

CAN OUTSOURCING OF INFORMATION TECHNOLOGY FOSTER INNOVATIONS IN CLIENT ORGANIZATIONS? AN EMPIRICAL ANALYSIS¹

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There is a substantial body of literature on information technology (IT) outsourcing. However, little is known about employing IT outsourcing to generate innovation. In this paper, we articulate the ex ante as well as ex post contracting challenges that could preclude firms from realizing such business value through outsourcing. We develop and test a model linking innovation in IT outsourcing (process innovation and service innovation) to two complementary solutions to the contractual problems: credible commitments and contingent control rights. Alternative empirical estimation approaches support the basic thesis that contractual solutions are complementary in their association with enhanced innovation performance. Our study suggests that portfolios of complementary contractual provisions need to simultaneously address ex ante and ex post hazards through contract design in the outsourcing of innovative tasks. Theoretical and practical implications are explicated.

Keywords: Information technology outsourcing, contract design, control rights, innovation, process innovation, product innovation, multivalued treatment effects, bivariate probit

Introduction

Not only has the market for outsourced information technology (IT) services continued unabated in the past few decades, the motive for IT outsourcing and the range of activities outsourced has undergone a significant shift. Given the pace of technological change, the range of managerial and organizational capabilities required for innovations in IT services precludes firms from developing needed capabilities internally (e.g., Gilson et al. 2009). Rather than arms-length transactional arrangements, firms are looking to structure IT

outsourcing initiatives as partnerships for long-term value creation (Lacity and Willcocks 2013) with a focus on innovation and strategic performance (Lacity and Willcocks 2013; Linder et al. 2003), and to orchestrating business processes to generate greater shareholder value (Quinn 1999).

Enabling innovation through outsourced IT initiatives has been an understudied area of literature. Prior research on IT outsourcing has primarily highlighted the role of production cost advantages accruing from outsourcing. In this paper, we consider two types of post contract innovations fostered through outsourcing of IT services. One dimension of innovation we consider is process innovation that delivers “substantial long-term improvements to the client’s operating efficiency, business-process effectiveness and strategic performance” (Lacity and Willcocks 2013, p. 63). A second dimension of innovation through outsourcing occurs when

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firms can build on the outsourcing initiative to design and execute services that complement, adapt, and extend the usage of their product offerings (Cusumano et al. 2015; Suarez and Cusumano 2009). We define this dimension as service innovation (e.g., Suarez et al. 2013), which encompasses new product development as well as efficiencies within manufacturing processes (Utterback 1994) realized through outsourcing.

A couple of examples from our study illustrate how well-managed outsourcing initiatives can realize such innovation. A client company,² Star Bank Corporation, contracted with a vendor, InfoServ, in order to make the overall business more competitive. In the course of the outsourcing initiative, Star Bank divested non-core operations and InfoServ faced a task of delivering “streamlined, enterprise-wide architecture that would obtain a dramatic reduction in the client company’s overall operating expense and reduce their total cost of ownership,”³ representing an example of process innovation. As an example of service innovation, one of the clients in our sample, American Automotive, outsourced its IT services to a vendor, Information Data Services. The contract states the vendor will partner with the client in developing “hardware, software and firmware”⁴ embedded into the client’s automotive products.

In recent years, as cloud-based IT outsourcing has gained in popularity, innovation through outsourcing is achievable through cloud-based initiatives as well. Costello and Willcocks (2018) offer an example of how an organization achieved seamlessly integrated sales and service capabilities by outsourcing through Software-as-a-Service (SaaS) cloud implementation. These two dimensions of innovation are not mutually exclusive but both can be realized through well-crafted outsourcing initiatives. Willcocks and Lacity (2018) posit that both service innovation and process innovation can be realized by outsourcing through the cloud.

There are, however, several challenges with realizing the above vision. Outsourcing for innovation needs a rethink from traditional cost-based models used in the outsourcing of transactional systems (e.g., Gilson et al. 2009). It is difficult to specify in advance the innovation that should result and mechanisms to reward performance (Gilson et al. 2009). Adopting a transactional approach results in piecemeal innovations that do not deliver significant value to client organi-

zations (Lacity and Willcocks 2013). The research question we consider is: *What is the role of contract design in enabling innovation to be realized in the client organization through outsourcing of IT services?*

To explore this research question, we identify two distinct motives for sourcing innovation through outsourcing: transformational intent, wherein the purpose of outsourcing is to usher in organizational or strategic transformation, and market orientation, wherein the purpose of outsourcing is to enable product development and market-centered outcomes. To foster innovation, clients and vendors need iterative collaboration in an environment characterized by inherent outcome uncertainty and the potential for rent appropriation. To this end, we identify and explicate the *ex ante* exchange hazards (incentive alignment) as well as *ex post* exchanging hazards (holdup) resulting from the joint imperatives to support iterative collaboration and to protect against each party appropriating the resultant rents.

Having explicated the unique contracting hazards present in this form of IT outsourcing, we propose two contract design elements that may overcome these hazards: credible commitments and contingent control rights. Based on this developed theoretical apparatus, we advance two hypotheses. The first refers to contract design itself, that is, credible commitments and contingent control rights are complementary in contract design. The second links contract design to contract outcomes: contracts with synergistic design of credible commitments and contingent control rights realize greater post contract innovation performance.

To test the developed hypotheses, we use data from IT outsourcing contracts sources through the 10-K, 8Q, and 10Q filings of firms, which are part of the public disclosure filings mandated by the guidelines of the U.S. Securities and Exchange Commission (SEC). We employ a longitudinal research design in order to examine the antecedents of contract design as well as the outcomes. Each contract has a negotiation phase where the contract negotiation and sourcing intent is determined, a contract execution phase, and a post contract implementation phase where the contracted-upon service is delivered. Triangulating the data by matching the actual contract documents with data from publicly available databases as well as a proprietary dataset from an outsourcing advisory firm allows us to build measures of intent to innovate (which predate the actual contract start date and is, therefore, distinct from the contractual clauses), and the measures of innovation performance that result post contract. We estimate a recursive simultaneous bivariate probit estimation to examine the impact of complementarity in contract choices. We also conduct a multivariate treatment effects estimation to test the impact of contract choices on outcomes.

²We refer to the outsourcing firm as the client and the outsourcee as the vendor.

³Quote from one of the contracts in our sample. We have anonymized names of all companies in the interest of confidentiality.

⁴Quote from one of the contracts in our sample.

We find support for both hypotheses. Endogeneity issues are addressed by using granular measures of contracting history between the parties as instruments in the estimation of complementarity.

Our study makes several contributions. Prior literature has analyzed IT outsourcing primarily through the lens of transaction cost economics (TCE) and opportunism, while neglecting the role of contracts in enabling innovation. We aim to address that gap. Literature in other disciplines on innovative sourcing has either employed a knowledge-based view of the firm in highlighting interorganizational mechanisms that enable exploitation and exploration (Nickerson and Zenger 2004), or alternately employed TCE to conceptualize the hazards of appropriation across firm boundaries (Arora 1996; Oxley 1997). We contribute to this stream by highlighting that the management of innovation requires complex elements of contract design to protect parties from the risks of misappropriation of rents from innovation while also allocating property rights equitably. We contribute to the theories of IS through a discussion of innovations enabled through IT initiatives.

Theory and Hypotheses

Sourcing Intent and Post Contract Innovation Performance

We conceptualize two motives wherein companies aim to achieve innovation by means of outsourcing: transformational intent and customer orientation. Each contract has a negotiation phase where the contract negotiation and sourcing intent is determined, a contract execution phase, and a post contract implementation phase where the contracted-upon service is delivered. A client's intent to achieve innovation through outsourcing predates the contract and is gleaned from press releases that detail the scope of IT activities outsourced to a particular vendor. Transformational intent refers to outsourcing initiatives wherein the motive for sourcing is stated to be innovations in business processes (Linder 2004; Susarla et al. 2010), including business process redesign tailored to the needs of end users (Miozzo and Grimshaw 2005). The motivation for such a contract could be the need to deal with "changing business requirements and changes in the global marketplace."⁵

The second intent to achieve innovation through outsourcing that we consider is market orientation, which is posited to enhance innovation by making an organization more respon-

sive to changing market conditions (Jaworski and Kohli 1993). It has been posited that market orientation enhances innovation by uncovering latent customer needs (Atuahene-Gima 1995). An example would be a contract where the one of the purposes of outsourcing was described as "developing a sophisticated profile of potential customers"⁶ in order to achieve better market focus. In both cases, the motives for outsourcing go well beyond cost savings to encompass management innovation, "defined as a practice or technique intended to further organizational goals" (Birkinshaw et al. 2008, p. 825). Outsourcing for innovation requires interactions between the provider and client, necessitating "interplay between the provider and user knowledge" (Freel 2006, p. 338).

We conceptualize two dimensions by which clients realize post contract process and service innovations through well-managed outsourcing initiatives. First, we consider the role of process innovation fostered through outsourcing. Consider a contract where the 10K statements of the client organization mention the "business impact, performance improvements and cost savings associated with Technology and Business Process Evolutions"⁷ as a result of IT outsourcing. Process innovation⁸ refers to new ways of delivering goods or services, which could occur from innovations in business processes (Linder 2004) as well as redesign of employee responsibilities and task structures (Bresnahan et al. 2002). Such investments are critical to formulating organizational strategy and in transforming business processes (Brynjolfsson and Hitt 2000), whether it is new business models and user experiences enabled by IT, or new processes and management practices enabled by IT (Miozzo and Grimshaw 2005).

Second, we consider the role of service innovation that is increasingly important as businesses become more mature (Cusumano et al. 2015). Cusumano et al. (2015) suggest that product-related services complement the offerings of product firms in adapting the product functionality by "modifying the product based on the environment or usage contexts" (p. 562). An example from 10K filings illustrates such innovation engendered through IT outsourcing. The 10K filing mentions the outsourcing initiative wherein the vendor's expertise was used to bring the product "in line with the needs of industry sales prospects [and utilizing the vendor's] technology exper-

⁶Quote from one of the contracts in our sample.

⁷Quote from one of the contracts in our sample.

