Knowledge Transfer between External IT Consultants and Business Professionals in IS Development - Impact of Social Interdependence

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Recommended Citation
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Abstract
Information System Development (ISD) is a knowledge-intensive activity demanding coordinated application of business and Information Technology (IT) professionals’ expertise. However, knowledge transfer between these groups is challenging, requiring the bridging of their different thought worlds. The problem is even more pronounced for project teams involving external IT consultants with whom the business professionals had no prior collaboration history. Therefore, a relevant but understudied issue is the motivations of business and external IT professionals in knowledge transfer. This paper applies the theory of social interdependence, which explains group cooperation, to study the problem. Based on the theory, a model is developed which proposes that goal, task, and reward interdependencies affect the extent of knowledge transfer between these groups during an ISD project. Construct operationalization and plan for data collection are discussed.

Keywords: Knowledge Transfer, Social Interdependence, IS Development

Introduction
Information System Development (ISD) refers to the analysis, design, and implementation of IS applications or systems to support business activities in an organizational context (Xia and Lee 2005). It is a knowledge-intensive activity demanding coordinated application of diverse expertise to provide solutions to business problems. Two broad domains of knowledge identified in ISD are business application knowledge and technical knowledge (Rus and Lindvall 2002). The former refers to knowledge about business processes, rules, policies, and business objectives associated with the ISD project’s problem domain. An important instance of transfer of this form of knowledge from business professionals to Information Technology (IT) professionals is the conveyance of business needs during requirements specification. Technical knowledge refers to knowledge about the ISD procedure, programming, technological tradeoffs, and constraints, that is used to translate business needs to technical solutions. Mechanisms through which it is transferred from IT professionals to the business users include user manuals and training documents.

In ISD projects, external IT professionals (e.g., consultants and outsourcing vendors) are often employed and temporarily teamed up with business professionals. The rationale for this approach is to harness the benefits of specialization for the organization, such that neither the business nor the IT professionals should require in-depth knowledge of each others’ domain. In such a set up, a black-box approach is often followed where the external IT professionals rely on the formal requirement specification developed by business professionals to generate an IT solution in isolation (Lee and Kim 1999). In reality, the lack of interaction and coordination between business and IT professionals in such an approach have been found to lead to poor project outcomes, especially in complex projects where knowledge boundaries of different expertise need to be spanned to tackle novel problems (Carlile 2004). Even when the need for business and IT professionals to acquire knowledge beyond their specialties is clear, it can be difficult to achieve as the thought worlds of the two groups differ. The
problem is even more pronounced for project teams involving external IT consultants with whom the business professionals had no prior collaboration history and shared communication norms. Consequently, knowledge transfer across these boundaries is often prone to distortion. This induces our interest to examine how knowledge transfer between external IT consultants and business professionals can be facilitated during ISD.

To ensure that the final system fulfills business needs, business and IT knowledge need to be effectively transferred and integrated during ISD. Knowledge transfer is considered a necessary condition for its integration. The extent of knowledge integration can have significant impacts on intermediate project outcomes such as creativity (Tiwana and McLean 2005) as well as final outcomes such as system quality (Nelson and Cooprider 1996). Effective knowledge integration requires the cooperation and coordination of business and IT groups in sharing their knowledge. However, how cooperation can be effected for knowledge transfer and integration has not been adequately examined. Most studies (e.g., Faraj and Sproull 2000; Ko et al. 2005) have focused on the inherent characteristics of the knowledge source or recipient (e.g., absorptive capacity), communication channel (e.g., channel richness), and social relationship (e.g., trust) rather than the motivation of the partnership between these groups. To address this gap, this research-in-progress proposes to empirically examine the knowledge transfer between business and external IT consultants in ISD projects in terms of the cooperation and interdependence between these groups.

In this study, we define knowledge transfer as the communication of knowledge from a source so that it is learned and applied by a recipient (Ko et al. 2005). Theories of group behavior and cooperation provide a viable lens through which to study knowledge transfer between business and IT groups. Particularly, the theory of social interdependence has been fruitfully applied to study coordination and cooperation in various types and levels of social systems such as organizations and communities (Johnson 2003). The theory posits that the way group members’ or subgroups’ goals, tasks, and rewards are structured determine how they interact, and the interaction pattern determines the situation’s outcome (Deutsch 1949; van der Vegt and van de Vliert 2002). The theory takes into account that groups are calculative and attempt to maximize their own gains. This is highly congruent with the phenomenon of IT-business interaction in ISD, which can be viewed as a form of joint work where the subgroups work with each other to achieve various group and project objectives while at the same time attempting to maximize their own goals.

