8-2010

Utilizing End-user Requirements to Inform the Knowledge Supply Strategies of IT Project Teams

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ABSTRACT

This research investigates the knowledge sourcing requirements of teams that implement novel IT projects. It then compares those requirements to the mainstream strategy proffered in the literature for knowledge reuse within project environments. Using a grounded theory approach, this research found that the knowledge sourcing requirements do not align with the mainstream strategy, which is based on a codification approach. Rather, the findings indicate the teams that implement novel IT projects rely primarily on a personalization strategy for sourcing complex, incipient, and sensitive knowledge and the Internet for sourcing simple knowledge. These teams generally did not use internal knowledge repositories to fulfill their knowledge sourcing needs.

Keywords

Knowledge Management, IT Project Management, Grounded Theory.

INTRODUCTION

Organizations increasingly use project management as a means to cope with intensifying competitive pressure and complexity. Söderlund (2004) noted that "most of the emergent industries since World War II are project intensive" (p. 655), and Drucker (1993) predicted that project management will become the dominant management form as knowledge work overtakes manufacturing in significance. The purpose of a project is to create a unique product, service, or result (Project Management Institute, 2008). Thus, by definition, project teams must generate or adapt knowledge to satisfy their objectives (Drucker, 1993).

The track record for IT project management is arguably dismal. Glen (2006) reported that "even by optimistic estimates, about 75% of projects are late, over budget, missing major functionality, or canceled outright" (p. 39). Jørgensen and Moløkken-Østvold (2006) found that IT project teams overrun their budgets by 33% on average. Moreover, U.S. corporations spent approximately one trillion dollars (US), or about 40% of the total IT investment, on underperforming IT projects during the period of 1997 through 2001.

By systematically learning from their project experiences, organizations may avoid repeating mistakes and "reinventing the wheel" (Kasi et al., 2008; Markus, 2001). Ideally, organizations should have systems in place that enable project teams to bring the collective intelligence of the organization to bear upon any challenge encountered.

There are different types of knowledge (Davenport and Prusak, 1997). Organizations could improve the performance of their IT project teams by using strategies that align with the specific needs of their environments (Becerra-Fernandez and Sabherwal, 2001). However, a codification approach is the predominate strategy proffered in the literature for reusing knowledge within IT project environments (Reich and Wei, 2006; Williams, 2008). Arguably, understanding the knowledge sourcing strategies of teams that implement novel IT projects could aid in understanding the suitability of a particular knowledge management strategy. Unfortunately, little attention has been given in the literature on the strategies used to source knowledge (Boh, 2008; Gray and Meister, 2004). This leads to the following research questions:

RQ1: What are the general types of knowledge sourced by teams that implement novel IT projects?

RQ2: How do the knowledge sourcing behaviors of project teams that implement novel IT projects align with the mainstream strategy used to supply knowledge to those teams?

Using the techniques of grounded theory, data was collected from project managers and analyzed. Based on our analysis, we argue that a codification strategy does not align with the knowledge sourcing requirements of teams that implement novel IT projects. We base our argument on the social and technical limitations of a codification strategy as well as the evolutionary nature of knowledge.

LITERATURE REVIEW

Knowledge enables organizations to solve problems, create wealth, and achieve a panoply of other goals. The ability to manage and exploit knowledge effectively is a paramount concern of organizations. In an increasingly knowledge-based economy (Drucker, 1993), the ability to manage knowledge effectively is viewed as the primary means to achieve a sustainable competitive advantage.

