

## ABSTRACT

Title of Dissertation: PRACTICES AND STRATEGIES OF DISTRIBUTED KNOWLEDGE COLLABORATION

Srinivas Kudaravalli  
Doctor of Philosophy in Information Systems

Directed By: Associate Professor Samer Faraj,  
McGill University  
Professor Ritu Agarwal,  
Department of Decision, Operations & Information  
Technologies

Information Technology is enabling large-scale, distributed collaboration across many different kinds of boundaries. Researchers have used the label new organizational forms to describe such collaborations and suggested that they are better able to meet the demands of flexibility, speed and adaptability that characterize the knowledge economy. Yet, our understanding of the organization of such collaborative forms is limited. In this dissertation, I study distributed knowledge collaboration in the context of a unique setting – a large, distributed, professional legal association, where practice involves knowledge that is complex, highly contextualized and failures have extremely consequential results. The first essay focuses on knowledge sharing at the individual level. Differing approaches have been developed for the study of knowledge sharing - I distinguish between approaches that focus on knowledge transfer and those that highlight the need to transform knowledge to be effective. The former emphasizes availability of and access to knowledge sources while the latter argues that knowledge is difficult to share since it is ‘localized and embedded in practice.’ In this study, I empirically examine the notion that, in the presence of novelty, knowledge sharing involves not simply the transfer of information but rather the transformation of knowledge and understanding. I proposed a theoretical model and tested it by gathering 160 survey responses from individuals who answered questions about two specific cases they encountered - one routine and one novel. The results largely support the key arguments presented here. The second essay examines, at the organizational level, the practices used to mitigate the challenges of distributed collaboration. For example, since larger geographic dispersion may result in pockets of local expertise, how is such knowledge shared with the community? What practices are used to mobilize members for collective action? I undertook a field study using a grounded theory approach and a practice lens to investigate the every day activities that are used to coordinate knowledge work. I found evidence for two distinct sets of practices – one with an internal focus and the other with an external focus. I describe these in detail and suggest that the way in which distributed communities balance the two is essential for their continued viability.

# PRACTICES AND STRATEGIES OF DISTRIBUTED KNOWLEDGE COLLABORATION

By

Srinivas Kudaravalli

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Advisory Committee:

Co-Chair - Associate Professor Samer Faraj  
Co-Chair - Professor Ritu Agarwal  
Associate Professor Katherine Stewart  
Research Associate Professor Joseph P. Bailey  
Associate Professor Alan Neustadt

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# STRATEGIES FOR SHARING SITUATED KNOWLEDGE IN DISTRIBUTED ENVIRONMENTS

## **Abstract**

With the increasing recognition of the importance of knowledge work to organizations, researchers and practitioners alike have focused on ways of improving knowledge sharing between individuals. However, differing approaches have been developed for the study of knowledge sharing - I distinguish between approaches that focus on knowledge transfer and those that highlight the need to transform knowledge to be effective. The former emphasizes availability of and access to knowledge sources while the latter argues that knowledge is difficult to share since it is 'localized and embedded in practice.' Therefore, according to the latter view, merely having access to and using various knowledge sources does not ensure successful outcome in each individual case, which may be characterized by its own unique context. Consequently, knowledge sharing involves not so much exchange of information but rather, transformation of knowledge and understanding. However, investigation of the conditions which determine the utility of these approaches has been limited, as is our understanding of knowledge transformation processes. In this study, I build a framework that integrates these two approaches to examine the effect of knowledge source use on effectiveness and learning. Further, I outline the knowledge transformation strategies used by individuals in knowledge work and suggest that they depend not only on the type of knowledge source but also task novelty. I distinguish between the strategies of reanalysis and dialogic practices and argue that they moderate the relationship between the use of knowledge sources (codified and interactive) and outcomes. I gathered survey data from members of a legal association by querying them about two different cases they have encountered. I tested this model using responses from 160 professionals and the results support the key arguments in the study. This essay will contribute to the study of the situated nature of knowledge and knowledge sharing in distributed environments. The results improve our understanding of the specific practices that can be used to adapt situated knowledge, and have consequences for large-scale collaborative work enabled by IT.