⁸In this paper, we use the term *process innovation* to reflect the role of IT in distinct service innovations (Lyytinen and Rose (2003) identify four types of service innovations: administrative process, technological process, technological service, and technological integration innovations).

⁵Quote from one of the contracts in our sample.

tise in developing a portfolio of value-added products.”⁹ We examine three interrelated types of service innovations that improve the usage of the product or expand the product functionality offered in the market (e.g., Cusumano et al. 2015). The first is innovation in production technologies (Bartel et al. 2007; Stanko and Calantone 2011). The second is that of adaptation of product usage, such as innovation through delivery of value-added products (e.g., Mahnke et al. 2006), and digital technologies embedded in products in the client organization (Konana and Ray 2007). Third, we consider streamlining of new product development initiatives (e.g., Stanko and Calantone 2011).¹⁰

Contracting Environment for Innovation and Gaps in Prior Literature

There is little hazard of appropriability in outsourcing routine services when the goal is cost savings. Consider a contract wherein the customer defines the required functionality, and the vendor supplies a system and is paid when the acceptance tests are approved; this scenario is relatively close to a market transaction for procurement.¹¹ However, innovation generates appropriable rents (Anton and Yao 1994), and a vendor undertaking innovation could benefit from strategically redeploying some of the solution specific knowledge in other client engagements, or focus efforts on service dimensions that are valuable in other outsourcing engagements (e.g., Susarla 2012), raising the hazard of appropriation. At the same time, the vendor could be concerned that the client obtains property rights (and thus would capture the rents from innovation), thereby under-investing in innovation (e.g., Aghion and Tirole 1994). Innovation tasks by definition are not well defined up front and require continual modification from parties *ex post* (Gilson et al. 2009). Clients and vendors need to orchestrate cross-boundary processes and communication channels (Linder et al. 2003), requiring iterative collaboration between them (e.g., Gilson et al. 2009). It has been posited that collaboration between the client and vendor is a precursor to obtaining innovation within organization (Costello and Willcocks 2018). The challenge is to achieve coordinated and iterative problem solving akin to that in a hierarchy without

the benefit of fiat or administrative controls that exist within an organization (Gilson et al. 2009; Miles 2002).

Parties need to structure contracts so as to foster the iterative collaboration necessary for innovation while also reducing hazards of appropriation of rents arising from innovation. This unique aspect of outsourcing for innovation creates two distinct contractual challenges. The first problem is that of *ex ante* incentive alignment. Since the end result of an innovation is ill defined, it is difficult to set up performance benchmarks and develop guidelines for managing innovative processes *ex ante*. Investments in innovation made by a vendor may limit her ability to seek alternative trading partners; there could then be a danger of a vendor under-investing in innovative task dimensions. The second contractual challenge is *ex post* contractual holdup. A vendor that seeks to protect her appropriable rents may not be willing to engage in the iterative collaboration needed for innovation. At the same time, the vendor could take advantage of her incumbency position to engage in *ex post* rent seeking (e.g., Susarla 2012) by appropriating value from innovation. The primary tension in contracting for innovation is enabling interfirm value creation through iterative collaboration while also protecting against rent appropriation. Table 1 describes the two task dimensions along with the exchange hazards.

Prior literature has primarily highlighted three types of solutions: incentives (Arora 1996), contractual safeguards (Oxley 1997), or maximizing collaborative value (Kale and Singh 2009). The literature on transaction cost economics (TCE) and property rights theory (PRT) has primarily focused on contractual mechanisms to mitigate appropriation (e.g., Lerner and Malmendier (2010), who explore intellectual property rights) such as *ex ante* allocation of control rights, that is, rights to either vendors or clients at the outset of an outsourcing initiative (e.g., Hart and Moore 1990). However, delineating such ownership rights raises the risk that the client could lose valuable know-how and lead to a redistribution of effort when the vendor would want to maximize her surplus from tasks that would deliver her a future stream of revenue. Agreements on allocating royalties are also infeasible when parties do not know what appropriable rent generating assets would be developed as a result of innovation. From an *ex post* perspective, as posited by Gilson et al. (2009), the collaborative process generates continuous uncertainty, due to which “the parties are continually cycling between different combinations of *ex ante* and *ex post*” (p. 455) states, where one party can take advantage of the uncertainty to appropriate rents. As Anton and Yao (1994) highlight, such appropriable rents can be accrued even in the absence of property rights when only one party (e.g., the vendor) knows the true value of the innovation. Delineating control rights up front does not solve either the *ex ante* or *ex post* hazards that arise in outsourcing of innovation.

⁹Quote from one of the contracts in our sample.

¹⁰Examples can be new product development (NPD) project management practices, data standards to support information needed for NPD, and enhanced collaboration and communication in NPD processes (e.g., Nambisan 2003).

¹¹The software developed by a vendor is considered “work for hire” and clients retain ownership of those aspects of the software that rely on patents, trademarks, and other proprietary information.

Table 1. Innovation, Task Dimensions, and Contracting Hazards

Nature of Problem	Sourcing Intent (Antecedents)	Challenges in Contracting	Representative Solutions Identified in the Literature	Gaps in Prior Literature
Iterative collaboration between client and vendor	Transformational Intent	Client and vendor work together in conceptualizing a new solution to an organizational problem, joint problem solving	Co-ownership, vertical integration (Nickerson and Zenger)	Challenges of appropriation, Arrow information paradox
	Market Orientation	Client and vendor need to work together in co-creating or co-producing a product or service		
Appropriability and value creation	Transformational Intent	Exploitation of client capabilities from recombination of client and vendor knowledge and expertise	Vertical integration (Nickerson and Zenger 2004)	Does not address the need for access to capabilities external to the client firm, especially with rapid technological change
	Market Orientation	Enables exploitation of client capabilities through access to complementary knowledge assets of the vendor	Vertical integration (Nickerson and Zenger 2004)	
<i>Ex ante</i> exchange hazards	Transformational Intent	Vendor expends insufficient effort <i>ex ante</i> in process redesign	Ownership rights (Anand and Khanna 2000, Lerner and Malmendier 2010); Contractual safeguards (Oxley 1997, Lumineau and Oxley 2011)	Need for iterative collaboration <i>ex post</i> in a contracting environment characterized by appropriable rents
	Market Orientation	Effort diverted away from tasks that do not result in appropriable rents for vendor		
<i>Ex post</i> exchange hazards	Transformational Intent	Vendor is less flexible in accommodating changes <i>ex post</i> , unwilling to incur costs involved in continued collaboration	Interfirm routines and governance (Kale and Singh 2009); Vertical integration (Nickerson and Zenger 2004)	
	Market Orientation	Vendors may extract surplus from innovations or less likely to adapt to needed changes; <i>ex post</i> rent seeking; insufficient effort spent in learning to work with the client		

Prior literature on interfirm alliances posits a number of mechanisms to achieve harmonious relationships between firms, such as interfirm routines and alliance management capabilities (Kale and Singh 2009). However, such mechanisms may not address the challenge of protecting against appropriation of rents by independent exchange partners. *Ex ante*, the problem is that a vendor could increase her profit by redirecting effort in preparation of her own competitive activities, and selling non-specific parts of the generated knowledge to a competitor (Kloyer 2011). *Ex post*, a vendor that seeks to protect her appropriable rents may not be willing to engage in the iterative collaboration needed for innovative tasks. The vendor could also take advantage of her incumbency position to engage in *ex post* rent seeking (Susarla 2012) by appropriating value from innovation.

The solutions highlighted in prior literature lead to the Arrow information paradox (Arrow 1962) in that, if the vendor were to disclose the nature of the innovation, the client would obtain the benefits without paying for it. The cost of transmission makes information about the nature of innovation

(undertaken within the contract) itself an appropriable commodity (e.g., Arrow 1962). This is because the value of the innovation may not be clear to the client unless the vendor explains what types of innovations have been undertaken.¹² However, once the vendor explains what has been done in a contract, the client essentially acquires the innovation at zero cost. Thus, vendors would be deterred from investing in innovations out of concern for future profits. Due to the Arrow information paradox, complete contracts or incentive-based contracts would only lead the vendor to maximize effort into activities that will generate appropriable rents elsewhere. Gilson et al. (2009) provide an example where jointly produced information was appropriated for purposes outside the collaboration. The mental process of generating innovative ideas is not transparent at the market-distant stages of innovation (Kloyer 2011). When the motive for outsourcing is transformational intent and market orientation, the details of which are not realized at the outset, milestone-based payments are ineffectual.

¹²This example has been adapted from Arrow (1962).

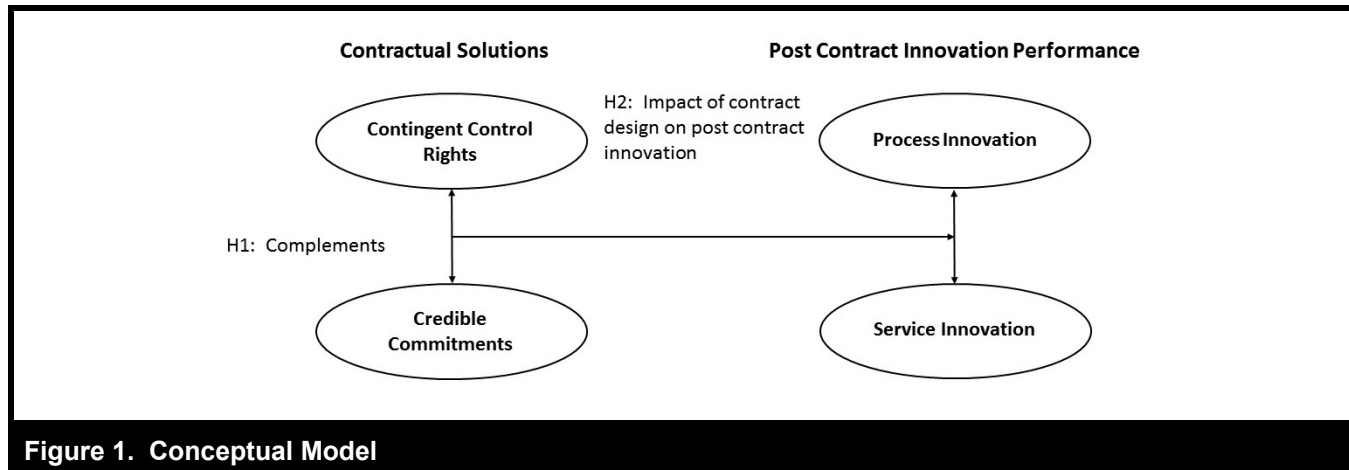


Figure 1. Conceptual Model

Contractual Provisions to Foster Innovations

We suggest two solutions to these contracting hazards: contingent control rights and credible commitments. The conceptual model is presented in Figure 1 and serves as a roadmap for hypotheses development. Figure 2 provides the time line of contracting activities and explains the longitudinal nature of data analyzed in this paper. Parties sign a contract, specifying the terms and the client undertakes credible commitments that act as reciprocal pledges to the vendor. After observing outcomes, contingent control rights allow control to be retained by the client or ceded to the vendor. We then investigate whether the two contractual solutions are complementary.