Knowledge Forms and Knowledge Management Strategies

Knowledge is often characterized as being tacit or explicit. Plato viewed knowledge as a "justified true belief" (Nonaka and Takeuchi, 1995) that could be expressed precisely (Sutton, 2001). Plato's view of knowledge serves as the foundation of explicit knowledge, and "many of the knowledge management approaches still rely on an objectivist view not far removed from Plato's original definition" (Bergquist et al., 2001, p. 101). Explicit knowledge is defined as knowledge that is unambiguous, objective, semantic, easy to express, declarative, and related to facts (Sutton, 2001). Due to its qualities, explicit knowledge is sometimes referred to as "know-what." The portability of explicit knowledge enables organizations to transmit explicit knowledge across time and space with relative ease. Due to its expressibility and manipulability, explicit knowledge is often associated with information systems (Alavi and Leidner, 2001). But, overemphasizing the role of technology may lead to neglecting the tacit and social aspects of knowledge management (Johannessen et al., 2001).

Polanyi (1983) extended the understanding of knowledge by introducing the concept of tacit knowledge, which he defined as being subjective, personal, related to action, episodic (i.e. related to stories), and difficult to express. Due to its characteristics, tacit knowledge is sometimes referred to as "know-how." Polanyi (1983) described tacit knowledge using his oft-cited quote, "we know more than we can tell," which suggests that there are limits to the extent that tacit knowledge may be externalized and preserved in electronic databases. Polanyi also believed that invention was strongly rooted in personal beliefs and commitments. Because of its close association with knowledge creation and action, tacit knowledge is considered to be the more valuable form of knowledge (Johannessen et al., 2001).

Codification and personalization are the two general strategies used to manage knowledge (Davenport and Prusak, 1997). The codification approach is based on externalizing knowledge and storing it in centralized databases. This approach assumes that knowledge seekers possess the absorptive capacity needed to recover the knowledge embedded in codified artifacts (Cohen and Levinthal, 1990; Szulanski, 1996). The need for people to possess preexisting knowledge to recover knowledge from centralized repositories limits the usefulness of those repositories to groups that share a common background (Sutton, 2001).

The personalization strategy aligns with the management of tacit knowledge and emphasizes connecting knowledge seekers with experts. Accordingly, the role of technology in this strategy is to facilitate and simplify the matchmaking process, which is achieved through databases of *who knows what* and *who is working on what* (i.e. corporate "yellow pages") (Alavi and Leidner, 2001). Although organizations employ elements of both strategies (Mathiassen and Pourkomeylian, 2003), the codification strategy predominates in Western countries (Grover and Davenport, 2001).

Knowledge Capture and Supply in Project Environments

A codification approach for managing knowledge within project environments predominates in the literature (Reich and Wei, 2006; Williams, 2008). The primary mechanism to capture knowledge in project environments is the postmortem review (Anbari et al., 2008; Koners and Goffin, 2007). The purpose of the postmortem review is for project teams to learn from their experiences through the process of reflection and group dialogue (Dingsøyr, 2005). The outcome of a postmortem review is a codified report that is intended to capture the lessons learned by a project team. The report is then stored in a centralized repository where it may be accessed by others.

Figure 1 displays the general model used to capture and reuse knowledge within project environments. The model is based on a codification strategy to manage knowledge, which is outlined by the *Project Management Book of Knowledge PMBOK* ®

(Project Management Institute, 2008). The model does not incorporate personalization elements because of the predisposition of the practitioner literature toward a codification strategy (Reich and Wei, 2006; Williams, 2008). Note that the postmortem report—a codified artifact—intermediates the transfer of knowledge between producers and consumers.

