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Coordination in Business Process Offshoring

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Abstract:
We investigate coordination strategies in the remote delivery of business services (i.e. Business Process Offshoring). We analyze 126 surveys of offshored processes to understand both the sources of difficulty in the remote delivery of services as well as how organizations overcome these difficulties. We find that interdependence between offshored and onshore processes can lower offshore process performance. Investment in coordination mechanisms such as modularity, ongoing communication and generating common ground across locations ameliorate the performance impact of interdependence. In particular, we are able to show that building common ground – knowledge that is shared and known to be shared- across locations is a coordination mechanism that is distinct from building communication channels or modularising processes. Our results also suggest the firms may be investing less in common ground than they should.

Keywords: Coordination; offshoring; modularity; common ground; interdependence

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INTRODUCTION

The relatively young phenomenon of Business Process Offshoring (BPO) offers an interesting context in which to re-examine a fairly old, but central problem in the study of organizations- how interdependent activities are coordinated (March and Simon, 1958; Thompson, 1967). In BPO, activities that hitherto were performed collocated with their connected activities are moved to different locations, typically to lower wage economies. Since several of the linked processes continue to be performed onsite after the focal process is offshored, managing these interdependencies is essential. Yet the communication constraints posed by geographic distance and differences in time zones make this a non-trivial problem (Kraut et al, 2002; Armstrong and Cole, 2002). The purpose of this paper is to understand the mechanisms that enable offshored business processes to be coordinated with those retained on-shore, as well as the relative effectiveness of such mechanisms.

To see why an analysis of coordination mechanisms in the BPO context is not only topical but also has immense academic value, it is useful to revisit some basic theoretical generalizations about how coordination takes place in organizations. Coordination depends on the creation of reciprocal predictability of action and is necessary whenever actions are interdependent – i.e., when the outcomes of actions taken by A depend in some way on the actions taken by B (Thompson, 1967; Heath and Staudenmayer, 2000; Gulati, Lawrence and Puranam, 2005). In general more complex forms of interdependence require greater efforts at achieving coordination (Van de Ven et al, 1976; Tushman and Nadler, 1978). This has led scholars to propose two generic strategies for coordinating interdependence: either redesigning tasks to minimize interdependence or alternatively creating opportunities for extensive communication among interdependent actors so that they achieve reciprocal predictability of action. The well known dichotomies of coordination by plan vs. feedback (March and Simon, 1958; Thompson, 1967; Tushman and Nadler, 1978), modular vs. integral designs (Baldwin and Clark, 2000; Sanchez and Mahoney, 1996) and loose vs. tight coupling (Orton and Weick, 1990) reflect these twin approaches to coordinating interdependence that have been widely recognized as well as advocated.

However, a new and exciting stream of recent research suggests the possibility of a third approach – in which coordination is achieved in situations of high interdependence in a *tacit* manner - without recourse either to explicit communication, or through redefining work to minimize interdependence. Instead, in this approach, interdependent individuals are able to coordinate their activities largely by relying on common knowledge formed by other means. While the notion of tacit coordination based on shared knowledge - such as focal points, conventions and precedents- has been well known at least since Schelling's pioneering work (1960), it is only of late that scholars have begun exploring this form of coordination in greater detail. In laboratory settings, there are now a substantial number of studies that have analysed the aids and impediments to tacit coordination (see Camerer, 2003 for an overview), and scholars in the fields of linguistics (Clark, 1996) and organizations (Bechky, 2003; Puranam, Singh and Chaudhuri, 2008) have begun to examine how some forms of commonly known knowledge may economize on the need for explicit communication or coordination mechanisms even in situations of complex interdependence.

The prospect of coordination with limited communication is of particular interest in the context of remote service delivery (as in BPO). Geographic distance necessarily places the burden of communication across locations on information and communication technologies, but even the most advanced of these are very poor substitutes for collocated face-to-face communication (Kraut et al, 2002; Olson et al, 2002). The advantages of being able to coordinate interlinked but geographically dispersed processes with limited communication are therefore obvious. Indeed, there is some evidence based on laboratory and case studies, that tacit coordination based on some form of common knowledge plays an important role in coordinating geographically distributed activity (Gutwin et al, 2004; Crampton, 2001).

Our goal in this paper is to offer a comparative analysis of all three generic approaches to achieving coordination – modularity, communication and common ground. We use survey data from 126 offshored software, back-office and contact centre processes to test the impact and the relative efficacy of the three generic coordination strategies. We are able to show that the three generic coordination approaches are empirically distinguishable. While each helps to manage interdependence across locations, the most effective appears to be tacit coordination based on common ground. Our results have important implications for both scholars interested in understanding coordination within and between organizations, as well as practitioners who wish to improve the performance of BPO activities.

The rest of the paper is organized as follows. In the next section we present our research hypotheses. Next we present our sample and analysis techniques followed by our findings. Finally, we present a discussion of these findings, conclusions and directions for future research.

THEORY AND HYPOTHESES

The sourcing of any process can be discussed along two dimensions – that of ownership, (i.e., who executes the process) and geography, (i.e., where is the process executed). Offshoring involves the geographic distribution of a process, typically to a low wage location, regardless of whether the process is in-house or by a 3rd party vendor. Interdependence between processes is likely to be a significant impediment to offshoring, since interdependence imposes the need for ongoing coordination between the offshored process and remaining onsite processes in order to produce the goods/services required by the customer. Interdependence between the focal activity and surrounding activities gives rise to the need to coordinate across activities (Clark and Fujimoto, 1991; Wheelwright and Clark, 1992).

When a process that has high interdependence with its context (or surrounding activities) is offshored, its performance is therefore likely to critically depend upon the ability of the onsite and offshore locations to coordinate their actions for the continued production of the service. The higher the interdependence between the onsite and offshore locations, the more likely is coordination failure and lowered performance, unless coordination mechanisms are implemented to fully account for such interdependence.

Coordination by plan: As March and Simon remind us, as long as the patterns of interaction are stable, coordination could be achieved by following pre-specified standard operating procedures (March and Simon, 1958; Thompson 1967). The well developed literature on modularity helps us understand how such planned coordination mechanisms may be applied to offshoring. The essence of the modularity argument is that a system of activities can often be decomposed into sub-systems (also known as modules or components), such that activities within a component are highly interdependent with each other, but there are few dependencies between activities that are part of different components (Baldwin and Clark, 2000; Langlois, 2002). The power of a modular system lies in the realization of interfaces that are well specified – i.e., when the nature of all interactions between modules can be specified ex-ante in rules and procedures, such that there is no need for ad-hoc unstructured information transfer between the two modules. A well-specified interface thus limits interactions between modules, reducing the amount of coordination necessary between adjacent activities (Baldwin and Clark, 2000).

Modularity is expensive to accomplish. Modularity typically implies upfront investment in generating detailed knowledge about the process and its surrounding activities and understanding the nature of interdependence between them. Only with such investment can the tasks be divided into appropriate modules and the interfaces can be specified such that unstructured interdependence across modules is minimized or eliminated. Therefore, investment in modularising business processes to be offshored may be useful in mitigating the negative performance consequences of interdependence between offshored and retained onshore processes. We formalize this as follows:

Hypothesis 1: *Investment in modularizing offshored processes weakens the negative impact of interdependence between offshored and onshore processes on post offshoring process performance.*

Coordination by Communication: While modular solutions critically depend on well specified interfaces, it may not be always possible to identify the correct modular structure and create these interfaces (Ethiraj and Levinthal, 2004). The first limitation to achieving completely modular solutions is bounded rationality of the individuals who design the modular system. Second, modular architectures cannot be fully specified when faced with uncertainty. Uncertainty leads to less than complete specification of the interface and changing circumstances would require re-specifying the interface. Finally, while such extensive specification is conceivable in very simple processes, it is likely to become very expensive for processes with even moderate levels of interdependence. Hence, large investments may be required to create a modular solution, and these costs are likely to increase sharply with interdependence.

