A CONCEPTUAL FRAMEWORK OF KNOWLEDGE INTEGRATION IN MULTISOURCING ARRANGEMENTS

Completed Research Paper

Xiaowei Jin  
Warwick Business School  
University of Warwick  
Coventry, U.K.  
phd11xj@mail.wbs.ac.uk

Julia Kotlarsky  
Aston Business School  
Aston University  
Birmingham, U.K.  
j.kotlarsky@aston.ac.uk

Abstract

As organizations are increasingly outsourcing interdependent IT and business services to multiple vendors, the issue of knowledge integration between client and multiple vendors is becoming of high relevance today. This paper explores the antecedents and mechanisms which facilitate the success of knowledge integration across multiple stakeholders in multisourcing and the outcomes of successful knowledge integration in this context. The paper develops a conceptual framework of knowledge integration in the multisourcing arrangements, based on a detailed review of current literature on knowledge integration and applying it to the multi-vendor environment. This paper concludes by calling for further empirical study to examine the integrative framework of the key antecedents, mechanisms and consequences of knowledge integration in the multisourcing arrangements.

Keywords: outsourcing, multisourcing, multi-vendor, knowledge integration
Introduction

Multisourcing (also referred to as “multi-vendor” or “multi-supplier” sourcing) which implies buying interdependent IT and business services from internal and/or external vendors to seek optimal business goals (Bapna et al. 2010; Oshri et al. 2011) is becoming a dominant sourcing model for organizations that rely heavily on third parties to provide IT and business processes and services. Today organizations are shifting away from large-scale long-term contracts with a single vendor to smaller contracts of shorter duration with multiple vendors that deliver interdependent processes and services. One example of such a multisourcing arrangement is a US$2.2bn five-year outsourcing deal signed by the ABN AMRO bank in late 2005 under which the Netherlands-based bank contracted five vendors: IBM, Tata Consultancy Services (TCS), Infosys, Patni Computer Systems, and Accenture.\footnote{In 2010 this multisourcing arrangement was extended; the same vendors were contracted but the majority of work was divided between IBM, TCS and Infosys, leaving relatively small scope to Accenture and Patni Computer Systems.}

While there is a vast literature on multiple suppliers focusing on the supply chain perspective (in particular in the operations management field), or from the supply base perspective (often in the manufacturing and retail contexts) where having a number of suppliers for the same part or product is considered as a strategy to reduce dependency on a specific supplier, and increase competition between the suppliers (Levina and Su 2008), there is limited research on multisourcing from IS perspective. In the earlier IS literature, multisourcing has been discussed in the context of IT outsourcing, where it has been regarded as one of the sourcing models, or new trends in outsourcing. In this IT outsourcing literature the term “multisourcing” has often referred to a scenario where a client firm has several IT-related contracts with several IT suppliers providing different IT services (Carmel et al. 2002; Cullen et al. 2005; Currie 1998; Lacity et al. 1998). With the maturation of the outsourcing industry and IT outsourcing vendors moving up the value chain to offer strategic and knowledge-intensive outsourcing services, nowadays client organizations always use more than one supplier for various IT and business processes and services. For example, Su et al. (2011) suggested that multisourcing arrangements can be characterized by the different breadth and depth of supply relationships that constitute a supply base of a client firm, where the breadth of the supply base reflects the number of suppliers the focal firm uses for a given business function, and the depth of a supply relationship is characterized by the client's level of investment in a particular supply relationship for a given function. Yet, the most important characteristic of multisourcing that client firms experience today is the interdependency between services or processes contracted to different vendors. Bapna et al. (2010) in their Research Note highlighted that task interdependencies in modern multisourcing arrangements create challenges associated with the ability to observe and measure performance of individual vendors when the outcome of a process/project is dependent on the effort of multiple suppliers. Consequently, coordination between the suppliers is critical to ensure the success of a multisourcing arrangement. Vendors need to identify interdependencies and adopt coordination mechanisms that are able to address task interdependencies whilst keeping transaction costs at a relatively low level (Bapna et al. 2010).

Adopting the multisourcing definition of Bapna et al. (2010) and Oshri et al. (2011) who stressed that interdependency between tasks outsourced to different vendors is the central characteristic of multisourcing, we argue that, in multisourcing arrangements, vendors need to work together to deal with the consequences of task interdependencies to find (mutually satisfying) approaches to deliver to their individual objectives (e.g., Service Level Agreements) while still delivering to the joint goals. The degree of success in dealing with interdependencies depends to a great extent on vendors’ ability to understand each other and integrate their knowledge in situations when they face problems (e.g., the jointly supported service fails and vendors need to identify where and under whose responsibility the problem lies), or when they are trying to increase their profits (e.g., trying to improve joint performance which would result in additional financial rewards that the vendors would share).

As vendors involved in a multisourcing arrangement bring their own expertise which is associated with their domain (e.g., a specific technology or business process), experience in specific contexts associated with past projects and clients, as well as their own terminology and organizational culture, they might
sometimes find it difficult to understand each other in relation to a specific context and/or terminology, let alone to integrate knowledge towards developing a joint solution or strategy.

The literature on the interpretive and practice-based views of knowledge highlights that, knowledge is not simply an aggregate of information which can be de-coupled from its context, but is inherently tacit and embedded in social and practical contexts (Bourdieu 1990; Levina et al. 2005; Orlikowski 2002). Thus, knowledge processes take place where practices are shared in a rich and meaningful way (Brown et al. 1998; Brown et al. 2001; Cook et al. 1999). However, where shared practices are absent, boundaries emerge that impede knowledge processes (Levina et al. 2008b). Therefore, in the multisourcing context where client and multiple vendors represent different knowledge domains, and have expertise associated with different contexts and embedded in different organizational routines, these differences may impede knowledge integration between the parties involved.