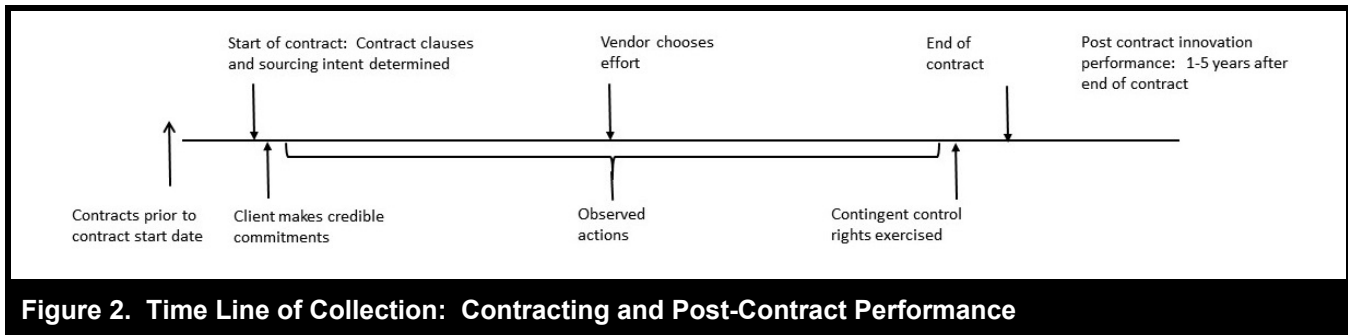
Contingent Control Rights

Contingent control rights are defined as “provisions that give one of the contracting parties certain prerogatives in specific states of the world” (Elfenbein and Lerner 2009, p. 46). When parties face incentive conflicts about appropriate actions, *ex ante* control rights cannot solve the incentive conflict since we do not know what outcomes would result. There is then a danger that the party with the control rights would be unwilling to make *ex post* adjustments, such as redefining the desired outcomes or engaging in the redesign of requirements and specification. Allocating property rights *ex ante* could also skew incentives as the vendor could divert effort into task dimensions that are individually beneficial, such as investments in patentable processes that could generate rents in settings outside the contractual relationship. In other words, allocating property rights *ex ante* can solve the *ex ante* incentive alignment but not the *ex post* holdup problem through property rights.

Following Anton and Yao (1994) we consider decision rights, wherein the decision right hinges on excludability rather than on ownership. Key to contingent control rights is that one party has the ability to exclude another party. Division of appropriable rents in the absence of *ex ante* delineation of property rights can still take place when the client retains the discretion of what rights can be ceded based on observable performance. Contingent control rights are rights ceded to the client (or the vendor) depending on the observable (to the parties, but difficult to specify in advance) performance of the vendor in enabling innovations. We consider three types of contingent control rights whereby the contract confers certain rights to the client depending upon observable (to the vendor and client) outcomes. First, we consider state-contingent ownership whereby the client could cede control of the innovative output to the agent depending on actions observed between parties. Second, we consider benchmarks to assess the vendor’s performance that are contingent upon observed progress, rather than absolute levels of performance demarcated in the contract. Third, we consider incentives to vendors contingent upon observable actions (i.e., a vendor’s actions observed by a client).

Credible Commitments and Innovations

We build upon Williamson’s (1983) definition of credible commitments as a form of mutual hostage taking that encourages reciprocal investments and lowers the hazards of opportunism. As Williamson (1983) posits, “the investments made by suppliers are influenced by the incentives experienced by the buyers” (p. 520). Essentially, credible commitments by clients and actions by vendors (such as investments in product and process transformations) function as reciprocal pledges that sustain commitment between parties. That is, ex-



change partners post bonds that are forfeited when there is a breach of obligations by either party. There are two dimensions to making a commitment credible. The first is that it should be irreversible and the second that it is visible to both parties (Williamson 1983). We consider two forms of credible commitments. First, we consider whether clients make up-front investments in the vendor's proprietary technologies and process methodologies. Williamson (1983, p. 532) states the "type of specific asset that is placed at hazard by unilateral long-term trade, but which a reciprocal long-term exchange agreement serves to protect, is that of a dedicated asset." In the case of IT, the client's investments in specialized technology or platforms unique to the vendor is akin to making dedicated asset-specific investments that would be lost in the case of contract termination, which raises the cost of switching to alternate vendors. Second, we consider the establishment of specialized dispute resolution mechanisms in the client organization that create "bilateral dependency conditions ... supported by a variety of specialized governance features" (Williamson 1991, p. 269). By making irreversible and upfront investments, the client loses the value of effort and time required for better requirements definition and improved contract execution in switching vendors. Investments that are irreversible, and forfeited when there is a switch in exchange partners, which is involved in the process of setting up a costly "specialized dispute settlement" (Williamson 2002, p. 176) convey commitment to the other party, ensuring both would act in each other's best interests and make it difficult to break away from the current contract. Dependence balancing through reciprocal investments by clients and vendors induces each to invest in the future of the relationship and thereby maximizes the value of the collaboration.

Complementarity in Contractual Provisions

Drafting contractual provisions to maximize collaboration across vendors and clients without considering the *ex post* and *ex ante* hazards may lower the incentives of a vendor to commit to the *ex post* collaboration necessary for the success

of an innovation. There is a need to simultaneously address the *ex ante* incentive alignment problems along with the problem of holdup *ex post*. A lack of incentive alignment *ex ante* lowers the vendor's willingness to accommodate changes as the contract unfolds. At the same time, addressing *ex ante* incentive alignment may still lead to *ex post* holdup if parties do not have a clear expectation of how the appropriable value is to be shared. For instance, a vendor motivated by ownership rights and performance incentives may not focus enough on building collaborative interactions with clients, leading to lower value from outsourcing. In contracting for innovation, the *ex ante* and *ex post* challenges are interlinked. Innovation takes place in multiple stages where there are dependencies between stages (Gilson et al. 2009, 2013). If the client makes credible commitments that would be forfeited if the current contract were to be cancelled, it reassures the vendor about business continuity, and in turn ensures that the vendor will not strategically reprice ancillary services. At the same time, delineating contingent control rights up front provides the vendor reassurance that she can benefit from investments in innovation in the client organization. The credible commitments made by the client ensure harmonious behavior by both sides, enabling iterative collaboration. Given the mutual perception of shared value wherein the cost of continuing the relationship outweighs the gains from opportunistic rent seeking, we hypothesize:

H1. Credible commitments and contingent control rights are complementary in contract design.

Complementarity and Post Contract Innovation Performance

Contractual provisions provide the most benefit when vendors and clients understand the interdependence in the nature of contractual solutions. Information sharing enabled by credible commitments encourages co-specialization, and the resultant codependence and implicit understanding of mutual responsibilities lowers the likelihood of *ex post* holdup,

making contractual safeguards self-enforcing (Klein 1996). It needs to be highlighted that, in practice, it can be difficult to perceive the complementarity of organizational choices (Milgrom and Roberts 1990), and even when senior executives understand the complementarity of choices, it can be difficult to execute such a vision into practice (Siggelkow 2002). The value to client organizations, however, is enhanced when clients and vendors understand the sources of complementarity. When contractual provisions act in tandem to lower both *ex ante* and *ex post* hazards, parties can harmoniously work together to achieve value creation without the threat of appropriation. In particular, such interorganizational value is created through two mechanisms, both of which rely on parties' expectation of a harmonious and cooperative relationship. First, the client's access to the vendor's technological expertise enables exploitation of client capabilities (e.g., Lavie 2007). Second, there is interaction-based generation of knowledge wherein the vendor learns to solve problems on behalf of the client firm (e.g., Muller and Zencker 2001). Thus, we hypothesize:

H2. Contracts with synergistic design of credible commitments and contingent control rights realize greater post contract innovation performance.

Data and Empirical Approach

Data Collection Approach

The data for this study is drawn from 10-K, 8Q, and 10Q public disclosure filings mandated by the guidelines of the U.S. Securities and Exchange Commission (SEC). To start with, we downloaded all contracts from the SEC's EDGAR Database that were classified in the two-digit SIC category 73, which denotes that the contract is written for computer-related services. We restricted our focus to contracts between 1998 and 2008, since that would allow us to collect granular measures of post contract innovation. From overall filings from over 3,000 registrants, a sample of 553 contracts was obtained based on two criteria: (1) contracts should include detailed descriptions of the deliverables from the vendor, and (2) contracts have to be governed by the law in some state within the United States of America. The sample was intensively screened to ensure that the filings pertained to information systems outsourcing agreements and indicate that the client engages the vendor as an independent contractor. We also removed strategic alliances, joint ventures, mergers, or acquisition-related agreements, which pose substantially different challenges in contracting. Firm and vendor information for each contract was matched with data from the One Source Online Business Information database and Hoovers database.

We also gathered data from publicly available databases, such as Dow Jones Interactive and Factiva, and industry reports and trade and business press. We developed measures by examining prior literature in accounting, finance, economics, and strategic management (e.g., Anderson and Dekker 2005; Kaplan and Stromberg 2003).