The above considerations suggest that in offshoring situations, after an effort is made to partition activities into modules with little interdependence across locations, there will typically remain some residual interdependence that needs to be coordinated for successful service delivery. This suggests an important role for the second generic coordination strategy – "feedback" or ongoing communication across the interdependent units.

When interdependence cuts across locations, whatever communication occurs must necessarily be by means of ICT tools such as email, telephone, pager, videoconference, computer conference etc. Indeed the "null hypothesis" in the minds of most practitioners as well as researchers regarding what enables remote coordination is "ICT enabled feedback": i.e., remote teams making use of the increasing sophistication and availability of ICT enabled communication tools to coordinate their activities. We therefore expect that in the offshoring context, investments in providing channels of ongoing communication across locations should help to mitigate the coordination challenges created by interdependence. Applied to the offshoring setting, these investments include the provision of IT infrastructure such as special applications, the need for high bandwidth tools (such as videoconferencing, Net meeting) and high capacity lines that make these tools operational, as well as training personnel in remote collaboration techniques (such as active listening, role playing) that allow them to be effective in interdependent tasks without being collocated (Kraut et al, 2002).

Hypothesis 2: *Investment in facilitating ongoing communication between the onsite and offshore locations weakens the negative impact of interdependence between offshored and onshore processes on post offshoring process performance.*

Coordination by Common Ground: In addition to the two generic strategies of coordination by plan and feedback discussed in hypotheses 1 & 2, recent research suggests that *tacit* coordination may be achieved under conditions of high interdependence without the need for communication, but by relying on mechanisms that generate common ground across interdependent actors. In BPO, coordination may be achieved by generating common ground across locations that forms the basis for accurately predicting actions of interdependent others across geographies. While communication is the fastest mechanism to create common ground (Clark, 1996), it may also be generated by other mechanisms such as ensuring visibility of information across locations, prior shared experience and reliance on common procedures to perform tasks across locations (Gutwin et al, 2004; Crampton, 2001).

Clark (1996) extensively discusses the concept of common ground in his analysis of communication using language as a coordination game. He defines common ground between two people as "the sum of their mutual, common or joint knowledge, beliefs and suppositions" (Clark, 1996; p93)[1]. Clark explains the need for common ground for coordination thus:

> In any joint act, participants face a coordination problem: what participatory actions do they expect each other to take? To solve this problem, they need a coordination device – something to tell them which actions are expected. …Everything we do is rooted in information we have about our surroundings, activities, perceptions, emotions, plans and interests. Everything we do jointly with others is also rooted in this information, but only in that part we think they share with us. [p91-92].

Common ground is this shared information that allows participants to anticipate each other's actions and correctly interpret their communication. Clark's (1996) focus is on the use of communication as the mechanism to build common ground. Communication is a powerful coordination technique precisely because in most situations it is the quickest means of establishing the necessary common ground. Communication is often broader than verbal discourse; sometimes rich media are necessary to convey meaning that is not possible with just verbal cues.

However, communication is not necessary to achieve coordination if there is a pre-existing stock of common ground. Clark (1996) argues that common ground from prior knowledge arises from belonging to a common category, such as nationality, race, gender, culture, profession, residence, hobby, religion etc., (in which case he refers to it as communal

[1] This concept of common ground is closely related to the economic concept of common knowledge. Common ground defined as iterated propositions (Clark, 1996, p95) is exactly the same as common knowledge. However, common ground can also be defined from a shared basis or as reflexive. Clark suggests that common ground as iterated propositions is psychologically infeasible (p96). Aumann and Brandenburger (1995) similarly suggested that "mutual knowledge" which is identical to common ground reflexive is adequate for the economic theories of coordination games and the more restrictive definition of common knowledge is not necessary.

common ground), or it could arise from prior interactions and shared experience, (in which case he calls it personal common ground).

Common ground achieves informal coordination since the actions are aligned not because they are mandated by formal procedures, but because *individuals share sufficient knowledge that enables them to anticipate and adjust actions on an ad-hoc as needed basis*. Since this mechanism relies on shared knowledge rather than ex-ante specified procedures, coordination by common ground is likely to be more robust to uncertainty or changing circumstances.

Prior researchers have discussed the importance of common ground for coordination both in collocated as well as geographically distributed settings. Studying collocated teams, Bechky discusses how common ground in the form of role structure helps achieve coordination in film crews (Bechky, 2006). Similarly, the literature on transactive memory systems (TMS) discusses coordination among small groups of collocated members without the need for communication since they have developed pre-existing knowledge of each others expertise based on prior shared experience (Moreland 1999).

The importance of common ground to achieve coordination is also documented in geographically distributed settings. Crampton (2001) and Weisband (2002) show how the lack of "mutual knowledge" or information that is not mutually shared in virtual teams leads to coordination failure in such teams. Gutwin et al (2004) discuss how visibility of work by other contributors in code repositories and CVS logs generates "awareness" that helps achieve coordination in the open source software projects they studied. The above literature suggests that common ground may be achieved across locations in offshored settings by reliance on shared work procedures, enabling visibility of information across locations and by relying on prior shared experience. Finally, the literature on virtual groups suggests that limited travel, especially at the beginning of the project may be important in generating such common ground across locations (Carlson and Zmud, 1999; Armstrong and Cole, 2002).

Thus analogous to investments in modularity and communication, we expect that investments in the creation of common ground have a similar ameliorating effect on the negative performance consequences of interdependence. We therefore predict:

Hypothesis 3: *Investment in creating common ground across locations weakens the negative impact of interdependence between offshored and onshore processes on post offshoring performance.*

Figure 1 schematically shows the above hypotheses we intend to test in this paper. [2]

The next section discusses the empirical methods used to test these hypotheses, and the one after discusses the findings from this study.

Methodology

SAMPLE AND DATA COLLECTION

To test the above propositions we collected survey data from managers of offshored processes from a number of client and vendor organizations. The target population was managers who had primary responsibility for the delivery of an ongoing service from an offshore location for an IT, back office or call centre process.

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[2] Please note that in this work, we am not proposing or testing any 'main effects' of coordination mechanisms, since we do not expect any theoretically. This is because, each of these coordination mechanisms is expensive to deploy in organizations and therefore have to be tailored to the level of interdependence that actually exists. Therefore, any test of whether increasing modularity, communication or common ground lead to a secular increase in performance is not likely to result in any meaningful results. This is similar to work in organization design or media richness theory. Contingency theory suggests that centralization or decentralization (or mechanistic or organic structures) does not automatically lead to better performance, but depends on the level of uncertainty (Burns and Stalker, 1962; Tushman and Nadler, 1978). In media richness theory, the choice between poor and rich media is made based on the level of ambiguity or equivocality. High richness does not always lead to high performance (Daft and Lengel, 1984; 1986). Similar to these studies, since we are proposing a contingency argument involving use of coordination mechanism based on the level of interdependence, we do not propose any "main effects" in this paper.

Offshore services can be divided into two categories – content development and service provisioning. Content development involves generation of content to pre-defined specifications on a one-time basis such as in market research or software development. The service provider is free to choose any method to create the output as long as it adheres to pre-specified agreements regarding the outcome. Service provisioning on the other hand involves ongoing delivery of service from a remote location and therefore implies the specification of not only the outputs but also the process by which the output is generated. Interdependence across locations and the need for ongoing coordination is much higher for service delivery. Therefore, in this paper we focused on service provisioning as the population of interest. Processes involving service provisioning include maintaining IT systems from offshore locations, contact centres that provide services such as handling inbound enquiries, making telesales calls, and performing back office operations such as accounting, check clearing etc.