## Introduction

The knowledge-based view of the firm holds that the ability of firms to create and use knowledge is fundamental to achieving a sustainable competitive advantage in the marketplace (Grant 1996, Nonaka 2000). Perhaps in recognition of this importance, the last decade in organizational studies has seen a steady stream of literature exploring knowledge in organizations. Moreover, with the recognition that organizations are becoming more knowledge intensive across the board (Boland and Tenkasi 1995), knowledge sharing has become a key topic of interest to researchers and practitioners alike. Consequently, there has been a wide-ranging investigation of the many factors that inhibit knowledge sharing. This topic has achieved greater significance given the changing context of knowledge work, which increasingly occurs in large-scale, distributed groups (Orlikowski, 2002).

Recent advances in information and communication technologies have made it possible for large groups of people to collaborate on complex projects, despite being separated by time and space (DeSanctis & Monge, 1999). The increased reach afforded by technology creates the possibility of enrolling people with the right expertise in projects even if they reside in another part of the country or the world (Fulk & DeSanctis, 1995). Moreover, technology also makes it possible for hundreds or even thousands of people to collaborate on shared tasks. As a result, large-scale distributed collaborations, many of them outside formal organizations, have emerged in recent years (Lee & Cole, 2003; Sproull, 2004). Researchers have suggested that such collaborations are essentially new forms of organizing (Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007).

Yet, our understanding of knowledge sharing processes in such groups is limited. First, researchers have adopted a variety of, often conflicting, approaches to study knowledge sharing. One approach involves distinguishing between different types of knowledge and identifying the kinds of knowledge that are difficult to transfer. Examples of such classifications are tacit vs. explicit (Nonaka 1994) and sticky vs. leaky (Szulanski 1996). Although such distinctions play a valuable role in conceptualizing organizational knowledge, others have argued that they provide a necessarily incomplete account of how knowledge is generated in organizations. Alternative models that emphasize the importance of interpretive aspects involved in knowledge sharing in organizations do much to fill the gaps (Boland and Tenkasi 1995). In addition, research has also begun to highlight the pragmatic aspects of knowledge sharing – since knowledge is “hard-won,” knowledge sharing involves not transfer of knowledge but transformation of knowledge (Carlile 2002). However, our understanding of the knowledge transformation processes has been limited. Further, there is a need to better integrate the different approaches to studying knowledge sharing and investigate the conditions that determine their applicability.

Second, while IT connects dispersed and disparate groups to collaborate across geographic and temporal boundaries, such collaborations also introduce new challenges. The paradox of new organizational forms is that while technology allows novel forms of organizing, it also creates a proliferation of information sources, which include not only codified sources (Kankanhalli, Tan, & Kwok-Kee, 2005) but also interactive sources, such as social networks (Agarwal, Gupta, & Kraut, 2008). The challenge in these settings is no longer having enough information, but rather, it is generating actionable knowledge

from all available information (Cross & Sproull, 2004; Hansen & Haas, 2001). Moreover, work in distributed settings is rarely accomplished using a single medium or type of interaction. To accomplish the complex tasks that characterize such work, professionals use multiple knowledge sources and networks. Yet, our understanding of the impact of different knowledge sources on effectiveness and learning in knowledge work is limited. Therefore, in this study, I focus on the following research questions:

1. *How can individuals benefit from the availability of a variety of knowledge sources, including the experience of others, in distributed environments?*
2. *What kinds of knowledge transformation strategies are used by individuals to adapt situated knowledge to their circumstances and how do the strategies differ by knowledge source?*

In order to address these research questions, I build on the findings of my qualitative study and construct a model, at the individual level, of knowledge sharing effectiveness and learning in distributed environments. I build on existing theory and suggest that while routine cases involve knowledge transfer, novel situations give rise to the need for knowledge transformation in order to be effective. The basic premise of the model is that merely having access to and using knowledge sources is inadequate when faced with novel problems. Given the situated and interest laden nature of knowledge work, individuals have to transform knowledge from various sources to adapt to their unique situations. However, the strategies individuals use – reanalysis and dialogic practices - vary by knowledge source. I propose in our model that these strategies moderate the relationship between the use of knowledge sources and successful outcomes.

