THE INFLUENCE OF OUTSOURCING MODELS ON VENDOR KNOWLEDGE INTEGRATION

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Abstract

In this paper, we attempt to address the role of outsourcing models (Global Delivery, Global Shared-services, and Build-Operate-Transfer Models) - on vendor knowledge integration, i.e., the understanding of the project requirements and client needs by the vendor. Specifically, the paper examine (a) what is the role of team identification, project complexity, and infrastructure diversity in vendor knowledge integration?, and (b) How does the type of outsourcing model moderate the respective relationships of team identification, project complexity, and infrastructure diversity with vendor knowledge integration? Theories of Social Exchange and a Knowledge-Based view are utilized. Using a sample of 66 randomly selected outsourced software development clients, we show that Team Identification and Infrastructure Diversity influence Vendor Knowledge Integration, which then influences project success. Further, use of appropriate outsourcing model has a moderating effect on the relationship of independent on the outcome of Information System Development projects.

Keyword: Outsourcing, Information Systems Development, Knowledge Integration, Social Exchange theory, Knowledge-based view
1 INTRODUCTION

There is little doubt that outsourcing, the strategic decision to transfer a firm’s non-core activities to outside suppliers (Kishore et al. 2003), and offshoring, a part of a firm’s strategy in which business practices are relocated to another country (Prikладникі et al. 2007), are a prominent trend of the last decade in the field of Information Systems. As more and more companies take advantage of this trend to reduced costs, increase flexibility, and enhance their competitive advantage, this trend is likely to get even stronger. Managing these projects is, however, not for the faint of heart. Challenges of managing these projects arise out of multiple locations and time zones, less face-to-face interaction, limitations of time, and the asynchrony of communication. These factors lead to decreased communication, reduced visibility into the project and individual work status, heterogeneity in infrastructure, and cultural differences between customer and vendor countries.

While these challenges exist in all types of Information Technology (IT) outsourcing, software development adds its own complexities when outsourced. This is particularly true when national, cultural, and organizational boundaries exist between the client and the vendor. Although Information Systems Development (ISD) projects are a primary focus of research in Information System (IS), management of these projects remains a challenge, mostly because of the need for knowledge transfer between users and developers in a context where they operate from different mental models and speak different languages, so to speak. The complexities of the project requirements have always been difficult to transfer from users to developers; the dynamic and ever-changing project requirements and priorities are exceedingly difficult to handle. Offshoring adds further difficulties as companies now have to move from Project Management to Project Portfolio Management or Vendor Management.
Research in the area of Information Technology outsourcing has primarily focused on the antecedents to the outsourcing decision. The common theories that have been applied are Production and Transaction Cost Economics (Ang et al. 1998), business and Information System competencies (Loh et al. 1992), Resource-dependence, and Resource-based perspectives (Grover et al. 1996). However, more research is warranted in the post-contract phase, where project management issues tend to mar the progress and often result in a product that is not exactly what was expected or wanted by the client. The press reports many instances of lawsuits where the product delivered was not as intended and many more settlements undoubtedly go unreported. In the post-contract phase, many issues with respect to coordination and control exist, and yet, not much is known about the outsourcing provisions that may allow for the appropriate level of control and coordination needed in specific situations.

Similarly, not much is known about the antecedents that either constrain or mitigating the extent to which vendor team absorbs the client requirements. For example, if the client and vendor team comes together in a cohesive manner and members identify with the team, it is likely that knowledge integration will take place. Second, complexity of the requirements is likely to be a constraint to the overall level of knowledge integration. Finally, if the infrastructures at the client site and vendor site are sufficiently diverse, the language used at the two organizations is likely be different, making the knowledge transfer challenging. In this paper, we seek to empirically examine the role of these three key antecedents (team identification, project complexity, and infrastructure diversity) in vendor knowledge integration. Similarly, not much is known about the antecedents that either constrain or mitigating the extent to which vendor team absorbs the client requirements. For example, if the client and vendor team comes together in a cohesive manner and members identify with the team, it is likely that knowledge integration will take place. Second, complexity of the requirements is likely to be a constraint to the overall level of knowledge integration. Finally, if the infrastructures at the client site and vendor site are sufficiently diverse, the language used at the two organizations is likely be different, making the knowledge transfer challenging. In this paper, we seek to empirically examine the role of these three key antecedents (team identification, project complexity, and infrastructure diversity) in vendor knowledge integration. While infrastructure diversity and project complexity are impediments to knowledge integration, we propose that creating higher levels of team identification will likely mitigate their adverse effects.