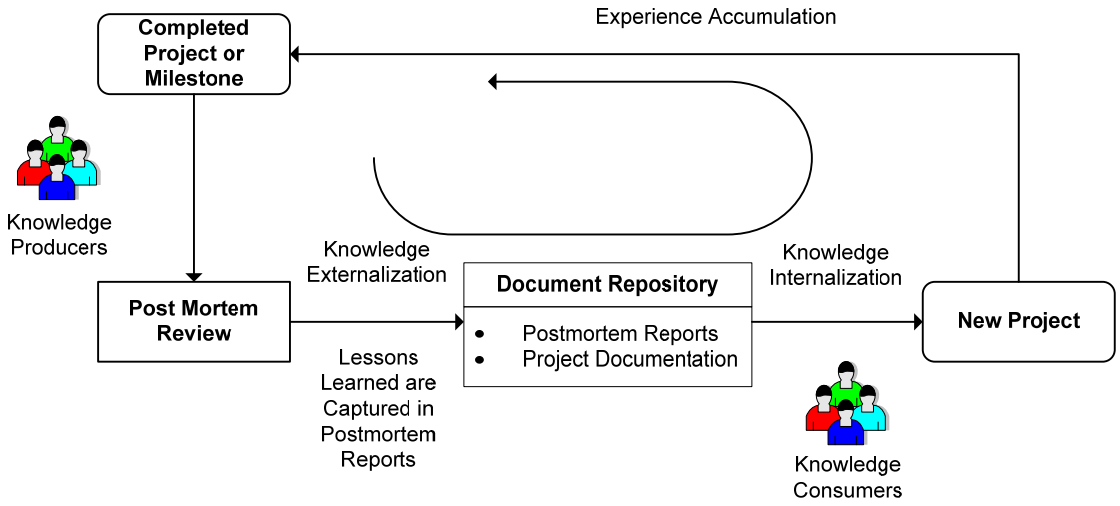

Figure 1. Common Approach Used to Capture and Reuse Knowledge within Project Environments.

Prior studies established the inefficacy of using codified reports to intermediate inter-project learning (Anbari et al., 2008; Koners and Goffin, 2007; Kasi et al., 2008; Kokkoniemi, 2008; Williams, 2008). Ideas were advanced to correct the deficiencies of using postmortem reports to intermediate knowledge exchange. For example, Koners and Goffin (2007) argued the utility of postmortem reports could be improved by using a formal process to generate the reports. Other approaches to improve the utility and usability of postmortem reports were advanced (cf. Desouza et al., 2005; Kasi et al., 2008; Kotnour and Vergopia, 2005; Schalken et al., 2006). Unlike prior studies that sought to correct the deficiencies of a codification approach for reusing knowledge within project environments, this study challenges whether a codification strategy is appropriate for fulfilling the knowledge needs of teams that implement novel IT projects.

Summary

The literature identifies codification and personalization as the two strategies used to manage organizational knowledge (Davenport and Prusak, 1997). Reich and Wei (2006) observed that the primary practitioner literature emphasizes the use of a codification strategy to support knowledge reuse within project environments. Arguably, adding to the understanding of knowledge sourcing behaviors may assist in evaluating the suitability of using a specific approach to furnish knowledge to teams that implement novel IT projects. Unfortunately, scant attention has been given in the literature to identifying and explaining the knowledge sourcing behaviors of project teams (Boh, 2008; Gray and Meister, 2004). Accordingly, this study attempts to identify the general types of knowledge sourced by teams that implement novel IT projects and to initiate a dialogue on the knowledge sourcing strategies of these teams.

RESEARCH METHODOLOGY

The study used the techniques of grounded theory to analyze the data collected. Grounded theory is a systematic approach that uses inductive reasoning to generate theory from data (Glaser and Strauss, 1967). The unit of analysis was the knowledge sourcing event. Each informant provided multiple descriptions of sourcing events. Descriptions of their knowledge sourcing activities were interpreted and framed into a model that explains the data collected.

PROSERVE (a pseudonym), an international professional services company with an annual revenue in excess of one billion dollars (US), was selected as the site for the study for several reasons. First, it claimed that it learned from its project experiences. Second, it uses IT as a business enabler and does not sell IT as a product or service. Third, its customer base is heterogeneous, requiring PROSERVE to support multiple, diverse IT systems. Unlike an IT consulting firm that develops a competency and resells it to other firms, PROSERVE develops a competency for a single project and then moves onto different projects, which typifies the knowledge work encountered by in-house IT organizations. The lack of repetitive work requires PROSERVE to develop adaptation competencies to manage incipient knowledge.