I tested this model in the context of a unique setting – a professional legal association, where knowledge is complex, highly contextualized, and errors are costly. I gathered survey data from members of the association by querying them about individual cases they have encountered. For two different types of cases they encountered, one routine and one novel, members identified the knowledge sources they used as well as the knowledge transformation strategies employed. Based on the analysis of 160 survey responses, the results largely support the key arguments of the study.

This research contributes to the study of the situated nature of knowledge and knowledge sharing in distributed environments. Specifically, I identify and test the use of different strategies used to adapt local knowledge for successful outcomes. While the difficulty of sharing knowledge due to its local and embedded nature has been widely noted in the literature (Carlile, 2002; Sole & Edmondson, 2002), the strategies used to benefit from it have not received attention. The results from this study are expected to improve our understanding of the specific practices that can be used to adapt situated knowledge, and have consequences for large-scale collaborative work enabled by IT. For example, emerging social media (e.g., Wikipedia) have created a proliferation of information sources, however, their use remains controversial. The model presented here suggests that the use of a variety of sources can be beneficial as long as the appropriate knowledge transformation strategies are used.

## Theoretical Background

In this section, I survey the existing literature on knowledge sharing and lay the ground for the hypotheses development in the next section. First, I identify two broad themes in the literature on knowledge sharing and distinguish between knowledge transfer and knowledge transformation. I then expand on the knowledge transformation view by discussing the notion of situated knowledge that underpins this view. Finally, building on Carlile (2004), I outline how task novelty can be used to integrate the two views of knowledge transfer and transformation.

### *Knowledge Sharing: Two Approaches*

Literature in this area has grown along with the increased interest in knowledge management, focusing on a variety of themes and employing several different discourses (Schultze & Leidner, 2002). Despite the interest in studying knowledge in organizations having gained momentum lately, most studies have adopted a small number of limited perspectives. For the interests of this study, I identify two broad themes from the vast literature on knowledge sharing – the first centered on the individual and knowledge transfer; the second centered on the social and contextual, thereby emphasizing transformation of knowledge and understanding. The first theme concerns the difference between various types of knowledge and how individuals can transfer or exchange knowledge. Examples of such taxonomies include distinctions such as know-how and know-what, tacit and explicit and sticky and leaky (Brown & Duguid, 1998; Nonaka & Takeuchi, 1995; Szulanski, 2000). The metaphor of knowledge common to many studies in this category is that of knowledge as an asset. Studies that fall in this category tend to

objectify knowledge and view it as an asset that can in turn be stored and transferred. In line with this emphasis and given the static and objectified view of knowledge, a large number of studies using this discourse are concerned with knowledge repositories and transferring or exchanging different types of knowledge to facilitate problem solving (e.g., Kankanhalli et al., 2005). It also follows that the metaphor for the theory of the firm most closely associated with this view is of the firm as an information processing entity. Therefore, the success of the firm is believed to depend on how it manages the process of identifying, integrating, storing and transferring the knowledge assets residing in various individuals, groups and repositories within the firm (Argote, McEvily, & Reagans, 2003). These processes have also been linked to how effectively organizations learn and consequently, achieve competitive advantage (Argote & Ingram, 2000). In so far as the expansive term of 'knowledge management' is driven by a common view, it relates to these various processes of managing knowledge assets within the firm.

The second theme emphasizes knowledge in practice and the context surrounding knowledge production. The discussion of the situated nature of learning by Lave and Wenger (1991) in the context of communities such as those of midwives, tailors and butchers has been extended to organizational and extra-organizational settings using the notion of "communities of practice" (Wenger, 1998). Many communities of practice are also distinct epistemic communities that operate with their own specialized language, symbols and beliefs. Consequently, insights gained from studying knowledge work in scientific communities have also been applied to them (Boland & Tenkasi, 1995). These views emphasize the boundaries between different practice domains, based, as it were, on differing paradigms of knowledge. Thus, knowledge cannot be separated from

interpretation. Working across such knowledge boundaries in every day organizations, therefore, is especially challenging.