The sampling frame was the set of firms that provided or received offshore service delivery from India, identified though public announcements between 2000 and 2005. Since India accounts for 65% of global offshore IT industry and 46% of the global BPO industry (NASSCOM-McKinsey Report, 2005), restricting the sample to just firms with an Indian connection does not come at the cost of reduced generalizability. By searching for public announcements of offshoring of services during the specified time period we identified 44 firms, of which 17 firms agreed to participate in this research[3]. We received completed surveys for multiple processes from each firm, for a total of 126 surveys[4], thus allowing us to control for firm specific factors in the analyses. We received information about 42 IT, 54 back office and 30 call centre processes.

[3] We performed tests for non-response bias. The Kolgosmirov-Smirnov non-parametric tests for differences in distribution of size (as number of employees or sales revenue) between the responders and non-responders were not significant.
[4] Data limitations reduced the effective number of observations for some analyses.

The survey instrument was designed using items from prior studies where available, and on the basis of interviews conducted in a related qualitative study where prior items were not available. The interviews were especially useful in classifying the types of effort involved in migrating processes from their original location to the offshore location, such as knowledge capture, modularization etc.

The survey was piloted with several managers to remove ambiguities and examine the face-validity of our measures. The managers who provided feedback on the survey items were different from the survey respondents. We used the insights from the pilot study experience to reword some questions as well as add appropriate comments next to some items using the comment feature in MS Word as additional help for respondents to interpret the questions. These comments were also piloted with managers before the surveys were sent to respondents. Finally, in order to reduce response bias, we used multi-item scales for most constructs and used multiple response formats.

For each offshored process, the questionnaire requested information on the knowledge characteristics of the process before offshoring, the effort spent on migrating the process, and performance of the process in steady state. Since many of the measures are subjective, to avoid common method bias, two different individuals who had knowledge about the process completed each questionnaire. Part A of the questionnaire requested information on process characteristics before offshoring and the steps taken to migrate the process from its original location to the offshore location. Part B requested information on the steady-state performance of the process. However, for 15 surveys, the same person completed both parts of the questionnaire. This was mainly because another person who had knowledge of the process was not readily available[5]. However, for these single respondent surveys, the two

[5] The high growth and the very high attrition rates of over 35% in the Indian BPO industry mean that when a manager quits, there is often no one available who has knowledge about the history of the process and its performance except the other respondent.

parts were completed at different times, after an effort was made to identify another suitable respondent, and none was found. Our results are robust to dropping these observations.

MEASURES

Each respondent first answered some general questions about the offshored process such as process size, its location pre- and post offshoring, the length of time spent in preparing the process for offshoring and the time this process has been operating in steady state at the offshore location. The respondents then answered detailed questions about the nature of the process pre-offshoring, the steps taken to migrate the process and its performance post-offshoring. We used multi-item formative scales for all constructs. Where possible, we also measured some constructs using objective information.

We measured the reliability of the constructs used in the analyses by using both Cronbach alpha and performing confirmatory factor analysis. Nunnally and Bernstein (1994) suggest that alphas higher than 0.7 are acceptable in most cases[6]. Therefore, in this research we use an alpha of 0.7 as the cut-off value to accept a scale. All confirmatory factor analyses reported here were performed using AMOS v6.0. We used two measures of fit provided by AMOS to judge the models: Comparative Fit Index (CFI) proposed by Bentler (1990) and the minimum discrepancy divided by the degrees of freedom for the model (CMIN/DF), proposed by Wheaton et al (1977). Models with CFI closer to 1.0 than 0 are considered to have good fit (Bentler, 1990). Values of CMIN/DF less than 5 are considered reasonable for macro constructs (Wheaton et al, 1977; Marsh and Hocevar, 1985). Table 1 lists the items for each measure as well as measures of their reliability.

Dependent Variables

Steady State Performance of the process post-offshoring

The dependent variable is the steady-state performance of the process from the offshore location. We measured performance along the following four categories (1) cost savings, (2) service quality improvements, (3) rapid growth and (4) overall satisfaction with the service. We decided to specifically focus on these categories since our interviews as well as prior studies of offshoring (Srikanth et al, 2006; Scott, 2005) suggested that these capture the motives for offshoring for a large majority of the firms. These four items produced a single scale with Cronbach's alpha = 0.72. In a confirmatory factor analysis, all items loaded on a single factor with a CFI of 0.97 and CMIN/DF of 2.7.

Independent Variables

Process Interdependence

Process interdependence was captured using two items that measured the intensity of interactions between focal process with other processes, and the magnitude of cascading effects of process changes across its linked processes. These items were adapted from prior literature to make them applicable to the offshoring setting (Zander & Kogut, 1995; Gatignon et al, 2002). Since these two items capture different dimensions of interdependence of the focal process, we created this measure by adding the scores on each item. In the data, the correlation between these two items is 0.4, showing that these do capture different aspects of interdependence. Robustness checks using the average of these two items, and the effect of each individual item show similar results.

Investment in Modularity

Five survey items were used to measure the extent of investment in modularizing the process during transition. These items were created based on our fieldwork in the offshoring setting as well as adapting items from prior literature to the offshoring setting (Sobrero and

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[6] Higher alphas of around 0.9 are expected only when measuring personality-type constructs intrinsic to an individual such as self-motivation, self/other orientation, etc.

Roberts, 2001; Gulati et al, 2005). The Cronbach alpha of 0.88 for this scale indicated a good fit. Confirmatory factor analysis resulted in a CFI 0.92 indicating a very good fit, though CMIN/DF was 5.9 indicating a poor fit.

Investment in Remote Communication

Four items were used to measure the extent of investment in ongoing communication between the onsite and offshore locations. The items, created based on our fieldwork in the offshoring setting as well as from prior studies on virtual teams (Weisband, 2002; Kraut et al, 2002). The Cronbach alpha for this scale was 0.75 indicating a satisfactory fit, while confirmatory factor analysis indicated a good fit with a CFI of 0.98 and CMIN/DF of 2.0.

Investment in Common Ground

Six survey items captured the extent of investment in creating common ground during transition and afterward. Since the survey based measurement of common ground is novel to this study, the items used to measure this construct are explained in detail below. Prior work as well as our field research suggested that common ground is built by:

a. enabling mutual knowledge of decision making procedures - by enabling an understanding decision making procedures, and cultural training (Schelling, 1960;)

b. the ability to make actions transparent across locations - by investment in technology tools (Gutwin et al, 2004; Bechky, 2003)

c. enabling mutual knowledge of individuals idiosyncrasies - typically by investment in shared work experience (Hollingshead, 1998; Crampton, 2001)

d. the knowledge to easily interpret communications across locations by using a shared vocabulary (Clark, 1996)

Since initial travel at the beginning of the project is used as a compensating mechanism when requisite common ground for coordination is not already present (Carlson and Zmud, 1999; Armstrong and Cole, 2002), we also measured the level of such compensatory travel[7]. The Cronbach alpha measure for reliability of this construct is satisfactory (ά = 0.81). Confirmatory factor analysis with a single factor had a CFI of 0.87 and a CMIN/DF of 4.0, indicating acceptable fit.

Discriminant Validity among the Coordination Mechanisms

One of the contributions of this paper is to establish a measure for common ground and show that it is a distinct coordination mechanism from modularity and communication. For this purpose we carried out further analyses to establish discriminant validity between these constructs. In confirmatory factor analysis, all three constructs were entered as endogenous variables and their respective items as observed variables. The three factor model allowing co-variation between the constructs has vastly superior goodness of fit over the single factor model. The CFI and CMIN/DF were respectively 0.89 and 1.9 for the multi-construct model, compared to 0.54 and 4.5 for the single construct model. In the multi-construct model, the co-variances between each pair of constructs were also significantly different from 1.0, again showing discriminant validity. The multi construct model had significantly better fit on all measures than any of the single construct models since the former accounts for both the distinct constructs as well as the correlations between them.

