but low levels of cognition (tacit).	*Simple projects* Implementation project: Development of a basic spreadsheet application, which requires low knowledge of systems development (tacit) and low levels of experience (explicit). Strategy project: Development of a basic feasibility assessment for an uncomplicated application, which requires low knowledge of applications (tacit) and low levels of experience (explicit).

TRC implicitly acknowledges that some level of tacit and explicit knowledge appears in every contract. That is, very rarely is there a *complete* absence of either knowledge type in any IS consulting project (Dawson et al. 2011). Even when a knowledge-type is low, it still exists and still requires an appropriate constraint. As a result, it is unlikely that any single constraint would fully accommodate both tacit and explicit knowledge and so buyers need to create the combination of constraint mechanisms that constrain *both* the level of tacit and explicit knowledge that is present in the engagement.

Given that constraint mechanisms are believed to be differentially effective for certain circumstances, we suggest that clients will select the constraint mechanism that they believe to constrain opportunism in the least obtrusive and least costly way. We also argue that, over time, clients have developed an understanding of what constraints work best under these circumstances and that an experienced client will be able to identify and select the most effective constraint mechanism based on the levels of information asymmetry, tacit and explicit knowledge. Accordingly, our research proposition states that *the perceived efficacy of a constraint mechanism will vary based on the levels of information asymmetry, tacit and explicit knowledge.*

Research Approach

A scenario-based approach was used to examine the preceding proposition. Scenario-based research has a rich history within IS research, particularly when skilled judges are used (Banerjee et al. 1998), and is appropriate when seeking precision. This research is a policy capturing study that seeks to understand how respondents use available information to make evaluative judgments. We seek to understand the *perceived* effectiveness of each constraint under different levels of information asymmetry, tacit knowledge, and explicit knowledge. As such, each of our constraints is a dependent variable and our aim is to understand under what conditions a constraint is perceived to be effective.

Three independent attributes were used to predict the type of constraint mechanism: the levels of explicit knowledge, tacit knowledge and client disadvantaged information asymmetry. We closely followed the definitions used in Dawson et al. (2011) to operationalize each construct. We used their typology to identify IS consulting projects that have varying levels of tacit and explicit knowledge (see Table 2). In addition, we also used the typology to operationalize information asymmetry.

For each attribute, we used a two-level predictor (high/low) for two reasons. First, our primary goal was to understand the importance of each attribute in predicting the perceived efficacy of each constraint mechanism and a two-level predictor provided sufficient insight. Second, the required number of scenarios increases substantially as the number of predictor levels rises. Using two-level predictors, we

were able to conduct the analysis with a total of eight scenarios, which results in a questionnaire that respondents can reasonably be asked to complete. Theoretically, we can identify eight (2^3) scenarios, but during the pilot phase (discussed later) learned that one was infeasible from a practical sense, so it was excluded from consideration during data collection.

The dependent constructs (our constraint mechanisms) were measured using a five-point Likert scale in order to obtain a granular understanding of the perceived efficacy of each constraint for each scenario. We used three primary sources to identify the constraint mechanisms. First, we used those proposed in previous work on constraints on professionals (Sharma 1997). Among Sharma's proposed constraints is the notion of self-control and it is easy to conceive self-control as trusting the other party to behave in a non-opportunistic fashion. As such, self-control differs from the other constraints but is still widely discussed in Sharma (1997) as a response in the face of opportunism. Second, we used constraint that surfaced in the development of TRC (Dawson et al. 2011). Finally we used some of the legal constraints that are commonly mentioned in agency theory (Eisenhardt 1989).

We do not argue that these are the only possible constraint mechanisms that exist; there are additional ones (see Sappington (1991) for a summary). However, it was impractical to test for every possible constraint mechanism that could possibly work. We decided to focus on these eight constraints because they were the most commonly seen in IS literature and practice.

In our instructions, we provided the respondent with a definition of each constraint mechanism (see Table 3). Given that the target respondents were all highly experienced and likely did not require any explanation of each constraint type, we opted to provide only a brief definition of each constraint. Table 3 also provides the source for the constraint mechanisms that we used.