The data gathering process comprised steps of identifying the registrants and clients, identifying number of SEC contract filings, and removing contracts out of scope and units without matching financial data. This approach is presented in Table 2. Table 3 summarizes the measures for innovation value realized, the data sources, and examples of how triangulation was achieved by comparing across press releases and 10K filings of client firms. The coding schema for the independent and dependent variables is explained in the Appendix A, Table A1. The sourcing intent was coded from a proprietary dataset listing press releases of complex outsourcing deals while the contract terms were coded from the SEC filings. The instrumental variables for the multivalued treatment effects estimation are explained in Table A2 and control variables in Table A3. Correlations of key variables are provided in Table A4.

Dependent Variables

Post-Contract Innovation Performance in the Client Organization

Since complex outsourcing initiatives involve an initial transformational phase where clients and vendors are collaborating on the minutiae of the outsourcing agreement and desired outcomes are not yet realized, we looked at the period 1 to 5 years after the start of the contract as the time period in which organizations are likely to obtain benefits from outsourcing. The coding was done in two stages. We first examined data from press reports from business and industry databases such as Business Source Complete, Dow Jones Interactive, Factiva, and Lexis-Nexis for a 5-year period following a year after the contract commencement. We then used the Words Analytics database to retrieve 10-K filings and then conducted a textual analysis of phrases related to innovation from 10-K filings of client firms using TAPoR textual analysis tools. The textual analysis looks for phrases to examine whether the client mentioned the benefits from innovation such as market value and enhanced performance in their annual reports. We identified the following two dimensions of post contract innovation performance realized:

- **Post Contract Process Innovation:** We created a binary variable (= 1) when the client's annual reports mention that the client realized service innovation performance

Table 2. Sample Construction

Sample Construction from SEC Filings		Observations
Total number of registrants		1,724
Total number of clients		1,024
Total number of material contracts filed with the SEC from the above list of registrants (clients and vendors)		3,800
Sample after removing all non-IT outsourcing contracts such as asset purchase agreements, compensation, non-IT outsourcing, wage agreements, etc.		466
Sample after removing other types of arrangements that do not constitute outsourcing		173
Removing contracts without detailed information about vendors and clients		169
Less contracts without financials related data and company information (from Hoovers and One Source Business)		161

Table 3. Coding Template for Post Contract Innovation Performance

Variables	Definition	Time Line and Sources	Example Clauses
Process Innovation Performance	Denotes whether the client realized service innovation value such as better decision-making, improving process efficiency and enhanced operational excellence	Collected from press releases and 10K of client company 1-5 years after contract completion (or 3-7 years after contract start date for long term contracts)	<ul style="list-style-type: none"> 10K mentions "operations efficiency initiatives" as a result of transformation 10K mentions new "business improvement initiatives" 10K mentions "transformation of IT" resulted in more efficient operations 10K mentions improved decision making such as "integrated IT solution that enables client to enhance customer-driven targeted marketing"
Service Innovation Performance	Denotes whether client realized product innovation value such as introducing product innovations, faster time to market and new product introductions	Collected from press releases and 10K of client company 1-5 years after contract completion (or 3-7 years after contract start date for long term contracts)	<ul style="list-style-type: none"> 10K mentions new products introduced such as "new product designed to serve key customer groups" 10K mentions "development, marketing and distribution of a new product" based on the expertise of both the client and vendor 10K mentions extending new product offering to industry segments

such as the redesign of organizational processes resulting in better decision making, improving process efficiency, and enhanced operational excellence (Lacity and Willcocks 2013; Linder 2004).

- **Post Contract Service Innovation:** We examine service innovations, carried out through the course of an outsourcing initiative that improve the usage of the product or expand the product functionality offered in the market (e.g., Cusumano et al. 2015). This was coded as a binary variable (= 1) when the client's annual reports mention realized post contract service innovation through (1) new product development (Stanko and Calantone 2011), (2) development of IT embedded in product design (Konana and Ray 2007), (3) faster time to market for new product introductions on the client side (e.g., Bartel et al. 2007).

Contract Design Dimensions (Dependent Variables)

Credible Commitments was measured by the presence of (1) dispute resolution terms and (2) the investment in vendor's proprietary technology by the client. This measure was coded as a binary variable 0 if none of the clauses were present, and 1 if either of the two is present.¹³ We coded cooperative dispute resolution terms following Lumineau and Oxley (2012) and proprietary technology following Walker and Weber (1984).

Contingent Control Rights: Control rights are contingent on observable performance by the vendor. For instance, the

¹³There is a high degree of clustering of both dimensions of credible commitments, making a binary scale appropriate.

client can be allocated copyright to the software developed by vendor, but depending on the innovation produced during the outsourcing initiative, there could be rent-generating knowledge assets that represent a modification to a vendor's pre-existing knowledge. Thus, ownership rights could be contingent upon modifications that are not a derivative of client or vendor systems software. We coded this measure as a binary variable¹⁴ if any of the following were present in the contract: (1) state contingent ownership (e.g., Lerner and Malmendier 2010), (2) contingent performance measures (e.g., Elfenbein and Lerner 2009), and (3) incentives for vendors contingent upon actions (Kaplan and Stromberg 2003).

Sourcing Intent

Sourcing intent was analyzed by coding clauses from press releases of IT outsourcing announcements made by client firms that list service scope and purpose of the outsourcing initiative.

Transformational Intent measures whether the purpose of the outsourcing initiative lists strategic goals to be achieved from outsourcing (e.g., Susarla et al. 2010), or when the client and vendor describe their partnership as transformational outsourcing (e.g., Miozzo and Grimshaw 2011).¹⁵

Market Orientation measures whether the purpose of outsourcing is to enhance market orientation of the client (e.g., Bresnahan et al. 2002). This measure was coded as a binary variable depending on whether the press release mentions that the client and vendor collaborate either (1) in assessing current and future customer needs or (2) in initiatives aimed at enhancing responsiveness to customer needs (Jaworski and Kohli 1993). (Table 5 provides the coding schema for task dimensions and contractual clauses.)

Controls

Breadth of Services was measured as a summation of 14 different types of sub-services delivered by the vendor (Susarla et al. 2010). The coding schema is described in Appendix B.

¹⁴For robustness, we conducted all the analyses presented in the "Controls" subsection with the three types of contingent control rights and verified that the direction and significance of coefficients did not change.

¹⁵We conducted a co-word analysis of key phrases such as "strategic" or "reengineering" to code this variable.

Contract Value: To control for the size of the transaction, we included the contract value in US dollars (Anderson and Dekker 2005), log-transformed to adjust for scale effects.

Investments in Non-Appropriable Specific Investments: Poppo and Zenger (1998) define specific investments as a vendor needing to acquire "company-specific or division-specific knowledge to adequately perform the IS function" (p. 866), wherein a vendor's approach is "custom tailored" (p. 866) to the client. This was measured as a binary variable (= 1) when the task is (1) customized to client-specific needs (e.g., Bettencourt et al. 2002), or when (2) the vendor needs to acquire specialized knowledge or skills unique to the client organization (Poppo and Zenger 1998).

Contract Extensiveness: Extensiveness denotes the extent to which contract designers take into account mechanisms to protect against contractual hazards. Following Susarla et al. (2010), we considered 21 of the list of 24 potential clauses from Anderson and Dekker (2005) to measure the extent to which a given agreement incorporates protection mechanisms in the contract, in particular, the financial, legal, and operational issues that need to be addressed in outsourcing IT.

Input Monitoring was coded from the contract document and measured as a binary variable denoting whether clients provide strict guidelines as to what activities are performed by the vendor and how (e.g., Heide et al. 2007).

Following Susarla (2012), we coded the following: (1) **Performance Milestones** tied to specific outcomes, (2) **Audit Rights** whereby clients have the right to inspect service delivery, and (3) **Service Level Agreements (SLA)** that specify damages for nonperformance by the vendor.

We included the following controls for vendor and client characteristics. **Dominant Customer** was coded as 1 if the client firm accounted for 10% or more of the vendor's annual revenues, in accordance with SEC guidelines. **Prior Relationship** was coded as 1 when the contract or press releases document a prior relationship between parties. **Size** was measured by the log of (number of employees). We also coded proxies for whether the client and vendor are listed in the Fortune 1000 and whether the vendor is a publicly traded company. From a proprietary dataset listing press releases of complex IT outsourcing arrangements starting from the early 1990s, we coded a binary measure of the market experience of a vendor (i.e., whether vendors had signed contracts with clients in the same industry in a 5-year horizon preceding contract signing, which serves as a proxy for a vendor's capabilities in contract execution).

Baseline Estimation

Table 4 presents the summary statistics. The hypotheses consider the role of contractual design elements: credible commitments and contingent control rights, when the sourcing intent is transformational or market orientation. We first examine the role of contract design in enabling innovation. Since our dependent variables are binary, we first conducted independent probit estimations for each dependent variable. The empirical approach is presented in Figure 3. The results are shown in Table 5. We first estimate baseline probit models of credible commitments and contingent control rights of clients on the independent variables and a number of control variables listed in columns 1 and 2 of Table 5. Examining the impact of task characteristics on contractual provisions is complicated by potential omitted variables bias. We also do not observe whether some exchange partners are better equipped to understand innovations in an outsourcing initiative and actively work to foster these through up-front discussions and investments in contract design, such as outlining additional contract clauses. We therefore used a detailed set of vendor and client controls as well as details of contractual contingencies, such as the extent of enforcement and monitoring. We also control for contract extensiveness that measures formal contractual protection mechanisms in a contract (e.g., Anderson and Dekker 2005).

Complementarity in Contractual Provisions

We hypothesized that the two contractual solutions proposed in this paper are complementary (H1). A common approach to assess complementarity is to measure interaction effects. The correlation estimates reveal that there is a strong positive statistical association between contingent control rights and credible commitments. However, there could be positive correlation in these contract dimensions without true complementarity (e.g., Athey and Stern 1998). For instance, when a client is less experienced in managing innovative sourcing, the vendor and client may perceive greater value in simultaneously making credible commitments to foster joint action as well as specifying control rights to deal with uncertain innovation outcomes. The identification challenge is that of separating complementarity from unobserved firm-level heterogeneity, whereby two processes appear to be complementary because of other enabling practices that influence the joint returns (Athey and Stern 1998; Cassiman and Veugelers 2006; Miravete and Pernias 2006). The identification challenge is that if exogenous factors enhance the difficulty in contracting when innovative tasks are outsourced, the two contractual provisions can show positive covariation without being truly complementary.