With the above practical and theoretical motivations, the research questions for this study are:

a) How do various forms of interdependencies motivate the transfer of knowledge between business professionals and external IT consultants in ISD?

b) How does the extent of knowledge transfer affect ISD project performance? The focus on interdependencies can potentially offer a fresh theoretical perspective on the underlying mechanisms motivating business professionals and external IT consultants to transfer knowledge to each other. It can also provide insights into practical means for managing goal, task, and reward structures to foster knowledge transfer and ultimately improve project performance.

The following section reviews existing literature on knowledge transfer between business and IT professionals. The concept of interdependence and its applicability to study knowledge transfer in ISD are also discussed. The proposed research model and hypotheses are then presented in Section 3. Section 4 briefly describes our plan for data collection.

**Literature Review**

Prior research on knowledge transfer between business and IT professionals has identified different antecedents of their transfer behavior. The antecedents can be categorized into
characteristics of source/recipient, characteristics of communication, characteristics of social relationship, and motivational factors (see Table 1). Although these antecedents outline the circumstances that can affect knowledge transfer, they fall short in explaining participants’ underlying motivations. Studies that examined motivational factors in knowledge transfer have partly filled this void (e.g., Ko et al. 2005). However, the delineation of motivational factors in these studies is mainly through their intrinsic or extrinsic role. In particular, the mechanisms (e.g., goal, task, and reward structures) through which the cooperative motivations for knowledge transfer can be achieved have not been studied. To address this gap, we adopt the theory of social interdependence to explore how cooperative motivations for knowledge transfer between business and external IT professionals can be fostered.

Table 3: Antecedents of Knowledge Transfer between Business and IT Professionals

<table>
<thead>
<tr>
<th>Proposed Taxonomy of Antecedents</th>
<th>Constructs Examined</th>
<th>Example Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of Source/Recipient</td>
<td>Absorptive capacity</td>
<td>Ko et al. (2005), Tiwana and McLean (2005)</td>
</tr>
<tr>
<td></td>
<td>Source credibility</td>
<td>Ko et al. (2005)</td>
</tr>
<tr>
<td></td>
<td>Expertise</td>
<td>Faraj and Sproull (2000)</td>
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<tr>
<td></td>
<td>Professional experience</td>
<td>Faraj and Sproull (2000)</td>
</tr>
<tr>
<td>Characteristic of Communication</td>
<td>Encoding competency</td>
<td>Ko et al. (2005)</td>
</tr>
<tr>
<td></td>
<td>Decoding competency</td>
<td>Ko et al. (2005)</td>
</tr>
<tr>
<td></td>
<td>Frequency</td>
<td>Lind and Zmud (1991)</td>
</tr>
<tr>
<td></td>
<td>Channel richness</td>
<td>Lind and Zmud (1991)</td>
</tr>
<tr>
<td>Characteristic of Social Relationship</td>
<td>Shared understanding</td>
<td>Ko et al. (2005)</td>
</tr>
<tr>
<td></td>
<td>Arduous relationship</td>
<td>Ko et al. (2005)</td>
</tr>
<tr>
<td></td>
<td>Mutual Trust</td>
<td>Nelson and Cooprider (1996)</td>
</tr>
<tr>
<td>Motivational Factors</td>
<td>Intrinsic motivation</td>
<td>Ko et al. (2005)</td>
</tr>
<tr>
<td></td>
<td>Extrinsic motivation</td>
<td>Ko et al. (2005)</td>
</tr>
</tbody>
</table>

**Theory of Social Interdependence**

The theory of social interdependence describes how individuals interact in cooperative working situations. The theory has been effectively applied to explain and predict the behaviors of both individuals and groups. In this study, we focus on the IT and business subgroups in ISD team. The theory posits that interdependencies among subgroups’ goals, tasks, and rewards can determine the extent to which they promote the success of others by cooperating (Deutsch 1949; Van der Vegt and Van de Vliert 2002). As interdependencies between business and IT professionals abound in ISD, this theory has the potential to offer important insights into the phenomenon. In particular, all ISD involves key processes such as requirement specification and user training whose accomplishment relies on the subgroups’ cooperation. A knowledge source at one phase (e.g., business users during requirements specification) can become a knowledge acquirer (e.g., business user during training) at another, which generates various interdependencies between business and IT professionals. These interdependencies can affect their interaction and knowledge transfer in ISD and subsequently the outcome of the situation i.e., ISD project outcome. The three forms of interdependencies i.e., goal, task, and reward, are further explicated below.