To ensure discriminant validity between communication and common ground, we carried out a procedure similar to the above, where just communication and common ground were the endogenous constructs. Again, the two-factor solution had superior goodness of fit with a CFI of 0.85 and CMIN/DF of 2.74 over a single factor solution with CFI of 0.7 and

[7] We checked to understand if our results are primarily driven by the travel related items. Our results are robust to eliminating this item as well as the item involving shared work experience from the common ground measure.

CMIN/DF of 3.7. The covariance between the two factors of 0.7 is significantly different from 1.0, establishing discriminant validity.

Control Variables

Size of the process: Size is measured as the log of number of full time equivalent employees that are employed in the process.

Maturity of process offshore: Maturity of the process offshored is measured as the time since steady state operations were achieved in the offshore location for this process.

Migration Time: The time taken to migrate the process is likely to affect the nature of operations offshore and any efforts taken to mitigate post offshoring coordination difficulties.

Process Type: The data consists of IT, back office and contact centre processes. The effects of the process types are controlled for using dummy variables.

Process Knowledge Stickiness: While process interdependence is the characteristic of interest in this paper, process stickiness is another characteristic that could significantly affect process performance. Knowledge stickiness impedes the transfer of knowledge necessary for executing the process from one set of personnel to another set of personnel (Szulanski, 1996; Zander & Kogut, 1995; Birkinshaw et al, 2002) – in this case from onsite personnel to offshore personnel. It is therefore important to control for the effects of knowledge stickiness, since low performance of the offshored process could result from the inability to transfer the knowledge required to execute the process rather than the inability to coordinate between the onsite and offshore locations.

To measure knowledge stickiness we used seven items from the literature that capture tacitness, codifiability, causal ambiguity, and social complexity (Szulanski, 1996, Zander & Kogut, 1995). The Cronbach alpha for this scale was 0.82 indicating satisfactory fit. Confirmatory factor analysis indicated an good fit with a CFI of 0.96 and a CMIN/DF of 1.8.

Knowledge Transfer efforts: Prior literature has suggested a number of mechanisms that are useful in transferring sticky knowledge (Szulanski, 1996; Zander and Kogut, 1995). We used two items capturing the dimensions of close observation and process mapping and documentation[8].

ANALYSIS TECHNIQUES

The hypotheses predict that the effects of interdependence will be moderated by the type of investments in migrating the process from onsite to offshore locations. We test these hypotheses using OLS regression models. Since the data contains multiple processes from each firm, we control for the resulting non-independence of observations by clustering the standard errors for each firm. We examined the presence of firm effects by analysing both fixed effects and random effects models. In both cases, model results suggested that the null hypothesis that all the firm effects are not different from zero could not be rejected. This is not surprising since most of the data come from vendors for processes they perform for several clients. It is likely that across client firm differences are larger than across vendor differences. To harmonize the different scales and make interpretation easier, we use standardized items in the analyses.

Findings

SUMMARY STATISTICS

Table 2 reports summary statistics and Table 3 the pair-wise correlations between the variables used in the analysis. Inspecting the descriptive statistics, we see that there is considerable variation in the important independent variables – the investments in modularity, ongoing communication and common ground. The processes also vary widely in other

[8] The items have very low correlation of 0.23 and have poor fit in confirmatory factor analyses. This is mainly because different firms and different process types emphasize different means of transferring knowledge: some

characteristics such as size, maturity and migration effort. Inspecting Table 3, the low correlations between most of the independent variables suggests that collinearity is not a significant concern for analyses. However, we note the expected very high correlation between the interaction terms.

HYPOTHESES TESTING

The modularization process occurs (if it does) during process transition and migration. In contrast, communication and common ground play a role in coordinating across locations only after any modularization efforts. We therefore first test hypothesis 1- the effect of modularization and interdependence on process performance (Table 4), and then test the effects of communication and common ground (hypotheses 2 and 3) conditional on modularity (Table 5).

Table 4 reports OLS models in which the dependent variable is post-offshoring performance. Model 1 is the baseline that reports the effect of all control variables. We find that of the control variables, only the time taken for migration and type of process adds any explanatory power to the models. Processes that take longer to migrate have poorer performance: since more complex and difficult processes are likely to take longer to migrate, it is possible that they also have poorer performance. IT processes in general seem to have poorer performance than other types of processes.

Preceding the test of our hypotheses, we add the main effects for interdependence followed by coordination mechanisms. Inspecting model 2 in Table 4, we find that interdependence of the process with other processes has a strong negative relationship with outsourced process performance. This direct relationship validates our fundamental premise that it is harder to coordinate processes with high interdependence across locations.

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rely on close observation and not much documentation and vice versa, others rely on study and examination type methods.

Interestingly, in the same model, we notice how process knowledge stickiness has no significant relationship to post-offshoring performance. Also, inspecting model 3 in Table 4 we find that efforts at modularization ("Modularity") has no main effect on process performance. The first hypothesis suggests that as process interdependence increases, increasing investments in modularity lead to higher performance post offshoring. Model 4 in Table 4 shows that the interaction term between modularity and process interdependence is positive and significant, supporting the first hypothesis.

The second and third hypotheses predict that investments in ongoing communication and generating common ground across locations positively moderate the impact of process interdependence on post offshoring performance. Model 1 in Table 5 adds the main effects of communication and common ground, in addition to modularity, and none of these effects are significant. In model 2, Table 5 we find that the interaction term between communication and interdependence is positive and significant as expected from the second hypothesis. Hypothesis 2 is therefore supported. In model 3, Table 5 we find a positive and significant coefficient of the interaction term between common ground and interdependence, providing support for the third hypothesis.

One of the main aims of this paper is to empirically measure common ground and demonstrate its value in coordinating process across locations. Note that in Table 5 we have the most conservative econometric specifications. In these results we control for other interventions that may affect process performance: such as investments in modularity and ongoing communication, as well as knowledge transfer efforts, while testing for the interaction effect of common ground and process interdependence on performance. Finally, as an additional specification, we tested the interaction effect of both communication and common ground together by specifying both interaction effects in the same model. Model 4 in Table 5 shows that both the interaction terms, though having a positive sign are not significant. As noted earlier, since the correlation between the two interaction terms is high at 0.7, we suspect that multicollinearity is inflating the standard errors and making it harder to detect their independent effects. A joint test of just the two interaction terms is significant ($F(2,15) = 3.96$; p-val = 0.04).

The above results suggest that common ground and communication have the hypothesized positive moderation effects on the relationship between interdependence and process performance, as does modularization effort. We present several checks on the robustness of these results in the next section.

ADDITIONAL ANALYSES & ROBUSTNESS CHECKS

Apart from the above measures of investments in the coordination mechanisms, the respondents were also requested to provide the percentage of transition effort that was spent in modularity, ongoing communication, generating common ground and knowledge transfer efforts. These form alternative measures for the investments in the coordination mechanisms, and we tested the hypotheses with these effort measures rather than with the "item" based measures as reported above. Table 6 and 7 replicate the models in Table 4 and 5 with these new measures. The strength of these measures is that they allow us to explore the impact of the relative levels of investments in these coordination mechanisms as opposed to the absolute levels of investment. The results from the two measures are therefore not directly comparable, but can help generate some additional insight over what we learn from the item measures.