Likewise, using the appropriate outsourcing model can help mitigate the knowledge transfer challenges. Many models of coordination of control in outsourced software development projects exist. Each of these models represents a different type of arrangement, facilitating specific types of coordination and control processes as well as team processes. It is the goal of this paper to address the role of outsourcing models in knowledge transfer from client to vendor. We attempt to address the role of outsourcing models on Vendor Knowledge Integration, i.e., the understanding of the project requirements and client needs by the client. Specifically, we ask - how does the type of outsourcing model moderate the respective relationships of team identification, project complexity, and infrastructure diversity with vendor knowledge integration?

2 THEORETICAL FRAMEWORK AND MODEL DEVELOPMENT

Outsourcing has been defined as “a strategic decision to transfer a firm’s non-core activities to suppliers in offshore locations” (Babu 2006). Thus, outsourcing is often part of a firm’s strategy with the goal of achieving competitive advantage. Thus, a successful outcome of these decisions is crucial and depends largely upon effective knowledge integration of the client needs.

In order to address the above research questions in a post-contract outsourcing context, we utilize the view of knowledge-based view, since to accomplish successful project success, knowledge must be successfully exchanged and both parties must be on the same page. The post-contractual stage of an outsourced ISD project begins when the client and the vendor have signed the outsourcing contract and ends when the vendor has signed-off on the deliverables, and typically includes analysis, design and implementation. Prior research in the field of global teams and project management indicates that this stage entails two important considerations for the client. First, the social exchange of knowledge between the client and the vendor teams is crucial in the successful completion of the project. Project performance is dependent on successfully addressing the challenges of coordination and integration of team members’ knowledge, since project requirements can be complex and difficult to transfer (Faraj et al. 2000). Additionally, infrastructure differences among the parties add to the difficulties of coordination and knowledge transfer.

Second, we consider the outsourcing models employed by outsourcing arrangements. The management of the ISD projects, and control and coordination of vendor activities varies based on the
types of outsourcing models agreed upon by the vendor and the client. Different outsourcing models are a means of controlling the project in order to directly and indirectly control the outcome and behavior of the vendor and are likely to affect the extent to which the vendor team absorbs the knowledge of what was the intended outcome, and therefore, whether this outcome is accomplished.

In any intra- or inter-organizational dyadic arrangement, the exchange consists of “voluntary transactions involving transfer of resources between two or more individuals (i.e. the actors) for mutual benefit” (Kern et al. 2000, pp. 1). As Kern and Willcocks (2000) point out, in economic theories, namely Transaction Cost Economics and Production Cost Economics, the decisions of actors are made, not as a result of the actions of the other actor, but based on the environmental parameters. We consider some of these environmental factors in this research, and examine their role in knowledge integration.

Social Exchange theory (Blau 1964; Roloff 1981) suggests that people interact socially in order to obtain rewards such as enhancement of status, reputation, approval and respect. Sharing information (which is one form of organizational interaction) will occur when the agents concerned believe that this will result in creating value for the others in the firm, and when they can expect to retain some of the value for themselves (Nahapiet et al. 1998). Repeated exchanges taking place in this environment should result in peer-to-peer relationships of trust and mutual cooperation based on reciprocity and concern for reputation because of the collaborative nature of the work situations (Kollock 1994). In fact, building and maintaining reputation provides a strong motive for participation in information exchange actions (Constant et al. 1994; Jones et al. 1997).

The knowledge-based theory of the firm posits that the ability to integrate members’ knowledge as the primary reason for the existence of the firm. For instance, Grant (1996) has asserted that as in the current dynamically-competitive market conditions, knowledge has emerged as the most strategically-significant resource of the firm. Thus, as Constant et al. (1994) states, information or knowledge sharing is an essential aspect of social exchange between actors. By using a Knowledge-Based View (KBV) theoretical perspective, we examine if these different outsourcing strategies translate into a sustainable competitive advantage.

