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Achieving offshore software development success: An empirical analysis of risk mitigation through relational norms

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ABSTRACT

Behavioral risks such as shirking and misappropriation of information assets are more prominent in offshore software development context and could adversely affect offshore outsourcing success. This paper studies the moderating effects of different relational norms on the link between behavioral risks and offshore software development success. We focused on three major modes of relational norms: norm of flexibility, norm of solidarity and norm of information exchange. Using PLS path modeling to test a sample of 40 US corporations engaged in offshore software development, we found that the norms of solidarity and flexibility reduced the negative effects shirking risk on offshore software development success. Our results suggest that client firms shall benefit by forming the right mode of relational norms to achieve offshore success.

1. Introduction

Offshoring of Software Development (OSD) has become an established business practice (King and Torkzadeh, 2008).[2] While there are potential benefits in offshoring software development such as cost savings and access to highly skilled professionals (Gwebu et al., 2010; Khan et al., 2003; Tafti, 2005), it could also result in significant losses as companies have to face very different kinds of risks in a culturally different environment (Aron et al., 2005). Compared to other types of IT offshoring initiatives, OSD projects have some unique characteristics that may exacerbate risk factors and influence OSD performance. First of all, OSD projects tend to be less structured in general and software specifications are more likely unclear and incomplete (Gopal et al., 2003). The requirement uncertainties create problems in estimating and scheduling development time and further increase the level of difficulty in controlling and monitoring service provider behavior. Secondly, software development projects require knowledge specific investments such as training service provider employees to get familiar with client's business and operation processes. Such investments may have little or no value if the contract terminates prematurely in a short run. Third, software development is knowledge-intensive with high level of task interdependency, requiring the integration of tacit knowledge between client and service provider (Nicholson and Sahay, 2004). It is common that client organizations share information about the client's customers, product design, and business processes with service providers. Service provider's performance and the quality of software somewhat depends on effectiveness of communication and coordination between clients and service providers (Rai et al., 2009). But intensive interactions and communications take up most of software engineers' work hours

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[2] Computer Economics, IT outsourcing statistics 2010/2011: Outsourcing and offshoring trends, cost/service level experiences, and analysis for 11 outsourced IT functions. http://www.computereconomics.com/page.cfm?name=Outsourcing.

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(Cherry and Robillard, 2004). This nature of inter-dependence further magnifies the difficulty in measuring service provider's effort and outcome of the effort in software development, which increases service providers' inclination to behave opportunistically. Service providers may exert less effort than is agreed upon in software development to increase their own benefits at the expense of the client (Clemons and Hitt, 2004). Another risk of opportunism that client firms may face is that service providers or their employees may accidentally or purposefully release client's intellectual assets and proprietary information to interested third parties such as client's competitors. These kinds of risks becomes more prominent in OSD due to the differences in work styles, ethics, culture, and the level of intellectual property protection at offshore and onshore sites of OSD (Aron et al., 2005; Clemons and Hitt, 2004). Given that these natures of OSD projects critically affect OSD projects, there is a need to better understand how to mitigate risks more effectively in offshore projects.

Previous research suggests that relational norms play a major role in the maintenance of a highly interactive, flexible inter-organizational relationship (Lee and Kim, 1999; Goles and Chin, 2005), especially for knowledge – intensive activities (Dwyer et al., 1987; Kern and Blois, 2002; Kern and Willcocks, 2001). Relational norms are multidimensional in the sense that the effectiveness of individual relational norm may relate to particular kinds of behaviors (Heide and John, 1992; Choudhury and Sabherwal, 2003; Jap and Anderson, 2003). Though several recent anecdotal and case analyses of offshoring suggest that it is necessary to further examine effects of individual modes of relational norms in offshoring projects separately (Bryson and Sullivan, 2003; Gefen and Carmel, 2008; Heiskanen et al., 2008), so far as we know there is no systematic and empirical analyses on this issue.

To fill this research gap, we take client's perspective and aim to empirically examine the moderating effects of individual mode of relational norms on the relationship between particular opportunistic behaviors and OSD success. Our empirical analysis uses a survey of 40 senior IT executives who have an average of 6 years of experience in the offshore software development to validate our main hypotheses. The results help to enrich our limited understanding of relationship management in OSD projects and the conditions under which clients are better off to use a specific mode of relational norms to facilitate OSD success. The next section provides a theoretical background for our research. It follows a section of hypothesis development. We then proceed to describe data collection and empirical analyses followed by the presentation of results. We conclude the paper with a discussion of the key findings and directions for future work.

2. Theoretical framework

2.1. Opportunism in offshore outsourcing

Opportunism is defined as "self-interest seeking with guile" (Williamson, 1985: p. 47). Two types of opportunistic behavior are prominent in OSD practice: (a) shirking (Aron et al., 2005); and (b) misappropriation of information assets (Clemons and Hitt, 2004). Shirking is about reneging on explicit or implicit commitments and failing to fulfill promises and obligations (Jap and Anderson, 2003). It may take several forms in OSD activities. For example, an offshore service provider may deliberately shirk its effort and deliver a product or service inferior to what was promised, but may claim the full reward. This occurs as the service provider has alternative uses of resources deployed for the client and the client lacks the ability to monitor service provider behavior closely (Alchian and Demsetz, 1972; Aron et al., 2005). Shirking may also occur when an offshore service provider assigns an experienced programming staff in a given project to another more demanding project and substitutes a staff who is new to the project and does not enjoy as much expertise as the former (Aundhe and Mathew, 2009). This adds to the transaction cost of the client especially in a time and materials contract. Service provider may also under invest in training, equipment or just not putting enough efforts in a project (Aron et al., 2005).

Misappropriation of information assets (MIAS) involves the leakage of a client's proprietary information to a third party and the misappropriation of the client's intellectual assets for service provider's own benefit (Brynjolfsson, 1994; Clemons and Hitt, 2004). Clients and service providers share proprietary information including business plans and process specifications, product sales information, technical and performance specifications and customer data. These information assets are non-excludable and non-rival in consumptions, that is, the use of information assets by one party does not automatically exclude another party from use of the same asset and the consumption of the asset by one party does not reduce availability of the asset for the other parties. These unique attributes of information assets in software combined with the difficulties of monitoring service provider behavior pose additional misappropriation problems as well (Aron et al., 2005; Clemons and Hitt, 2004). For example, in the Financial Services domain, a service provider developing supporting software for a client's new credit card product might win the bid for a similar project with the first client's competitor. In such a situation the second client could receive some private information about the product of the first client through the service provider's IT staff (Clemons and Hitt, 2004). Misappropriation of information assets may also happen when service provider staffs who betray the company release client's valuable information to competitors purposefully. Such leakage of information assets through an IT service provider or employees is detrimental to the client.

2.2. Offshore software development (OSD) success

Firms expect to realize good outsourcing service performance such as reduced costs in staff and technology investment, access to world-class technological expertise, access to global market, improved enterprise-wide performance, and improved

customer satisfaction (Grover et al., 1996; Lee and Kim, 1999; Lee et al., 2004; Saunders et al., 1997). As summarized by Willcocks et al. (2006), outsourcing can bring manifold benefits from economic, technological, and strategic perspectives. Among all the benefits of OSD, efficiency has been identified as a major motivation for offshore IT outsourcing in the past 10 years (Lacity and Willcocks, 1998; Manning et al., 2008) and remains the strongest factor in the decisions of most CIOs looking to shift IT work offshore.[3] In software development outsourcing, outsourcing success represents the extent to which the development process is well managed, i.e., whether the software was developed on time and within budget (Gopal and Sivaramakrishnan, 2008; Tiwana and Bush, 2007). In addition, quality of developed software is also an important criterion in evaluating software as suggested by many IT outsourcing market research (e.g., IDC Worldwide Outsourcing Services 2012 Top 10 Predictions[4]), one of the objectives that client firms send software development projects to offshore site is to gain access to high quality of talent pool. In this study, we measure the OSD success based on the above three percepts of benefits from offshore outsourcing.