The recommended method to test complementarity is to measure the conditional correlation (e.g., Arora and Gambardella 1990) using an exclusion restriction. Since both contract design elements are choice variables, we employ a seemingly unrelated (SUR) bivariate probit model that explicitly takes into account the fact that error terms could be correlated across the two dependent variables. The correlation of residuals in the SUR bivariate probit (e.g., Novak and Stern 2009) provides an estimate of complementarity. In order to achieve identification, it should be possible to separate out the antecedents of these contract choices from other organizational and interorganizational factors that have an impact on post-contract innovation. We use the fact that our data is temporally separated. We can glean the intent of innovation from press releases. A select review of press releases associated with contracts indicates that the intent of outsourcing is usually¹⁶ announced before the formal contracting signing (right after vendor selection). We use these as explanatory variables along with other contractual terms. Athey and Stern (1998) posit that instruments should be observable factors impacting the adoption of one choice but independent of other choices and measured outcomes. The exclusion restriction we employ is to find instruments for contingent control rights that are uncorrelated with credible commitments. Complementarity can then be disentangled from simple correlation in unobservables (e.g., Cassiman and Veugelers 2006). We denote instruments for the exclusion restrictions in contingent control rights by Θ . X and Y denote the antecedents of each of the contract design dimensions respectively. We examine the conditional correlation by including instruments for contingent control rights. We examined as instruments (1) the role of exclusivity in contracts that bars the vendor from engaging in new business relationships with any competitors of the client (e.g., Susarla et al. 2010), and (2) restrictive covenants (e.g., Gompers and Lerner 1996) wherein the vendor cannot reuse the client's confidential intellectual property in other outsourcing engagements. The presence of these mechanisms is meant to assuage client fears about potentially ceding control to vendors (Elfenbein and Lerner 2009). Thus, we expect exclusivity to be associated with contingent control rights but not credible commitments.

$$\left. \begin{aligned} CREDIBLE &= \alpha_0 + \alpha_1 X + \varepsilon_1 \\ CONTINGENT &= \beta_0 + \beta_1 Y + \beta_3 \Theta + \varepsilon_3 \end{aligned} \right\}$$

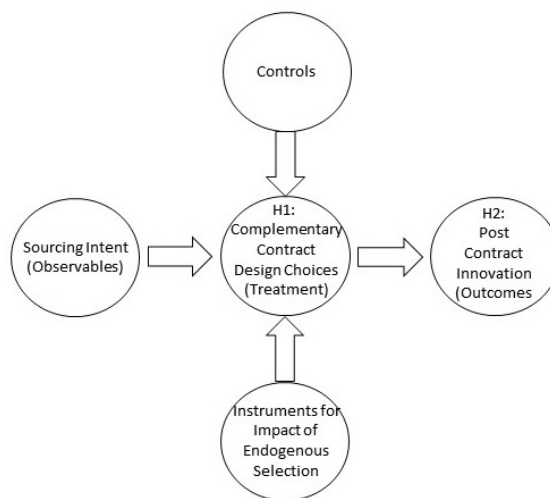
We conducted a seemingly unrelated bivariate probit to assess complementarity of contingent control rights and credible commitments in columns 3 and 4 of Table 5. For the comple-

¹⁶We interviewed senior practitioners (involved in crafting outsourcing deals) from client firms to ascertain this was common practice in the industry.

Table 4. Descriptive Statistics (N = 161)

	Variable	Mean	Std. Dev.	Min	Max
Contract Design	Credible Commitments	0.43	0.50	0	1
	Contingent Control Rights	0.22	0.41	0	1
Sourcing Intent	Transformational Intent	0.31	0.35	0	1
	Market Orientation	0.26	0.39	0	1
Post Contract Innovation	Process Innovation	0.30	0.46	0	1
	Service Innovation	0.22	0.48	0	1
Contractual Contingencies	Contract Extensiveness	12.66	4.71	5	21
	Input Monitoring	0.60	0.47	0	1
	Milestones	0.26	0.44	0	1
	Audit Rights	0.64	0.48	0	1
	Service Level Agreements	0.39	0.49	0	1
	Breadth	4.01	2.40	0	12

Notes: In the following tables * \geq 10% level of significance, ** \geq 5% level of significance, *** \geq 1% level of significance. Standard errors are shown in parentheses.



Notes: * $p = .10$, ** $p < .05$, *** $p < .01$

Figure 3. Empirical Strategy of Multivalued Treatment Effects

Table 5. Results (N = 161)

Variables	(1) Probit of Credible Commitments	(2) Probit of Contingent Control Rights	SUR Bivariate Probit Test of Complementarity (Test of H1)	
			(3) Credible Commitments	(4) Contingent Control Rights
Contractual Intent				
Transformational Intent	0.355(0.166)**	-0.061(0.015)**	0.313 (0.153)**	0.073 (0.170)
Market Orientation	-0.063(0.22)	0.798 (0.289)***	-0.047 (0.285)	0.760 (0.284)***
Contractual Contingencies				
Contract Extensiveness	-0.007 (0.03)**	0.060 (0.060)	-0.026 (0.048)	0.063 (0.061)
Input Monitoring	-0.123(0.201)	0.510 (0.325) *	-0.150 (0.304)	0.327 (0.305)
Milestones	0.193(0.324)	0.468 (0.303)*	0.306 (0.315)	0.464 (0.325)*
Audit Rights	0.092(0.412)	0.789 (0.468)*	0.070 (0.410)	0.504 (0.301)*
Service Level Agreements	0.236(0.203)*	-0.989(0.353)***	0.169 (0.298)	-1.008 (0.353)***
Other Task Dimensions				
Specific Investments	1.885(0.314)***	0.399 (0.303)*	1.808 (0.321)***	0.440 (0.326) *
Breadth	0.012(0.068)	0.186 (0.083)**	0.036 (0.068)	0.191 (0.085)**
Prior Relationship	-0.128 (0.109)	0.109 (0.151)	-0.164 (0.290)	0.127 (0.295)
Constant	-1.384 (0.587)	-2.520 (0.69)***	-1.33 (0.571)***	-2.244 (0.680)***
Instrument				
Exclusivity		0.253 (0.120)**		0.173 (0.086)**
Restrictions on outside activities		-0.447 (0.228) **		-1.559 (0.547)***
Correlation between residuals			0.418(0.170)**; c ² (1) = 5.033**	
Goodness of fit Ln(s ²)			LR test of Ln(s ²): c ² (1) = 2.95 **	

Significance: ***0.001, **0.05, *0.1

mentarity estimation, the instruments were used to satisfy the exclusion restriction that we need an independent variable that would predict one of the contract terms but not another. We tested for exogeneity using the Durbin-Wu-Hausman test for endogeneity and established that these instruments are exogenous to credible commitments (i.e., the null hypothesis was not rejected). In Table 5, column 4, we test H1 by estimating ρ and testing its significance. As indicated, it is positive and significant, supporting H1. The positive correlation between the residuals denotes that the two contract dimensions are complements.

Endogeneity between Contract Complementarities and Innovation Performance

We hypothesize (H2) that contract design that facilitates iterative collaboration and minimization of appropriation should result in greater post contract innovation performance. There is potential endogeneity in the relationship between contract design and *ex post* innovation performance. Post contractual innovation performance will be greater when parties take actions that lower the threat of value appropri-

tion and enhance collaborative value creation. For instance, innovation could be more likely when parties that frequently transact with each other invest in credible commitments. Equally, parties' ability to reassure each other about concerns relating to appropriation enhances the likelihood that they would invest in contingent control rights. In other words, there is an identification challenge in that, since vendors and clients choose the synergistic contract design elements (i.e., credible commitments and contingent control rights to maximize the resultant innovation, the causality is reversed).

Normally, the preferred empirical method to deal with endogenous self-selection is the literature on treatment effects that provide conditions for identification (Heckman and Vytalacil 2007; Imbens and Wooldridge 2009). The treatment effect is the probability that a particular contract has a given form, for instance, the presence of contingent control rights in a contract. The average treatment effect provides a comparison of performance across contracts wherein contingent control rights are defined (the treatment regime) to those that do not have contingent control rights (the counterfactual). However, since we have two contract design elements, credible commitments and contingent control rights, we cannot apply the

standard treatment effect methods that examine the binary decision of selection into a single treatment (this was the approach in prior literature that dealt with the impact of endogenous selection of contract form and the resultant performance, for example Susarla and Barua (2011) and Gopal and Sivaramakrishnan (2008)). We build upon Cattaneo (2010) who provides an approach for multivalued treatments to address this problem. The treatment effects literature assumes that the treatment is randomly assigned conditional on a set of observable characteristics. When the treatment is binary, each subject could either receive the treatment or not receive the treatment. In the binary treatment case, the propensity score of the treatment group and that of the control group add up to one.¹⁷ In contrast, multivalued treatments refer to cases in which each subject could receive either one of several different treatments or else not receive treatment at all. Cattaneo provides a method wherein estimation does not require that there be a clearly defined comparison (counterfactual) group, and instead the method of estimation of multivalued treatment effects is through a comparison between characteristics of the (conditional) distributions of the potential outcomes. The details are presented in Appendix A.