Therefore, the knowledge integration process in a multi-vendor outsourcing context is a complex, intensive and dynamic activity, which requires close cooperation, coordination and governance among the diverse stakeholders from several organizations (Bapna et al. 2010). Knowledge integration in this context is conceptualized as a collaborative process that crosses organizational boundaries by combining complementary, distributed, specialized knowledge possessed by multiple internal and external parties or “clusters” that contribute to joint outcomes. If knowledge from a particular cluster is missing or is not integrated (e.g., as a result of poor participation of one of the parties), the multisourcing outcomes may suffer (Bhandar et al. 2007).

Outsourcing literature shows that client firms need to develop internal capabilities to be able to learn from the competencies and experiences of their providers (Azadegan et al. 2008). Knowledge integration between client and multiple vendors is one of such capabilities and needs to be studied in depth. Knowledge integration capability is important even in the single-sourcing scenario (i.e., knowledge integration between a client and vendor organizations), in particular when dealing with novel circumstances, such as the transformation of business services and innovation. Under such conditions knowledge integration would facilitate learning and knowledge transformation (Bechky 2003; Carlile 2004) between client and vendor personnel. Having multiple vendors involved in the provision of inter-dependent services would add additional challenges to knowledge integration efforts, as more parties would be involved.

Although existing literature on multisourcing has not addressed knowledge integration, there has been a considerable amount of research on mechanisms and forms for effective inter-organizational knowledge management and collaboration (Myers et al. 2008) and knowledge integration in cross-functional teams (Kellogg et al. 2006; Majchrzak et al. 2011), which is relevant to multi-vendor settings. Building on this extensive literature, this paper addresses the following research question:

*What antecedents and mechanisms facilitate the success of knowledge integration across multiple stakeholders in multisourcing, and what are the outcomes of a successful knowledge integration in this context?*

**Knowledge Integration in the Multisourcing Context**

In the existing literature knowledge integration (KI) has been studied from different angles and defined in many different ways. Some scholars view knowledge integration as a *process* that takes place on an intranational level. For example, Bhandar, Pan et al. (2007) define it as “the process of combining, applying, and assimilating disparate specialized knowledge” (p.264). The process view of knowledge integration stresses the integration activities as a series of processes of knowledge identification and reconfiguration that lead to creating new knowledge (Berggren et al. 2011), or the processes of transferring, translating and transforming knowledge, according to Carlile (2004). Other scholars focus on knowledge integration as an *outcome* of the process, focusing on the quality of the outcome (i.e., integrated knowledge) achieved. For example, according to Dibiaggio and Nasiriyar (2009), “knowledge integration refers to the capabilities to bring together and combine knowledge elements to perform innovative activities” (p.268). The context in which knowledge integration is studied and a unit of
analysis, for instance, a project team (e.g. Newell et al. 2004) or cross-functional team (e.g. Majchrzak et al. 2011), is reflected in the way knowledge integration is defined for the purpose of a specific research. For example, focusing on the project level Tiwana (2008) defined knowledge integration as “the process of jointly applying specialized knowledge held by various alliance partners at the project level. In this perspective, knowledge integration creates value through the application of alliance partners’ specialized knowledge to project specific activities” (p.255).

As multisourcing arrangements involve representatives from different organizations, and most likely different functional domains, in our conceptualization of knowledge integration in multisourcing we were guided by the literature on knowledge integration in inter-organizational context and cross-functional teams. According to this literature KI can be viewed as the synthesis of specialized knowledge into situation-specific systemic knowledge (Alavi and Tiwana 2002). From a practice-based perspective, knowledge integration within a project involves “overcoming barriers to the flow and transfer of knowledge arising from pre-existing divisions of practice among team members” (Scarbrough et al. 2004: p.1582). This view highlights the tacit and embedded nature of specialized knowledge, in line with Newell et al. (2004) who stated that “the integration of knowledge within the project team does not simply involve the mechanistic pooling of the various ‘pieces’ (Knights and Wilmott 1997). Rather, the integration of knowledge depends on joint knowledge generation” (p.45). Nonaka (1994) also notes that, by way of outsourcing, knowledge can be integrated between clients, suppliers, agencies and even competitors. In the inter-organizational context, Tiwana et al. (2003) identified two types of KI activities, to support external and internal knowledge integration. Consistent with these literatures, we characterize KI in the outsourcing environment as follows: 1) Knowledge integration is concerned with knowledge dispersed across client and vendor organizations; 2) The purpose of knowledge integration addresses a certain objective(s), i.e., new or improved services, business processes and other innovative outcomes; 3) The knowledge integration process may occur not only as a formal activity, but also as an informal interaction amongst the parties involved.

Typically, some delegates (be it an individual or a group) from client and vendor organizations are involved in a multisourcing engagement. These representatives or stakeholders in the KI process can be regarded as “knowledge clusters”. Specifically, a knowledge cluster in our study refers to a group of people that possess certain specialized and essential knowledge (e.g., from the client and various vendors). As knowledge from multiple knowledge clusters can be highly differentiated and specialized, these groups are likely to face numerous boundaries that may influence their perceptions and attitudes towards the KI process (Carlile 2002; Majchrzak et al. 2011). Based on an extensive review of KI definitions and its characteristics in this study, KI in the multi-vendor outsourcing context is regarded as:

A collaborative process that crosses organizational boundaries through which distributed, specialized knowledge held by various partners (client and vendors) is combined and applied to contribute to joint outcomes at the multisourcing arrangement level, and create value in the context of specific activities related to the multi-vendor arrangement.

In line with this definition, we argue that any multisourcing arrangement will involve knowledge integration between the parties involved in the arrangement. This process will not be easy, not only because knowledge in such context is often dispersed, differentiated and embedded (Pan et al. 2007) in various knowledge clusters, but also because the parties involved typically possess diverse competencies (Pisano 1994) and have their own agendas that are intrinsically different and may lead to conflicting interests (Pan et al. 2001). Problems may also arise from the differences between the goals and structures of different organizations, which cause each party to feel vulnerable to opportunism or shirking of responsibilities by others (McFarlan et al. 1995).