2.3. Risk mitigation approach and relational norms

When the risk level of opportunism in a particular relationship is high, appropriate governance structure shall be chosen to safeguard exchange partners against the hazards of opportunism (Williamson, 1985; Wathne and Heide, 2000). Mismatched governance will increase transaction costs and negatively influence the transaction outcomes (Williamson, 1985). Among all the governance mechanisms, relational norms have been widely considered as one of the most important in the inter-organizational relationship management. Macneil (1980) proposed four relational norms in general exchanges: role integrity, contractual solidarity, flexibility, and supra contractual norm. Heide and John (1992) went a step forward and unified these norms into three specific constructs of relational norms: *norm of solidarity* (SLTD); *norm of information exchange* (INEX), *norm of flexibility* (FLEX) (Heide and John, 1992). A recent study by Goo et al. (2009) found that these three types of relational norms were specifically important in IT outsourcing context.

Norm of solidarity is the mutual expectation that both parties will exert effort and devote resources in order to sustain an ongoing relationship and will amicably replace disagreement with agreement (Dwyer et al., 1987; Goles and Chin, 2005; Heide and John, 1992). In previous studies of inter-firm relationships, solidarity has been found to have an important effect on the relationship management (Henderson, 1990). When an outsourcing relationship depicts a characteristic of mutual commitment and solidarity, this relationship is more likely to succeed (Lee and Kim, 1999).

Norm of information exchange is the proactive formal and informal sharing or exchange of meaningful and timely information between parties (Goles and Chin, 2005). It was through constant communication and information exchange that the client and the service provider could identify problems and alleviate conflicts (Kern, 1997; Khan et al., 2003). In a case study of IFNO (France) offshore software development business, Kim and Kim (2008) found that norm of information exchange facilitated knowledge transfer and governed software developers' coding behavior. in a survey of 193 IS top executives in large US companies, Grover et al. (1996) pointed out that high quality of communications and interactions with service provider was critical to achieving the greatest benefits from outsourcing (Grover et al., 1996). In the similar vein, Lee and Kim (1999) found that information sharing, communication, and participation were significantly related to partnership quality which in turn had positive impacts on outsourcing success in terms of customer satisfaction and cost efficiency (Lee and Kim, 1999).

Norm of flexibility is the norm shared by the exchange parties that they are willing to make adaptations as circumstances change (Goles and Chin, 2005) and both parties expect that "the relationship will be subject to good faith modifications" (Heide and John, 1992, p. 35). When offshoring clients and service providers form norm of flexibility, they have mutual adjustment processes to accommodate changes in circumstances and environmental conditions and to maintain ongoing inter-firm relationship (Heide, 1994; Heide and John, 1992). Flexibility was found to be an essential element to the outsourcing relationship quality (Lacity, 2002; Willcocks et al., 1999) because contract parties are willing to make adjustments or work out new deals when unexpected situations arise.

Literature suggests that the relative importance of relational norms in ensuring the desired performance outcome depends on the context of exchange (Gulati and Nickerson, 2008) which includes task characteristics, degree of interdependence of activities, and the social and cultural context where the exchange activities are embedded in (Sobrero and Schrader, 1998; Borgatti and Foster, 2003). Carson et al. (2006) found that relational norms were effective in mitigating behavioral risks in volatile situations, though not in the situations with high ambiguity (Carson et al., 2006). In a study of a UK company's IT outsourcing practice, Fitzgerald and Willcocks (1994) found that relational norms might only be appropriate under conditions of high uncertainty, when flexible contracts become important. The case study by Aron et al. (2005) suggested that some modes of relational norms might not work as expected when structural risks such as shirking and misappropriation of information assets were prominent in offshoring initiatives. In Choudhury and Sabherwal's multi-cases study (2003), they found that clan controls which were based on social network between the client and service provider were not always working in software outsourcing. This kind of controls might only have effect when the two parties had goal congruence (Choudhury and Sabherwal, 2003). Although these qualitative studies have provided evidence that individual

[3] Ronald Escanlar, Cost efficiency remains top factor in shifting IT work offshore. March 02, 2011. http://www.microsourcing.com/blog/cost-efficiency-remains-top-factor-in-shifting-it-work-offshore.asp.

[4] http://www.marketresearch.com/IDC-v2477/Worldwide-Outsourcing-Services-Predictions-6789721/.

relational norms shall be used strategically to manage offshoring relationship, a better understanding about the interactions between specific relational norm and opportunism, and their impact on offshoring outcome requires greater attention.

3. Hypotheses development

In this section, we first present hypotheses related to the direct relationship between the risks of opportunism and OSD success. Then we address the moderations by relational norms on these relationship based on the research model depicted in Fig. 1.

3.1. Effects of opportunism

In an exchange relationship, without full control and effective monitoring, service providers would behave opportunistically and make decisions which would maximize the welfare of themselves but at the cost of clients (Alchian and Demsetz, 1972; Eisenhardt, 1989). Offshoring increases the chance of service provider's opportunistic behavior such as underinvestment in software development. This less than committed quality of delivery incurs residual loss (Jensen and Meckling, 1976) on the client for rework, adjustments, complaint redress, and delays losses (Alchian and Demsetz, 1972; Aron et al., 2005) and result in poor software quality and budget overrun. The clients who have foreseen negative outcome would invest in constantly controlling and monitoring the service provider's software development process and the quality of software (Dibbern et al., 2008). Shirking behavior thus increases client firm's transaction costs and control costs in the OSD projects and adversely affects OSD engagements where cost savings is the dominant objective of the client. Therefore, we hypothesize that

H1. *Shirking will be negatively associated with outsourcing success of OSD projects.*

Being an information intensive activity, OSD engagements let client's business knowledge and proprietary information register into an offshore service providers' knowledge base whereby a client is no more in charge of its critical information assets. Greedy service providers or their employees may use client's information asset for alternate sources of revenue (Clemons and Hitt, 2004). Loss of control over information assets may put clients in danger of business bankruptcy (Mata et al., 1995). Although intellectual property protection agreements or secrecy clauses are ways to get legal redress, detection and prove of contravention would be very difficult and no legal redress would be enough to compensate for the commercial damage incurred (Hoecht and Trott, 2006). Alternatively, clients can reduce the amount of information shared with service providers to prevent misappropriation. For example, clients provide only object code to service providers for black box testing of developed software. But black box testing will dramatically increase the cost of testing because of the combinatorial complexity attributes of software systems. In this case, OSD clients face the challenge of attempting to maintain a sufficiently open information sharing regime for meeting their software development objectives while sufficiently controlling informa-