Goal interdependence is defined as the extent to which a subgroup (i.e., business or IS professionals in the ISD team) believes that their goals can be achieved only when the goals of the other subgroup are also met (Deutsch 1949). It goes beyond goal alignment in that it requires the subgroups’ goals to be not only integrated and compatible, but also reliant on the goal attainment of the other subgroup. When subgroup’s goals are interdependent, the attainment of one subgroup’s goal is subjected to that of the other subgroup. Such goal interdependence promotes interaction where subgroups facilitate each other’s effort to reach
their goals by exchanging resources and information, giving and receiving feedback, and challenging each other’s reasoning (Johnson 2003).

Task interdependence refers to the extent to which a subgroup believes that they depend on the other subgroup for being able to carry out their job (van der Vegt et al. 2000). In the context of ISD, task interdependence results from the division of labor between business and IT professionals who possess different expertise and contribute differently to the project. When task interdependence is high, task completion requires collective action and subgroups must closely coordinate their actions and share resources.

The terms task interdependence and goal interdependence have sometimes been used interchangeably. However, they are conceptually and empirically distinct (Wageman 1995). Groups may have an overall interdependent goal (e.g., develop IS that can adequately fulfill business needs) but the means to complete their tasks to accomplish the overall goal may be independent (e.g., installation of hardware and software by IT professionals may not involve business professionals). To ensure their discriminant validity, a careful construct operationalization process needs to be undertaken to delineate their conceptual boundaries.

Organizations typically possess performance-related pay systems, which explicitly link financial rewards to individual or group performance (Guest 2002). These structures are often designed such that rewards of individuals and groups are interrelated. Reward interdependence refers to the degree to which the significant reward a subgroup receives depends on the performance of the other subgroup (Wageman 1995). In the context of ISD, reward interdependence is likely to occur if each subgroup’s reward is based upon the entire ISD project team’s performance in which case the subgroups can be expected to cooperate to maximize their overall rewards.

Research Model and Hypotheses
In this study, we posit that the interdependencies in goal, task, and reward among the subgroups of business and external IT professionals in an ISD project team significantly affect the extent of knowledge transfer. Knowledge transfer is in turn expected to influence project performance. The proposed research model is depicted in Figure 1.

Goal Interdependence
ISD is a socio-technical process involving multiple objectives of various project stakeholders, with two major stakeholders being business and IT professionals. It is likely that each group will have multiple goals and some are dependent on the goal attainment of the other group. When business professionals and external IT consultants have interdependent goals, they will promote their mutual goal attainment by coordinating and cooperating (Deutsch 1949). This suggests that when the work of either subgroup calls for knowledge input from the other subgroup, the source will be more willing to transfer their knowledge in order to support the work of the other subgroup. This is because the more their colleagues can perform well, the
more they can contribute to the attainment of shared goals. Hence, we propose that:

**H1:** The level of goal interdependence among business and external IT professionals is positively related to the extent of knowledge transfer between them.

**Task Interdependence**

Knowledge transfer between business and IT professionals occurs more intensively during requirement specification and user training (Tiwana et al. 2003). During requirement specification, the IT professionals depend on the business professionals to transfer their business knowledge while the business professionals count on the IT professionals’ expertise to translate their requirements accurately so that the final IS reflect their needs. During user training, the business professionals rely on the IT professionals to impart their knowledge on the operation and functionalities of the new IS so that they can perform their business activities. At the same time, the IT professionals depend on the business users to provide feedback with regard to the new IS so that it can be improved.

These reciprocal task interdependencies often require joint control of tasks and stimulate exchange of knowledge about project requirements, task assignments, and development progress (Straus and McGrath 1994). With such reciprocal task interdependencies, knowledge transfer is seen as a form of social exchange (Kankanahalli et al. 2005), where the knowledge contributing subgroup expect some future return for transferring their knowledge, probably in the form of knowledge that are relevant to their own future tasks. Both groups perceive mutual obligation (Koh et al. 2005) to transfer knowledge to the other group in exchange for knowledge they need for other tasks. Thus, we hypothesize that:

**H2:** The level of task interdependence among business and external IT professionals is positively related to the extent of knowledge transfer between them.