Table 3 - Constraint Definitions

Constraint	Definition	Source
Firm Fixed Price Contract	A contract where a set amount of work is performed for a set price	Eisenhardt (1989)
Time and Materials Contract	A contract where a client buys a certain number of hours of a consultant's time	Eisenhardt (1989)
Purchase Order	A brief contract that specifies the product/service to be delivered and its cost	Dawson et al (2011)
Incentive Contracts	An addition to a contract that specifies a bonus for certain actions (e.g. faster delivery)	Dawson et al (2011)
Advisor Firm Participation	The hiring of another consulting firm to help oversee the consultant	Sharma (1997) Dawson et al (2011)
Bureaucratic Control	The use of the consultant's chain of command within his/her consulting firm	Sharma (1997) Dawson et al (2011)
Self Control	Reliance on a consultant's personal ethics	Sharma (1997) Dawson et al (2011)
Informal Community	Reliance on the lead consultant's desire to maintain his/her public reputation for integrity and honesty	Dawson et al (2011)

Scenario-based research is dependent on realistic scenarios that match the domain of interest, IS consulting in this case (see Table 2). We analyzed approximately 100 IS consulting contracts for their content, levels of tacit and explicit knowledge demanded (based on service types), and the extent of information asymmetry in order to select the ones to use for our scenarios. All of the contracts were gathered from the State of California, which has numerous contracting "vehicles" for different types of IS work. The public sector is generally required to list all of its procurements, which are available on a website maintained by the State of California's procurement division. All State of California agencies are required to use these contracting vehicles and the Procurement Division for all IS-related work within the agency. We searched the Procurement Division's website to find procurements that matched the typology

provided by Dawson et al (2011) (see Table 2). Using this, we were able to find projects with different levels of tacit and explicit knowledge.

One of the tenants of TRC is that both the client and consultant have an information asymmetry advantage but the type of information is different. For example, the consultant will generally have an information asymmetry advantage about the process/technology to be used for the project while the client may have an information asymmetry advantage about the client firm's acceptance of the new technology or project. Varying the consultant's level of information asymmetry would substantially increase the number of necessary scenarios (from 8 to 16) and so we decided, as a scope narrowing approach, to stipulate that the consultant has a high information asymmetry advantage about the process/technology that would be used for the project. For each scenario, we stated (in the scenario) that the consultant was highly experienced with the project, which fixed the consultant's advantaged level of information asymmetry as high. This allowed a sharper focus on different levels of client disadvantageous information asymmetry.

Because the procurement documents were so lengthy (averaging 50-200 pages), it was necessary to summarize them in order to form the scenarios. We initially summarized each of the seven procurement documents into seven scenarios averaging 3-4 paragraphs in length. This use of actual projects increases the realism of the scenarios, which is a requirement for scenario-based research.

We were not able to identify a procurement to meet one of our requirements: high information asymmetry, low tacit knowledge, and low explicit knowledge. As a result, we were forced to create a scenario that met these requirements. We sought to match the tone and level of detail from the other scenarios for this fabricated scenario.

Pilot tests

Once the scenarios were completed, we conducted a first pilot test with twelve respondents (i.e., IS consultants or clients known by the first author). The goal of the first pilot test was a manipulation check to see if the respondents correctly identified each scenario with the levels of tacit and explicit knowledge and information asymmetry. We provided a definition and description of all three attributes to the respondents, asked them to read the scenario and to provide an estimate of the level for each of the three attributes. The definitions that we provided were consistent with the definitions used in Dawson et al (2011). In addition, we asked the respondents to judge the level of realism of each scenario.

The results from the first pilot test revealed several problems. In several of the scenarios, the levels of tacit and explicit knowledge were not clear and respondents did not correctly distinguish between high versus low levels of information asymmetry. All of the respondents judged the realism of the scenarios to be high, with the exception of the fabricated scenario. The respondents argued that they could not envision a case where the information asymmetry would be high (reflecting that the client would be very unfamiliar with the project) while the level of tacit and explicit knowledge is low (reflecting an easy project). Upon reflection, we agreed with this viewpoint and dropped the fabricated scenario.