2.1 Knowledge Integration

Knowledge integration is the process of absorbing knowledge from external sources and blending it with the in-house technical and business skills, know-how, and expertise (Kogut et al. 1992; Szulanski 1996; Tiwana et al. 2003). The sharing of knowledge between the client and the vendor is considered an important antecedent of success (Koh et al. 2004). Based on interviews with practitioners, Rottman and Lacity (2004) contend that bridging the learning curve is vital for deriving value from the outsourcing arrangement. Lacity et al. (1995) posit that continuous learning in negotiating with an external supplier is necessary for a successful outsourcing relationship. In software development, in addition to the social exchange of knowledge, clients and vendors also need to act on each others’ knowledge, to bring it to bear on the project (Faraj et al. 2000). As actors in the dyadic relationship, clients and vendors exchange business and IS knowledge, integrate them with knowledge from external sources (Tiwana et al. 2003), in order to help facilitate Information Systems Development. This aspect of social exchange of knowledge is termed as Knowledge Integration, and is defined as “the process of absorbing knowledge from external sources and blending it with the technical and business skills, know-how, expertise that reside in the business and IS units of a firm” (Tiwana et al. 2003). In the context of offshore Information Systems Development, knowledge integration is accomplished by bringing together the disparate slices of knowledge inherent in the client and the vendor, together with the knowledge obtained from sources external to the relationship, such as communities of practice and external social-networks.

Kogut and Zander (1992), describe the concept of combinative capability, that reflects a firm’s ability to synthesize and apply current and acquired knowledge. Yet, knowledge can also be integrated and created in groups that cross-organizational boundaries. For instance, Nonaka (1994) notes that “In addition to the creation of knowledge within an organization, it is also possible that there will be
formal provisions to build knowledge at an interorganizational level. This might occur if informal communities of interaction, that span the link between customers, suppliers, distributors, and even competitors, are put on a more formal basis, for example, through the formation of alliances or outsourcing.” While Nonaka (1994) is referring to formal arrangements, knowledge can also be integrated across informal, inter-organizational, self-organizing teams, social networks, or “evolving communities of practice” (Brown et al. 1991). Brown and Duguid (1991) argue that the exchange and development of information within these evolving communities facilitate knowledge creation by linking the routine dimensions of day-to-day work to active learning and innovation. They note that evolving organizational structures practice often cross “the restrictive boundaries of the organization to incorporate people from outside”.

In this paper, we define knowledge integration as the absorbing of client knowledge by the vendor team. The impact of the sharing of such knowledge ultimately rests upon the project team members involved in the Information Systems Development. The team members act as conduits and storehouses of knowledge and in this regard, a different conceptualization of Knowledge Integration is adapted in Tiwana, Bharadwaj and Sambamurthy (2003) namely: external and internal Knowledge Integration. External knowledge integration refers to the extent to which the firm integrates knowledge from outside, whereas internal knowledge integration refers to the extent to which the development team builds on the knowledge of the stakeholders. As knowledge from disparate sources (Szulanski 1996) are brought together to bear on the project, the likelihood of a successful project increases (Faraj et al. 2000). Hence, knowledge integration is considered as an important antecedent to a successful project.

H1: Vendor Knowledge Integration will positively influence Project outcomes.

2.2 Outsourcing Models

Outsourcing involves complex decisions involving multiple factors. One important aspect of the outsourcing strategy is selecting the right model. The model that is best suited to handle the project complexity, the diversity of the infrastructure, and team-relationship factors will most likely facilitate successful knowledge integration needed to satisfy the specific business needs of the client. Three main models of coordination of control in outsourced software development projects currently exist, each representing a specific arrangement, requiring different coordination, control, and team processes. We propose that choice of these outsourcing models, if appropriate, will enhance knowledge transfer from client to vendor, and ultimately influence project success. We attempt to address the role of outsourcing models on Vendor Knowledge Integration, i.e., the understanding of the project requirements and client needs by the client. Specifically, we ask - how does the type of outsourcing model moderate the respective relationships of team identification, project complexity, and infrastructure diversity with vendor knowledge integration?

The three models currently most popular among business leaders are, the global delivery (or contract) model, global shared-services (or captive) model, and the Build-Operate-Transfer (BOT) Model (Robinson et al. 2004). The main differences between these models lie in the ownership arrangement between the company and the offshore service-providers.

The Global Delivery (Contract) model refers to contract outsourcing offshore with a third-party vendor (Robinson et al. 2004). The sourcing company effectively transfers the control of specific functions to an external service-provider in a different location, frequently a foreign country. Typically a make-or-buy decision, the global delivery model takes advantage of cheaper labor and other fixed costs. The most popular, or classic offshoring model, is one in which the software service provider takes over the end-to-end program management and delivery from a client organization.