Empirical data was obtained through semi-structured interviews, observations, and document collection related to four projects. The collection of data from multiple sources enabled interpretation from multiple vantage points. The data collected is summarized in Figure 2. A total of 14 semi-structured interviews were conducted. The interviewees were purposely selected to represent a range of experience levels from junior to senior project managers. On average, each interview lasted 1 hour and 5 minutes. To create a more casual and open atmosphere, the interviews were not recorded. Instead, the researcher took copious notes. In all cases, the notes were transcribed that day. Investigator bias was controlled by asking the interviewees to "member check" the transcripts and interpretations of their interviews.

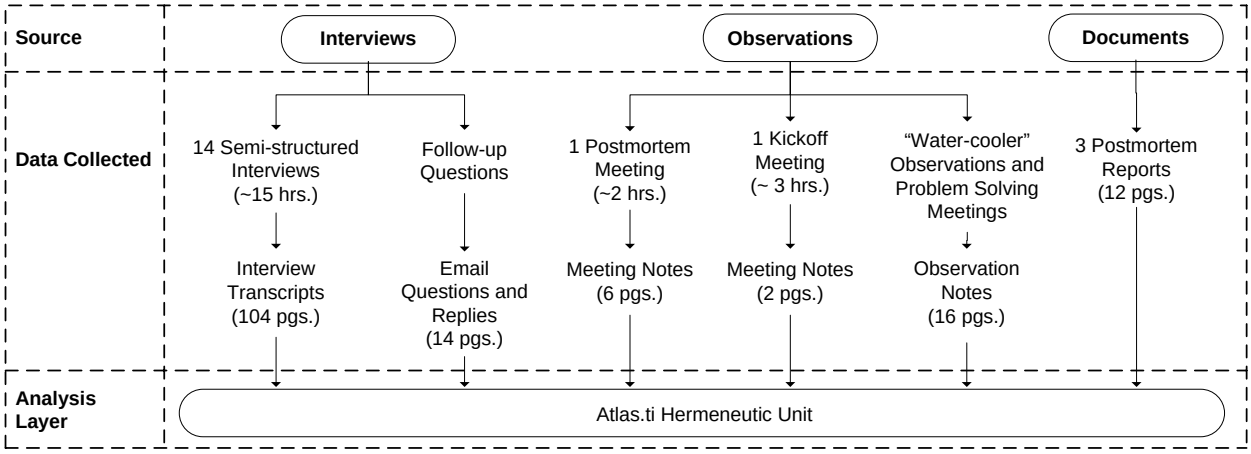

Figure 2. Summary of data collected.

The data collected was transferred to electronic form and analyzed using Atlas.ti. The process used to analyze the data is diagrammed in Figure 3. Following Glaser and Strauss (1967), the data was coded using an open coding technique. The codes were grouped into concepts and the concepts were aggregated into broad categories. The analysis of codes, concepts, and categories stopped when saturation was achieved and further analysis was deemed to be of marginal value. Throughout the study, the researchers reflected on the data and integrated the derivates of the data into a model that describes the knowledge sourcing requirements of the informants. The outcome of the process was four general knowledge sourcing requirements, which are discussed in the following section.