Finally, we discovered that the pilot survey took almost 30 minutes to complete and felt that most respondents would not complete a survey of such time duration. As a result, we shortened the scenarios to one or two paragraphs along with several bullet points highlighting the key facts.

After these modifications, we sent the revised instrument to eight new pilot testers and asked them to identify the manipulation levels (levels of tacit/explicit knowledge, level of information asymmetry) and to judge the realism of each scenario. The results were encouraging. For each aspect of the manipulation check, we had a minimum of seven respondents who correctly categorized the attributes. We computed the probability of getting seven or more matches (respondents) out of eight, and eight out of eight using the binomial distribution assuming random selection (i.e., $p= .5$). The respective probabilities were .035 and .004. With this empirical validation of the levels of the three attributes across the seven scenarios, we removed the manipulation check from the instrument and finalized it. Table 4 shows the subject of each of our scenarios as well as their respective levels of each attribute. Some representative examples of our final scenarios are shown in Appendix A.

Table 4 – Summary of Scenarios

Scenario	Level of		
	Info Asymmetry	Explicit Knowledge	Tacit Knowledge
1 – Complex software development of a COTS financial system	High	High	High
2 – Assessment of disaster recovery readiness	High	Low	High
3 – Greening of a data center	High	High	Low
4 – Development of a complex secure electronic communications and information processing network	Low	High	High
5 – Developing and rolling out a new organizational structure	Low	Low	High
6 – Data center equipment installation	Low	High	Low
7 – Building microwave connectors	Low	Low	Low

Data collection

We sent the instrument to 240 project managers (or people holding similar positions), from different industries, who were part of the first author's LinkedIn contacts. A total of 50 people responded to our request to participate (20.8%) and completed the full instrument. As we used a scenarios approach, this study is more like an experiment than a survey, and as such the emphasis is on causality rather than generalizability (McGrath 1982). Respondents' demographic information is presented in Table 5.

Table 5 – Respondents' Demographic Information

Element	Mean
Years of experience working with consultants	12.63
Number of consultants supervised	77.90
Average age	43
Gender distribution	Male: 38 Female: 12
Prior work experience	All consulting: 12 All client: 4 Mix: 34

We found no significant difference in the results based on any of the demographic information that was captured.

Results

The data set consists of eight dependent variables (the constraint choices) (Y) for the seven scenarios (S) and 50 respondents (R), and three treatments (information asymmetry (A), level of tacit (T) and explicit (E) knowledge) with levels of high and low. We use the R notation (Kabacoff 2009) to indicate models tested. MANOVA indicates that the different scenarios (Y ~ S) produced significantly different responses for the dependent variables (p < .0001), which is another form of manipulation check. We then conducted a MANOVA with the three treatments (Y ~ A*T*E) to test for treatment effects. Main effects were detected for each of the treatments and for interactions A*T, A*E and E*T (p < .0001). Table 6 reports the means for each constraint within each scenario.

Table 6 – Means and MANOVA Analysis for perceived constraint effectiveness

Constraint	Scenarios*							Overall Mean	P-value
	1 HHH	2 HLH	3 HHL	4 LHH	5 LLH	6 LHL	7 LLL		
Firm Fixed Price Contracts	3.18 [bc]	3.58 [b]	**3.69 [ab]**	3.12 [bc]	3.39 [b]	3.38 [b]	3.12 [b]	3.37	< .0001
Time and Materials Contracts	2.80 [c]	2.98 [c]	3.02 [c]	**3.60 [a]**	3.43 [b]	3.52 [b]	**3.57 [a]**	3.30	< .0001
Purchase Orders	2.50 [c]	2.77 [c]	3.23 [c]	2.94 [c]	2.78 [c]	2.96 [c]	**3.22 [ab]**	2.92	< .0001
Incentive Contracts	**3.64 [ab]**	2.96 [c]	3.48 [bc]	3.20 [b]	3.45 [b]	**3.96 [a]**	3.24 [ab]	3.46	< .0001
Advisor Firm	**3.96 [a]**	3.85 [ab]	3.33 [bc]	2.76 [c]	3.24 [b]	2.82 [c]	2.67 [c]	3.31	< .0001
Bureaucratic Control	3.52 [b]	3.60 [b]	3.40 [bc]	**3.50 [ab]**	3.78 [b]	**3.56 [ab]**	**3.35 [ab]**	3.57	< .0001
Self Control	3.52 [b]	3.54 [b]	3.42 [bc]	**3.58 [ab]**	3.59 [b]	3.44 [b]	3.16 [b]	3.49	< .0001
Informal Community	**3.92 [a]**	**4.23 [a]**	**4.00 [a]**	**3.58 [ab]**	**4.20 [a]**	3.52 [b]	3.16 [b]	3.82	< .0001