Researchers studying organizational knowledge have proposed a great many reasons for why knowledge is shared effectively in some instances, but not in others (Szulanski, 2000). For example, some have suggested that knowledge is easy to communicate within practice, while it is sticky across practice boundaries (Brown & Duguid, 2001). In so far as organizations are comprised of professionals from multiple practice areas, knowledge sharing presents a difficult challenge for organizations.

Researchers have suggested that knowledge work across boundaries is difficult due to interpretive barriers and have illustrated how the use of boundary objects facilitates the “transformation of understanding”, therefore promoting innovation (Bechky, 2003).

Extending the practice-based perspective, more nuanced views of knowledge have also emerged that clarify how knowledge can function both as a barrier and enabler of innovation (Carlile 2002). This work highlights the contested nature of organizational knowledge (Carlile, 2002). According to this view, since knowledge is hard-fought and ‘won’, individuals are invested in their knowledge, thus creating resistance to change. Resolving differences across such “pragmatic boundaries” requires not only developing shared meanings but also the creation of common interests to transform knowledge (Carlile, 2004).

A further point of clarification is necessary in relation to the latter view of knowledge sharing delineated here. The preceding discussion of interpretive barriers in practice communities as well as the use of phrases such as “knowledge transformation” (Carlile, 2002) and “transformation of understanding” (Bechky, 2003) used in describing

this view should not be interpreted as primarily a focus on cognitive, mental processes in the minds of individuals. In fact, this view emphasizes knowledge in practice, proposing that knowledge and practice are “reciprocally constitutive, so that it does not make sense to talk about either knowledge or practice without the other” (Orlikowski, 2002, p. 250). Therefore, as situations and contexts change, organizational actors “modify their knowing as they change their practices” (p. 253). Further, this view also highlights the material, social and jurisdictional contexts of knowledge work. For example, Carlile (2002) describes knowledge as “invested in the particular *objects and ends* of a given function” (p. 443, emphasis added). Similarly, since individuals are invested in their way of doing things, knowledge is often “at stake” (p. 446).

Despite the broad themes identified here, it should be noted that many researchers do not employ one theme or the other exclusively. Nevertheless, the distinction is useful in highlighting the importance of the various contexts of knowledge creation, for the studies in the second category. For example, Brown and Duguid (1998; 2001) outline how some distinctions between different types of knowledge (know-how, know-what, sticky, leaky) describe aspects of knowledge work in communities of practice. Nonaka (1994) emphasizes the role of socialization and externalization in sharing and converting tacit knowledge. Carlile and Rebentisch (2003) describe the knowledge transformation cycle which builds on earlier knowledge transfer models and includes storage and retrieval of knowledge. They suggest that the factor that determines whether stored knowledge can be retrieved and used in a given situation is the presence of novelty. When the situation or problem resembles previous experience, stored knowledge can be retrieved and applied successfully to address the problem. However, when the situation is



characterized by novelty, previous experience and knowledge is less useful, thus necessitating transformation of knowledge and understanding. In this study, I build on this perspective by including both knowledge transfer and knowledge transformation in our model and use task novelty to identify when each is applicable.

### *Knowledge Situatedness and Transformation*

Lave and Wenger's (1991) study of apprenticeship in five different contexts did much to popularize the anthropological notion of local knowledge for organizational scholars. They suggest that learning is situated in social and cultural contexts and is the result of participation in a community of practitioners. Newcomers are socialized in the community through peripheral participation and eventually move towards full participation by taking part in the socio-culturally situated activities of the community. However, situated activity is not to be understood merely as the idea that "thoughts and actions are located in time and space" but,

"as a general theoretical perspective, the basis of claims about the relational character of knowledge and learning, about the negotiated character of meaning, and about the concerned (engaged, dilemma-driven) nature of learning activity for the people involved. *That perspective meant that there is no activity that is not situated. It implied emphasis on comprehensive understanding involving the whole person rather than "receiving" a body of factual knowledge about the world; on activity in and with the world; and on the view that agent, activity, and the world mutually constitute each other.*" (emphasis added)

Further, their view emphasizes learning not as a cognitive process, but rather, as engagement with a social practice. Recent views have furthered such emphases by applying the practice perspective to knowledge and the idea of communities of practice that share work practices and social identity. For example, Orlikowski (2002) proposes a knowing in practice perspective that focuses on "organizational knowing as emerging

from the ongoing and situated actions of organizational members as they engage the world.”