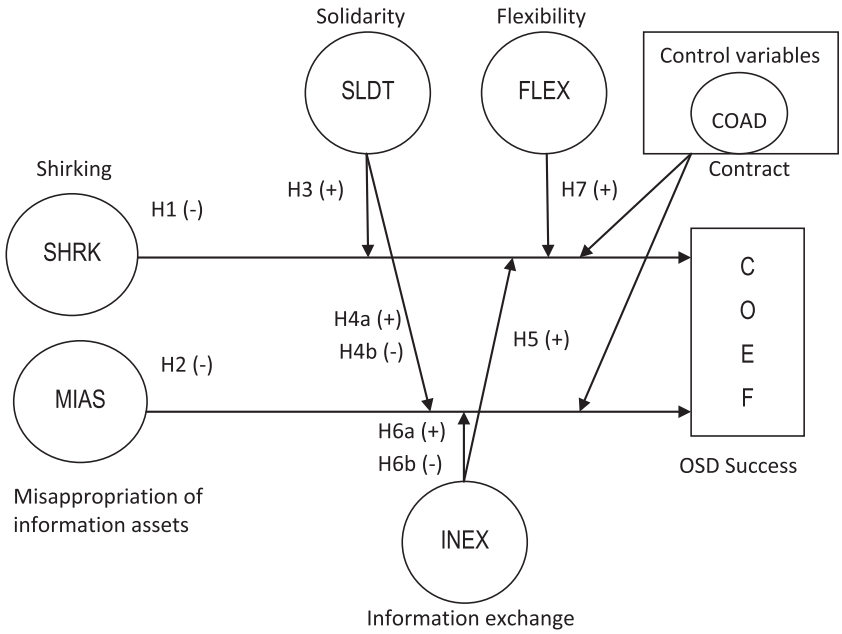

Fig. 1. Empirical research model.

tion flows to minimize unintended leakage of sensitive information (Oxley and Sampson, 2004). Either way will cost clients more in administration and control of the OSD activities and obligations of the service provider. Therefore, we hypothesize that:

H2. *Misappropriation of information assets will negatively impact outsourcing success of OSD projects.*

3.2. Moderating effects of relational norms

An antecedent of shirking behavior is the service provider's perception of not meeting the targeted profit during the course of a software development project (Aron et al., 2005). This misalignment of perceived effort and incentive drives the service provider to make up for the losses through under investment (Aron et al., 2005; Aundhe and Mathew, 2009). If a client is able to understand service provider concerns about its need for profit and is willing to ensure a reasonable profit to the service provider (Kern and Willcocks, 2001), service provider's motivation to shirk would diminish (Heide and John, 1992). The norms of solidarity encourage service providers to work on preserving relationship investments by cooperating with clients and resist attractive short-term alternatives in favor of the expected long-term benefits of staying with existing clients (Dwyer et al., 1987; Klepper, 1995). Therefore, a solidarity norm would prescribe "forbearance" behavior and reduce the inclinations of partners to shirk on performance and at the mean time produce a "bonding" scenario where ultimate objective is the realization of offshoring success. Following this logic, we hypothesize that:

H3. *Shirking will have weaker impact on outsourcing success under a high (rather than a low) level of norm of solidarity, all else being equal.*

Although it is clear that norm of solidarity may reduce the incentive of shirking, its role in controlling misappropriation of information asset is not so obvious. On one hand, outsourcing partners want to form norm of solidarity and have long-term relationship which may reduce the transaction costs and maintain business opportunities in the long run. On the other hand, contract parties who receive information may prompt to be leery of information poaching and misappropriation when they foresee the economic value of the information assets. The social solidarity may disguise this "self-interest seeking with guile". We expect that bright side and negative side of solidarity exist simultaneously in the offshoring environment.

On the bright side, software development requires clients to open to information and knowledge sharing with their outsourcing partners. In situations where service provider's opportunistic exploitation looms especially large, offshoring client will tend to protect its own resources, especially knowledge and proprietary information by implementing monitoring mechanisms in controlling and tracking service provider's behavior (Heiskanen et al., 2008). Norm of solidarity increases offshore client's confidence that the service provider will not abuse its vulnerabilities (Mayer and Salomon, 2006). The mutual desire to preserve the relationship and contribute to create joint value makes offshore contract parties more likely to respect the boundaries of the other's resources and proprietary knowledge. The appropriation of information assets is less likely to be of concern when the norm of solidarity has been formed in-between the contract parties. Thus, the costs of control of information assets are reduced. Therefore, we hypothesize that

H4a. *The impact of risk of misappropriation of information assets on outsourcing success will be weaker under a high level of norm of solidarity, all else being equal.*

However, the influence of norm of solidarity may decrease as the inter-firm relationship progresses and knowledge of each other deepens (Grayson and Ambler, 1999). Recent inter-firm relationship studies suggest a striking phenomenon that relationships that appear to be doing well are "often vulnerable to the force of destruction that are quietly building beneath the surface of the relationship" (Anderson and Jap, 2005, p. 75). Exchange partners who are close to each other may make errors of judgment by psychologically ignoring evidence that falsifies previous beliefs about the partner's cooperation (Nooteboom, 2002). For example, client firms who believe that their service providers have actively implemented security to protect information secrecy may relax explicit control and monitoring mechanisms against information misappropriation when they perceive their relationship are in congruent (Selnes and Sallis, 2003). When the inter-firm relationship becomes closer and closer, firms may tent to avoid negative information for the fear of confronting friends within the relationship (Kusari, 2010). Subsequently, reduced control and monitoring creates incentives of opportunistic behavior. This dark side of the close relationship is particularly prominent in protecting information assets due to the non-exclusive, non-rival attributes and difficulty in capturing contraventions. Hence, we hypothesize a negative effect of norm of solidarity.

H4b. *The impact of risk of misappropriation of information assets on outsourcing success will be stronger under a high level of norm of solidarity, all else being equal.*

To minimize the risks of shirking, offshoring clients will invest in monitoring and coordinating mechanisms. However, the use of unilateral control is likely to have an opposite effect on client-service provider relationship as efforts to enforce formal authority usually lead to relational tensions such as resentment. Service providers who are under intensive monitoring and control are less likely to cooperate voluntarily and may tend to defect and shirk. Alternatively, relational norms, in particular, norm of information exchange, which act as bilateral control mechanism (Heide and John, 1992) appear to have particular importance in offshoring relationship as sharing of information and knowledge of a project increases the transparency of

software development process. Offshoring contract parties have the expectation that contract partners are willing to exchange key technical, financial and strategic information (Teimoury et al., 2010). The sharing norm reduces the conflicts between firms and the relational tensions caused by unilateral controls. Therefore, we expect that

H5. *Risk of shirking will have weaker impact on outsourcing success under a high (rather than a low) level of norm of information exchange, all else being equal.*

The information exchange norm may have opposite effects in mitigating the risks of information assets misappropriation. On the positive side, information exchange norm encourages information sharing. On the negative side, high volume of information sharing increases the risk of misappropriation. It is difficult to foresee which effect will dominate in the offshoring software development contracting. Therefore, we hypothesize both effects separately.

We first discuss the positive effect of the norm of information exchange. One of the major characteristics of offshore outsourcing is the lack of frequent face-to-face communication. Inadequate communications ranks high on the causes of offshore relationship failures (Iacovou and Nakatsu, 2008). The negative effect of miscommunication is even exaggerated when the original set of requirements for offshored projects is complex and it requires subsequent request for changes. Inadequate communication or miscommunication causes substantial and unanticipated reworks that will increase the length and costs of projects (Narayanan et al., 2011). Norms of information exchange incentivize contractual parties share information with their OSD partners. Frequent and effective communications are pivotal to help the service provider keep track of the changes in project requirements and functions as a relational governance mechanism to reduce the incentives of misappropriations. Therefore, we hypothesize that

H6a. *Risk of misappropriation of information assets will have weaker impact on outsourcing success under a high (rather than a low) level of norm of information exchange, all else being equal.*

While norms of information exchange encourage greater sharing of important private plans with service providers, the firm providing the information is potentially putting itself at a disadvantage if the receiving firm has incentive to misappropriate the information. Clemons and Hitt (2004) notes that the potential for this information misappropriation may increase if there is no effective way to track the information flowing. In a multi-national, long-distance working teams, the increased difficulty in observing and implementing protection mechanisms create incentives to misappropriate contract party's information assets. As loss of information in OSD context often occurs through service provider staff that move from project to project, service provider's information protection and assess monitoring mechanism would not be good enough to prevent information leakage happened through their staffs. Therefore, we hypothesize that