* The letters below each scenario reflect, in order, the levels of information asymmetry, explicit knowledge, and tacit knowledge present in that scenario. The highest means for each scenario is bolded.
Means with the different alpha superscripts are significantly different.

MANOVA (Table 6) supports the proposition that the perceived effectiveness of constraint mechanism varies based on the levels of information asymmetry, and tacit and explicit knowledge. Given the significance of the MANOVA, we conducted a series of ANOVAs to better understand the conditions under which each constraint was perceived to be effective. That is, we were interested in knowing how significant information asymmetry, tacit knowledge and explicit knowledge are in predicting the perceived effectiveness of each constraint mechanism. We initially formulated the second MANOVA as (Y ~ A*T*E + Error(R)), recognizing the repeated measures on each respondent, but the model is singular. For the individual ANOVAs, we run this repeated measures model. Our results (p-values) are shown in **Table 7** and our discussion of perceived effectiveness of each constraint mechanism follows.

Table 7 – Perceived Effectiveness of Constraint Mechanisms (p-values in cells)

Constraint	Information Asymmetry (A)	Explicit Knowledge (E)	Tacit Knowledge (T)	A * E	A * T	E * T
Firm Fixed Price Contracts	.056	.474	.283	.830	**.043***	.064
Time and Materials Contracts	**< .0001***	.978	.533	.382	.398	.428
Purchase Orders	.181	.954	**< .0001***	.707	**.032***	.108
Incentive Contracts	.384	**.001***	.802	.145	.105	**.001***
Advisor Firm	**< .0001***	.056	**< .0001***	.456	.103	**.013***
Bureaucratic Control	.581	.378	**.027***	.876	.732	**.011***

| Self Control | .550 | .724 | **.006*** | .650 | .262 | .165 |
| Informal Community | **< .0001*** | **.023*** | **< .0001*** | .689 | **< .0001*** | **< .0001*** |

* - Significant at p < .05

Firm Fixed Price Contracts: There is an interaction effect between information asymmetry and tacit knowledge. In the presence of low tacit knowledge, the perceived effectiveness of a fixed price contract is higher when information asymmetry is high (see Table 8).

Table 8 – Fixed Price Contract Interaction Means*

		Tacit Knowledge	
		Low	**High**
Information Asymmetry	**Low**	3.252^b	3.260^b
	High	3.673^a	3.365^{ab}

* Means with the different alpha superscripts are significantly different.

We offer the following interpretation for this finding. A firm fixed price contracts limits the financial damage that could be done by an opportunistic consultant since it specifies a fixed amount for a set amount work. When a project's required tacit knowledge is high, a firm has problems specifying outcomes and thus a precise contract. When tacit knowledge is low, a firm can be quite explicit about what should be performed. However, as information asymmetry increases, the client is increasingly unable to accurately project the cost of the effort. By turning to a fixed price contract, it forces consultants to price the work competitively and effectively limits their ability to be opportunistic.

Time and Materials Contracts: Only the information asymmetry factor is significant (p < .0001). Time and materials contracts are perceived as *less* effective as the level of information asymmetry rises (low mean = 3.561, high mean = 2.979). If the level of information asymmetry is low, a client knows a great deal about the project and may be confident in its ability to spot and stymie a potentially opportunistic consultant. As a result, it is willing to assume more of the risk under a time and materials contract. However, as the level of information asymmetry rises, a client is likely to feel increasingly uncertain about its ability to stop an opportunistic consultant and this is why the perceived efficacy of a time and materials contract decreases with higher levels of information asymmetry. This suggests that the use of time and materials contracts will generally be confined to conditions of low information asymmetry.