The pretreatment characteristics, ordered probit estimates, and multivalued treatment estimates are presented in Tables 6, 7, and 8. Using the treatment effects model, we simultaneously run a model to estimate contract terms (i.e., treatment regime) through an ordered probit (presented in Table 7) and a model to predict post-contractual performance outcomes. We implemented multivalued treatment effects that compute the weighted means of the treatment-specific predicted outcomes for each treatment level (i.e., for each contract design variable, credible commitments, and contingent control rights). The estimation fits a model for the various treatments and computes the probabilities of the treatment. We tested for direct effect of the instrumental variables on post contract innovation performance (e.g., Angrist and Krueger 1991). A Wald F-test for the joint significance of the parameters, conducted by including instrumental variables along with other independent variables (Angrist and Krueger 1991), validated that the instruments are appropriate. Table 8 presents the results of the estimation on post-contract innovation performance and is used to test H2 through the average treatment effect in row 2, columns 2 and 3. Both coefficients are significant and positive, supporting H2. We used the same set of covariates from columns 1 and 2 of Table 5 as explanatory variables for contract terms. Having both credible commitments and contingent control rights significantly increases the likelihood of realizing post contract innovation value in the client organization.

¹⁷When there is a single contract design dimension (i.e., fixed price versus time and material as in Susarla and Barua), the control group would be a particular type of contract.

Robustness Checks

If the client and the vendor trust each other, it may influence the design of both contractual contingencies. We conduct a series of robustness checks to address this issue. First, it may be that the impact of prior relationships improves outcomes through better governance and by lowering costs associated with opportunism. This results in heterogeneity in how outsourcing initiatives are structured depending on the pattern of prior relationships. We conduct a heteroskedastic probit estimation with robust standard errors (Greene 2003) to address the heterogeneity that results from differences in relationships across different outsourcing engagements. The likelihood ratio indicates that the null hypothesis of homoskedasticity is not rejected; thus, the heterogeneity from prior relationships is less of a concern in our study. Second, since we measure prior relationship using a binary variable, our analyses may be biased by the possibility that the degree of trust between the client and vendor may vary on an ordinal or continuous scale. We conducted two different split sample analyses to address this possibility. We divided the sample into contracts (1) where the vendor and the client have a prior relationship with each other and (2) where the vendor and client do not have a prior relationship with each other. The split sample analysis does not find that contract design varies significantly depending on whether parties had a prior relationship or not. The second split sample analyses was to distinguish between (1) clients and vendors that had a long-term contract in the past (more than 4 years) and (2) clients and vendors that did not have a long-term contract in the past. The split sample probit estimation does not find that contracts are significantly different when parties had a prior long-term relationship. The results from the split sample analysis are in line with the results from the heteroskedastic probit estimation.

Another robustness check was to examine the validity of the measurement approach for process and service innovations. We recoded innovations in product design distinctly from service innovation. We verified that the main relationships and interaction effects work similarly as in the hypothesized relationships. Another robustness check was to examine whether a combined measure of post contract innovation would affect the results from the multivalued treatment effects and we find that the main results are unchanged. A final robustness check was to examine whether there is any bias in the results given that we do not have measures for the magnitude of innovation. For a subsample of the contracts where we could identify the magnitude (in dollar amounts) of process and service innovations realized, we reestimated the results and ensured that the coefficients are consistent across contracts where the magnitude was reported and for those that did not report the financial value of innovations realized.

Table 6. Pretreatment Characteristics of Outsourcing Initiatives

Variables		With Contingent Control Rights		Without Contingent Control Rights		With Credible Commitments		Without Credible Commitments	
		Mean (S.D.)	Max	Mean (S.D.)	Max	Mean (S.D.)	Max	Mean (S.D.)	Max
Sourcing Intent	Market Orientation	0.60 (0.49)	1	0.32 (0.46)	1	0.38 (0.49)	1	0.37 (0.49)	1
	Transformational Intent	0.39 (0.42)	1	0.30 (0.35)	1	0.46 (0.39)	1	0.21 (0.29)	1
Contractual Contingencies	Contract Extensiveness	17.14 (14.21)	21	15.0 (4.74)	21	15.88 (4.98)	21	15.12 (4.48)	21
	Input Monitoring	0.74 (0.44)	1	0.69 (0.46)	1	0.59 (0.50)	1	0.40 (0.49)	1
	Milestones	0.42 (0.50)	1	0.21 (0.41)	1	0.30 (0.46)	1	0.23 (0.42)	1
	Audit Rights	0.77 (0.42)	1	0.60 (0.49)	1	0.61 (0.49)	1	0.66 (0.48)	1
	Service Level Agreements	0.40 (0.49)	1	0.39 (0.41)	1	0.49 (0.50)	1	0.31 (0.47)	1
Other task dimensions	Breadth	4.97 (2.17)	12	3.71 (2.38)	11	4.35 (2.43)	11	3.74 (2.35)	12
	Specific Investments	0.68 (0.47)	1	0.57 (0.43)	1	0.92 (2.59)	1	0.32 (0.47)	1
Client and Vendor Characteristics	Client in Fortune 1000	0.51 (0.50)	1	0.26 (0.44)	1	0.39 (0.46)	1	0.26 (0.44)	1
	Ln (Client Size)	7.4 (2.69)	12.71	6.38 (2.83)	12.67	6.87 (2.92)	12.71	6.44 (2.76)	12.67
	Ln (Vendor Size)	6.6 (2.74)	11.78	5.58 (3.66)	13.07	5.54 (3.84)	12.78	6.00 (3.11)	13.07

Table 7. Ordered Probit Model of Likelihood of Complementary Contract Terms

Variables		Estimate (S.E)
	Intercept 1	5.92 (1.21)***
	Intercept 2	7.79 (1.30)***
Sourcing Intent	Transformational Intent	0.46 (0.20)**
	Market Orientation	0.38 (0.15)**
Contractual Contingencies	Contract Extensiveness	0.05 (0.02)**
	Input Monitoring	-0.32 (0.16)**
	Milestones	0.15 (0.49)
	Audit Rights	-0.25 (0.12)**
	Service Level Agreements	-0.18 (0.50)
Other task dimensions	Breadth	0.12 (0.11)
	Specific Investments	1.87 (0.49)***
Instruments	Information Disclosure Terms in Earlier Contract	3.54 (0.78)***
	Contingency Planning in earlier contract	0.55 (0.18)***
Controls for Ln (Client size), Ln (Vendor size), Client in Fortune 1000, Prior Market Experience of Vendor		

Significance : ***0.001, **0.05, *0.1

Note: In Table 10, a positive estimate implies greater likelihood that both credible commitments and contingent control rights are used.**Table 8. Multivalued Treatment Effects Estimation of Complementary Contract Terms and Innovation Realized (Test of H2)**

	Credible Commitments and Contingent Control Rights	Post-Contract Process Innovation Performance	Post-Contract Service Innovation Performance
Average Treatment Effect	Presence of either contract terms vs. none	-0.132 (0.072)**	-0.113 (0.085)*
	Presence of both contract terms vs. none	0.263 (0.130)**	0.622 (0.111)***
Potential Outcome Mean		0.284 (0.050)***	0.259 (0.05)***

Note: Table 8 presents estimates of the impact of synergistic contractual provisions on post contract innovation. A positive estimate implies 30% greater likelihood that contracts that employ both credible commitments and contingent control rights realize post contract innovation value.

Discussion and Conclusions

Contract Design and Innovation

Innovations within an IT outsourcing initiative require intense interactions between clients and vendors. Such efforts need to take place in a manner so as to maximize the joint value from exchange, which creates both *ex ante* and *ex post* challenges for governance. In particular, the challenges of achieving iterative collaboration given the risks of misappropriation of intellectual property make it difficult for parties to simultaneously achieve *ex ante* incentive alignment while minimizing *ex post* holdup. We propose that credible commitments and contingent control rights solve these exchange hazards. We find that contingent control rights are more important with market orientation. Contingent control rights grant broad decision rights to the client by simultaneously protecting against appropriation and providing the advantages of residual claimancy. Thus, contingent control rights act as restrictions on outside activities, bolstering incentives to the vendor to exert noncontractual effort. However, we do not find evidence that contingent control rights are important with transformational intent in outsourcing. The risk of appropriation of knowledge is possibly greater when outsourcing is related to production facing tasks that are of strategic value to the organization. It is therefore likely that contingent control rights are relatively more important the greater the hazard of appropriation. We find that credible commitments are very important in process innovation. We find that credible commitments are relatively less important in enabling market orientation through outsourcing. The challenges in appropriation of valuable organizational know-how could result in asymmetric commitment in exchange, which could lower the efficacy of credible commitments when the purpose of sourcing is to enable market orientation.

We find significant evidence of complementarity between credible commitments and contingent control rights, validating H1. While credible commitments by clients lead to greater assurance to the future of the relationship, asymmetry in such pledges can leave the client vulnerable to opportunism. Such asymmetry in exchange could be exacerbated given some of the challenges in appropriating investments in innovation. When clients invest in credible commitments, vendors could strategically shirk on some of their responsibilities, which could be possible given the intense interaction and joint investments required in innovative outsourcing. In other words, vendors could opportunistically shift some of the burden of their share of effort onto the client. On the other hand, when a vendor over-commits to the exchange, the client could extract concessions from the vendor through mechanisms such as low-balling. Such distortions in both *ex ante* and *ex post* outcomes can be mitigated through simultaneous design of contract features.

We conduct a treatment effects model to examine the role of complementary contractual provisions in enabling clients to realize post contract innovation value. We find that contracts where both credible commitments and contingent control rights are defined are more effective in realizing *ex post* innovation value to the client, validating H2. When a vendor and client are involved in a harmonious contractual relationship, the client firm has an opportunity to engage in value enhancing activities that are otherwise unavailable given the constraints of its internal resources and knowledge capabilities (e.g., Gulati 1999). Such contracts could be more effective at managing both *ex ante* and *ex post* hazards when outsourcing innovations where the outcomes are hard to foresee. The magnitude of impact from complementary contractual provisions is greater for *ex post* service innovation outcomes realized. Managing asymmetric commitment in a contracting environment characterized by appropriation demands that parties understand the importance of synergistic contractual provisions. Table 9 distinguishes between sourcing intent, contract design dimensions, and resulting post contract innovation.