A somewhat more mature approach to this classic model involves an onsite team at the client location. This team acts to coordinate the tasks with the offshore team. The goal of this onsite team is to effectively transfer the knowledge to the team at the vendor site doing the development work, to ensure that the product delivered adheres to the client requirements, and to manage the relationship
The global delivery model (or contract offshore outsourcing), while providing the most rapid speed to market, comes at a cost, as providers take a cut of the cost savings as their profit margin.

In the Global Shared-services or Captive model, client companies establish independent offshore subsidiaries, or shared-services centers, for the purpose of performing all business process outsourcing in-house. The advantage of this model is that the company is still able to achieve economies of scale and generate cost savings, while maintaining control over the work performed.

Robinson and Kalakota (2004) suggest that in the initial stages of the global shared-service model companies often start with a form of joint venture. However, companies which are more sophisticated in their ISD capabilities and international operations may set-up a subsidiary or local office, without involving a joint venture. These have been variously described as offshore development center, captive development center, or in some cases simply branch or local office. Because these subsidiaries operate as independent business units or branches, executing programs and projects for onsite teams, the issue of effective knowledge transfer is akin to that of the global delivery model employed by software service delivery companies. The difference is the client has greater authority and therefore more control, as opposed to having to negotiate with the vendor. Examples of companies that fit the profile for this model include large software development companies such as IBM, Microsoft, and Oracle as well as consulting companies such as Accenture, EDS, and Deloitte Consulting.

The global shared-services model is a high-risk, high-reward proposition. While this outsourcing model provides the greatest potential for longer-term savings, the initial startup cost can be substantial. The model is also likely to require a strong commitment on the part of a client organization and, as such, involves a measure of risk.

The Build-Operate-Transfer (BOT) model is a joint venture or strategic alliance between the sourcing company and the service-provider. The model is seen as a hybrid which takes the form of a global delivery model until the offshore operation is ‘transferred’ from the offshore partners to the sourcing company, at which point, it effectively converts to a captive model. In this model, an organization may collaborate with a local firm or company either by taking an equity stake or forming an independent company in which each company contributes resources (Babu 2006). The goal of this arrangement is to create a symbiotic relationship in which both client and vendor organizations hope to benefit from the other's strengths. By capitalizing on the strengths of a local player, the client organization can mitigate some of the risks of internalization; similarly, the local player can benefit from partnering with a strong player and the opportunity to scale up the value chain. Joint venture contract may include Build-Operate-Transfer clauses in an attempt to motivate both parties to work toward a clearly defined exit strategy. The Build-Operate-Transfer, or its variation, Build-Own-Operate-Transfer (BOOT), may involve an option for the domestic company to sell its stake to the foreign company after a stipulated period or after agreed-upon milestones.

The Build-Operate-Transfer is a hybrid model that has the potential to provide the best of both worlds. However, as this is a relatively new concept, the merits and demerits of its use remain to be seen.
3 THE RESEARCH MODEL

Figure 1 depicts the research model. The model posits that project success is influenced by the extent to which the vendor is able to integrate the knowledge related to the project and client needs (Vendor Knowledge Integration). Vendor Knowledge Integration, in turn, is influenced by Team Identification, Project Complexity, and Infrastructure Diversity. Finally, outsourcing model moderates the relationships of Team Identification, Project Complexity, and Infrastructure Diversity with Vendor Knowledge Integration.

3.1 Antecedents of Knowledge Integration

We propose that infrastructure diversity and project complexity act as constraints and impediments to knowledge integration. Further, we suggest that fostering higher levels of team identification will facilitate knowledge integration and mitigate the adverse effects of the above constraining factors. That is, if the client and vendor team members exhibit higher levels of team identification, higher levels of knowledge integration is likely.

Social Identity Theory posits that individuals will try to belong to groups they believe compare favorably with, and are distinct from, other groups as a way to enhance their own self-esteem (Ashforth et al. 1989; Tajfel 1978; Tajfel et al. 1986). Research has shown team identification to be positively associated with several important outcome variables, including organizational citizenship behaviors (van Dick et al. 2006), job satisfaction (Marks et al. 2005), conflict management (Desivilya et al. 2005), and group performance (Gundlach et al. 2006; Scott 1997).

It is vital for team members to identify with their outsourcing team just as they would with any other in-group member (Lembke et al. 1998). Two distinct reasons dictate whether a team will work effectively. One reason is identification, this creates an emotional bond between the team member and the target (in this case, the outsourcing team); this emotional bond increases the team member’s commitment toward the target (Ashforth et al. 1989). Two, the identification process actually involves adopting attitudes and commitments of the reference group (Becker 1992; Meyer et al. 2001; O'Reilly et al. 1986; Pratt 1998). In an outsourcing context, this means that the members must identify not just with their respective employers, but with the project team, consisting of the client as well as the vendor members. When team members identify with their team their individual goals and personal interests recede and the goals and interest of their team dominate their actions (Lembke et al. 1998; Scott 1997).