H6b. *Risk of misappropriation of information assets will have stronger impact on outsourcing success under a high (rather than a low) level of norm of information exchange, all else being equal.*

The degree to which contract parties engage in joint planning and the extent of proactive support are determinants to the costs associated with *ex post* contract negotiation (Artz and Brush, 2000). Offshoring clients and service providers who have established norms of flexibility that can simplify and smoothen the *ex post* negotiation process can reasonably expect to incur low *ex post* bargaining costs than those who have not. Moreover, inter-firm joint problem solving process and risk sharing attitudes can encourage cooperation between contract parties as their future become increasingly intertwined (Shapiro, 1987) and thereby may act as an effective safeguard to circumvent opportunistic behavior (Artz and Brush, 2000). Therefore, we expect that

H7. *Risk of shirking will have weaker impact on outsourcing success under a high (rather than a low) level of norm of flexibility, all else being equal.*

4. Research methodology

4.1. Data collection and measurements

We conducted a qualitative study following interview method prior to implementing our survey based research. The purpose of the qualitative study was to receive insights from practice that support or contradict our variables based on theoretical concepts and their contextualized labels based on OSD. We interviewed senior executives of five client organizations based in US who offshore software development to India. The respondents had minimum 10 years of experience in offshore outsourcing and were actively involved in outsourcing decisions. We also contacted the same respondents for checking the content validity of our survey instrument.

For the subsequent survey study, our sample was drawn from US organizations engaged in offshore software development with a third party service provider. Owing to the issue of confidentiality in offshore outsourcing decisions and restrictive policies of firms against participation in surveys as experienced in an earlier study (Tanriverdi et al., 2007) with a similar target population, we sought the support of Project Management Institute's (PMI) Global Operations Centre to administer our survey. We developed an online version of our survey instrument and sought the participation of senior IT executives who were members or visitors of PMI website for about 6 months.

We followed key informants method in our survey wherein individuals who had the requisite knowledge, involvement and confidence of the phenomenon under study would respond to our survey on behalf of the organizations they belonged to. To overcome various challenges in key informant method, we followed the guidelines of Huber and Power (1985) and Kumar et al. (1993) for key informant validity. The opening page of our survey instrument explicitly communicated the requirements for respondents. These requirements included the need to inform on outsourcing risks and relationships on behalf of a US organization; having a long term experience with offshore software development; and having been a project manager managing service provider relationship. To further ensure perceptual and cognitive competence of key informants our instrument had three items in a 1–7 scale to capture the perceived knowledge, involvement and confidence of the respondents. Our survey instrument did not have mandatory fields requiring for personally identifiable data such as respondent's name, name of the organization and position in the organization.

We operationalized various constructs identified in our study by developing a multi-item questionnaire for each construct in the form of a survey instrument. The theoretical foundation and prior research references for the constructs and items are given in Table 1.

Outsourcing success of OSD project (COEF): The key objective for offshoring software development is to get labor at reduced cost but get the same or slightly better performance. Following the measurements used in the previous IT outsourcing literature, we devised three performance dimensions: information technology cost savings, IS service quality, and access to talent pool (Lacity and Willcocks, 1998; Lee et al., 2004).

Opportunism: We measured two risks of opportunism: *shirking* (SHRK) and *misappropriation of information assets* (MIAS). SHRK is a construct composed of three items referring vendor's input effort, personnel quality, and renegotiation *ex post*. These measurement items are based on buyer–supplier relationship literature (Jap and Anderson, 2003; Wathne and Heide, 2000) and IT outsourcing research (Clemons et al., 1993; Aron et al., 2005). In IT outsourcing and offshoring, client firms may

Table 1
Measure development.

Construct	Measures, scale and ref to literature	Items
Outsourcing Success (COEF)	Newly developed (1–7) using (Lacity and Willcocks, 1998; Lee et al., 2004)	In our outsourcing relationship with this service provider, we have been able to: COEF1: Achieve Information Systems (IS) cost savings COEF2: Improve IS service quality COEF3: Obtain better availability of talent pool
Shirking (SHRK)	Newly developed (1–7) based on (Clemons et al., 1993; Wathne and Heide, 2000; Jap and Anderson, 2003; Aron et al., 2005)	SHRK1: Service Provider (SP)'s personnel do not put their best efforts SHRK2: SP argues and re-interpret in their favor contracted terms of quality SHRK3: SP deploys lesser competent/ qualified staff than promised
Misappropriation of Information Assets (MIAS)	Newly developed (1–7) based on (Clemons et al., 1993; Clemons and Hitt, 2004; Aron et al., 2005)	MIAS1: We lose proprietary information about our product/processes to competitors through this SP MIAS2: In your relationship with this SP, you risk losing control over third party Intellectual Property (IP) assets
Solidarity (SLDT)	Adopted (1–7) from (Dwyer et al., 1987; Heide and John, 1992; Goo et al., 2009)	SLDT1: We would like to continue in long term relationship with this service provider SLDT2: This relationship deserves our firm's best efforts to maintain
Information Exchange (INEX)	Adopted (1–7) from (Dwyer et al., 1987; Heide and John, 1992; Goo et al., 2009)	INEX1: This service provider's movement of personnel from our relationship to other similar relationships is transparent INEX2: In our relationship we discuss our important private plans with our service provider
Flexibility (FLEX)	Adopted (1–7) from (Dwyer et al., 1987; Heide and John, 1992; Goo et al., 2009)	FLEX1: In our relationship we share the risks that could occur in the process of business FLEX2: In our relationship we proactively support each other's work
Control variables Contract Adequacy (COAD)	Newly developed (1–7)	COAD1: Our contracts correctly specify our requirements COAD2: Our contracts completely specify our requirements

allow service providers to get access to two general kinds of intellectual assets: clients own proprietary intellectual assets (e.g., business secret of client firm's products and processes, customer information, etc.) and the third parties' intellectual property assets utilized by the client (e.g., licenses for third-party's database and software). Our measurements for *misappropriation of information assets* cover both types of information assets.

Relational norms: Following Dwyer et al. (1987) and Heide and John (1992) we measured relational norms under three constructs of Solidarity (SLDT), Information Exchange (INEX) and Flexibility (FLEX). We chose to look at each dimension separately, rather than group them into one construct so that we could understand the impact of each relational norm on outsourcing performance. Each relational norm construct was measured using items as given in Table 1.

Control variable In addition to aspects of relational contract identified in the study, we control client firm's contracting capability measured in terms of contract adequacy (COAD).

4.2. Data analysis methods

We received 52 responses to our survey of which 10 responses were dropped due to high level of missing data or non-disclosure of critical information. We further dropped two cases which had the mean value of knowledge, involvement and confidence measures for key informant validity less than 3.5. Subsequently, our final data set consisted of responses from 40 senior IT executives who have extensive knowledge and involvement in the offshore IT outsourcing projects. Because our study was from client's perspective, we needed to ensure that respondents were from client companies. We checked the identity of the individuals disclosed in the response and found that 31 out of the 40 respondents had voluntarily disclosed their organizational identity. We used the IP addresses captured by the online survey instrument to locate the country from where the responses originated. We found that only one of the responses was from Switzerland and the rest from USA. We conducted independent *t*-tests to compare the responses from the group of 31 who disclosed their organizational identity with the group of 9 who did not disclose their identity. The results did not show any statistically significant difference between the two groups with respect to client's outsourcing experience ($t = -0.17$, $p > 0.1$) opportunism risks shirking ($t = 1.24$, $p > 0.1$) and misappropriation of information assets ($t = -0.12$, $p > 0.1$). These checks gave us reasonable confidence that the respondents who used the PMI survey represented client organizations.