Researchers have studied situated knowledge in a wide variety of settings. For example, the geographic location and physical setting was found to be important for learning, suggesting that organizational actors must move between different settings in order to find solutions to problems (Tyre & Von Hippel, 1997). Similarly, a study of geographically dispersed teams finds that, in order to access and use situated knowledge, teams must “first recognize and adjust for locale-specific practices within which that knowledge is embedded before they can use it” (Sole & Edmondson, 2002). Finally, communication scholars have studied how the lack of grounding creates barriers to communication (Clark & Brennan, 1991). This notion of common ground has been applied to geographically dispersed teams and researchers found that failure to establish mutual knowledge can create roadblocks to effective collaboration, due to failures of information exchange, failures of interpretation, and incorrect attribution (Cramton, 2001). These views on situated knowledge point to a critical problem in organizations – how can knowledge be shared in organizations, given that knowledge is situated and localized in practice? In the present study, I focus on this question and suggest several strategies that individuals use to share situated knowledge.

However, I adopt the approach that these views do not necessarily invalidate the knowledge as asset view outlined earlier but rather, supplement it. For example, Carlile (2004) distinguishes between different types of knowledge boundaries – syntactic, semantic and pragmatic – and suggests that different processes are at work at each individual boundary. The objectified knowledge view outlined earlier, by building on the

information processing view, refers primarily to the syntactic boundary. When there is a common lexicon and the differences and dependencies are well specified, knowledge ‘transfer’ across the syntactic boundary can be unproblematic. The semantic boundary, on the other hand, refers to the notion that individuals often have different interpretations, which could make communication challenging even when a common lexicon or language is present. Such interpretive barriers call for translation across the boundary in order for groups with different perspectives or “thought worlds” (Dougherty, 1992) to collaborate. Finally, the pragmatic boundary refers to the fact that individuals have jurisdictional, political or other interests that may limit their willingness to make changes or alter their interpretation. Carlile (2004) suggests that the focus on pragmatic boundaries recognizes that “knowledge is invested in practice and so is ‘at stake’ for the actors who have developed it” (p. 559). Moreover, individuals must be able to represent and transform their domain specific knowledge at the pragmatic boundary.

The semantic and pragmatic boundaries are included in our discussion of the socially rooted conceptualization of knowledge. By taking all three boundaries into account, this integrated view not only explains such traditional concerns as how knowledge can have seemingly contradictory characteristics such as sticky and leaky (sticks to communities of practice and leaks across organizational boundaries), but also shifts the focus of research on knowledge creation from individuals to groups.

While such distinctions are a useful analytical tool, they also highlight favored emphasis in the knowledge literature on cross-functional settings that better serve to illustrate such boundaries. For example, Bechky (2003) similarly found, from her study of communication barriers between different occupational communities, that knowledge

was not transferred but transformed as a result of the understanding gained from seeing how knowledge from another community fits into one's own. Therefore, the focus on cross-functional barriers may suggest that interpretations within practices are fairly homogeneous and knowledge transformation occurs only at the boundary. In reality, knowledge is continuously created and transformed within practices. Within each practice, current interpretations are refined and new perspectives are shaped as they come in contact with changing reality and changing contexts. Knowledge is thus continuously recreated as it is applied across differing contexts. Consequently, in this study, I refer to the transformation of situated knowledge even when it does not refer to cross-functional knowledge sharing. This view is closer to the situated view of learning outlined earlier, which suggests that all activity is situated.

### *Task Novelty*

One way in which the two approaches to knowledge sharing outlined above can be integrated is related to task novelty. When tasks are routine, individuals are able to rely on existing knowledge accumulated from previous experience - whether it is their own or that of others – and which may be stored in databases or communicated through informal advice networks. Just as organizations depend on established procedures and routines to accomplish day-to-day activities, individuals also use habitual processes in accomplishing knowledge work (Pentland, 1992). Arguably, a significant part of achieving competence in an area involves developing an ability to deal with routine activities in that area. This is especially true in professional work, where individuals develop expertise in different specialized areas and, over time, learn to routinely and

competently perform complex tasks. For example, lawyers and doctors often have very narrow specializations in which, despite the complexity involved, they are able to routinely accomplish tasks due to their training and experience performing similar tasks.