Given this background, multisourcing is a complex and collaborative value creation process (Levina et al. 2008a; Su et al. 2011) characterized by the degree of inter-dependence amongst various knowledge clusters, which requires a series of cooperation, coordination and governance activities (Bapna et al. 2010). We also regard a multisourcing engagement as a complex endeavor as it involves both collaborative and competitive behaviors among knowledge clusters. Compared with other inter-organizational projects, another apparent characteristic of multisourcing is the contractual governance, which details the potential outputs for clients and the coordination among multiple suppliers engaged in the multisourcing project. These characteristics, along with the difficulties in building multilateral relationships, make the
knowledge integration among vendors and the client an arduous task. Taking into account these characteristics, this paper aims to develop a conceptual framework of knowledge integration in multi-vendor outsourcing relationships based on a detailed review of the key literature. Guided by our research question “What antecedents and mechanisms facilitate the success of knowledge integration across multiple stakeholders in multisourcing, and what are the outcomes of a successful knowledge integration in this context?” in the following sections we aim to investigate in depth what antecedents and mechanisms influence the ability of a team that includes representatives from the client firm and multiple-vendor organizations to assimilate and combine knowledge from these different stakeholders towards a joint outcome, and what the outcomes are of a successful knowledge integration.

The primary antecedents of knowledge integration refer to those factors that affect the degree of success of the KI process. Those activities that are supporting the achievement of successful knowledge integration are referred to as knowledge integration mechanisms. A successful knowledge integration is associated with some outcomes, such as organizational capabilities (Dutta et al. 2005) and satisfying outcomes (Berggren et al. 2011). Figure 1 depicts (schematically) the proposed conceptual framework for analyzing the knowledge integration process between multiple suppliers and a client firm. All elements of this model are described in detail (respectively) in the following section.

**Antecedents of Knowledge Integration**

The antecedents of knowledge integration refer to those factors that affect the degree of success of the KI process. Literature on what factors influence KI range over discipline domains, levels of analysis and methods, with a multitude of qualitative case studies (Berggren et al. 2011). Although the antecedents summarized do not cover all the factors, Table 1 shows the main factors driving knowledge integration, based on the existing studies. We distinguish four types of antecedents that influence knowledge integration: type of knowledge, social factors, organizational capabilities, and task characteristics.

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>Description</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge Attributes</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal knowledge and external knowledge</td>
<td>External knowledge refers to the existing knowledge within the organization/team, while the external knowledge refers to the new knowledge from outside.</td>
<td>D’Adderio (2001); Tiwana et al. (2003); Woiceshyn et al. (2005); Mitchell (2006); Dibiaggio et al. (2009); Ahuja et al. (2011)</td>
</tr>
<tr>
<td>Tacit knowledge and explicit knowledge</td>
<td>Explicit knowledge is transmittable in formal, systematic language while tacit knowledge is usually difficult to formalize and communicate, and also rooted in action, commitment, and involvement in a specific context (Polanyi 1966).</td>
<td>Nonaka (1994); Grant (1996a)</td>
</tr>
<tr>
<td>Knowledge</td>
<td>The degree to which the knowledge to be</td>
<td>Grant (1996a); Schmickl et al.</td>
</tr>
<tr>
<td><strong>Knowledge Management and Business Intelligence</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Differentiation</strong></td>
<td>Integrated is common or not. Common knowledge means common understanding of a subject area shared by the members engaged in communication.</td>
<td>(2008); Nicolini et al. (2009); Enberg et al. (2006); Erkelens et al. (2010); Bhandar (2010)</td>
</tr>
<tr>
<td><strong>Knowledge Boundaries</strong></td>
<td>Differences in knowledge that is localized, embedded and invested in different practices. They can be of syntactic, semantic or pragmatic nature.</td>
<td>Carlile (2002); Carlile (2004); Majchrzak et al. (2011); Scarbrough et al. (2004); Bechky (2003); Dougherty et al. (2011)</td>
</tr>
</tbody>
</table>

### Social Factors

| **Trust** | The confidence and reliance on other individuals or parties. | Mehta (2006); Erkelens et al. (2010); Bhandar (2010) |
| **Culture/Climate** | Organizational culture or work environment that enhances the integration willingness. | Kogut et al. (1992); Huang et al. (2003); Argote et al. (2003); Collins et al. (2006); Adenfelt et al. (2007); Hung et al. (2008); Erkelens et al. (2010) |
| **Structure (of team, project, organization or network)** | The underlying interconnection of communication and power links between the members from client and vendor, e.g., hierarchy and cohesion. | Ravasi et al. (2001); Erkelens et al. (2010); Bhandar (2010); Tiwana (2008); Balaji et al. (2005); Hung et al. (2008); Ordanini et al. (2008) |
| **Team Identification** | Identification creates an emotional bond between team members and the target, and enhances their commitment to the target. | Kogut et al. (1996); Willem et al. (2008); Ahuja et al. (2011); Liu et al. (2011) |
| **Socio-cultural Boundaries** | The client and the vendor teams come from different cultural backgrounds and hence have diverse sets of beliefs regarding work culture, deadlines and general behavior. | Balaji et al. (2005) |

### Organizational Capabilities

| **Experiences** | Practical experience of solution implementation from previous projects. | Grant (1996a); Huang et al. (2003); Hung et al. (2008); Zirpoli et al. (2009); Thatcher et al. (2011) |
| **Expertise (of client and vendors)** | Such as basic knowledge of the specialized field, client IT expertise (i.e., client firm's knowledge in the domain of the outsourced IT project) and vendor expertise (repeated experience in providing similar services to other client firms). | Hung et al. (2008); Thatcher et al. (2011) |
| **Extensible Capacity** | Expanding the existing knowledge base by searching, accessing and absorbing new and diverse knowledge to generate additional feasible solution(s). | Hung et al. (2008) |
| **Technological Capability** | The application capability of technology tools, such as communication systems, knowledge channel data mining techniques, communication platform providing by IT infrastructure. | Balaji et al. (2005); Hung, et al. (2008); Zirpoli et al. (2009); Ahuja et al. (2011) |