Although our sample size is small, the wide variety of the offshore projects surveyed can still provide insightful information. The average size of outsourcing client companies in our sample was about 5000 employees, ranging from very small company (e.g., 12 employees) to large multi-national companies with more than 90,000 employees. More than 80% of the outsourcing client firms have at least 3 years offshore outsourcing experience and about 30 out of 40 client firms have multi-service provider outsourcing experience. The 40 client firms are from a variety of industries including finance, banking, insurance, publishing, and IT, etc. More than half of the service providers hold one or more than one IT service quality certifications (e.g., ISO standard, CMM/CMMI, and Six Sigma). Table 2 provides details of the sample characteristics.

Content validity of the instrument used in our survey was established by adapting constructs and concepts from prior research literature on software development, IT outsourcing or relationship marketing (Ganesan, 1994; Gopal et al., 2003; Lee and Kim, 1999). In order to minimize the occurrence of response biases, questions in the survey instrument were randomized (i.e. sequenced independent of the constructs). Survey instrument was pilot tested with IS Faculty and research scholars engaged in outsourcing research and industry experts from client, service provider and influencer firms. Corrections were made in the contents based on their feedback and the suitability of updated contents again confirmed with them for compliance.

Following Fornell and Bookstein (1982), Tenenhaus et al. (2005) and Goo et al. (2009), we chose Partial Least Squares (PLS) path modeling to test our research model. We used the add-on 'plspm' software in the open source 'R' V. 2.12.0 environment. PLS is useful for predictive purposes where theory is under development and it also allows for the analysis of the measurement and structural models simultaneously. PLS has been found to work with small samples, with sizes as low as 24 cases by 7 variables in Fornell and Bookstein (1982), and it does not assume multivariate normality of data. Since this imposes a restriction in the estimation of significance, we used bootstrap induction for the estimation of significance levels (Hesterberg et al., 2006; Johnston et al., 2004). However, PLS is not a "silver bullet" for overcoming all issues associated with small samples (Marcoulides and Saunders, 2006). A relatively low sample size in our study could possibly restrict detection of low valued model coefficients (Hui and Wold, 1982) which is a limitation of our study. We first discuss the results of measurement model and then for the moderating effects.

Table 2
Data descriptions.

Characteristic	Mode	Median	Mean	Std deviation
Client's experience in offshore IT outsourcing (years)	5.89	5.89	6.60	3.97
Respondent's knowledge (1–7)	6	6	5.55	1.13
Respondent's involvement (1–7)	7	5	5.22	1.56
Respondent's confidence (1–7)	6	5	5.05	1.53

4.2.1. Measurement model

Using PLS path modeling, we analysed the measurement model for validity and reliability, following data analysis procedure available in previous studies (e.g.: Tenenhaus et al., 2005). The construct validity of the measurement model was reported from Confirmatory Factor Analysis (CFA). All the indicators used in the measurement model were reflective. Statistical evidence for unidimensionality and convergent validity were checked through *Cronbach's* alpha, Dillon–Goldstein's ρ, Average Variance Extracted (AVE), first and second Eigen values and factor loadings (Table 3). We had one item with loading less than 0.5 (COAD2) and one with *Cronbach's* alpha less than 0.6 (INEX2) which were dropped from the measurement model (Gefen and Straub, 2005). Subsequently the factor loadings for all other items were above 0.7, *Cronbach's* alpha for each construct exceeded 0.7 and AVE was more than 0.65. A block is considered uni-dimensional if Dillon–Goldstein's $\rho > 0.7$ (Tenenhaus et al., 2005) and the first Eigen value is larger than the second; the measurement model satisfied these conditions also. The results confirmed the uni-dimensionality and convergent validity of the outer model (Tenenhaus et al., 2005). Table 3 reported the convergent validity of the measurement model.

Discriminant validity was confirmed by comparing the square root of AVE of individual constructs with the correlation of constructs (Gefen and Straub, 2005). In Table 4, the result showed that all AVEs were above 0.8, against the prescribed threshold of 0.5; and all AVEs were larger than the correlations. In all cases, the requirements for discriminant validity were satisfied, indicating that the measures distinguished between distinct constructs. We also checked the cross correlations of the items with other constructs and found that in all cases the items are more correlated with their constructs than with other constructs used in the study (Appendix A). The goodness of fit of the outer model was found to be 0.99 which established a very good fit of the measurement model with the real data.

In order to assess the influence of common method variance in the survey, we conducted Principal Component Analysis (PCA) for Harman one-factor test. With seven components given as the theoretical number of factors the data set, no single component alone shared more than 20% of the variance (chi-squared = 80.08, $p < 2.7 * e{-}11$, fit = 0.99). When one factor PCA was conducted with varimax rotation the single component explained only 41% of the variance (chi-squared = 147.46, $p < 2.4 * e{-}6$, fit = 0.89). To further analyse the influence of common method variance, we included in the PLS model a common method factor whose indictors were the combined indicators of all other constructs. We followed the procedure recommended in Liang et al. (2007) and implemented the test in PLSPM software in R environment. The results of the common method bias analysis using this procedure have been reported in Appendix B. The results show that (i) the average substantively explained variance has a much higher value of 0.86 compared to the average method based variance of 0.24 (ii) All the substantive factor loadings are significant while all the method factor loading are not significant ($p < 0.05$). Since both Harman one factor test and the common method factor approach did not report significant effect of common method variance in our study, we have reasonable confidence that this bias is not a major concern in our study.

4.2.2. Test results of moderating effects

We took two approaches to test the proposed models: (i) a full structural model with endogenous, exogenous, interaction and control variables; and (ii) Block by block multiple regression (MR) models with and without interaction terms to test

Table 3
Convergent validity of the measurement model.

Construct	MVs	*Cronbach's* α	DG-ρ	AVE	Eig 1st	Eig 2nd	Item loadings
Shirking (SHRK)	3	0.91	0.94	0.78	2.37	0.37	0.96, 0.86, 0.81
Misappropriation of information assets (MIAS)	2	0.74	0.85	0.65	1.35	0.65	0.85, 0.80
Solidarity (SLDT)	2	0.76	0.89	0.80	1.62	0.38	0.94, 0.85
Flexibility (FLEX)	2	0.76	0.84	0.72	1.44	0.56	0.83, 0.87
Information Exchange (INEX)	1	1	1	1	1	0	1.0
Contract Adequacy (COAD)	1	1	1	1	1	0	1.0
Outsourcing success (COEF)	3	0.86	0.92	0.79	2.36	0.44	0.86, 0.87, 0.93

Table 4
Inter-correlations between constructs.

	SHRK	MIAS	COEF	SLDT	FLEX	INEX
SHRK	**0.88**					
MIAS	0.43	**0.80**				
COEF	−0.42	−0.42	**0.89**			
SLDT	−0.57	−0.47	0.62	**0.90**		
FLEX	−0.44	−0.19	0.48	0.58	**0.89**	
INEX	−0.20	−0.14	0.40	0.15	0.28	**1.00**

Note: Diagonal elements represent the AVE shared with measures. Off-diagonal elements represent the correlations between constructs. For adequate discriminant validity, the diagonal elements should be greater than the entries in corresponding columns and rows.

Table 5
PLS results of proposed structural model.