However, increased specialization in professional work can also be problematic. While it allows knowledge workers to tackle complexity through division of labor and task decomposition, specialization also leads to localized practices and cross-boundary coordination and communication challenges (Carlile & Reberich, 2003). Often, the challenges faced by knowledge workers are not restricted to a given set of specializations or familiar patterns, thus introducing novelty. Therefore, when circumstances change and there is considerable novelty, individuals can no longer rely on their past experience alone to solve such problems. In order to devise solutions to such problems, individuals have to venture into new or different knowledge domains or revise their current understanding. Consequently, established routines and habitual information seeking procedures may no longer be sufficient.

In order to address problems crossing multiple specializations and knowledge domains, organizations typically use cross-functional teams. In the context of professional work, ad-hoc teams comprising members from related disciplines are the norm, for example, as in a trauma surgery team (Faraj & Xiao, 2006). Further, many professions are also characterized by more loosely-knit and larger collaborations that researchers have labeled “collaborative community” (Adler, Kwon, & Heckscher, 2008). In all these forms, the various aggregate groups are designed to promote collaboration across specializations to achieve collective goals as well as promote individual learning.

When individuals belong to the same specialization or are engaged in a similar practice, they share common ground and acquire a similar worldview and approach to problem solving. When there is a common lexicon among individuals, knowledge sharing is assumed to be unproblematic and may be usefully conceptualized as knowledge transfer (Carlile, 2004). Therefore, the objectified view of knowledge and the information processing metaphor provide a reasonably accurate portrait of knowledge work. However, in the context of cross-boundary collaboration, significant differences often appear in the lexicon, worldview and approach used to solve problems (Boland & Tenkasi, 1995). In such cases, knowledge sharing is not simply a matter of exchanging information and the transfer metaphor is not accurate. Therefore, the second view of knowledge sharing that emphasizes the situated nature of knowledge is more appropriate in the presence of novelty.

It should be noted that specialization and cross-functional collaboration is not problematic in itself. Despite the different specializations, individuals often make collaboration routine through a history of working together and by deferring to each other's expertise. Through formal training as well as a history of working in a cross-functional setting, individuals may have a good understanding of the boundaries of different specializations and the worldviews represented by each. It is only when novelty is present and it is unclear what specialized expertise is needed to solve the problem that existing practices of cross-functional collaboration may prove to be inadequate. For example, in the context of product development, Carlile (2004) finds that when novelty is present, "the knowledge developed in one domain generates negative consequences in another" and therefore, "actors must be able to represent current and more novel forms of

knowledge, learn about their consequences, and transform their domain specific knowledge (p. 559).” Similarly, in the context of trauma work, Faraj and Xiao (2006) distinguish between a habitual trajectory and a problematic trajectory and suggest that in the latter case, the normal expertise coordination practices are no longer sufficient and find evidence of dialogic coordination practices involving epistemic contestation, joint sensemaking and cross-boundary intervention.