Purchase Orders: There is an interaction effect between information asymmetry and tacit knowledge such that in the presence of high information asymmetry, a purchase order is perceived as more effective when tacit knowledge is low (see Table 9).

Table 9 – Purchase Order Interaction Means*

		Tacit Knowledge	
		Low	**High**
Information Asymmetry	**Low**	3.108^{ab}	2.884^{bc}
	High	3.251^a	2.680^c

* Means with the different alpha superscripts are significantly different.

In many ways, a purchase order parallels a fixed price contract: it specifies the amount of work to be done and the price for that work to be done. Like with a fixed price contract, higher levels of tacit knowledge hinder the client's ability to precisely and fully specify outcomes and thus limit its ability to create a

precise contract. Higher levels of information asymmetry further hinder this. A purchase order also limits the financial damage that can be done by an opportunistic consultant. So, when information asymmetry is high, a purchase order will be perceived to be more effective than when tacit knowledge is low.

Incentive Contract: There is an interaction effect between tacit and explicit knowledge (see Table 10), such that in the presence of high explicit knowledge, an incentive contract is perceived as more effective when tacit knowledge is also high.

Table 10 – Incentive Contract Interaction Means*

		Tacit Knowledge	
		Low	High
Explicit Knowledge	**Low**	3.353 [ab]	3.580 [a]
	High	2.938 [b]	3.575 [a]

* Means with the different alpha superscripts are significantly different.

An incentive contract tries to set up conditions to encourage a consultant to work in a non-opportunistic fashion by making it financially beneficial to work in a way that is consistent with what the client wants. If set up properly, an incentive contract amplifies the incentives for working in the client's interests and dampens the incentives to be opportunistic. An incentive contract does not place a substantial burden of knowledge on the client since it only requires the establishment of a limited number of incentives rather than a precise specification of outcomes or processes to be followed.

Advisor Firm: There is an interaction effect between tacit and explicit knowledge, such that in the presence of low explicit knowledge, an advisor firm is perceived as more effective constraint when tacit knowledge is high (see Table 11).

Table 11 – Advisor Firm Interaction Means*

		Tacit Knowledge	
		Low	High
Explicit Knowledge	**Low**	2.682 [b]	3.579 [a]
	High	3.069 [ab]	3.375 [ab]

* Means with the different alpha superscripts are significantly different.

Advisor firm participation comes at a cost since the client has to hire a second consulting firm to oversee the work of the primary consulting firm. Since non-professionals (in our case, clients) do not have access to the tacit knowledge of the profession (Sharma 1997), high levels of tacit knowledge would seem to make advisor firm participation a worthwhile investment. By contrast, a client is capable, with diligent searching, of gathering all of the relevant explicit information and so high explicit knowledge is not likely to justify the incremental cost of an advisor firm. We posit that clients will only hire an advisor firm when they feel highly (or completely) incapable of overseeing the work. The interaction effect supports our positing.

Bureaucratic Control: There is an interaction effect between the level of explicit knowledge and tacit knowledge such that in the presence of low tacit knowledge, bureaucratic control is perceived as more effective when explicit knowledge is high (see Table 12).

Table 12 – Bureaucratic Control Interaction Means*

		Tacit Knowledge	
		Low	High
Explicit Knowledge	**Low**	3.346 [b]	3.484 [ab]
	High	3.696 [a]	3.510 [ab]

* Means with the different alpha superscripts are significantly different

Bureaucratic control seems to be a good general constraint that is perceived to be effective in a number of situations involving different levels of explicit and tacit knowledge. We suggest that this is because tacit knowledge requires some judgment and expertise to assess whether the lead consultant was opportunistic. Conversely, explicit knowledge is much easier to judge. However, if tacit knowledge is low, bureaucratic control is seen as more effective when explicit knowledge is high.