Variables	Original β (n = 40)	Mean boot β (std error) $n1$ = 100	Mean boot β (std error) $n1$ = 500
Direct effects			
Shirking (SHRK)	−0.59	**−0.48*** (0.17)	**−0.47*** (0.14)
Misappropriation of Information Assets (MIAS)	−0.55	**−0.44*** (0.12)	**−0.43*** (0.13)
Contract Adequacy (COAD)	0.16	0.13 (0.24)	0.13 (0.22)
Interaction effects			
SHRK × Solidarity (SLDT)	0.26	**0.18*** (0.11)	**0.18*** (0.10)
SHRK × Flexibility (FLEX)	0.28	**0.20*** (0.12)	**0.20*** (0.12)
SHRK × Information Exchange (INEX)	0.11	0.09 (0.14)	0.07 (0.14)
MIAS × Solidarity (SLDT)	0.13	0.09 (0.12)	0.13 (0.12)
MIAS × Information Exchange (INEX)	0.09	0.08 (0.13)	0.10 (0.11)

* $p < 0.05$.

moderation effect with effect size and power analyses, similar to the approach followed in Liang et al. (2007, p. 69). Since all our variables had reflective measures with interval scales, we took product term approach whereby the moderating effects are measured as product terms of the independent variables and the moderator variables (Henseler and Fassott, 2010, p. 723). We multiplied the mean of the indicators of the latent independent variables with the mean of the indicators of the latent moderator variable as suggested by Joreskog and Wang (1996). Therefore, we built five product terms to serve as indicators of the interaction terms in the proposed structural model. The full structure model can be expressed by the following equation:

$$COEF = \alpha + \beta_1 SHRK + \beta_2 MIAS + \beta_3(SHRK * SLDT) + \beta_4(SHRK * FLEX) + \beta_5(SHRK * INEX) + \beta_6(MIAS * SLDT) + \beta_7(MIAS * INEX) + \beta_8 COAD + \varepsilon \quad (1)$$

The result of the full structural model estimation is presented in Table 5. We performed a bootstrap validation on the model with $n1 = 500$ drawn by re-sampling the original data set to determine the statistical significance of the parameter estimates (Hui and Wold, 1982). Comparing Column (3) and (2) in Table 5, we observed that the mean boot β values obtained during bootstrap validation were consistent in signs and very close in magnitude with the original β values. The model explained 38% of variance overall; absolute goodness of fit (GoF) index of the structural model was found to be 0.44 and the relative GoF value was 0.68 which showed moderately good fit of the proposed theoretical model with the data.

As shown in Table 5, *shirking* and *misappropriation of information assets* had a negative and significant impact on *OSD success*. Therefore, hypothesis H1 and H2 were supported. Among five proposed moderating effects, the interaction effects of *solidarity* and *flexibility* on shirking were positive and significant at $p < 0.05$ level, supporting H3 and H7. Though the interaction term of *shirking* and *information exchange* was positive but the effect was not significant to support H5. Neither had we found the supports for the proposed moderating effect of *solidarity* nor *information exchange* on the relationship between *misappropriation of information assets* and *OSD success*. Thus, H4 and H6 were not supported. The control variable, *contract adequacy*, was also not significant, which is consistent with the proposition that an adequate contract is necessary but not sufficient for ensuring OSD success.

The results of the full structural model estimation indicate that solidarity and flexibility may weaken the negative impact of shirking behavior on OSD success. But it is necessary to measure the strength of these moderating effects. As suggested by Henseler and Fassott (2010), individual MR path models were estimated to compare the proportion of variance explained by the moderating variables. Because our structural model was a pure moderation model, we calculate the effect size, f^2 as follows[5]:

$$f^2 = \frac{R^2_{\text{model with moderator}} - R^2_{\text{model without moderator}}}{1 - R^2_{\text{model with moderator}}} \quad (2)$$

The tests of the strength of moderating effects were carried out in multiple steps. For comparative purposes, the direct relations between each of the opportunistic behaviors and OSD success were measured. The next step was to add interaction of individual relational norms to each of the opportunistic behaviors one by one. The results of this analysis are given in column 2 and 3 of Table 6 with estimations based on original sample and re-sampling based on bootstrap method.

Comparing Column 2, 3 and 4 in Table 6 to the results in Table 5, we observed that the main effects were consistent with the full structural model in terms of direction and significance. *Shirking* and *misappropriation of information assets* negatively and significantly affected outsourcing success, and each explained 19% of the variance ($R^2 = 0.19$). The *norm of solidarity* significantly reduced the impact of the *shirking* on *OSD success* and showed a relatively weak effect size of $f^2 = 0.03$, when estimated from original sample. The moderating effect of the norm of *flexibility* on the relationship between *shirking* and *OSD*

[5] Drawing on Cohen (1988), moderating effects with f^2 of 0.02 may be regarded as weak, f^2 from 0.15 as moderate and those above 0.35 may be regarded as strong (Henseler and Fassott, 2010; Cohen, 1988).

Table 6
Test of moderating effects.

Variables	β (n = 40)	Mean boot (n = 100)	Mean boot (n = 500)	R^2 (n = 500)	Effect size	VIF
Main effects						
Shirking (SHRK)	−0.44	**−0.45***	**−0.47***	0.19	0.24	2.16
Misappropriation of Information Assets (MIAS)	−0.43	**−0.47***	**−0.47***	0.19	0.23	1.26
Interaction effects						
SHRK × Solidarity (SLDT)	0.56	**0.58***	**0.60***	0.21	0.03[a]	1.59
SHRK × Flexibility (FLEX)	0.51	**0.50***	**0.53***	0.22	0.03[a]	2.93
SHRK × Information Exchange (INEX)	0.29	0.30	0.29	0.16		1.52
MIAS × SLDT	0.57	0.55	0.55	0.18		1.20
MIAS × INEX	0.38	0.37	0.37	0.17		1.80
Controls						
Contract Adequacy (COAD)	0.10	0.02	0.02	0.01		1.03
COAD × SLDT	0.90	**0.99***	**0.99***	0.16	0.18[b]	1.53
COAD × FLEX	0.74	**0.75***	**0.75***	0.12	0.13[b]	1.18
COAD × INEX	0.42	0.42	0.42	0.12		1.02

* 95% Confidence interval.
[a] Weak to medium moderation.
[b] Medium to strong moderation (n = 40).

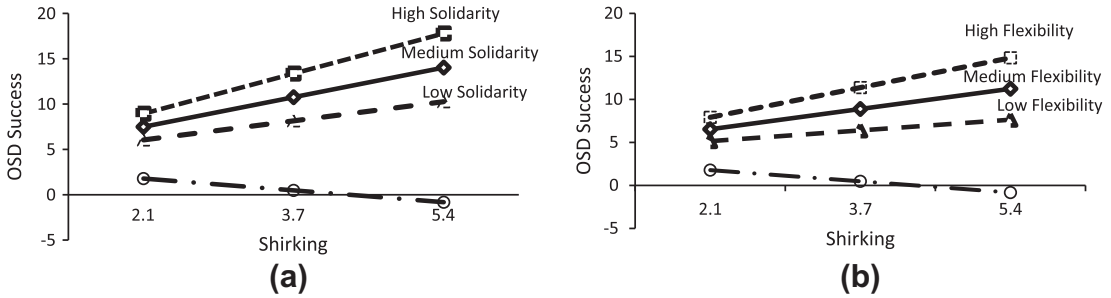

Fig. 2. Three way interactions of (a) OSD success-shirking-solidarity and (b) OSD success-shirking –flexibility.

success was positive and significant with an effect size of f^2 = 0.03. Consistent with the results from the full model estimation, the hypotheses about moderating effects of *solidarity* and *information exchange* on *misappropriation of information assets-outsourcing success* relationships were not supported. We also conducted multicollinearity checks using Variable Inflation Factor (VIF) for each block and found that for all relationships VIF were <3.