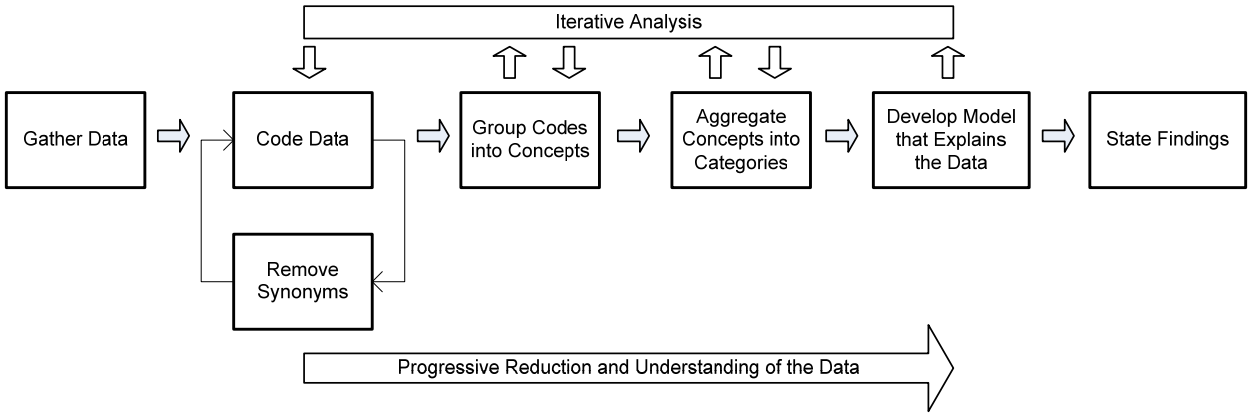

Figure 3. Data analysis process.

FINDINGS

The study identified four general knowledge types used by teams that implement novel IT projects. It also identified a predominant strategy used to source each knowledge type. The general knowledge types and the corresponding sourcing strategies are discussed in the following sub-sections:

Sourcing Complex Knowledge

By their nature, projects are complex endeavors (Fong, 2005). Accordingly, project teams are required to source and manage complex knowledge in order to meet their objectives. For the purposes of this study, complex knowledge was defined as knowledge that is difficult to explain and is usually expressed through demonstration, analogies, metaphors, and storytelling (Nonaka, 1994). The project teams examined in the study tended to source complex knowledge from subject matter experts (SMEs) because they were often the sole source of complex knowledge and they possessed the capability to explain complex knowledge as well as adapt it to a particular circumstance. Moreover, SMEs provided advice on which knowledge best suited a complex requirement.

> *Based on my experience, the valuable organizational knowledge is invested in the SMEs. Those are the ones that have been through the wars. They know what is going on. They know where the weak spots are and where the bodies are buried (Senior Project Manager 2).*

> *... the transfer of complex knowledge is typically done in person (Junior Project Manager 4).*

> *Most often, you need to go to someone who has already developed this understanding. ... There is no way that someone can develop in a short time what someone else has spent their life studying. Just-in-time learning goes only so far (Junior Project Manager 3).*

Project environments are time constrained. Therefore, team members do not have the luxury to externalize knowledge (Kasi et al., 2008). Moreover, complex knowledge may be beyond the ability of people to externalize (Stenmark, 2001). As a result, SMEs are likely to be the only source of complex knowledge. In addition, they provide services that document repositories do not, such as the ability to explain, adapt, and evaluate knowledge.

Sourcing Incipient Knowledge

The study found that project team members tended to source incipient knowledge from internal SMEs.

> *When I am looking for newly created knowledge within my organization ... I do not go to my firm's document management system or the web because I do not expect novel knowledge to exist in those locations. ... Even when it is documented, I would still go to the person because they know what it [i.e. the document] means (Senior Project Manager 2).*

> *At the beginning, knowledge is stored in someone's head. Over time, knowledge starts to diffuse until it becomes common knowledge. However, knowledge starts with people (Junior Project Manager 1).*

As a result of the unique nature of projects, project teams need to create or adapt knowledge in order to meet their objectives. Based on its evolutionary nature, knowledge starts as an idea within the consciousness of an individual and diffuses across organizations over the course of time (Birkinshaw and Sheehan, 2002; Nonaka, 1994; Tuomi, 2000) as knowledge is articulated in groups and codified (Zollo and Winter, 2002). Before knowledge has diffused across an organization and become common, knowledge seekers may lack the background needed to understand it (Cohen and Levinthal, 1990). Thus, during the incipient phase of knowledge evolution, knowledge seekers are aware that knowledge producers are likely the only source of incipient knowledge and that the knowledge producers (i.e. those with experience behind the knowledge) possess the background needed to explain the newfound knowledge.