From Model 4 in Table 6 we see that the interaction term for the effort spent in modularity, though positive is not significant, unlike the results reported above. This suggests that the level of relative investment in modularity (as opposed to communication and common ground) in our sample is about right- performance cannot be improved by increasing or decreasing investment in modularity relative to other mechanisms. In Model 2 in Table 7 we see that the interaction term for ongoing communication is significant but negative. This suggests that proportionally increasing investment in ongoing communication at the expense of the other mechanisms harms performance, and that in our sample, firms are on average spending relatively more on communication than they should. From model 3 in Table 7, we see that the interaction term for common ground is positive and significant, which indicates that they should be spending even more on building common ground than they currently are. From model 4 in Table 7, we see that when the interaction terms for both communication and common ground are present in the model, the interaction term for communication is negative and not significant, while for common ground is positive and significant. A joint test of these two interaction terms is highly significant ($F(2, 15) = 11.9$; p –val =0.0008). This suggests that increasing effort in common ground at the expense of modularity and communication is beneficial to achieving coordination in interdependent processes, while increasing effort in communication at the expense of common ground lowers performance. These results cumulatively suggest that common ground is an extremely important mechanism in achieving coordination of distributed processes with high interdependence.

Though not formally hypothesized, the theory section suggests that the problem of knowledge transfer is distinct from the problem of ongoing coordination in BPO. The theory also suggests that transition activities needed to achieve ongoing coordination are likely to be distinct from those that mitigate the impact of process stickiness. Based on prior theory, we expect that "knowledge extraction" procedures that either reduce stickiness (such as documentation) or help in transferring sticky knowledge (such as direct observation and working closely with current process experts) would positively moderate the impact of knowledge stickiness on post-offshoring performance (Szulanski, 1996; Zander & Kogut, 1995; Birkinshaw et al, 2002). We also expect that the three coordination mechanisms discussed above would not impact the performance of sticky processes. We examine these ideas through our results in Tables 8 and 9. While model 2 in Table 8 suggests that stickiness does not have a direct impact on post offshoring performance, model 4 in Table 8 shows the positive and significant coefficient for the interaction term between stickiness and knowledge extraction. The models in Table 9 show that the coordination mechanisms, modularity, communication or common ground have no impact on performance, none of the interaction terms are significant. These results suggest that the problem of knowledge transfer and that of ongoing coordination are quite distinct.

Alternative Specifications

To test the robustness of our findings we tried to reproduce the above results reported in the hypothesis testing section for alternative measures of interdependence, using only the first item, only the second item and the average of the two items respectively. In all specifications, investments in common ground and modularity positively moderate the impact of interdependence on performance. The evidence for moderating effects of communication are less robust. We also tested our results for alternative specifications of common ground, in which the two travel-related items (items 3 and 4) are removed. Our results are robust to all these different specifications. Finally, to identify whether a few observations are influencing our results (i.e. for outliers), we constructed bootstrapped estimates of our coefficients and standard errors. The bias in our coefficients for all variables are less than $1/10^{th}$ the bootstrapped standard errors, showing the robustness of our results.

DISCUSSION AND CONCLUSIONS

The primary purpose of the quantitative study was to investigate in a field setting the performance consequences of investment in three coordination strategies, modularity, ongoing communication and generating common ground, as a function of the interdependence between the process to be offshored and processes that stayed onshore.

The results show that common ground is a distinct coordination mechanism that can be empirically distinguished from modularity and ongoing communication. The results also suggest that investments in modularity, ongoing communication and common ground are effective in coordinating across geographic distance for an interdependent process. The interaction effects of the coordination mechanisms and interdependence is graphically shown in Figure 2.

Interestingly, the results also suggest that firms in our sample over-invest in communication and under-invest in common ground. We acknowledge that correlations are not causation, but do believe our results are strongly suggestive. Finally and quite unsurprisingly, we find that none of the coordination mechanisms have any influence on the relationship between process knowledge stickiness and performance. Only knowledge transfer mechanisms ameliorate the effect of stickiness on performance. These procedures however have no influence on the impact of process interdependence.

To summarize, our results lead to the following conclusions. First, interdependence between offshored and onshore processes can lower offshore process performance, which prior theory strongly suggests is due to coordination problems. Second, modularization, communication and common ground are conceptually as well as empirically distinct coordination mechanisms. Third, all of them can be shown to mitigate the coordination problems that interdependence creates in the context of offshoring. Fourth, these coordination mechanisms are not useful to overcome knowledge stickiness, just as knowledge extraction methods (which can deal with stickiness) are not useful to manage interdependence. This reinforces the distinction between knowledge transfer and coordination problems. Fifth, it appears that at least in our sample, the tendency is towards over-investment in communication channels at the expense of building common ground.

This study is subject to a number of limitations. First, the majority of our data comes from vendor companies. While vendors should have an accurate knowledge of the state of the process prior to offshoring since they observe it in action at its original location during migration, it is likely that their perceptions are biased toward exaggerating how dysfunctional the processes were prior to them taking it over, and to overstate current performance. We do try to correct for this bias by introducing a dummy variable in our analysis that takes into account whether a client or vendor completed the survey. This dummy is not significant, suggesting that a bias may not exist; however it does not substitute for having responses from both parties to the transaction. Second, it is unclear how much of the investment in modularity, and especially in ongoing communication and common ground occurred during transition rather than after, when coordination difficulties were experienced. From this data we cannot conclude whether it is better to first modularize the process efficiently and then use common ground for residual interdependence or if it better to only invest in common ground. Longitudinal data collected at each state of the movement of a process, such as pre-transition, migration, post-transition, and steady state would help alleviate these problems. Finally, investments in modularity, communication and common ground are endogenous. Therefore we can only make a correlational argument rather than a causal one for the observed relationships. However, we are confident about the basic validity of these results: we have controlled for obvious alternative explanations such as the stickiness of knowledge, process type and complexity (as proxied by migration time).

Perhaps, most importantly, our fieldwork in the IT services offshoring setting also suggests the basic validity of these propositions and results. In field work accompanying this study, we discovered that that communication between the onshore and offshore teams is rather limited because of the time difference between the two locations, a theme well known in the literature on virtual teams (Armstrong and Cole, 2002). As a manager told us,

> "We do not have instant messenger or videoconferences, no. That (using net meeting, IM) is against the client's security policy. I don't see why it will be helpful, basically, we don't have the same time [zone], I don't think it will work in my project."

Instead, managers indicated in several interviews the value of standardizing and making the work procedures transparent across locations. One manager told us about the effort to create new standardized templates and coding processes by combining both the client and the vendor methodologies. When we asked whether this resulted in substantively better processes, she said

> "Not really! We could have used either template. We simply wanted to ensure that there was a standardized process in place that everyone will use. Why not each firm use its own template? Then the coders will not know what the other person is using" (and this leads to coordination problems).

Another manager told us how they created a tool that forces the developers to use exactly the same standards in their coding when several different options were available. He said if such standardization did not occur each developer will follow their own process and make independent decisions that will make code re-use and synchronous coding difficult. Interestingly, another manager in a different firm said that in his project precisely the lack of such standardized coding procedures led to severe problems in leveraging code written by different developers across locations leading to severe delays in the project. All of these vignettes point to the relative importance of tacit coordination through common ground rather than explicit communication , in the remote delivery of services.

These results have several implications for practitioners. It is interesting to compare our results with practical wisdom. Conventional wisdom suggests that standardized and well documented processes are easier to offshore since knowledge transfer is easier for such processes (Szulanski, 1996; Warner and Brown, 2005). Our results, however, suggest that interdependence is a significant barrier to process performance, a barrier that is as important as or more important than knowledge stickiness, but one to which much attention is not paid.

Even highly standardized processes may face coordination problems unless the links between the process and other processes are also standardized or ongoing coordination is facilitated.