Self Control: There is a single direct effect with the level of tacit knowledge (low mean = 3.34, high mean = 3.57) (p-value < .006). The perceived effectiveness of self-control rises as the level of tacit knowledge rises. We speculate that people may not feel that self-control is as effective when tacit knowledge is low, since clients can readily determine if a consultant is being opportunistic. As such, the perceived effectiveness of self control as a constraint rises when tacit knowledge increases, since it is more difficult to determine if a consultant is being opportunistic. Dawson et al. (2011) found difficulty with self-control as a constraint. In that study, self-control was mentioned as a constraint but numerous people doubted its ability to be effective.

Informal Community: Informal community had the highest overall perception of effectiveness as a constraint and there are interaction effects between information asymmetry and tacit knowledge and between tacit knowledge and explicit knowledge (Table 133). In the presence of low tacit knowledge, the informal community is perceived as more effective when information asymmetry is high. The interaction between tacit and explicit knowledge indicates that the informal community is judged more effective when explicit knowledge is high.

Table 13 – Informal Community Interaction Means*

		Tacit Knowledge	
		Low	High
Information Asymmetry	**Low**	3.343 [b]	3.900a [a]
	High	4.000 [a]	4.060 [a]
		Tacit Knowledge	
		Low	High
Explicit Knowledge	**Low**	3.696 [b]	3.550 [b]
	High	4.200 [a]	3.959 [a]

* Means with the different alpha superscripts are significantly different.

As the level of information asymmetry rises, the perceived efficacy of the informal community as a constraint rises and this is based on the idea that only a consultant is capable of understanding the actions of another consultant (Dawson et al. 2011). Hence, the consulting community effectively polices itself against opportunistic consultants. The second interaction effect suggests that it is easier to determine if a consultant has been opportunistic if the level of explicit information is high since it requires less judgment. Of all the constraints, the informal community had the highest overall perceived efficacy, although it is not perceived to be the most effective constraint in all scenarios.

Discussion and Conclusions

Several major findings emerge from this research. First, as predicted by TRC, the perceived effectiveness of constraints varies significantly based on the levels of information asymmetry, explicit, and tacit knowledge. As a first empirical examination of TRC, this research provides evidence of the explanatory and predictive power of this theory.

Second, no constraint is perceived to be universally effective. As shown in Table 6, no constraint is most effective in *all* situations; yet, every constraint is perceived to be effective in *some* situations. This suggests that opportunism can be constrained, but it is incumbent upon the client to choose the correct constraint

for each situation. A client has to correctly understand the situation (and its levels of information asymmetry, tacit and explicit knowledge) in order to choose an efficacious constraint.

Third, generally speaking, social constraints are believed to be more efficacious than legal constraints when information asymmetry is high (scenarios 1, 2 and 3). This suggests that the IS consulting domain's historical reliance on legal constraints is misplaced when information asymmetry is high. It also draws into question the predictive power of agency theory and its legal constraints when information asymmetry is high.

Fourth, self-control, which is similar to the concept of trust (Sharma 1997), is believed to have very low effectiveness under most conditions. This suggests that self-control is simply ineffective and bolsters the argument for the need for other mechanisms to constraint opportunism.

Fifth, for many constraints, the interaction between information asymmetry, explicit and tacit knowledge is salient and this eliminates the possibility of simply examining each attribute in isolation. While there are salient direct effects for most constraints, interaction effects are usually present. Successfully studying IS consulting constraints depends on examination of these interactions.

Sixth, a constraint that was not envisioned by agency theory or the principal-professional lens, the informal community, was believed to be the single most effective constraint. This is particularly interesting since the informal community is a low cost constraint and simply requires an ability to tap into the informal community. Clearly, this constraint has significant promise but seems to be ignored in the literature, with the exception of TRC.

Finally, the results are actionable and pragmatic for those in the IS consulting domain, as they will allow clients to better protect themselves from opportunistic consultants. Solving the problem of opportunism can be attacked in a number of ways. For example, a situation with high information asymmetry can be resolved with a variety of constraints (with different levels of perceived efficacy) or, potentially, can be resolved by shifting the project to only have low levels of information asymmetry (e.g., the client could hire an expert in a given technology). Client firms frequently view this as a strategic hire and it is specifically done to reduce the disadvantageous information asymmetry that faces the client firm.