Sourcing Sensitive Knowledge

The project team members interviewed preferred to source sensitive knowledge from their trusted networks, which often provide access to knowledge that was not otherwise available. Several interviewees stated for reasons of discretion, self-preservation, and the need to protect relationships, others often omit candid details when documenting knowledge. For these and other reasons, team members did not use their document management system to source sensitive knowledge. This interpretation is supported by the following vignettes:

> *I would expect sensitive knowledge to be locked down by the system's security. ... I do not expect sensitive knowledge to be publicly accessible (Senior Project Manger 5).*

> *I know a lot of organizational information is privately held. A good example is my understanding of how to work with a person who others find to be difficult. I would never put that recipe in a document because that could lead*

> *to the person finding out and being insulted by my views about him. ... It would be naïve to think that everything could be put into a document (Junior Project Manger 3).*

The tendency to source sensitive knowledge from personal networks finds support in the literature. For example, Gwillim et al. (2005) investigated the political realities of the project postmortem review process. They found that executives refrain from documenting mistakes in order to avoid negative consequences such as embarrassment. The implication of this behavior is that political realities limit the utility of codified repositories. Moreover, the true reason for project failures, which arguably provides the greatest potential for learning (Williams, 2008), may only be accessible via trusted networks.

Sourcing Simple Knowledge

The project team members in this study tended to source simple knowledge from the Internet. For the purposes of this study, simple knowledge is defined as knowledge that is readily understood without requiring explanation from others. When faced with a sourcing decision, the project managers preferred the Internet for simple knowledge because it is convenient and spares them from intruding on others to resolve trivial matters.

> *When I need knowledge, the first place I go is to the Internet. ... I go there because I want to prepare myself before I talk to others. ... I don't want to go to someone to answer a basic question. (Junior Project Manager 6).*

A person requires tacit knowledge stocks in order to recover knowledge from a codified artifact (Stenmark, 2001). The absence of knowledge stocks creates absorptive barriers (Szulanski, 1996). Unlike complex knowledge, which requires socialization or direct experience in order to be understood, simple knowledge is readily understood because the knowledge seeker, by definition, already possesses the background needed to understand it.

When dealing with novel IT projects, project managers do not expect internal repositories to contain information that is relevant to their concerns due to the novelty of their work.

> *It just makes sense to use the Internet when working on a project that is novel to my firm. Obviously, I would not expect precedents to exist in my document management system under these circumstances (Senior Project Manager 5).*

> *When I start a new project, I usually start with Google or the blogs I trust. I type in a few search words and I see what hits. I don't search our document management system because I don't expect to find as much there as I expect to find on the web (Senior Project Manager 3).*

An interesting aspect of the above statement is the sophisticated search skills developed by the senior project manager. Rather than using a generic search, the senior project manager preferred sites he found to be trustworthy and relevant. Arguably, junior project managers could benefit from the a systematic diffusion of the search skills developed by senior project managers.

DISCUSSION

The purpose of the study was to understand the nature of the knowledge required by teams that implement novel IT projects, and to initiate a dialogue on the strategies used to source the various knowledge types. To fulfill this purpose, a study was conducted using the techniques of grounded theory to guide the collection and analysis of data. In the course of the analysis, four general knowledge types were identified: complex, incipient, sensitive, and simple knowledge. Strategies were also observed for sourcing the various knowledge types identified (see Table 1).

Although the practitioner literature advises project teams to employ a codification strategy to reuse knowledge (Reich and Wei, 2006), this study found that project teams that implement novel IT projects tend to use a personalization strategy to source complex, incipient, and sensitive knowledge. It also found that these project teams source simple knowledge from the Internet, but generally did not source knowledge from the organization's internal knowledge repositories. Consequently, this study suggests that personalization-based strategy combined with the development of Internet search skills may provide greater benefits to teams that implement novel IT projects than does a codification-based strategy.