### Task-related Factors

| **Contractual Terms/Strategic Objectives** | The agreement that specifies the needs, responsibilities, project targets, expected | Rauniar (2005); Adenfelt et al. (2007); Zirpoli et al. (2009); Ahuja et al. (2011) |
Knowledge Attributes

The first category of antecedents is knowledge attributes, as different types of knowledge will directly affect the pattern and mechanisms of knowledge integration. For example, explicit knowledge is transmittable in formal, systematic language while tacit knowledge is usually difficult to formalize and communicate, and also rooted in action, commitment, and involvement in a specific context (Nonaka 1994); therefore, tacit knowledge would be more efficiently integrated in a collaborative approach. Additionally, (Grant 1996b) suggests more elaborate knowledge integration is needed for less explicit knowledge, and he also proposes that tacit knowledge is a determinant of knowledge integration. However, few scholars have conducted an empirical investigation to validate this argument owing to the difficulty of operationalizing tacit knowledge (Berggren et al. 2011).

The degree of differentiated or shared knowledge between the parties involved in knowledge integration is also emphasized as one of the factors affecting knowledge integration (Lindkvist, 2005; Grandori, 2001; (cf. Berggren et al. 2011). The similarity in a knowledge base is referred to as “some kind of overlap in their basic knowledge” (Erkelens et al. 2010: p.93). In line with this, other studies have argued common knowledge as another influencing variable of knowledge integration (i.e. Erkelens et al. 2010; Grant 1996b; Huang et al. 2003; Nicolini et al. 2009). Common knowledge is claimed as prerequisite for integrating knowledge by Grant (1996b). Drawing from a comparative qualitative case study on projects in IT/insurance and biotechnology, Nicolini et al. (2009) argue that KI is related to the development of common ground among specialized practices (cf. Berggren et al. 2011). Other research, however, shows that common knowledge may be kept to a minimum, while maintaining an efficient knowledge integration (Berggren et al. 2011).

Common and differentiated knowledge may also be related to homogenization and heterogeneity. For instance, a team with high knowledge heterogeneity is more likely to absorb external knowledge from multiple domains (Anand et al. 2003; Cohen et al. 1990). Therefore possessing high levels of knowledge heterogeneity (Tiwana et al. 2005) may better enable the integration of external knowledge (Zahra et al. 2002). On the other hand, excessive heterogeneous knowledge may result in a lack of common knowledge for team members from diverse functional areas, and the pertinence of one another’s knowledge can be difficult to identify. Thus, barriers to understanding and to the integration of knowledge resources are created (Mehta 2006). Such barriers are associated with knowledge boundaries that, according to interpretive and practice-based views of knowledge, individuals from different areas of practice will encounter when attempting to integrate their differentiated knowledge. Therefore, we specified an additional category “knowledge boundaries” that aims to distinguish between syntactic, semantic and pragmatic (or political) knowledge boundaries (Carlile 2002; Carlile 2004) associated with different terminology (i.e., syntax), meaning (i.e., semantics), and diverging goals (i.e., politics). In particular, the pragmatic boundary has been identified as the fundamental boundary creating major obstacles for knowledge integration (Carlile, 2004; Bechky, 2003).

Insights for the Multisourcing Context

Researchers have identified and examined different types of knowledge, and investigated how to integrate different types of knowledge within or across organizations. Overall, compared to explicit knowledge,
integrating tacit knowledge is considered to be more efficient through a collaborative approach (Nonaka 1994). Furthermore, developing common ground among specialized practices facilitates knowledge integration. In the multi-vendor environment, such specialized practices are associated with knowledge clusters of different parties involved. In the outsourcing context scholars have highlighted the challenge of integrating large chunks of external knowledge (Becker et al. 2003). We believe that it is important to include different types of knowledge in the framework for studying KI in the multisourcing context. In spite of this, knowledge integration is studied as a process rather than an outcome in our definition; we believe that this category is less relevant to the multisourcing context as knowledge itself cannot be regarded as a determinant. Knowledge boundaries, however, are a result of different types of knowledge possessed by different parties – client and vendors – involved in multisourcing arrangements. In particular, the more complex the knowledge boundaries are between the parties involved, the more challenging it will be to integrate knowledge between them.

Therefore we formulate the following proposition and include knowledge boundaries in the integrated framework (Figure 2).

**Proposition 1a:** Knowledge boundaries (in particular, a pragmatic boundary) between partners will create difficulties for KI in multisourcing arrangements.

**Social Factors**

Regarding social factors, the roles of relationship, trust, level of interaction, and organizational climate, and work environment, in the integration of knowledge are intensively discussed in the current literature on knowledge integration. For example, Ashkanasy et al. (2000) believe employees’ collective attitude and belief make up the organizational climate. These shared values and behaviors may encourage employees to concentrate on corporate interests, and this then affects the ability, motivation and opportunity for employees’ knowledge integration (Argote et al. 2003; Kogut et al. 1992). The empirical research of Smith et al. (2005) shows the team’s work environment has a significant positive influence on knowledge creativity, which includes knowledge integration. Similarly, cultural awareness, referring to the cultural norms and beliefs of a team, is analyzed as a contributor to knowledge integration in global R&D networks (Erkelens et al. 2010). Moreover, the study of Collins et al. (2006) validates that the collaborative environment also promotes knowledge integration. In addition, literature has indicated that motivation or willingness factors may contribute to the knowledge integration performance. Drawing from the social identity theory, Ahuja et al. (2011) proposed team identification (the degree to which team members identify with the whole team) will positively affect knowledge integration, and their findings supported this hypothesis. Identity and social identity is also highlighted as an important facilitator of knowledge integration (Kogut et al. 1996; Willem et al. 2008).

In the research of Mehta (2006), the level of mutual trust, closeness of relationships, and reciprocity among members are proposed as key antecedents of knowledge integration. From a social network perspective, Erkelens et al. (2010) used the concepts of relational embeddedness and structure embeddedness as the affecting factors of knowledge integration. The former refers to the quality and depth of relationships between units (i.e., trust, identity, face-to-face contact), and the latter means the bonding between members/units (i.e., cohesion).