We propose that to the extent the client and vendor team members identify with the whole team, the more effective knowledge integration is likely to be.

H2: Team Identification within outsourcing teams will positively influence Vendor Knowledge Integration.

Information Technology infrastructure is comprised of the standards, tools, and platforms for hardware, software and communication systems in a firm (Broadbent et al. 1999; Tanriverdi 2005; Zhu et al. 2002). Clearly, the nature and sophistication of the Information Technology project determines the type of hardware, software and communication systems needed, whether in outsourcing or otherwise. More often than not, client and vendor organizations are likely to possess different hardware, software and communication platforms (Ravichandran et al. 2005). These differences in hardware, software, and communication systems create complexities and difficulties in communication, interaction, and subsequently, knowledge integration. The higher the diversity in these platforms, the more difficult it will be to convey the requirements since the language and
discourse in the two sites will act as a barrier. Also, it would be more difficult to develop a system at the vendor site so that it works seamlessly at the client site.

H3: Infrastructure diversity within outsourcing teams will negatively influence Vendor Knowledge Integration.

Software development is an inherently complex, highly creative task that involves several diverse, yet related project activities (Pressman 1993) and requires participants to assume several different and very unique roles. At the same time, the activities are characterized by high levels of sequential, pooled, and reciprocal interdependency between team members (Thompson 1967). This high level of dependency, coupled with the need to bring multiple perspectives and knowledge to bear upon the task, makes the management of software development teams a highly complex process (Curtis et al. 1988). The more complex the project requirements, harder it is to convey them. Thus, we propose:

H4: Project Complexity within outsourcing teams will negatively influence Vendor Knowledge Integration.

3.2 The Moderating Effect of Outsourcing Model type

For outsourcing teams, communication and inter-group interactions can be problematic because of the geographical distance between the client and vendor teams. Because of the distance, clients and vendors communicate through digital technologies. Further, the separation of distance, time, culture and organizations, members of outsourcing teams will tend to exhibit less positive social behaviors which can lead to less positive social behaviors (Mortensen et al. 2001), lower satisfaction with team interactions (Peters et al. 2007), and assumption of the worst in the absence of information about their team members (Cramton 2001). Identification with the team can decrease these negative impacts by reducing the psychological distance perceived among team members (Hinds et al. 2005).

Different outsourcing models provide varying degrees of opportunities for face-to-face and computer-mediated interaction. The degree to which each of the outsourcing models allows opportunities for rich exchange of information is likely to determine to what extent team identification will result in Vendor Knowledge Integration. As discussed above, communication and the high quality of inter-group interactions are essential for Vendor Knowledge Integration to occur. For instance, in the captive outsourcing model, these boundaries are somewhat less threatening since the subsidiary is immersed in the culture of the vendor’s country. It would be hardest for the team members in Global delivery services to identify with their teams because the model does not provide for frequent interaction. In fact, the whole point of this model is to hand-off the work to the vendor so that the client does not have to deal with it.

While we do not offer hypotheses regarding specific effects of each outsourcing model, we do propose that on the whole, different outsourcing models will moderate the relationship of team identification with Vendor Knowledge Integration. Note that later in the paper, will we provide some ad-hoc analysis that will shed some light on possible effects of each outsourcing model.

H5: Outsourcing Model will moderate the relationship between Team Identification and Vendor Knowledge Integration.
stage. In the captive model, the subsidiary is likely to have infrastructure that is somewhat compatible with the host company. The Build-Operate-Transfer model, in some sense has the best of both worlds and may provide more flexibility as the model changes over time. While we do not make specific propositions for each of the models and do not have a large enough sample to test it, we propose the outsourcing model will moderate the effects of infrastructure diversity on knowledge integration.

H6: Outsourcing Model will moderate the relationship Infrastructure Diversity and Vendor Knowledge Integration.

As previously discussed, the discontinuities between vendor and client teams are many. The team members are frequently geographically, culturally, nationally, and organizationally diverse. These discontinuities make the task of transferring the project requirements to the vendor exponentially more difficult than it is when the work is performed the same organization and at the same location. Therefore, we propose.

H7: Outsourcing Model will moderate the relationship between Project Complexity and Vendor Knowledge Integration.