Table 1. Summary of Knowledge Types and Sourcing Strategies.

General Knowledge Type Sourced by Teams that Implement Novel IT Projects	Observed Sourcing Strategy	Offered Rationale	Supporting Literature
Complex Knowledge	Consult an SME	Project team members source complex knowledge from SMEs because socialization provides an effective means to transfer complex knowledge. Codified repositories are unlikely to fulfill complex knowledge needs due to the limitations in externalizing knowledge and time required to recover complex knowledge from codified sources.	Cohen and Levinthal (1990); Nonaka (1994)
Incipient Knowledge	Consult an Internal SME	Project team members source incipient knowledge from its producers because they do not expect incipient knowledge to be available in transferable form elsewhere.	Birkinshaw and Sheehan (2002); Nonaka (1994); Tuomi (2000)
Sensitive Knowledge	Consult Trusted Network	Due to limiting effects of political realities, project team members do not expect sensitive knowledge to be recorded in centrally located repositories. They expect sensitive knowledge to be available only via their trusted networks.	Gwillim et al. (2005)
Simple Knowledge	Consult Internet	Project team members use the Internet to source simple knowledge due to its abundance, ease of use, and low search costs.	—

Learning from mistakes related to IT projects provides one of the best means to improve the performance of IT project teams (Williams, 2008). Unfortunately, mistakes are often not codified because of political realities and the desire to protect relations (Gwillim et al., 2005). Consequently, codified repositories provide limited, if any, access to mistakes—a primary source for learning. As a result of the reluctance to codify mistakes, project teams would require either direct experience of project failures or access to trusted networks. The project management literature, however, provides limited advice on how to develop access to trusted networks. An investigation into this topic is left for future research.

Another interesting observation was Internet search techniques. It was observed that the senior project managers who participated in this study developed sophisticated techniques for searching the Internet. Specifically, they used trusted blogs and forums as the primary means to find answers to their questions. Arguably, the systematic diffusion of Internet search skills could benefit others in an organization, particularly junior project managers who have yet to develop these skills.

It is plausible that the practitioner literature was drafted based on the prevailing paradigm of using a codification approach to manage knowledge (Bergquist et al., 2001; Johannessen et al., 2001; Reich and Wei, 2006; Williams, 2008). But, the outcome of this research suggests a personalization approach to manage knowledge, combined with training to develop Internet search skills, would better serve teams that implement novel IT projects. The scant research on knowledge sourcing behaviors (Boh, 2008; Gray and Meister, 2004) raises the question of the extent to which the knowledge management systems are based on the sourcing requirements of the project teams they are intended to serve? According to Brooks (1987), defining the requirements has the greatest impact on the success or failure of a system design. “No other part of the work so cripples the resulting system if done wrong. No other part is more difficult to rectify later” (Brooks, 1987). This research suggests that the predominate knowledge management approach may not align with the sourcing needs of teams that implement novel IT projects.

CONCLUSION

Motivated by the limited extant literature on the knowledge sourcing behaviors of teams that implement novel IT projects, a study was conducted to identify the general types of knowledge sought by these teams and the strategies used to source the various types of knowledge. The study uncovered four general forms of knowledge sourced: complex, incipient, sensitive, and simple knowledge. The study also found that these teams favor a personalization strategy to source complex, incipient, and sensitive knowledge. It also found that these teams may be inclined to use Internet search to source simple knowledge. These findings add to the literature on the sourcing strategies of IT project teams. In identifying a potential mismatch, this research hopes to motivate a dialogue that extends the understanding of the knowledge sourcing needs and strategies of IT project teams. Further research in this area may be used to inform the design of strategies used to supply knowledge to these types of project teams.

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