The network structure (i.e., of team, project, organization, and industry) also impacts the knowledge integration (i.e. Balaji et al. 2005; Bhandar 2010). For example, Tiwana (2008) found a significant positive relationship between strong ties and knowledge integration in innovation-seeking project alliances. Increased structural ambiguity, namely, loosely coupled structure is found to be positively associated with knowledge integration(Ravasi et al. 2001).

Social capital – another similar concept to social factors – has been identified as one of the key influencing factors of knowledge integration (i.e. Bhandar 2010; Huang et al. 2003). For example, based on the three-partner collaborative project investigated by Bhandar (2010), the framework describing how the influence of different dimensions of social capital on knowledge integration behavior of the partners was proposed. Furthermore, in accordance with the three KI variables defined by Grant (1996a): scope, efficiency and
flexibility, Huang et al. (2003) studied the dynamics of knowledge integration in a cross-functional context through comparative study, revealing that social capital plays a crucial role in integrating knowledge.

Insights for the Multisourcing Context

A considerable amount of literature on KI’s antecedents is centered on trust, team awareness, boundaries, willingness, and relationships, which are categorized as social factors in this study. Although these analyses are conducted on project or organizational levels rather than in an inter-organizational environment, emphasizing these antecedents in the multisourcing context is particularly appropriate. In the multi-vendor environment where representatives from client and supplier organizations are involved in the knowledge integration process, geographical, temporal and organizational boundaries between the parties (Balaji et al. 2005) will cause additional challenges for knowledge integration. Hence, we formulate the following proposition:

**Proposition 1b:** Stronger social ties among partner organizations will be positively related to KI in multisourcing arrangements.

Organizational Capabilities

Organizational capabilities of parties involved in the integration process have been identified as another factor affecting knowledge integration. Organizational capabilities relate to the experiences, education levels, past integration, social capital, embedded practices, levels of coordination, resources, and expertise. These are discussed in detail below.

On the individual level, antecedents of knowledge integration involve experience and education levels. As indicated in previous studies, experience plays an important role in decision-making (Kolz et al. 1998). Experience also plays a crucial role in establishing the coordination capability of knowledge integration (Huang et al. 2003). Therefore, knowledge integration and new knowledge creation will be constrained if there is a lack of investment in experience and specialist expertise (Cohen et al. 1990). Education and skills that individuals develop through education is another antecedent of knowledge integration. For instance, Smith et al. (2005) show that employees with high education levels are more sensitive to new ideas and new changes and actively seek them as well, which is beneficial to mutual communication, opinion integration, and creating and developing new knowledge (Smith et al. 2005).

Hung et al. (2008) identified three KI contributing factors: field expertise, extensible capability and practical experience. In line with these findings, recent research that examined the impact of client and vendor expertise on knowledge integration concluded that both client IT expertise and vendor expertise are positively related to the knowledge integration during the outsourcing relationship (Thatcher et al. 2011). Other factors in this category include past integration, social capital, embedded practice, the levels of coordination, and resources (Huang et al. 2003).

Other capability factors influencing knowledge integration are broadly mentioned as information systems and technology, such as communication systems, data mining techniques, etc. A variety of techniques is claimed as the crucial condition for promoting knowledge transfer and enhancing knowledge integration efficiently (Zhang et al. 2004). As cited by Hong (2011), information systems provide the opportunity for firms to communicate and exchange without restraint, to adjust to different languages and cultures (Leonard-Barton 1998), to offer suggestions or supports for unfamiliar or distance colleagues (Constant et al. 1996), thereby improving the flexibility (Teigland et al. 2003) and efficiency (Mehta 2006; Smith et al. 1996) of knowledge integration. Other similar determinants of knowledge integration investigated in the literature include communication platforms, knowledge channels, infrastructure diversity, and the extent of technology usage. More specifically, Balaji et al. (2005) proposed the degree of technology used will positively affect the integration of both internal and external knowledge, as it facilitates the individual's communication from distance locations. Based on the observation of the RNS project, Hung et al. (2008) found that an adaptable knowledge channel contributed to the search, access, and obtaining of new knowledge efficiently and quickly. In addition, the communication platform is examined as a primary
contributor to knowledge integration, as interaction is essential to integration (Hung et al. 2008). On the other hand, recent research (e.g., Ahuja et al. 2011) on vendor knowledge integration argued that the diverse infrastructure processed by client and vendor resulted in complexities in communication, interaction and, subsequently, knowledge integration; moreover, developing a seamless system for both provider and client is more difficult owing to the different hardware, software and communication platforms (Ahuja et al. 2011).

**Insights for the Multisourcing Context**

This category summarized organizational capabilities and how they affect the knowledge integration process. In the multisourcing context, the client and vendors’ capabilities are also critical to the success of IT outsourcing (Lacity et al. 2009) and business process outsourcing. Therefore, we propose the following:

*Proposition 1c:* Stronger organizational capabilities of the partner organizations will have a positive impact on KI in the multi-vendor outsourcing context.

**Task-related Factors**

Other KI determinants, such as contractual terms, needs, task complexity, and task uncertainty, are suggested in the current literature, and are categorized as task-related factors in this paper.

Previous studies have argued that the integration of knowledge require parties involved to address the complexity, uncertainty and interdependence of tasks or projects in which knowledge integration effort is taking place (e.g., Ahuja et al. 2011; Grant 1996a; Mehta 2006; Stock et al. 2008). For instance, Ahuja et al. (2011), who studied knowledge integration by a vendor in the IT outsourcing context, highlighted that the development process is a highly complex process, concluding that the more complex the project requirements are, the more difficult it is to integrate knowledge (Ahuja et al. 2011). Other scholars studying IT outsourcing argued that process modularity is one of the antecedents of knowledge integration (Thatcher et al. 2011). Process modularity refers to “the degree to which the project is characterized by a loosely coupled modular design” (Thatcher et al. 2011). Uncertainty emanating from unclear project requirements and unfamiliar technologies (Thompson (1967) cited in Berggren et al. 2011) will determine the quality of specifications which, along with technological uncertainty, are found to affect the knowledge integration process (Mehta 2006). Similarly, Stock et al. (2008) analyzed technology integration and concluded that uncertainty and organizational interaction are key antecedents of the integration process.