First, managers should recognize that knowledge stickiness and interdependence are two distinct problems in offshoring and require distinct solutions. As discussed above, while issues pertaining to stickiness receive a lot of attention, issues pertinent to interdependence and the need for ongoing coordination receive short shrift, or worse are conflated with knowledge transfer issues in the practitioner literature (for example see Davison, 2004; Warner and Brown, 2005). Our results clearly show these are distinct problems, with different antecedents *and* solutions.

Second, there may be value in a wider recognition that communication through Information and Communication Technology channels is not the only means to achieve coordination across locations. The practitioner literature is rife with instances of the use of IT communication technology to deal with interdependence. Our results however suggest that investments in costly technologies such as videoconferencing may not be the most efficient means of achieving remote coordination. We suggest that managers must pay attention to much simpler tasks such as standardizing processes and ensuring transparency in decision-making processes and actions. Ultimately, successful coordination requires the creation of sufficient common knowledge, and direct communication is but one way to do this- building common ground is another (and in this context, perhaps cheaper) alternative.

Figure 1: Graphical Representation of Hypotheses

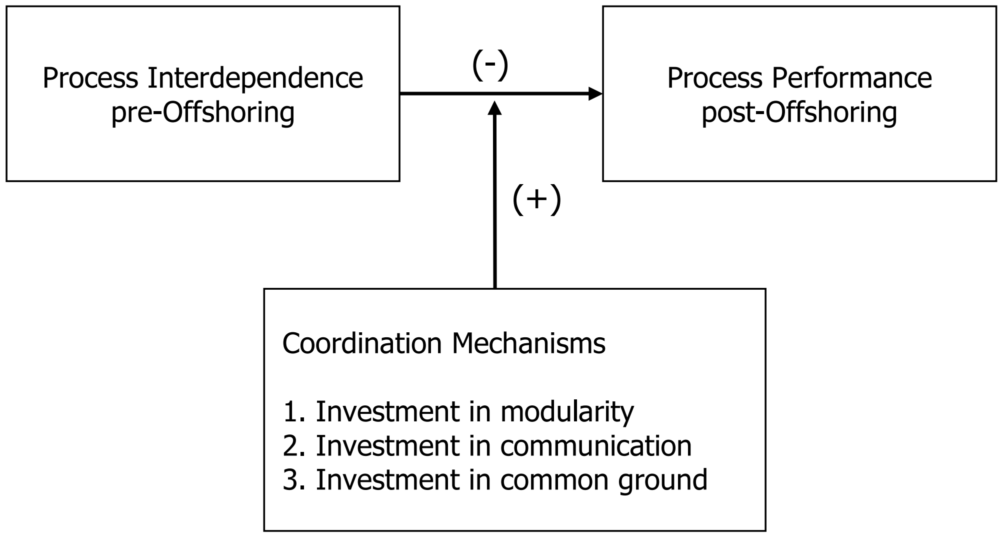


Table 1: Key Constructs

Performance	alpha: 0.72; CFI: 0.97
Please indicate the extent to which the offshoring initiative for this project has met/exceeded expectations on (-4: complete failure; 0: Meets expectations; 4: Exceeds expectations): (1) Cost savings; (2) Service quality improvements; (3) Rapid growth; (4) Satisfaction with service;	
Process Interdependence	
The following questions measure the nature of interactions between the offshored process and linked activities/departments in the client firm **before** this offshoring initiative was undertaken (-3: Strongly disagree; 0: Neither disagree nor agree; +3: Strongly agree) 1. Personnel executing this process were in constant touch with personnel executing other linked activities 2. Changes to this process led to substantial changes in other linked onsite processes	
Investment in Common Ground	alpha: 0.81; CFI: 0.87
Please tell us how much effort was spent on the following activities during and after transition (until now) to facilitate smooth interactions between the offshored location and onsite location (-4: Little or no effort; -2: Some effort; 0: Moderate Effort; +2: Significant effort; +4: Intensive focused effort): (1) Helping personnel in each location to understand the decision making procedures used by personnel in the other location (2) Investment in technologies that enable personnel in one location to observe the work –in-progress in the other location (3) Encouraging personnel from one location to relocate and work from the other location for some time (4) Encouraging and facilitating travel by personnel from the one location to visit the other location (5) Investment in cultural training for employees in each location to better interact with employees in the other location (6) Encouraging and facilitating personnel in the offshore location to learn and adopt the vocabulary used by personnel in the onsite location	
Investment in Communication	alpha: 0.75; CFI: 0.98
Please tell us how much effort was spent on the following activities during and after transition (until now) to facilitate smooth interactions between the offshored location and onsite location (-4: Little or no effort; -2: Some effort; 0: Moderate Effort; +2: Significant effort; +4: Intensive focused effort): (1)Developing/adapting a IT communication network; (2) Training personnel in remote collaboration; (3) Providing electronic tools that could be used to collaborate remotely (e.g., Net Meeting, Messenger, etc); (4) Encouraging and facilitating personnel from one location to contact the other location whenever they feel the need (e.g., telephone calls, Instant Messenger etc.)	
Investment in Modularity	alpha: 0.88; CFI: 0.92
Please tell us how much resources were spent on the following activities during transition to enable offshoring: (-4: Little or no effort; -2: Some effort; 0: Moderate Effort; +2: Significant effort; +4: Intensive focused effort): (1) Simplifying linkages between the offshored process and linked activities retained onsite (process was modularized); (2) Adapting the offshored process to be executed remotely so that need for interactions between the offshored process and linked activities retained onsite is minimized; (3) Creating standard operating procedures (rules, policies, etc) such that interactions between the offshored process and linked activities retained onsite are structured; (4) Partitioning the offshored process into portions with low and high interaction components (process chunking); (5) Reengineering the offshored process such that any coordination between the offshored process and linked activities retained onsite is fully structured	

Table 2: Descriptive Statistics

Variable	N	Mean	Std. Dev.	Minimum	Maximum
Dependent variable					
Process Performance post offshoring	122	2.40	0.79	0.00	3.75
Independent Variables					
Process Interdependence	126	1.45	2.44	-6.00	6.00
Investment in Common Ground	125	0.28	1.65	-4.00	4.00
Investment in Communication	125	0.78	1.73	-3.49	4.00
Investment in Modularity	125	0.90	1.69	-4.00	4.00
Control Variables					
Process Stickiness	126	0.22	1.26	-2.28	2.89
Knowledge Transfer Effort	125	2.29	1.53	-4	4
Log(Size)	123	3.91	1.26	1.39	7.38
Process Maturity	126	15.38	13.13	0.00	63.00
Duration of Migration	126	10.14	7.46	1.50	42.00

Table 3: Pair-wise Correlations Among variables

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Process Performance	**1**	1.00														
Process Interdependence	**2**	-0.10	1.00													
Investment in Modularity	**3**	0.02	0.09	1.00												
Investment in Communication	**4**	0.05	0.03	0.42*	1.00											
Investment in Common Ground	**5**	0.06	0.15	0.27*	0.62*	1.00										
Interdependence * Modularity	**6**	0.12	-0.01	-0.07	-0.05	-0.04	1.00									
Interdependence * Communciation	**7**	0.12	0.06	-0.06	-0.14	-0.09	0.66*	1.00								
Interdependence * Common Ground	**8**	0.18*	-0.08	-0.04	-0.09	-0.03	0.54*	0.69*	1.00							
Process Stickiness	**9**	-0.19*	-0.04	0.15	-0.08	-0.19*	-0.20*	-0.18*	-0.17	1.00						
Knowledge Transfer effort	**10**	0.10	0.13	0.32*	0.21*	0.27*	-0.19*	-0.18*	-0.16	0.13	1.00					
Process Size	**11**	0.09	-0.14	0.01	0.11	0.01	0.01	-0.06	-0.01	-0.15	-0.09	1.00				
Process Maturity	**12**	0.02	0.16	0.00	-0.06	0.06	0.06	0.03	0.03	-0.04	0.00	-0.05	1.00			
Duration of Migration	**13**	-0.31*	-0.19*	0.00	0.04	0.00	0.04	0.01	0.05	0.13	-0.13	0.17	0.12	1.00		
IT Process	**14**	-0.32*	0.09	0.01	-0.02	0.02	0.01	-0.02	-0.06	0.32*	-0.11	-0.18*	0.09	0.17	1.00	
Call Centre Process	**15**	0.11	-0.06	-0.02	0.00	0.06	0.05	0.03	0.09	-0.28*	-0.03	0.39*	0.10	-0.08	-0.39*	1.00