The interactions between *OSD success*, *shirking* and two significant moderators, *solidarity* and *flexibility* were graphically presented in Fig. 2 following the procedure given in Aiken and West (1991). The bottom lines in both the figures represented the effects of shirking on OSD success in the absence of relational norm moderation. After including the moderating effects of the norm of solidarity or the norm of flexibility in the model, the negative effects of shirking on OSD success became positive. When these moderation effect increased from low to high level (one standard deviation each in the figure), the probability of OSD success increased. The result indicated that the moderation component outweighs the shirking risk component and as such leaded to higher levels of outsourcing success. It implies that solidarity and flexibility not only cancel the negative effect of shirking, but further contributes to higher levels of economic performance of OSD.

We also tested the effects of the control variable used in the study. Contract adequacy (COAD) did not have any significant direct impact on outsourcing success (COEF). However the relational norm of *solidarity* had significant moderating effect on the *contract adequacy-OSD success* relationship with a coefficient of β = 0.99 and an effect size of f^2 = 0.18. The norm of *flexibility* was also found to strengthen the impact of *contract adequacy* on *OSD success* (β = 0.75, p < 0.05, and f^2 = 0.13). These findings about interactions between formal contract adequacy and relational norms indicate that relational norms complement with contractual governance.

4.2.3. Statistical power analysis

As our sample size is small and we used bootstrap validation method for testing statistical significance of our hypotheses, one of the concerns is the lack of sufficient statistical power to test the empirical model. To address this concern, we tested the statistical power of the results from bootstrapped sample as suggested by Cohen (1988). Using an approach used for PLS

path modeling (Liang et al., 2007, p. 69; Henseler and Fassott, 2010), we re-estimated effect sizes of the four hypotheses supported by bootstrap validation procedure based on the re-sample size $n = 500$. The effect size of SHRK-COEF (H1) was $f^2 = 0.32$, which meant that the statistical power of the test was >0.995 ($a = 0.05$) according to Cohen's (1988) power table. For the original sample size of $n = 40$, the effect size was 0.24 and the statistical power was >0.85 ($a = 0.05$) accordingly. The effect size for MIAS-COEF (H2) with $n = 500$ was $f^2 = 0.31$, and the statistical power was >0.995 ($a = 0.05$). With the original sample ($n = 40$), the effect size of MIAS-COEF became $f^2 = 0.23$ and statistical power dropped to 0.85 ($a = 0.05$). Power analysis of the moderating effect of SLDT on SHRK-COEF (H3) was $f^2 = 0.047$ with power >0.99 for $n = 500$ and with the original sample ($n = 40$), power = 0.27 for ($a = 0.05$). The moderating effect of FLEX on SHRK-COEF (H7) yielded power >0.99 ($a = 0.05$) for $n = 500$ and for the original sample ($n = 40$) the power was estimated to be 0.27 ($a = 0.05$). The detail of the test results is given in Appendix C. The above results showed that although the size of the original sample was relatively small, bootstrap validation based on re-sampling with $n = 500$ had provided sufficient statistical power to test the significance of the hypotheses.

5. Discussion and implications

5.1. Theoretical and managerial implications

While the importance of relational norms has been emphasized in previous literature, no empirical study has hitherto examined how individual modes of relational norms differ in their ability to mitigate opportunism risks. There is no empirical research that explains how to choose a particular relational norm for a specific type of opportunistic behavior in offshore software development. The primary objective of this research was to fill this research gap. We investigated the influence of individual modes of relational norms on opportunism and OSD success and how they differ in their influence. The differential impact of relational norms was articulated in our hypotheses and research findings. In particular, we hypothesized that all three modes of relational norms: solidarity, information exchange and flexibility will negate the effects of opportunism on OSD success; but for misappropriation of information assets, the norm of flexibility was not hypothesized to have any effect. We also hypothesized that solidarity and information exchange norms may have two sides of moderating effects on the relationship between misappropriation of information assets and OSD success.

Our results indicate that service provider's opportunistic behavior affected OSD performance directly, that the moderating influence of the norm of solidarity and the norm of flexibility on the relations between shirking and OSD success may outweigh the negative impact of shirking on OSD outcome. While it is not surprising to see the negative effects of shirking and misappropriation of information assets on OSD performance, what is more interesting is that individual modes of relational norms have moderating effects on the two types of opportunism in different ways: (a) the norms of solidarity is especially important to curb shirking behavior in OSD projects but it is not working in mitigating misappropriation of information assets; (b) the norm of flexibility only works on shirking behavior but is not able to circumvent misappropriation of information assets; and (c) the norms of information exchange does not help to mitigate both types of opportunism in OSD activities.

The norms of solidarity and flexibility create a cooperative as opposed to a confrontational environment for negotiating adaptations, thus safeguard the continuity of exchange which is subject to task ambiguity. This finding implies that when contract parties expect to preserve long-term relationship and they believe that rewards in the long term horizon will surpass the benefits from acting opportunistically in current contract, their inclination to renege on commitments can be curbed though not eliminated. The result highlights the need to create incentive for long-run relationship in offshored project management. There are many ways that firms can offer a 'bright future'' to the onset of the dark side such as repeated contracting of software development in the same functional domain and modular design of software components to increase the reusability of software.

Surprisingly, the analysis result shows that the coefficients of the two norms are positive but not significant. Because we have hypothesized two sides' effects of solidarity and information exchange, the positive coefficients imply that the positive effects of the relational norms supersede the negative one. However, the insignificant result implies that the benefits of the norm of solidarity and the norm of information exchange do not materialize when the client's major concern of opportunism is misappropriation of information assets by the service provider. These findings partly contradict the propositions by Clemons and Hitt (2004) and Aron et al. (2005), who suggest that relational norms circumvent poaching and misappropriation of intangible assets. One explanation for this counter-intuitive finding may be the nature of this kind of opportunism. Intangible assets shared and created in software development do not follow the same physical laws of property seen in other IT outsourcing contexts (Walden, 2005). The use of intangible assets is non-excludable and non-rival in consumption which means that the use of these assets by one entity does not preclude its use by other entities. Therefore, even if the client firm retains full rights of information assets, the service provider can still misappropriate assets in unauthorized contexts. Furthermore, misappropriation behaviors are most often unobservable and un-verifiable, thus the probability of getting caught and punished is very low. Absent effective punishment and enforcement systems, relational norms and self-enforcing mechanisms will not work well to curb misappropriation of information assets. The managerial implication of this finding is that instead of investment in OSD governance, client firms should invest more to enhance their project design capability. Clients who have good capability of modular design are able to control and protect their proprietary information assets.

Our hypotheses about the moderating effect of norms of information exchange on misappropriation of information assets were not supported. Software development projects often require face to face interaction between service providers and clients. It is quite costly to support site visits or sending a full-time project manager to work with service provider's employees (Rai et al., 2009). This kind of expenses is unexpected and can amount to surpass the cost-saving benefits from getting cheaper labour in foreign countries. Therefore, absent of effective information exchange system and routines, expectation of information sharing and cooperation will not be good enough to circumvent opportunistic behaviors in OSD projects.