4 METHOD

To test the hypothesized model, an invitation was sent to complete a web-based survey to 266 randomly selected outsourced software development clients, out of which 66 completed usable responses were received. Details of the measures are provided below.

*Project success* measures address success and satisfaction of the project from the point of view of the client. A project can be considered successful if the client is satisfied with the outcomes, the project meets the client requirements and expectations, and the client is therefore likely to do business again with this vendor. Items related to this operationalization were adapted from Grover (1996). Managers with first hand knowledge were asked to evaluate their “perception of the project success” by rating six items on a 7 point Likert type scale ranging from 1 “Strongly Disagree” to 7 “Strongly Agree”. These items included statements such as, “We consider the project as successful” and “Overall, we are satisfied with the project outcome”, (for a complete listing of all items see the Appendix). Due to the high degree of consistency between all six items ($\alpha = .96$), and for the sake of simplification, these items were combined into a single variable representing Project Outcome.

To measure the extent to which client knowledge was transmitted to the vendor, *Vendor Knowledge Integration*, managers were asked to respond to items relating to the transfer of knowledge. The section began with the following stem: “During the project, our interactions with the vendor improved their…” and included the following items, “understanding of the project”, “ability to ask penetrating questions about this project”, “knowledge of this project”, “knowledge about this project’s documentation”, and “knowledge about our own business process”. These items were again rated on a 7-point Likert type scale ranging from 1 “Not at all” to 7 a “GreatExtent”. Analysis of the five items again yielded a single factor ($\alpha = .93$), thus, the five items were subsequently averaged into the variable Vendor Knowledge Integration.

In order to measure *Team Identification*, respondents were asked to rate, on a 7 point Likert type scale ranging from 1 “Strongly Disagree” to 7 “Strongly Agree”, the extent to which they agreed with the following five statements. “I have a strong preference to participate in this team rather than a different team”, “I generally like the other team members”, “My attitude and beliefs are similar to other members of the team”, “I feel like I fit in with this team”, and “This team acted as a unit and not as a bunch of individuals”. Because the items load on a single factor ($\alpha = .91$), these items were averaged into a single variable representing Team Identification in an effort to maintain consistency.

To determine the project’s *Infrastructure Diversity*, managers rated the extent to which the project had certain components relating to diversity. The stem for this section began with, “To what extent does
the project have...” and included the items “multiple software environments”, “multiple technology platforms”, “significant interaction with other systems”, reported on a 7 point Likert type scale ranging from 1 “Not at all” to 7 a “Great Extent”. The items loaded on a single factor (α = .71) and were combined into a solitary variable.

Finally, to evaluate Project Complexity, managers were asked to rate the extent to which the project had components relating to the differing forms of complexity. The stem for this section began with, “To what extent does the project have...” and included the items “simple requirements”, “an easy set of project guidelines”, “clear specifications” as measures of the project complexity. Managers responded to these items on a 7 point Likert type scale ranging from 1 “Not at all” to 7 a “Great Extent”. The items loaded on one factor (α = .62) and was consequently combined into the variable project complexity.

A factor analysis was performed on all survey items in order to ensure construct validity. This was based on Principal Component analysis, with Promax Rotation and Listwise Deletion. The analysis showed support for the instrument by achieving a Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy of .77, with items loading on the five theorized constructs, and explaining 76 percent of the variance. Loadings below the acceptable cut-off of .60 were eliminated. The items that were preserved and their loadings are reported in Appendix.

5 RESULTS AND DISCUSSION

The goal of this research was to examine the role of team identification, project complexity, and infrastructure diversity in vendor knowledge integration. We also set out to examine the moderating effect of outsourcing models on the relationships of team identification, project complexity, and infrastructure diversity with vendor knowledge integration.

Table 1 reports the means, standard deviations, and correlations of the variables used in our model. Figure 2 shows the regression analysis results on the model. We first tested the effects of vendor knowledge on project success. As predicted, analysis confirms this relationship to be significant (R2 = .51, p < .001, β = .719, p < .001), supporting Hypothesis 1.