Legend: * $p<0.05$

Table 4: Effect of interdependence, modularity and transition procedures on post offshoring performance
OLS Models with standard errors adjusted for multiple responses per firm

Variables	MODEL 1	MODEL 2	MODEL 3	MODEL 4
Interdependence * Modularity				0.01* (0.005)
Interdependence		-0.014** (0.005)	-0.01** (0.005)	-0.01*** (0.004)
Modularity			0.00 (0.01)	0.001 (0.008)
Process Stickiness	-0.006 (0.01)	-0.006 (0.01)	-0.007 (0.01)	-0.004 (0.01)
Knowledge Transfer Effort	0.005 (0.01)	0.006 (0.01)	0.006 (0.006)	0.01* (0.006)
Process Size in FTE	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Process Maturity	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Duration of Migration	-0.003*** (0.001)	-0.003*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
IT Process	-0.05*** (0.02)	-0.05*** (0.02)	-0.04** (0.02)	-0.05** (0.02)
Contact Centre Process	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Intercept	0.83*** (0.03)	0.84*** (0.03)	0.84*** (0.03)	0.84*** (0.03)
N	116	116	116	116
F	8.76***	10.43***	10.56***	16.96***
R2	19.54	21.71	21.72	23.37

Legend: *** p<0.01 ** p<0.05 * p<0.1

Table 5: Effect of interdependence, communication and common ground on post offshoring performance
OLS Models with standard errors adjusted for multiple responses per firm

Variables	MODEL 1	MODEL 2	MODEL 3	MODEL 4
Interdependence * Communication		0.01** (0.005)		0.002 † (0.01)
Interdependence * Common Ground			0.02** (0.01)	0.02 † (0.01)
Communication	-0.00 (0.01)	-0.001 (0.01)	-0.002 (0.01)	-0.002 (0.01)
Common Ground	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Interdependence	-0.015** (0.005)	-0.016*** (0.004)	-0.013** (0.005)	-0.014** (0.005)
Process Stickiness	-0.005 (0.01)	-0.001 (0.01)	-0.00 (0.01)	-0.00 (0.01)
Modularity	0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)	-0.00 (0.01)
Knowledge Transfer Effort	0.005 (0.005)	0.01 (0.005)	0.01* (0.005)	0.01* (0.005)
Process Size in FTE	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Process Maturity	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Duration of Migration	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
IT Process	-0.05** (0.02)	-0.05** (0.02)	-0.05** (0.02)	-0.05** (0.02)
Contact Center Process	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Intercept	0.84*** (0.04)	0.83*** (0.04)	0.83*** (0.03)	0.83*** (0.03)
N	116	116	116	116
F	11.07***	13.75***	33.45***	28.73***
R2	22.13	24.23	26.00	26.02

Legend: *** p<0.01 ** p<0.05 * p<0.1
† two interaction terms jointly significant; F(2, 15) = 3.96, p-val =0.04; (correlation between two interaction terms = 0.70)

Table 6: Effect of percentage of transition effort spent on modularity and knowledge extraction on interdependence and stickiness.
OLS Models with standard errors adjusted for multiple responses per firm

Variables	MODEL 1	MODEL 2	MODEL 3	MODEL 4
Interdependence * Modularity				0.00 (0.00)
Interdependence		-0.012** (0.005)	-0.01** (0.005)	-0.01** (0.005)
Modularity			-0.00 (0.007)	0.00 (0.01)
Process Stickiness	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Knowledge Transfer Effort	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Process Size in FTE	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	0.00 (0.01)
Process Maturity	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Duration of Migration	-0.003** (0.001)	-0.003** (0.001)	-0.004** (0.001)	-0.004** (0.001)
IT Process	-0.05** (0.02)	-0.05** (0.02)	-0.05** (0.02)	-0.05** (0.02)
Contact Centre Process	-0.02 (0.02)	-0.02 (0.02)	-0.03 (0.02)	-0.03 (0.02)
Intercept	0.84*** (0.03)	0.84*** (0.03)	0.85*** (0.04)	0.85*** (0.04)
N	101	101	101	100
F	10.92***	14.01***	15.46***	16.19***
R2	23.96	25.41	25.43	24.79

Legend: *** p<0.01 ** p<0.05 * p<0.1

Table 7: Effect of percentage of transition effort spent on communication and common ground on interdependence.
OLS Models with standard errors adjusted for multiple responses/ firm

Variables	MODEL 1	**Communication** MODEL 2	**Common Ground** MODEL 3	**Both** MODEL 4
Interdependence * Communication		-0.02** (0.006)		-0.01 † (0.01)
Interdependence * Common Ground			0.02*** (0.004)	0.01* (0.006)
Communication	-0.01 (0.02)	-0.01 (0.01)	-0.01 (0.03)	-0.01 (0.03)
Common Ground	0.00 (0.02)	-0.00 (0.00)	-0.00 (0.02)	-0.01 (0.02)
Interdependence	-0.01** (0.005)	-0.01 (0.005)	-0.01** (0.005)	-0.01 (0.01)
Process Stickiness	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.01)
Modularity	-0.01 (0.01)	-0.02 (0.03)	-0.01 (0.03)	-0.01 (0.03)
Knowledge Transfer Effort	0.00 (0.01)	-0.01 (0.02)	0.00 (0.03)	-0.00 (0.03)
Process Size in FTE	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Process Maturity	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Duration of Migration	-0.004** (0.001)	-0.004** (0.001)	-0.003** (0.001)	-0.004*** (0.001)
IT Process	-0.06** (0.02)	-0.06*** (0.02)	-0.05** (0.02)	-0.06*** (0.02)
Contact Center Process	-0.04 (0.02)	-0.05* (0.02)	-0.03 (0.02)	-0.04 (0.03)
Intercept	0.86*** (0.04)	0.85*** (0.04)	0.84*** (0.04)	0.84*** (0.04)
N	101	100	101	101
F	19.26***	20.18***	9.1***	11.3
R2	25.94	28.29	28.3	29.4

Legend: *** p<0.01 ** p<0.05 * p<0.1

†: two interaction terms jointly significant F(2, 15)=11.9; prob =0.0008;

Table 8: Effect of process stickiness and knowledge transfer effort on post offshoring performance
OLS Models with standard errors adjusted for multiple responses per firm

Variables	MODEL 1	MODEL 2	MODEL 3	MODEL 4
Stickiness * Knowledge Transfer				0.01*** (0.004)
Knowledge Transfer Effort			0.006 (0.006)	0.01** (0.005)
Process Stickiness		-0.006 (0.01)	-0.007 (0.01)	-0.007 (0.01)
Interdependence	-0.013** (0.004)	-0.014** (0.005)	-0.01** (0.005)	-0.01** (0.004)
Modularity	0.002 (0.006)	0.003 (0.006)	0.001 (0.01)	0.001 (0.007)
Process Size in FTE	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Process Maturity	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Duration of Migration	-0.003*** (0.001)	-0.003*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
IT Process	-0.05*** (0.02)	-0.05*** (0.02)	-0.04** (0.02)	-0.04** (0.02)
Contact Centre Process	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Intercept	0.83*** (0.03)	0.83*** (0.03)	0.84*** (0.03)	0.83*** (0.04)
N	116	116	116	116
F	8.05***	10.26***	10.56***	23.18***
R2	20.96	21.31	21.72	24.85