Like all studies, this one has its limitations. First, while we developed our short scenarios from lengthy procurement documents and tested their realism, we did not test whether respondents reacted identically to the complete document as compared to the précis of it used as a scenario. Second, this study uses a convenience sample of professional contacts of the first author. While this is a limitation, we believe that the high experience level of respondents mitigates this concern. Given the experiment-like nature of the scenario approach, we opted for strong internal validity and gained external validity through grounding the scenarios in actual projects and by seeking respondents practicing in the domain. We also acknowledge that we did not test for every possible constraint mechanism and focused on those frequently found in the IS literature and practice. Finally, we did not test the *relative* importance of each of our attributes in predicting the perceived effectiveness of each constraint mechanism.

Future researchers can leverage this work and seek to understand what additional constraints exist and under what conditions each is perceived to work best. In addition, they can seek to extend generalizability of this study from the IS consulting domain into other domains. Finally, it is not clear what all the possible interactions between the constraint mechanisms are. That is, we did not attempt to undertake a study of the combinations of constraint mechanisms that work best in concert, although we suspect that there are combinations of constraints that work well together.

Much like Akerlof (1970) describes in the Market for Lemons, opportunistic behavior, if unchecked, drives ethical, high quality service providers out of the market. Simply trusting that a partner will behave honorably is not sufficient. While high quality service providers currently remain in the IS consulting domain, literature is replete with examples of consultants behaving opportunistically. Most insightfully, some of the comments by clients in the original TRC paper (Dawson et al. 2011) show that most clients perceive a marketplace that is populated by opportunistic consultants. Consultants are seen as routinely engaging in opportunism and continually trying to deceive naïve clients. TRC, by focusing on information asymmetry as the root cause of opportunism, takes an information-oriented perspective. This study shows that TRC has promise to predict the interactions of information asymmetry and knowledge type in predicting the choice of constraint mechanisms. When faced with tight budgets and potentially

opportunistic consultants, clients have a limited amount of money to put into constraints and so must be judicious, yet effective, in the constraint mechanisms that they use.

Similarly, high quality consultants should want effective constraints as these serve to ensure that opportunistic consultants do not prey on unsuspecting clients and that high quality work is recognized and rewarded. To continue to keep IS consulting as a robust and viable domain of ethical service providers, finding ways to effectively constrain opportunism is key. This research's findings provide an important step to understanding what clients can do to constrain opportunistic consultants and avoid IS consulting from becoming a market for lemons.

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Appendix A – Example Scenarios

Scenario 1 – Complex software development of a COTS financial system

The organization (Client Firm) is undertaking a major effort that centers on the replacement of 70 current financial applications with a commercial off-the-shelf (COTS) Enterprise Resource Planning (ERP) suite to include General Ledger, Accounts Receivable, Accounts Payable and Reporting functionality for a division of the organization. Client Firm, which has little idea about how to perform the work, has engaged Consulting Firm to perform this project.

Key Facts:

- The project is complex and large
- The project requires a great deal of knowledge about technology and how to apply that technology
- Client Firm knows very little about either the technology or how to approach the work
- Consulting Firm know a great deal about the technology and how to approach the work
- An advisor firm, which is precluded from performing the development work, is available, at a price, to help advise Client Firm

Scenario 2 – Assessment of disaster recovery readiness

Client Firm is a major bridge builder in the State of California and has been responsible for developing the engineering drawings that have been used to build major bridges within the State. These engineering drawings are useful to build the bridge but are also mandatory in the case of a seismic event (earthquake etc) that affects the bridge.

The press has found out about Client Firm has never examined its disaster recovery readiness and headlines in local, regional, and national newspapers are calling it a dereliction of duty that this assessment has never been done. The State of California government has asked Client Firm to have Consulting Firm assess its readiness in the event of a seismic disaster.

Key Facts:

- The project is visible and important
- The project requires very little knowledge about the specifics of any particular technology but does require a great deal of knowledge about the management of technology
- Client Firm knows very little about how to approach the work
- Consulting Firm know a great deal about how to approach the work
- An advisor firm, which is precluded from performing the assessment work, is available, at a price, to help advise Client Firm