Meanwhile, drawing on a case study of an IT outsourcing project, Bhandar (2010) proposed that obligation, needs and contractual terms are antecedents of knowledge integration in collaborative projects. Similarly, a study of knowledge integration in product development (Rauniar 2005) has found that team vision factors, including mission, strategic fit and project targets, affect knowledge integration. A strategic objective has also been identified as one of the key determinants of partitioning and integrating knowledge (Zirpoli et al. 2009). Simply put, the review above implies that the primary factors of KI, from a task perspective, are the goals and intended outcomes of the integration process (e.g., products, hardware/software, business processes and services), in addition to the characteristics (e.g., complexity, uncertainty) related to the tasks/projects.

**Insights for the Multisourcing Context**

This category has summarized the KI antecedents from the task characteristics perspective. Many of these characteristics are likely to be present in situations when knowledge integration objectives are associated with new or improved services, processes and other novel outcomes. Understanding the motivation (i.e., cost-saving, value-adding, innovation and competitive advantages) to engage in knowledge integration is also an important factor contributing to the integration outcomes. Considering multisourcing engagements, the *uncertainty, complexity, and interdependency* of outsourced tasks will influence knowledge integration between the client and vendors. The sourcing contract, in which integration terms
and intended objectives are included, will increase accountability of the side of service providers and determine the effectiveness and efficiency of the integration process. Thus, we formulate the following propositions:

**Proposition 1d:** High uncertainty and complexity of outsourced task(s) will create difficulties for KI in multisourcing arrangements.

**Proposition 1e:** Increased accountability for interdependent outcomes included in contracts with individual vendors will foster KI in multisourcing arrangements.

### Consequences of Knowledge Integration

In regard to consequences of knowledge integration (KI), empirical literature is consistent about the outcomes of knowledge integration. Similar to the taxonomy of Tell (2011), we distinguished between two categories of KI consequences: *Organizational Performance* and *Organizational Capability*. These two categories are described in detail below (see Table 2).

<table>
<thead>
<tr>
<th>Table 2. Outcomes of Knowledge Integration Studied in the Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td><strong>Organizational Performances</strong></td>
</tr>
<tr>
<td>Financial Performance</td>
</tr>
<tr>
<td>Efficiency</td>
</tr>
<tr>
<td>Effectiveness</td>
</tr>
<tr>
<td><strong>Organizational Capabilities</strong></td>
</tr>
<tr>
<td>Organization Innovativeness</td>
</tr>
<tr>
<td>Dynamic Capability</td>
</tr>
</tbody>
</table>

### Organizational Performances

Organizational performances in this paper refer to the performance improvement related to financial performance, effectiveness and efficiency of the development process. Based on a study in the software industry, the findings of Patnayakuni et al. (2006) show that integration of tacit knowledge is significantly associated with development performance. The findings of Marsh et al. (2006) also reveal that knowledge integration positively influences organizations’ new product development performance. Similarly, knowledge integration is demonstrated to facilitate both the outcomes and/or process performance of systems development (Patnayakuni et al. 2007). This finding is also supported by the studies conducted in various contexts, such as research on pharmaceutical (Henderson et al. 1994), biotechnology (Pisano 1994), scientific tools (Hoopes et al. 1999), and etc.
Mitchell (2006) found that acquiring external knowledge and integrating it internally through information executives and IT managers had a significant effect on timely project completion. It was also reported that KI enhanced the efficiency of task completion (Subramanian et al. 2008), strategy managerial decision-making and effective strategic responses are also positively associated with knowledge integration (Lessard et al. 1996). Furthermore, the positive impact of knowledge integration on stock market value (Nesta et al. 2006), financial accountability (Moorman et al. 1999), profit (Yang 2005), product time-to-market (Yang 2008) and user satisfaction (Chen et al. 2006) have been discussed and examined in existing literature (Berggren et al. 2011).

Organizational Capabilities

Findings also show KI's positive effects on the enhancement of organization capabilities. Whether studied as a direct or mediating influence, it is found that knowledge integration results in a cumulative building of capability. A set of studies has indicated that KI is positively related to dynamic capabilities (e.g. D'Adderio 2001; Söderlund et al. 2009; Verona et al. 2003). It is proved that knowledge integration has a strong, positive influence on alliance ambidexterity at a project level (Tiwana 2008) and is found to facilitate product innovation (De Luca et al. 2007; Lin et al. 2006). In addition, the innovation outcomes, even radical innovation (Zhou et al. 2012), are commonly mentioned in multiple KI studies. Considering that the knowledge integration process involves the creation of new knowledge, Tiwana et al. (2005) indicated that knowledge integration has a positive effect on creativity. Other research also shows the positive association of knowledge integration and product innovation; for instance, the innovativeness of a certain product (Marsh et al. 2006). A set of recent researches have investigated knowledge integration and innovation and concluded that there is a positive association (Brusoni et al. 2007; Dibiaggio et al. 2009). In the outsourcing context, scholars have conducted an empirical study in engineering companies and found that vendors’ integration significantly contributed to the innovation in outsourcing engagement (Bengtsson et al. 2008) cited by Berggren et al. 2011). Similarly, drawing upon a case study of eight food-processing companies in Greece, Tsekouras (2006) indicated that knowledge integration was particularly beneficial for their innovative capability. Tiwana et al. (2005) argued that knowledge integration is the primary reason for team creativity in information systems development (ISD) processes. Innovative performance enhancement is shown to rely on the integration of complementary knowledge (Dibiaggio et al. 2009). In Distributed R&D, cross-regional knowledge integration was revealed to have a direct positive influence on the quality of innovative output (Singh 2008).