Another explanation for the insignificant results is that inter-firm relational norms only control firm's opportunistic behavior but will not be able to deter service provider's individual employees from purposeful or accidental information leakage. Hoecht and Trott (2006) have shown that formal contractual controls and relational norms are of limited effectiveness on controlling information leakage. Companies need to rely on employee's self-awareness and social pressures which are based on individual's social ties and personal relationships. Different from traditional long-term relationship in IT outsourcing deals, most OSD contract are discrete where social ties are largely absent. Therefore the control over the behavior of IT employees depends almost exclusively on their internalization of professional norms (Hoecht and Trott, 2006). The misappropriation of information assets may still happen even the formal controls and inter-organizational relational norms are strong in an OSD relationship. While more work is needed to understand this finding, our work points to the necessity of taking into account both firm level of opportunism and employee's misappropriation opportunism in knowledge-intensive activities such as software development. Advising such a dual focus runs counter to the emphasis on the isolated influence of firm level control on opportunism in IT outsourcing literature. Research has not been reported about how to mitigate the misappropriation of information assets if former individual employees of service provider act opportunistically and cause damage to client firms. Thus, our study adds to the research agenda on the limits of individual modes of relational norms and calls for extending the theory of opportunism to include both firm level and individual level of considerations.

Although it is not our main objective, certain interesting findings regarding the role of contracts in outsourcing performance are pronged from this study. Contract adequacy did not have a direct significant impact on OSD success. However test of moderating effects of relational norms on the relationship between contract adequacy and OSD success showed that the norms of solidarity and flexibility complement contractual governance in preserving OSD performance. These findings from our empirical study are consistent with findings from the insightful work of Choudhury and Sabherwal (2003) and Poppo and Zenger (2002) which suggested that client firms would use a portfolio of formal and informal controls to ensure the success of OSD projects. An appropriate balance between formal contract and relational norms could have a significant positive impact on OSD success.

5.2. Limitations of the study

While the empirical results from our study are compelling, there are limitations that should be considered. First, the size of the data set used to test our models is small. Our data collection was restricted by several limitations pertaining to the socio-political sensitivity of offshore outsourcing. To overcome the potential limitation to generalization imposed by small sample, we chose PLS for path modeling and re-sampling using permutation and bootstrap techniques for validation. Following the guidelines to use model validation techniques using bootstrap and permutation methods (Hesterberg et al., 2006; Tenenhaus et al., 2005), we attained moderately stable results.

In addition, our study focussed only on US clients and their offshore software development relationships. However, client–service provider relationship and behavior in offshore outsourcing could vary based on geographical location (Lacity and Willcocks, 1998; Lee et al., 2004). Further, owing to confidentiality issues in offshoring, respondents were not mandated to disclose identity of service provider firms. Therefore our findings are restricted to US firms and their OSD relationships with service providers in unspecified geographical locations.

We may also experience sample selection bias, in the sense that successful offshoring firms may be more likely to participate and provide full information in the survey. Our survey research could be influenced by various response biases like halo effect although we randomized the items within the questionnaire to minimize the effects. Furthermore, our study does not include other constructs that may significantly affect software offshoring outcome. For example, managerial incentives, service provider's technology capabilities and project complexity could exacerbate software project cost overrun (Wallace et al., 2004).

5.3. Contributions and future research

Notwithstanding these limitations, our results provide some potentially provocative evidence on the moderating effects of particular relational norms on reducing behavioral risks and improving OSD performance. Our study contributes to the growing body of literature on IT outsourcing and offshoring by providing empirical evidences showing the interactions of behavioral risks and individual modes of relational norms in the context of offshore outsourcing. Previous studies in IT outsourcing considered relational norm as one construct. Instead of treating all relational norms together, our study identified the major modes of relational norms that could serve to circumvent particular opportunism. The findings suggest that the effects of individual modes of relational norms vary with the nature of opportunistic behavior and exchange context. While

the norm of solidarity and the norm of flexibility are useful for curbing shirking and preserving the cost efficiency of OSD projects, they may not work well to circumvent other types of opportunism which is difficult to identify and verify, such as misappropriation of information assets.

This work could be extended to develop and test risk mitigation models for other offshored IT services such as infrastructure management and application maintenance. Since various IT services differ in their nature and degree of risk (Beulen et al., 2005), a separate study is imperative to understand the role of contract and relationship on risk and their impact on IT offshoring success. This is particularly important for the growing service line of remote infrastructure management as the maintenance of mission critical IT services today move to offshore locations (Aundhe and Mathew, 2009). The hidden risks related to high turnover rate of service provider's employee and the employee mobility in offshore IT outsourcing, e.g., information leakage, have also received very little attention in literature. Future empirical investigations on service provider and employee's misappropriation of information assets are highly recommended.

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Appendix A. Correlations between measurement variables and latent variables

	SHRK	MIAS	SLDT	FLEX	INEX	COEF
SHRK						
SHRK4	0.96	0.43	−0.51	−0.43	−0.16	−0.48
SHRK3	0.86	0.35	−0.58	−0.36	−0.23	−0.30
SHRK1	0.81	0.33	−0.41	−0.33	−0.14	−0.20
MIAS						
MIAS1	0.45	0.85	−0.43	−0.26	−0.22	−0.34
MIAS3	0.24	0.79	−0.33	−0.03	0.08	−0.35
SLDT						
SLDT1	−0.53	−0.53	0.94	0.53	0.19	0.65
SLDT2	−0.49	−0.26	0.85	0.50	0.34	0.42
FLEX						
FLEX1	−0.45	−0.32	0.63	0.83	0.49	0.49
FLEX2	−0.30	−0.02	0.36	0.87	0.30	0.34
INEX						
INEX1	−0.20	−0.14	0.15	0.28	1.00	0.40
COEF						
COEF1	−0.24	−0.43	0.53	0.31	0.13	0.85
COEF2	−0.47	−0.38	0.55	0.60	0.20	0.88
COEF3	−0.41	−0.31	0.57	0.38	0.06	0.93

Appendix B. Results of common method bias analysis

Constructs	Items	Substantive factor loading ($R1$)	$R1^2$	Method factor loading ($R2$)	$R2^2$
Shirking (SHRK)	SHRK4	0.96*	0.93	0.57	0.32
	SHRK3	0.86*	0.74	0.57	0.33
	SHRK1	0.81*	0.65	0.37	0.14
Misappropriation of Information Assets (MIAS)	MIAS1	0.85*	0.72	0.60	0.36
	MIAS3	0.80*	0.63	0.37	0.14
SHRK × Solidarity (SLDT)	SHSL	1.00*	1.00	−0.05	0.00
SHRK × Flexibility (FLEX)	SHFL	1.00*	1.00	0.10	0.01
SHRK × Information Exchange (INEX)	SHIN	1.00*	1.00	0.56	0.32
MIAS × Solidarity (SLDT)	LCSL	1.00*	1.00	0.06	0.00
MIAS × Information Exchange (INEX)	LCIN	1.00*	1.00	0.51	0.26
Contract Adequacy (COAD)	COAD1	1.00*	1.00	0.06	0.00
Cost Efficiency (COEF)	COEF1	0.86*	0.73	−0.63	0.40
	COEF2	0.87*	0.75	−0.76	0.58
	COEF3	0.93*	0.87	−0.74	0.54
Average		0.92	0.86	0.11	0.24

* $p < 0.05$.

Appendix C. Statistical power test results for bootstrapped sample (n = 500)

	μ	w	$v = n - u - w - 1$	f^2	$\lambda = f^2(u + v + 1)$	Power test
H1: SHRK-COEF	1	0	498	0.32	159.6	>0.995(a = 0.05)
H2: LCIA-COEF	1	0	498	0.31	154	>0.99(a = 0.05)
H3: SHRK * SLDT-COEF	2	1	496	0.047	23.39	>0.99(a = 0.05)
H7: SHRK * FLEX-COEF	2	1	496	0.055	27.74	>0.99(a = 0.05)

Note: μ is the number of independent variables; w is the number of moderators; v is the number of numerators for the error variance; λ is the non-centrality parameter; and the power test is based on Cohen's (1998) power table (p. 420–423).

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