<table>
<thead>
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<th>Variable</th>
<th>Mean</th>
<th>S.D.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<td>5.06</td>
<td>0.96</td>
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<td></td>
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<tr>
<td>2 Vendor Knowledge Integration</td>
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<td>0.71</td>
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<tr>
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<td>0.52</td>
<td>0.29</td>
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<tr>
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<td>1.61</td>
<td>0.15</td>
<td>0.29</td>
<td>0.08</td>
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<tr>
<td>5 Project Complexity</td>
<td>4.24</td>
<td>1.19</td>
<td>-0.09</td>
<td>0.19</td>
<td>0.03</td>
<td>-0.14</td>
</tr>
</tbody>
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n = 66

Table 1. Descriptive Statistics and Correlations among Study Variables
To test the antecedents of Vendor Knowledge Integration, we performed hierarchical regression analysis. In the first step, Vendor Knowledge Integration was regressed against Team Identification, Infrastructure Diversity, and Project Complexity respectively. Team Identification ($R^2 = .08, p < .05, \beta = .299, p < .05$) and Infrastructure Diversity ($R^2 = .08, p < .01, \beta = -.308, p < .01$) showed significant relationships in the predicted direction on Vendor Knowledge Integration, showing support for Hypotheses 2 and 3. However, the relationship between Vendor Knowledge and Project Complexity, Hypothesis 4, was not supported ($R^2 = -.01, \beta = -.166, p = .17$). A lack of support for the relationship between Project Complexity and Vendor Knowledge Integration (Hypothesis 4), is counter-intuitive. We conjecture that this is attributable to the current small sample size of 66. As data collection is ongoing, it is expected that this relationship will gain significance once more data becomes available.

Next, the moderating effect of the type of Outsourcing Model was tested to evaluate Hypotheses 5, 6, and 7. The results show that the type of Outsourcing Model has a significant moderating effect on the relationship between Team Identification and Vendor Knowledge Integration ($\Delta R^2 = .05, p < .01$), supporting Hypothesis 5. Additionally, Outsourcing Model was also shown to significantly moderate the relationship between Infrastructure Diversity and Vendor Knowledge Integration ($\Delta R^2 = .09, p < .001$), showing support for Hypothesis 6. Finally, the moderating effect of Outsourcing Model on the relationship between Project Complexity and Vendor Knowledge Integration was evaluated. Hypothesis 7 was supported ($\Delta R^2 = .02, p < .1$).

Overall, the results show good support for the proposed model. Our findings imply that Vendor Knowledge Integration is an important antecedent to project success, explaining 51% of the variance in Project Outcomes. In other words, to the extent managers can make sure that an appropriate level of knowledge integration takes place, that is, the vendor understands the project and clients’ business processes, the greater the likelihood the vendor will be able to deliver a product that will meet the client’s expectations. This is also good news for the vendor, as one of the outcomes we examined is the continuation of the outsourcing relationship with the client.

The results clearly show that the type of Outsourcing Model significantly moderates the relationship between Team Identification and Vendor Knowledge Integration. This implies that the challenges arising from low Team Identification on Vendor Knowledge Integration in boundary-spanning outsourcing teams can be mitigated if the appropriate Outsourcing Model is used. To understand the unique effects of each model, we tested for moderating effect of each of the Outsourcing Models on this relationship. We found that when the Captive Outsourcing Model was used, it had a significantly greater moderating effect ($\beta = -.423, p < .01$) on the relationship between Team Identification and Vendor Knowledge Integration than when the other two Outsourcing Models were used. The Build-Operate-Transfer (Joint Venture) Model showed a small but insignificant effect, and the Global Delivery Outsourcing Model had no moderating effects. This result makes sense in that the Captive
model allows organizational identification of the client company to carry over to the outsourcing unit of the firm. In the other two cases, the client is dealing with a different organization and identity formation is not facilitated to the same extent. The results provide support for the notion that the identity formation is dependent on the organizational context and plays a significant role in Knowledge Integration.

We found that Outsource Model type moderates the relationship between Infrastructure Diversity and Vendor. In our post-hoc analysis (individual regressions for each Outsourcing Model) to further understand this relationship, we found similar results. The Captive Outsourcing Model had a significantly greater moderating effect than the Build-Operate-Transfer (Joint Venture) model and the Global Delivery model showing no moderating effect. In Captive models, the client-owned subsidiary unit is likely to have a more compatible infrastructure, thus allowing for better Vendor Knowledge Integration. In the Global Delivery mode, the infrastructure gap is likely to be the widest, thus creating more difficulties in Vendor Knowledge Integration. One would expect these difficulties to show up in the implementation phase. The Build-Operate-Transfer model showed a small and insignificant moderating effect. In both these scenarios, it is possible that the client is pleased with the vendor until they start implementing the system in the client organization, at which point they might encounter difficulties due to compatibility issues.