Implications for Research

In studying innovation in IT outsourcing initiatives, we examine an under-explored area of literature. Increasingly, many companies are looking to outside suppliers to deliver innovations. However, many clients and vendors have not yet grasped the need for collaborative arrangements that can address the complex interdependencies between vendors and clients. The kind of innovations that can occur in an outsourcing context is also not very well understood. By anchoring upon several streams of prior research in IS, strategy, economics, and the knowledge-based view of the firm in our theoretical conceptualization, we hope to shed more light on the enablers of innovation in outsourced IT initiatives and contribute to an understanding of process and service innovations through outsourcing. We make a first attempt in understanding contractual hazards and complementary contractual solutions in enabling innovation.

Outsourcing of innovation poses two puzzles to the traditional theories of firm boundaries. First, prior literature would suggest that vertical integration is the only solution in a setting characterized by innovation. For instance, the transaction cost economics (TCE) tradition contends the impossibility of “selective intervention,” whereby parties can replicate the useful features of market exchange but avoid the attendant inefficiencies (Williamson 1988, p. 574). However, the outsourcing of innovation demands arrangements that replicate collaborative problem-solving arrangements found inside the firm (Conner and Prahalad 1996). Second, the solutions prescribed in prior literature do not address the interlinked set

Table 9. Sourcing Intent, Contract Design, and Post Contract Innovation

Contract Design Dimensions	Sourcing Intent	Post Contract Innovation	
		Process Innovation	Service Innovation
Credible Commitments	Transformational Intent	Contracts with only one of the design dimensions are less likely to realize post-contract innovation	
Contingent Control rights	Market Orientation		
Complementary Contract Terms	Can be either or both	Complementarity in contract terms enables both post-contract process as well as service innovations	

of contractual challenges engendered by the innovation context. The literature on incomplete contracts might suggest that, when outsourcing a complex and uncertain task, parties should prefer to leave obligations deliberately ambiguous (e.g., Hart and Moore 1990). However, such discussions of incomplete contracts assume that parties could adjudicate competing claims about difficult to measure tasks through a court, which is difficult to accomplish in dynamic sectors such as IT. Thus, incomplete contracting without specifying mutual obligations is not a feasible option for firms outsourcing innovation. More recently, Hart and Moore (2008) posit that contracts serve as reference points, setting expectations for future relationships. However, such a perspective leaves open the question of how parties form expectations about uncertain outcomes when innovations are desired. We integrate explanations from multiple theoretical traditions in conceptualizing innovation as well as in articulating the challenges of managing innovation, thereby emphasizing the process where innovation can be managed through contract design, and desired outcomes of innovation can be achieved through crafting complementary contracting terms. Such phenomenon would become even more relevant with the growth of models of open innovation and network forms of production wherein innovation occurs across firm boundaries. Our work is a first step in this direction.

We extend the literature in three important ways. First, we highlight the simultaneous role of *ex ante* and *ex post* aspects of value creation and appropriation in innovation, in contrast to resource-based view, TCE, and PRT perspectives. While there are similarities with the broader literature on research and development outsourcing, there are several differences in our context. Most of the outsourcing in the R&D context is that of clinical trials outsourced to a contract research organization (CRO), which is relatively more standardized. Even in outsourcing to CROs, the relationships between client firms and CROs are marked by embeddedness failure, where clients have been unable to make credible commitments (Azoulay et al. 2010). We suggest that synergistic design of contractual provisions is key to realizing innovation through outsourcing. Future work can explore the role of interfirm processes and interorganizational governance routines that foster the development of IT-enabled collaborative innovation across firms.

The second contribution of our work is to highlight the role of contract design in enabling innovation. In high technology firms, the locus of innovation has shifted to a network of interorganizational relationships (Powell et al. 1996), where firms accrue innovative capabilities from a portfolio of collaborations. The absence of such a network of interorganizational relationships (and the accompanying interfirm mechanisms) in complex IT outsourcing raises the importance of contractual mechanisms in the latter scenario. Strategic behavior in the process of conceptualization of innovation could result in, say, a vendor investing in processes and product development routines with an aim to maximize redeployable knowledge that would generate returns in other engagements (e.g., Susarla 2012). Further, in contrast to literature on technology transfer that has focused on the delineation of ownership rights alone (e.g., Arora 1996), the transfer of codified knowledge from the vendor to the client would not achieve the synthesis of domain knowledge of the client with the solution-specific knowledge owned by the vendor. We examine a scenario where interfirm collaboration generates appropriable rents. Thus, the hazards of *ex ante* incentive alignment and *ex post* collaboration should be addressed simultaneously.

The third contribution of our work is to outline the importance of contingent control, rather than delineation of ownership rights alone, to highlight the difficulties in incentivizing innovations under the risk of appropriation. Contingent control rights solve the complex appropriability hazards in incentivizing innovative tasks. The specification of control rights governs the use of proprietary innovations and the rents accruing to the vendor from reusing byproducts of innovations. Such outsourcing arrangements resemble co-development initiatives where appropriable knowledge is jointly generated. In contrast, when IT outsourcing is done with transformational intent, there is less risk of appropriation, but it still requires intense collaborative interactions resembling relational governance.

Implications for Practitioners

Well-crafted contracting arrangements allow firms to realize the benefits from process and service innovations. Process

Table 10. Contract Complementarities and Post-Contract Innovation

		Contingent Control Rights	
		Not Required	Required
	Credible Commitments		
	Not Required	Sourcing Intent: Transactional Outsourcing, Non-Core Processes Exchange Hazard(s): Incentive Alignment Role of Contract Design: High Powered Incentives, Modular Task Design	Sourcing Intent: Market oriented innovations Exchange Hazard(s): Appropriation of Intellectual Property Role of Contract Design: <i>Ex ante</i> Specification of Contingent Control Rights
	Required	Sourcing Intent: Transformational Intent Exchange Hazard(s): Need for continuous <i>ex post</i> collaboration; <i>ex post</i> rent seeking Role of Contract Design: Dependence balancing, Relational collaboration	Sourcing Intent: Both Transformational Intent and Market Oriented Innovation Exchange Hazard(s): Iterative collaboration in the presence of appropriability leads to asymmetric commitment Role of Contract Design: Complementarity of credible commitments and contingent control rights, bilateral partnership

innovation carried out in the course of an IT outsourcing initiative allows firms to introduce better management of business functions, whereby functional capabilities are synthesized to enable desired organizational goals (e.g., De Luca and Atuahene-Gima 2007). Major process innovation initiatives could also analyze greater amounts of data and information to enable better decision making (Davenport 2013). Similarly, service innovations achieved through an IT outsourcing initiative could lead to faster introduction of new products and innovation in existing products (Quinn 1999) and speed up time to market. Table 10 summarizes the differences in the intent to outsource, the type of exchange hazards and contractual solutions, and the post contract innovation outcomes. When the purpose of outsourcing is purely transactional, outsourcing initiatives can be easily managed through high-powered incentives and modular architectures where the interactions across clients and vendors are highly systematized and standardized (e.g., Tanriverdi et al. 2007). Where there is relatively lower threat of appropriation of rents, credible commitments by clients could reassure the vendor about relationship continuity and enable the development of embedded relationships (Azoulay et al. 2010). At the same time, however, such initiatives are vulnerable to asymmetric commitment by the client, which exacerbates the challenges of iterative collaboration. When both contingent control rights and credible commitments are required, a successful outsourcing initiative resembles a bilateral partnership with integrated operations and synergistic investments across vendors and clients. Vendors need to invest in nurturing employee talent and in-house capabilities to complement client competencies (e.g., Maglio and Spohrer 2008). Clients

daunted by the difficulty in managing such synergistic interactions could altogether forego outsourcing in favor of insourcing (Leber 2012). Future work can consider the potential for co-specialization of knowledge assets and the range of governance arrangements in outsourcing for complex IT services.

Limitations

Our work has some limitations. We observe contracts that large public firms that are likely to file with the SEC. Thus, firms in our sample may be more likely to expect innovation through outsourcing to vendors with the requisite capabilities. While we control for endogeneity and heterogeneity, there could be other sources that result in differences in contracting ability and interfirm relational capital. We have not considered whether credible commitments foster non-appropriable, specific investments through dependence balancing. Future research can consider a broader set of motivations for contract design.

Conclusions

With the growth of collaborative innovations across firm boundaries, vertical integration cannot always be a solution to contracting hazards. Researchers need to consider richer motives for interfirm contracting besides that of production cost and transaction cost arguments. We highlight the distinct contracting environment of innovation—appropriable rents in

an environment of iterative collaboration—to articulate the specific exchange hazards that arise in contracting when the sourcing intent is innovation. We develop a hypothesis to articulate that complementary contract design enables firms to manage the *ex ante* and *ex post* hazards of exchange simultaneously. We then develop another hypothesis to posit that synergistic contractual provisions foster post-contract innovation in the client organization. While there is considerable literature that has examined how innovation occurs through interorganizational networks (Powell et al. 2005), limited work has considered such issues in the context of a contractual relationship. With the rise of innovation across firm boundaries (e.g., Gilson et al. 2009), and as firms understand the limits to internal sourcing, it is imperative that contracting arrangements can simultaneously enable iterative collaboration while protecting against the threat of rent appropriation. The dominant theoretical streams of transaction cost economics, property rights, and knowledge-based view of the firm only provide a partial explanation of contractual governance solutions in such contracting scenarios. Our work offers a first step in this direction. Future research can further examine contract design in settings where contractual learning and co-development of innovative knowledge necessitates sequential adaptations from both parties. Our work provides a direction for future studies to examine a range of boundary choices and motives for interfirm collaboration ranging from learning to open innovation.