**Reward Interdependence**

Different organizations adopt diverse reward mechanisms. However, rewards are almost always linked to performance. When the reward of business professionals positively depends on that of the IT professionals and vice versa, both groups will attempt to maximize their own reward by enhancing that of the other group. This implies that they are likely to cooperate rather than compete (Deutsch 1949). This will lead to harmonized action and therefore more effective knowledge transfer. Realizing that their knowledge is needed by the other group to perform, they are likely to be willing to transfer their knowledge to enable the other group to carry out their work successfully and reap the rewards. Thus, we hypothesize that:

**H3:** The level of reward interdependence among business and external IT professionals is positively related to the extent of knowledge transfer between them.

**Project Performance**

In this study, we conceptualize project performance in terms of efficiency of ISD project and effectiveness of the resultant IS (Faraj and Sproull 2000). Aspects of efficiency include adherence to budget and schedule. Dimensions of effectiveness include system reliability, completeness of functionalities, and attainment of project objectives. Evidence on the positive influence of knowledge transfer on these aspects of project performance is abundant. For example, cross-unit knowledge transfer has been found to lead to innovative solutions for business problems as it promotes organizational learning by bridging different perspectives in juxtaposition (Tiwana and McLean 2005). Hence, we hypothesize that:

**H4:** The extent of knowledge transfer among business and external IT professionals is positively related to the project performance.

**H5:** The extent of knowledge transfer fully mediates the effect of goal, task, and reward
Control Variables
Established teams are likely to have developed a shared perspective on many issues during their previous history together. They tend to continue to assume this shared perspective for many future issues which can facilitate knowledge transfer (Mennecke and Valacich 1998). Hence, it is important to control for the effect of the prior collaboration history of external IT and business professionals to fully discern social interdependencies’ effect on knowledge transfer. Knowledge transfer is also inherently more challenging in larger project teams than in smaller teams. In addition, development of more complex or innovative IS tends to generate more intensive knowledge transfer than simple or packaged IS. Teams in later phases of ISD might have developed shared understanding that affects their extent of knowledge transfer. Thus, we also include team size, project phase, and project complexity as control variables (Ko et al. 2005).

Plan for Further Study
The proposed research model will be assessed with data collected through survey of external IT consultants and business professionals in a matched-pair sample. A step-by-step procedure recommended by Churchill (1979) was used to develop the survey instrument. Goal interdependence is operationalized as the degree to which external IT consultants’ goals and objectives are aligned and interdependent with that of the business professionals’ and vice versa. Task interdependence is measured in terms of the level of cooperation, collaboration, and coordination among the subgroups needed to accomplish their tasks. Reward interdependence is assessed as the degree to which a subgroup’s bonus, reward, and feedback depend on the other subgroup. Knowledge transfer and the three forms of interdependence are measured from both business and IT groups. Project performance is measured in terms of system reliability, attainment of project objectives, and adherence to budget and schedule. All items are measured on 7-point Likert scales. Two sets of questionnaires will be mailed to each ISD project team – one tapping external IT consultants’ perceptions of their interdependencies and knowledge transfer and the other tapping business professionals’ perceptions of their interdependencies on consultants and knowledge transfer.

In sampling the respondents, we include only ongoing projects. Restricting the sample is considered necessary to avoid threatening internal validity as a result of maturation. Members of near-completion or completed projects are likely to be more cognizant of the interdependencies between external IT consultants and business professionals compared to when the project was underway as a result of experience. When the interdependencies and knowledge transfer scales are administered at the same time, respondents from near-completion or completed projects may report their current perception of the level of interdependencies and previous extent of knowledge transfer rather than their perception of the level of interdependencies at the time of knowledge transfer. Although providing clear instructions on the time frame of interest to respondents in the questionnaire may be able to alleviate some of the error, the data collected is still unavoidably subjected to recall error.

Conclusion
Cross-domain coordination between business and IT professionals is critical to the success of ISD efforts. This paper develops a view of knowledge transfer in ISD projects from the perspective of social interdependence theory. Studies on team dynamics, organizational, behavior and knowledge transfer have pointed towards the applicability of the theory in

interdependence on project performance.
understanding the phenomenon. The results of the study is expected to provide suggestions on how project managers can articulate project goals, design tasks, and structure rewards at the inception of and during the project to prompt external IT consultants and business professionals in redrawing the boundaries of ‘group’ and engage in knowledge transfer. By breaking through the defenses and achieving knowledge integration, the ISD project’s outcome can be enhanced.

References