We also conducted post-hoc regressions on the moderating effect of Outsource Model on the relationship between Project Complexity and Vendor Knowledge Integration. We found that the Captive Outsourcing model had a significantly greater effect on the relationship between Project Complexity and Vendor Knowledge Integration than the other two models.

The overall conclusion of this post-hoc analysis is that the Captive model provides the best Vendor Knowledge Integration, followed by the Build-Operate-Transfer model. The Global Delivery model provides the least amount of Vendor Knowledge Integration as the interaction is severely limited in this case. The benefits are of course offset by the high cost and need for a high level of commitment on the part of the client organization. However, our results support the notion that the cost and effort are well worth it if outsourcing is a part of the core strategy. In the case where outsourcing is not a part of the core strategy and the costs are not justified, the organization should take steps to reinforce team identification as well as assess the gaps in infrastructure early on create a plan to address it. These measures are likely to improve Vendor Knowledge Integration and subsequently, Project Outcomes.

6 CONCLUSION

This paper provided evidence that use of the appropriate Outsourcing Model acts to significant reduce the effects of team identification, project complexity, and infrastructure diversity on Vendor Knowledge Integration, which in turn increases the potentiality for favorable project outcomes.

This study contributes to the Information Technology outsourcing research by examining the role of outsourcing models in the Information Systems Development context. It also provides insights on antecedents of Vendor Knowledge Integration, which is an important determinant of Information Systems Development project success. The research reported here represents preliminary but important step toward understanding success factors in Information Technology outsourcing. We are continuing our data collection both from the clients well as vendors and expect to have richer data to report in near future. Future research should examine and test this model in other outsourcing contexts (e.g. Information Technology services) and from other views (e.g. vendors view) and involving other data collection methods such as case studies for richer understanding of this phenomenon.
References


Appendix

<table>
<thead>
<tr>
<th>Component</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>We consider the project as successful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.876</td>
</tr>
<tr>
<td>The strategic intent has been (or is expected to be) satisfied through this project</td>
<td></td>
<td></td>
<td></td>
<td>.918</td>
<td></td>
</tr>
<tr>
<td>The final project deliverables has satisfied (or is expected to satisfy) our requirements</td>
<td></td>
<td></td>
<td></td>
<td>.786</td>
<td></td>
</tr>
<tr>
<td>Project outcome has fulfilled (or is expected to fulfil) our expectations</td>
<td></td>
<td></td>
<td></td>
<td>.909</td>
<td></td>
</tr>
<tr>
<td>Overall, we are satisfied with the project outcome</td>
<td></td>
<td></td>
<td></td>
<td>.985</td>
<td></td>
</tr>
<tr>
<td>We expect the relationship with this partner to continue after this project</td>
<td></td>
<td></td>
<td></td>
<td>.862</td>
<td></td>
</tr>
</tbody>
</table>
Vendor Knowledge Integration
(During the project, our interactions with the vendor improved their…)

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding of the project</td>
<td>.940</td>
</tr>
<tr>
<td>Ability to ask penetrating questions about this project</td>
<td>.879</td>
</tr>
<tr>
<td>Knowledge of this project</td>
<td>.929</td>
</tr>
<tr>
<td>Knowledge about this project's documentation</td>
<td>.806</td>
</tr>
<tr>
<td>Knowledge about our own business process</td>
<td>.874</td>
</tr>
</tbody>
</table>

Team Identification

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have a strong preference to participate in this team rather than a different team</td>
<td>.817</td>
</tr>
<tr>
<td>I generally like the other team members</td>
<td>.788</td>
</tr>
<tr>
<td>My attitude and beliefs are similar to other members of the team</td>
<td>.996</td>
</tr>
<tr>
<td>I feel like I fit in with this team</td>
<td>.851</td>
</tr>
<tr>
<td>This team acted as a unit and not as a bunch of individuals</td>
<td>.677</td>
</tr>
</tbody>
</table>

Infrastructure Diversity

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple software environments</td>
<td>.908</td>
</tr>
<tr>
<td>Multiple technology platforms</td>
<td>.750</td>
</tr>
<tr>
<td>Significant interaction with other systems</td>
<td>.700</td>
</tr>
</tbody>
</table>

Project Complexity

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple requirements</td>
<td>.720</td>
</tr>
<tr>
<td>An easy set of project guidelines</td>
<td>.869</td>
</tr>
<tr>
<td>Clear specifications</td>
<td>.718</td>
</tr>
</tbody>
</table>

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.