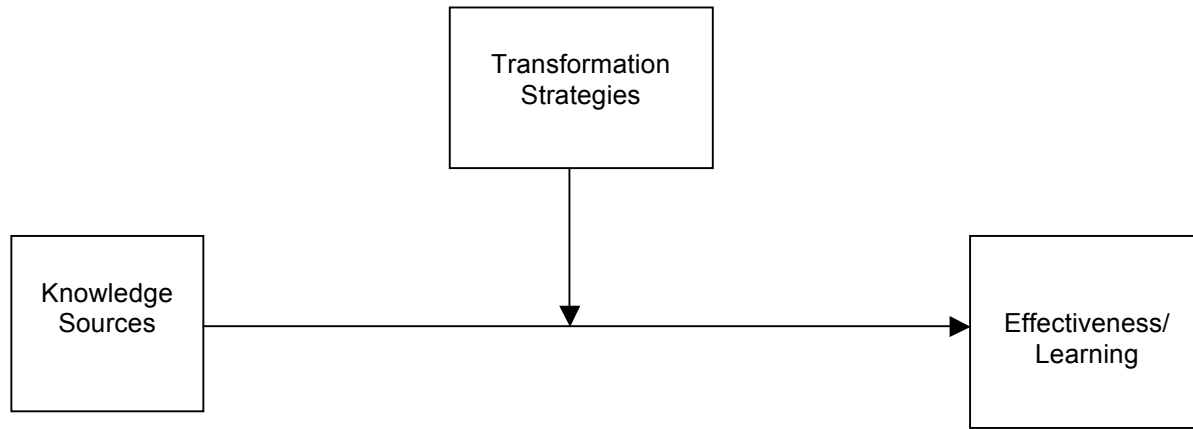
In this study, I build on these ideas and propose a framework that examines individual knowledge sharing through the lenses of knowledge transfer as well as knowledge transformation. The framework distinguishes between routine and novel cases in professional work and outlines the strategies used for knowledge transfer in routine cases and knowledge transformation in novel cases. As the prior discussion makes clear, researchers have outlined the need for knowledge transformation to overcome the challenges of knowledge sharing in novel circumstances. However, this area of research is new and still developing and there has not yet been an investigation of the knowledge transformation strategies used by individuals. Specifically, there needs to be an examination of the different knowledge sources used by individuals in professional work and the strategies used to transform knowledge from such sources for effective outcomes. In the next section, I develop a framework that distinguishes between different types of knowledge sources, involving written sources and advice networks, and how the strategies differ for each.

## Research Model and Hypotheses

In this section, I build on the review of the literature in the previous section to develop the research model and hypotheses. The key premise of the research model is that being linked by communication channels is no guarantee that groups will, or can, collaborate across distance. Even when individuals in knowledge communities have access to information resources, they cannot use the information for effective outcomes without transforming it or adapting to their circumstances. This is especially true in environments where there is considerable uncertainty and ambiguity. Moreover, as outlined in previous sections, the consequence of suggesting that knowledge is localized and embedded in practice (Carlile, 2002) is that knowledge obtained from one localized practice may not be applicable in a different circumstance or setting. A key difficulty for organizations, whether they are for-profit firms with global operations or nonprofit, professional associations, is benefiting from local, situated expertise (Bechky, 2003; Carlile, 2002; Haas, 2006; Lave & Wenger, 1991). While IT enables greater scale of operations, for organizations to be more than a patchwork of loosely connected groups, they have to leverage situated knowledge effectively. I build on this premise and develop hypotheses concerning knowledge work in distributed settings where individuals often use and access multiple sources. I suggest that the effective transformation or adaptation strategy differs by knowledge source. The conceptual model that describes this proposition is presented in Figure 1.



**Figure 1: Conceptual Model**



### Types of Knowledge Sources

Individuals use many types of knowledge sources in distributed collaboration. With increasing use of newer information technologies and the ubiquity of access to the Internet across a range of devices and settings, knowledge sources have also proliferated. However, extant literature has not sufficiently examined the different types of sources that individuals turn to in accomplishing knowledge work. While studies have examined the use of multiple media in organizations, the role such media play in knowledge work has not received enough attention (Massey & Montoya-Weiss, 2006). In addition, focus on media has several limitations. For example, the same information can be communicated over several different types of media. Moreover, this emphasis shifts the focus to technology rather than the underlying processes, which can be supported by multiple technologies (Maruping & Agarwal, 2004).

A common distinction that has received attention in the literature is that between codified sources (written material, documents) and interactive sources (people, i.e., personal networks, discussion forums). Researchers have sometimes referred to this distinction as that between relational and nonrelational sources, with the former referring to information from people and the latter referring to the use of documents and websites that does not involve any direct interpersonal contact (Rulke, Zaheer, & Anderson, 2000; Zimmer, Henry, & Butler, 2007). In the information systems literature, the predominant focus has been on codified sources as evident from the emphasis on knowledge repositories in the knowledge management literature (Kankanhalli et al., 2005). Contributions to such databases or repositories are presumed to help organizations by providing easy access to the experiences and insights of other members in a centralized location. In addition, the process of contributing to such databases is also expected to build the competitive advantage of firms by codifying knowledge that would otherwise remain

with individuals and lost when such individuals leave the organization. While repositories and other types of codified knowledge sources (static web pages, printed documents, etc.) continue to be an important component of knowledge management initiatives in organizations, recent studies have also highlighted the shortcomings of such an approach (Zimmer et al., 2007). First, employees resist contribution unless there is an incentive structure to support it and also because, by codifying their knowledge, they feel dispensable. Second, deep experience and insight accumulated over many years is difficult to codify and store in knowledge repositories.