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CAN OUTSOURCING OF INFORMATION TECHNOLOGY FOSTER INNOVATIONS IN CLIENT ORGANIZATIONS? AN EMPIRICAL ANALYSIS

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Appendix A

Coding of Variables

Table A1. Contract Excerpts for Clauses of Key Variables

Variable and Definition	Example Contract Clauses	Prior Literature
Credible commitments by clients refer to a client's binding investments in the vendor	<ul style="list-style-type: none"> The extent to which the client uses vendor's proprietary knowledge that provides them a defendable advantage over other vendors (e.g., Walker and Weber 1984), specifically mention of client investing in proprietary methods and intellectual property "developed and owned by Supplier" or "developed by a third party for, and owned by Supplier." The extent to which parties set up specialized internal dispute resolution mechanisms that increase the binding nature of contracts, specifically actions that designate key individuals such as the "Vice President of Procurement Governance" and a "Outsourcing Relationship Executive" who would be involved in developing a "transition plan" as well as assuming "responsibility for managing the relationship" with the vendor. 	Lumineau and Malhotra 2011; Walker and Weber 1984
Contingent control rights refer to the ability of the client to restrict the usage by the vendor	<p>Elfenbein and Lerner (2009) denote contingent control rights as "provisions that give one of the contracting parties certain prerogatives in specific states of the world." Accordingly we consider the following:</p> <ul style="list-style-type: none"> State-contingent ownership. When the ownership over the developed software can be shifted between parties depending on the observed state of the world, such as a contract where the client could transfer control over derivative rights to the vendor, subject to conditions such as when "such grant would materially impair a competitive advantage to Client or grant a material competitive advantage to a competitor of Client." Contingent performance measures. This denotes that parties incorporate benchmarks that are contingent upon realized performance. For example, in an innovative task, it could be difficult to set service level targets; however, parties could specify that in setting performance standards, both parties would review and "adjust Service Levels to reflect any improved performance capabilities associated with advances in the technology and methods used to perform the Services." Incentives contingent upon actions. This denotes whether vendors face rewards or sanctions upon observed performance (which is not contractible or verifiable). For example, a contract 	<p>State contingent ownership: Lerner and Malmendier 2010</p> <p>Contingent performance measures: Elfenbein and Lerner 2009</p> <p>Incentives contingent upon actions: Kaplan and Strömberg 2003</p>

	recognizes the vendor is performing services that do not have defined service levels; yet specifies that "Vendor should perform such Service or obligation with a level of accuracy, quality, completeness, timeliness and responsiveness," and that failure to meet the applicable standard (which is nonetheless, not a contractually specified standard) would result in fines that would be mutually decided upon by the parties.	
Transformational intent (coded from press releases)	<ul style="list-style-type: none"> Press release mentions transformational businesses objectives such as the ability of the client organization to "innovate business processes," or "design, develop and implement a new set of common business processes." Sourcing intent from press release is enabling client to "optimize its IT investments and achieve an anticipated increase in productivity." 	Lacity et al. 2003; Linder 2004; Susarla et al. 2010
Market orientation (coded from press releases)	<p>Measured in terms of outsourcing objectives dedicated to improving new product development, speed to market of products, embedded software and innovations in production processes, specifically:</p> <ul style="list-style-type: none"> Press release mentions new product introductions, such as a new type of "mortgage processing functions, from loan origination to servicing" enabled by the outsourcing initiative. Similar language in the contract mentions "enabling resources ... for new growth initiatives, including the development of new products." Outsourcing enables speedy introduction of new products or product extensions in the client organization, such a press release that mentions that the outsourcing enables rapid expansion of customer delivery capabilities such as "creating customized products" or "enhanced customer engagement." 	Bartel et al. 2007; Bresnahan et al. 2002; Konana and Ray 2007

Table A2. Instruments for Multivalued Treatment Effects

Instruments	Coded from Earlier Contracts between Client and Vendor
Information disclosure terms in earlier contract	Coded from SEC filings of the contract preceding the contractual engagement (the unit of analysis). Drawing upon Lumineau and Malhotra's (2011) discussion of coordination focus and prior discussion of "coordination provisions" in Reuer and Arino (2007, p. 322), we conceptualized this measure to examine the extent to which parties codify expectations that there would be "written reports of all relevant transactions" and "written notice of any departures from the agreement" (Parkhe 1993, p. 829).
Contingency planning in earlier contract	Coded from SEC filings of the contract preceding the contractual engagement (the unit of analysis). Contingency planning in earlier contracts indicates the extent to which partners could anticipate and plan for potential exchange hazards (Argyres et al. 2007), specifying procedures and processes to be undertaken in case an anticipated contingency occurs.

Table A3. Coding Template for Other Variables

Task Characteristics	
Service Breadth	Sum of 14 individual dummy variables of outsourced IT tasks (Lee et al. 2004): systems planning, application analysis and design, application development, operation and maintenance, systems integration, data center, telecommunications management, software and data licensing, hardware products, IT facilities management, basic support, training and documentation, advanced support, e-marketing, and e-advertising.
Specific Investments	Adapted from Rokkan et al. (2003) and Poppo and Zenger (1998). Measure captures the extent to which vendor personnel need to acquire division-specific or company-specific knowledge of the client organization in order to perform the contracted task.
Contractual Contingencies	
Contract Extensiveness	Total number of contractual provisions included per contract (21 contingencies from Andersen and Dekker 2005): price determination mechanisms, price level, payment terms, sanctions on late payment, delivery time specified, liability – supplier, force majeure – supplier, warranties – supplier, quality (norms), intellectual property protection, piracy protection, limitations on product, nondisclosure, insurance – supplier, duration of service specified, reservation (spare parts), duration of maintenance specified, arbitration provisions, calculation of R&D costs, technical specifications, termination of transaction – terms of notice.
Input Monitoring	Coded as 1 when the contract and the statement of work (SOW) provide detailed descriptions for how to perform tasks (Heide et al. 2007), for example: “The Client will provide the vendor with the task steps, their descriptions, relevant factors concerning the task use and other resources that are necessary...”
Milestones	Coded as 1 when the contract contains clauses relating to performance milestones tied to specific outcomes, for example: demarcating particular milestones in a statement of work (SOW) as dependent upon completion of tasks and/or performance by the vendor.
Audit Rights	Coded as 1 when clauses denote audit rights whereby clients have the right to inspect and validate service delivery by the vendor.
Service Level Agreements	Coded as 1 when the contract details acceptable service levels. Example: Exhibit B establishes service levels for certain specified services and groupings of services to be provided by vendor from the effective date throughout the remainder of the term.
Instruments for Bivariate Probit	
Exclusivity	Exclusivity provisions place restrictions on outside activities that can be undertaken by a vendor (e.g., Susarla et al. 2010).
Restrictive Covenants	Following Gompers and Lerner (1996), we consider restrictions on the vendor’s ability to reuse the client’s trade secrets and confidential intellectual property.
Vendor and Client Characteristics	
Fortune 1000	Indicates that the client/vendor belongs to the list of Fortune 1000 companies.
Dominant Customer	Value of 1 assigned to this variable if client accounts for more than 10% of the vendor’s business.
Prior Relationship	Coded as 1 when parties to a contract have prior contracting relations.
Ln(Client/Vendor Size)	Number of employees (log transformed).
Prior Market experience of vendor	Coded as 1 if the vendor had signed similar contracts with other clients in the same industry in a 5-year horizon prior to the date the contract was signed.

Table A4. Correlation Table of Key Variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1)	Credible Commitments	1.00						
(2)	Contingent Control Rights	0.18	1.00					
(3)	Transformational Intent	0.11	-0.03	1.00				
(4)	Market Orientation	-0.05	0.25***	-0.02	1.00			
(5)	Process Innovation	0.37***	-0.03	0.21	-0.11	1.00		
(6)	Service Innovation	0.02	0.19**	0.04	0.02	0.25***	1.00	
(7)	Non Appropriable Specific Investments	0.20**	0.04	0.07	0.13*	0.06	0.01	1.00

Notes: * $p < .10$, ** $p < .05$, *** $p < .01$

Appendix B

Estimation of Complementarity

We categorize contract design choices in an ordinal scale. We recoded the data into four mutually exclusive categories: contracts with both credible commitments and contingent control rights defined, contracts with only credible commitments, contracts with only contingent control rights defined, and contracts where neither terms were present. Since there were very few observations with only one term present, we combined the two categories into one category, and coded the contracts as taking a value of 2 when both contract terms are present, 1 when either is present, and 0 when neither is present. The set of contracts where neither term is present serves as the control group. We conducted an ordered probit of the recoded data as the selection into a treatment regime, using instrumental variables. In other words, we distinguish between the case when clients and vendors understand that these two contract design variables are complementary and design them together, versus having either contractual design dimension.

$$CONTRACT \text{ for } i = \begin{cases} 2 & \text{if both} \\ 1 & \text{if either} \\ 0 & \text{otherwise} \end{cases}$$

The treatments can be considered independent of each other (Cattaneo 2010). Under this approach, estimation relies upon conditional mean independence rather than the stronger assumption of conditional independence (Cattaneo et al. 2013). That is, for a multivariate treatment effects estimation (unlike in the case of propensity score matching), it is not necessary to assume that there is a control group for every treatment group. While these contract design features (i.e., both credible commitments and contingent control rights present or either of them present) are not randomly assigned across the contracts in our sample, we can control for the likelihood that contracts exhibit these terms without matching each contract with an equivalent contract that does not have these contractual contingencies. In other words, our approach still allows us to compare across these groups by taking into account they were not randomly assigned in the first place. The technical details of the identification conditions are provided in Cattaneo (2010). The innovation outcomes realized are as follows:

$$PERFORMANCE_i = Y_i(CONTRACT) \text{ for } CONTRACT = 0, 1, 2$$

The instruments used for estimation in the post-contract innovation value are the contract clauses from prior relationships between the vendor and client. From a proprietary dataset listing comprehensive details of very large outsourcing engagements in the United States, we collected data on prior IT outsourcing contracts entered into by each client for 3 years preceding the start of the current contracting engagement (i.e., the unit of analysis). Since we have temporally separated data with detailed contracting history between the parties, we use SEC filings to code the contractual clauses in a previous contract between the parties. We use the presence of information disclosure terms (Elfenbein and Lerner 2009) and contingency planning in earlier contracts (Lumineau 2017) as instruments for the presence of complementary contractual provisions in the current contract. Since there is learning (Argyres and Mayer 2007; Mayer and Argyres 2004) and path dependence (Argyres and Liebeskind 1999) in contracts, the presence of these variables indicates parties' ability to learn from their past and thus their willingness to draft complementary contractual clauses. While previous contract design could plausibly influence design of current contracts due to learning, it

is difficult to ascribe performance resulting in a current contractual engagement from the contract clauses employed in a previous contract, making these good instrumental variables from a causal identification perspective.

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