Legend: *** p<0.01 ** p<0.05 * p<0.1

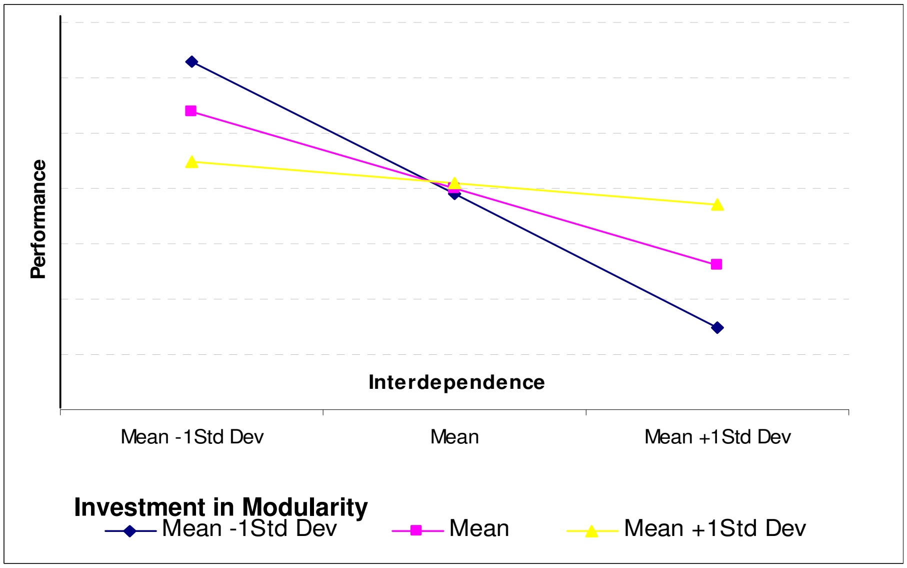
Table 9: Effect of process stickiness coordination mechanisms on post offshoring performance OLS Models with standard errors adjusted for multiple responses per firm

Variables	**Modularity**		**Communication**		**Common Ground**	**Both**
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6
Stickiness * modularity		0.00 (0.01)				
Stickiness* communication				-0.005 (0.01)		-0.001 (0.01)
Stickiness* Common Ground					0.01 (0.01)	-0.01 (0.01)
Modularity	0.001 (0.01)	0.001 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)
Communciation			-0.003 (0.01)	-0.003 (0.01)	-0.003 (0.01)	-0.003 (0.01)
Common Ground			0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Knowledge Transfer Effort	0.006 (0.006)	0.006 (0.005)	0.005 (0.005)	0.005 (0.005)	0.003 (0.005)	0.003 (0.005)
Process Stickiness	-0.007 (0.01)	-0.007 (0.01)	-0.005 (0.01)	-0.005 (0.01)	-0.004 (0.01)	-0.004 (0.01)
Interdependence	-0.01** (0.005)	-0.01** (0.005)	-0.01** (0.005)	-0.02*** (0.005)	-0.02*** (0.005)	-0.02*** (0.005)
Process Size in FTE	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)
Process Maturity	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Duration of Migration	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004*** (0.001)
IT Process	-0.04** (0.02)	-0.04** (0.02)	-0.05** (0.02)	-0.05** (0.02)	-0.05** (0.02)	-0.05** (0.02)
Contact Centre Process	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)	-0.02 (0.02)
Intercept	0.84*** (0.03)	0.84*** (0.03)	0.84*** (0.03)	0.84*** (0.03)	0.84*** (0.03)	0.84*** (0.03)
N	116	116	116	116	116	116
F	10.56***	9.62***	11.07***	26.29***	10.22***	12.47***
R2	21.72	21.72	22.13	22.41	22.72	22.73

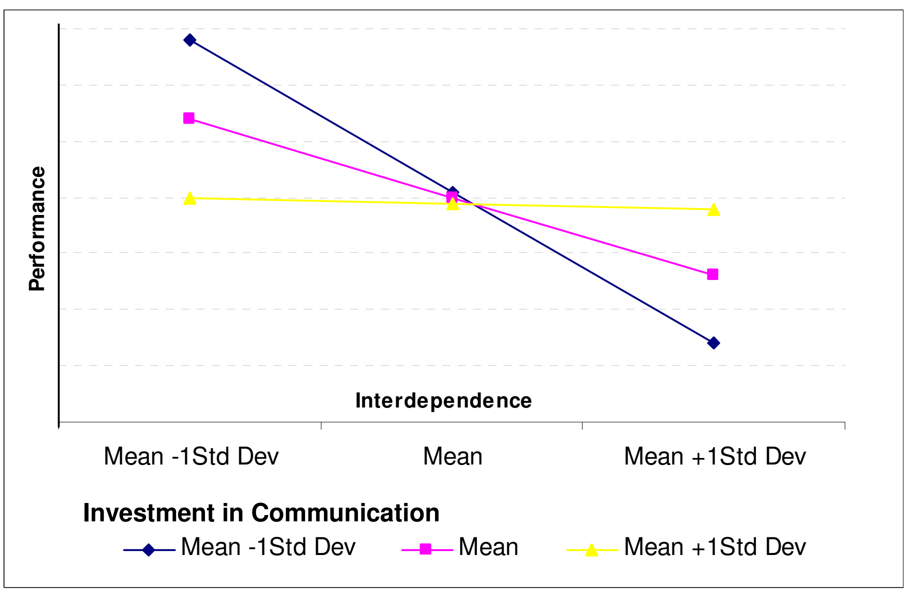
Legend: *** $p<0.01$ ** $p<0.05$ * $p<0.1$

Figure 2: Interaction Effect of Modularity, Communication and Common Ground[9]

Modularity

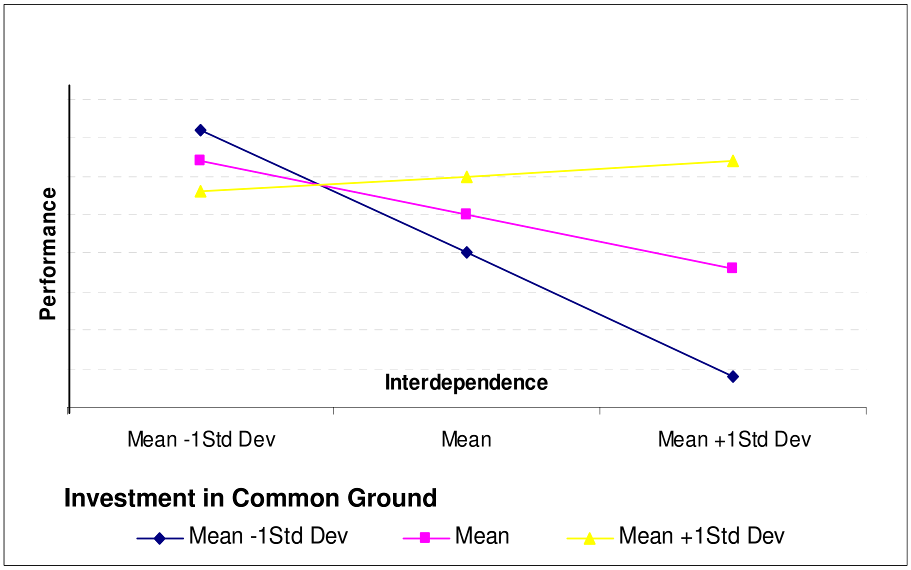


Communication



9 All the graphs are drawn to the same scale

Common Ground



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