Insights for the Multisourcing Context

The consequences of KI highlight new tangible and/or intangible achievements, such as new knowledge, novel products, improved business processes and better services. In the multisourcing context, achieving these outcomes will simultaneously determine the success of the multisourcing engagement. Current literature also identified user satisfaction as one of the KI outcomes. In the multisourcing context, clients of the “client firm” (outsourcer), or the client firm itself can be regarded as a “user” when satisfaction is measured.

In addition, achieving innovation in an outsourcing relationship is drawing the attention of scholars and practitioners alike. Considering outsourcing, in particular, multisourcing is increasingly regarded as an innovation and value-adding activity rather than solely as a cost-saving exercise (Oshri et al. 2011). The findings show that team creativity and innovativeness are enhanced during the KI process; thus, there is a strong possibility that KI may contribute to innovation in multisourcing engagements. Another study has identified efficiency and effectiveness as primary outcomes of KI, which in turn facilitate the cumulative building of KI capability (Dutta et al. 2005). We intend to further examine these findings in multisourcing settings. Thus,

---

2 Alliance ambidexterity is “the capacity to simultaneously exhibit alignment with alliance objectives and adaptiveness to changes in the environment” (Tiwana, 2008: 253), and is used to assess alliance performance at the project level.
Proposition 2a: The KI in multisourcing is likely to contribute to organizational performance.

Proposition 2b: The KI in multisourcing is likely to improve the client firm’s innovation capability.

Mechanisms of Knowledge Integration

A moderate amount of studies proposed mechanisms to facilitate knowledge integration processes. We group these mechanisms for knowledge integration into three perspectives: *systems and procedural mechanisms*, *interactive mechanisms* and *boundary-crossing mechanisms*.

*System and procedural mechanisms* are those formalized activities, such as rules, routines, procedures and schedules, aimed at enhancing the efficiency of knowledge integration through avoiding the costs of communication and learning. For instance, Grant (1996a) points out two primary mechanisms of knowledge integration: *direction* and *organizational routines*. The direction mechanism refers to embedding various specialist areas of knowledge into standard operating rules, while operational routines are used so “individuals develop sequential patterns of interaction which permit the integration of their specialized knowledge without the need for communicating that knowledge” (Grant 1996a). These two mechanisms are extended into four mechanisms in his subsequent paper, namely, *rules and directives*, *sequencing*, *routines and group problem-solving*, and *decision-making* (Grant 1996b). Similarly, a systematization mechanism and socialization mechanism are suggested to have positive effects on KI’s efficiency (De Boer et al. 1999). Formal interventions (e.g., information sharing, questioning others and managing time) are suggested by Okhuyen and Kathleen (2002) to enable the flexibility of integrating knowledge in groups (Ravasi et al. 2001).

The second perspective, *interactive mechanisms*, is thought to improve the possibility of integrating complex, tacit and specific knowledge through participants' interaction and collaboration through intensive interaction among various knowledge clusters, seeking the enhancement of KI's scope and flexibility. Some coordination mechanisms discussed in the literature are recognized as facilitating knowledge integration, among them are formal hierarchical structure and informal lateral relations (e.g., Tsai 2002). The findings showed that reducing hierarchical constraints and increasing inter-unit social interaction contributed to effective knowledge sharing across units within the same organization (Tsai 2002). In addition, empirical studies in various contexts broadly indicate Transactive Memory Systems (TMS) as an effective integration mechanism, for instance, studies in virtual settings (Ren et al. 2011), onsite-offshore teams in the outsourcing context (Oshri et al. 2008), and task execution circumstances in heterogeneous teams (Xiong 2008). Alavi et al. (2002) identified four major knowledge integration challenges in a virtual environment, such as (i) shortcomings of transactive memory, (ii) insufficient mutual understanding, (iii) failure to share and retain contextual knowledge, and (iv) inflexibility of organizational ties. They, therefore, put propositions that Knowledge Management Systems (KMS) foster and enhance the knowledge integration process. Other studies supplement mechanisms in this category, including organizational incentive mechanisms, intellectual training mechanisms (Chen et al. 2009; Hu 2008), cross-regional interpersonal ties (Hansen, 1999; Frost and Zhou, 2005), and mobility of individuals (Almeida and Kogut, 1999). Some structured practices, e.g., brainstorming (Hargadon et al. 1997) and liaison between organizations (Alemeida, 1996) are highlighted as being able to improve the integration effectiveness. Although the collaboration mechanism requires a large amount of investment, its benefits on KI’s scope and flexibility are outstanding (De Boer et al. 1999).

In contrast to the two perspectives listed above, some mechanisms are not focused on the direct effects on knowledge integration or a separate approach that promotes the integration process. Instead, they involve a series of transformation and/or facilitating practices to overcome and penetrate various types of boundaries in the integration process, which we refer to here as *boundary-crossing mechanisms*. Several studies indicated that knowledge integration in a cross-functional team confronts the differences and dependencies across knowledge boundaries (Bechky 2003; Carlile 2004; Majchrzak et al. 2011). Given this, *traverse approaches* and *transcend approaches* are proposed and compared by Majchrzak et al. (2011), thereby overcoming the syntactic, semantic and pragmatic boundaries (Carlile 2004). In particular, practices such as voicing fragments, co-creating the scaffold, dialoguing around the scaffold, moving the
scaffold aside, and sustaining engagement are suggested to transcend knowledge differences without concentrating on differences among knowledge domains (Majchrzak et al. 2011). In addition, a knowledge boundary, structural boundary and subculture boundary are also mentioned in Chen et al. (2006); therefore, five mechanisms are proposed to overcome these boundaries, namely, expanding individual and department’s paradigms; cross-functional job rotation, constructing cross-functional product development teams, building a flexible organization based on a peer-to-peer networks, and reconfiguring the organization memory to create a new a routine and knowledge (Chen et al. 2006). Moreover, conversational interaction has been suggested or implied as an important mechanism in socially structured settings (e.g., Bechky 2003; Carlile 2002; 2004). For example, dialogue enhances the negotiation of occupational as well as across-functions’ understanding (Tsoukas, 2009), the dialogical exchanges, in particular, has been highlighted by Tsokas (2009) in facilitating the new knowledge generation in organizations.

**Insights for the Multisourcing Context**

The mechanisms described above are associated with the specific settings in which they were investigated, so it is important to consider their relevance in the multisourcing context. In such context, associated with interdependency between outsourced tasks and the complexity due to interactions between multiple parties, systems and procedural mechanisms should provide structure for the integration process. Effective interactive mechanisms should facilitate interactions between the parties. Furthermore, in the light of organizational, temporal and geographic boundaries associated with multi-vendor relationships, boundary-crossing mechanisms suggested in existing literature may reduce the difficulties of overcoming these barriers. Therefore, we propose the following:

**Proposition 3a:** Adopting systems and procedural mechanisms in multi-sourcing arrangements will facilitate the KI process among the parties involved.

**Proposition 3b:** Adopting interactive mechanisms in multi-sourcing arrangements will facilitate the KI process between the parties involved.

**Proposition 3c:** Adopting boundary-crossing mechanisms in multi-sourcing arrangements will facilitate the KI process between the parties involved.

**Modified Research Model**

Based on the above review and analysis, Figure 2 shows a modified framework for analyzing the knowledge integration process among multiple suppliers and client firms, which presents an illustration of the framework guiding out further empirical research. Three categories of antecedents which are applicable to multisourcing settings are depicted on the left side of the framework. Factors that have been studied as mechanisms for facilitating the integration process are listed in the lower quadrant as they are influencing the relationship between antecedents and the knowledge integration process. Outcomes of knowledge integration studied in previous research are displayed on the right-hand side of the figure.
Conclusion and Recommendation for Future Research

The importance of knowledge integration, and the different aspects of KI, has been studied in depth in the existing literature. For instance, Grant (1996a) asserts “the primary role of the firm, and the essence of organizational capability, is the integration of knowledge”, and it is also argued as a vital reason for a firm’s existence (Kogut et al. 1992; Nickerson et al. 2004). Moreover, financial competitiveness (Nesta et al. 2006) and product development performance (Berggren et al. 2011) are also associated with successful knowledge integration. Other studies also suggested KI plays a crucial role in the subsequent success of outsourcing activities (Balaji et al. 2005) and innovation processes (Berggren et al. 2011). Thus, an increasing attention on knowledge integration across organizations is reflected in the growing amount of research concentrated on this topic.

Our study reveals key issues in the literature related to the antecedents, mechanisms, and outcomes of knowledge integration and extends these to the multi-vendor outsourcing context. Multisourcing is increasingly common today and such situations require the specialized knowledge of the client and vendors to be integrated, therefore posing the challenges of integrating diverse knowledge across organizations. Guided by our research question, this paper reviews primary studies on knowledge integration and summarizes the findings in our modified model to manage KI processes in the multisourcing context. Regarding KI antecedents, four categories are selected in this context, namely, Knowledge Attributes, Social Factors, Organizational Capabilities, and Task Characteristics. The main outcomes of KI are also grouped into Performance Improvement and Capability Improvement. Mechanisms are also reported in three primary perspectives: Systems and Procedural Mechanisms, Interactive Mechanisms, and Boundary-crossing Mechanisms.

For practitioners, this may provide guidelines on how to implement KI processes to facilitate successful KI outcomes, while the theoretical contribution of this paper is to extend existing research on knowledge integration in cross-functional teams by adding an additional layer of complexity, such as intra-organizational settings. This work will also extend existing literature on outsourcing. However, this paper needs further exploration and examination, and a number of directions for further research are suggested below:

Firstly, we have proposed a research framework/agenda of multisourcing knowledge integration; however, the propositions are basically stems from established literature, rather than those in the multisourcing context. In order to improve the framework and make valuable conclusions, subsequent empirical research is needed, such as empirically evaluating our framework, developing quantitative hypotheses based on propositions, and working on subsequent constructs and variables. Regarding the methodological difficulties in this research, it is not an easy work to measure the antecedents of knowledge integration in multisourcing at a given point of time and place (Martinkenaite 2011); therefore, we also call for further study in this area.
Secondly, because of defining the concepts of knowledge integration in current literature is various, there is a significant divergence in measuring this concept.

We have identified three sets of established measurements of knowledge integration in the literature. Therefore, we suggest further work on developing and using consistent, valuable measures, especially for knowledge integration study in multisourcing arrangements.

Thirdly, in order to develop a framework guiding the research on multisourcing KI, we conducted a static analysis of knowledge integration; in other words, we summarized and listed the elements of its antecedents, mechanisms and outcomes separately. We can predict that these factors are much more interactive, and the complementary and reciprocal relationships among the KI antecedents, KI mechanisms and KI outcomes may be significant (Tell, 2011). Further study is required, therefore, to pay attention to the dynamic and complex analysis of knowledge integration and its underlying process (De Luca et al. 2007).

Finally, though innovation is increasingly becoming the expectation of multisourcing, it is often studied as independent variables of outsourcing performance (Lacity et al., 2010), and there is a lack of further study on the determinants influencing innovation in the multisourcing context. Meanwhile, long-term business innovation (Berggren et al. 2011) is also suggested as one primary outcome of knowledge integration, and little is known about how the knowledge integration process works in the multisourcing setting, and how it contributes to innovative achievements. However, this research is, to some extent, simplistic in revealing the mediating role of knowledge integration between multisourcing and innovation. Therefore, the causal links between KI and innovation in the multisourcing context have not been discovered in the literature, which opens an interesting field for future study.

References


Rauniar, R. "Knowledge integration in integrated product development: The role of team vision, mutual trust, and mutual influence on shared knowledge in product development performance," University of Toledo, 2005.


Schmickl, C., and Kieser, A. "How much do specialists have to learn from each other when they jointly develop radical product innovations?," *Research Policy* (37:3) 2008, pp 473-491.


Knowledge Management and Business Intelligence