An approach that has received a lot of attention recently is the use of social networks. This is increasingly viewed as one way to overcome the limitations of the repository approach. Advances in information and communication technologies have created platforms that support interaction between individuals on a large scale and across distance (Agarwal et al., 2008; Zammuto et al., 2007). Through their interaction with others who have the relevant expertise, individuals can benefit from the experience of others. This approach derives its popularity from the renewed interest in examining organizational phenomena from a network perspective (Watts 2004; Newman 2003, Brass et al. 2004). Various types of networks have been studied - for example, social (advice, information exchange, etc.), biological and technological networks. In the social network view, primacy is given to relational ties over individual attributes in the explanation of social phenomena (Emirbayer & Goodwin, 1994; Wellman, 1988).

By encouraging interaction between their employees, organizations can create more opportunities for knowledge sharing and therefore, learning. It has also been pointed out that deep expertise and tacit knowledge are better shared through such interaction (Hansen, 1999). The popularity of social network analysis in organizational and information systems research as well as the popularity of social media in practice contributed to the increasing attention to this

approach. Therefore, organizations have attempted to build communities of practice to encourage knowledge sharing among employees. Increasingly, however, such communities have moved online into venues such as discussion forums and even the newer social networking technologies such as wikis (Ma & Agarwal, 2007; Wagner & Majchrzak, 2007; Wasko & Faraj, 2005).

Therefore, following this discussion, I suggest:

H1: In complex knowledge work, use of codified sources will be associated with effectiveness and learning.

H2: In complex knowledge work, use of interactive sources will be associated with effectiveness and learning.

In distributed professional work, while both codified and interactive knowledge sources are presumed to be important, the utility of each is dependent on the nature of the task. In their daily work, individuals rely on several sources based on their work habits. For example, in legal work, some lawyers prefer hard copies of treatises that contain expositions of sections of the law, while others turn to websites. Since the same information can be gleaned from multiple sources, for routine cases, one source is not necessarily better than the other. Ease of access and habit are the determining factors and therefore, personal preferences vary widely (Culnan, 1983). Moreover, when the stakes are high, individuals often do not rely on one source alone but rather, attempt to validate the information. This can take several forms – there is often a hierarchy of knowledge sources based on their perceived validity, or alternatively, knowledge gained from one source may be confirmed with the use of another. For example, in legal work as well as academic work, a distinction is often made between primary and secondary sources and primacy is granted to the

former. On the other hand, when multiple sources provide the same information, that may be viewed as providing confirmation (Cross, Borgatti, & Parker, 2001).

However, when faced with novel tasks or circumstances, actors are unable to rely on the usual sources. In such circumstances, it is often not clear where they should turn for guidance in solving the problem. While codified sources may provide a lot of information, they often do not cover all the exceptions that may need to be considered when circumstances change. Further, in cases characterized by significant novelty, it may not even be clear what specialization or sub-discipline is most applicable, which makes it difficult to use codified sources. As suggested earlier, deep expertise and tacit knowledge is also difficult to codify. Therefore, actors may rely more on colleagues and informal advice networks (Zimmer et al., 2007). When using interactive sources, it is easier to describe the context surrounding the problem in detail, which facilitates identification of the most relevant or applicable sources, whether they are published sources or human sources. The individual providing the advice may also ask clarification questions and elicit the relevant contextual details, which allow her to draw on her expertise and suggest a solution (Kudaravalli & Faraj, 2008).

A primary reason interactive sources are especially useful when faced with novelty is that they allow individuals to generate new knowledge through dialogue. For example, Nonaka (1994) suggests that “although ideas are formed in the minds of individuals, interaction between individuals typically plays a critical role in developing these ideas” (p. 15). He describes organizational knowledge creation as a “continual dialogue between explicit and tacit knowledge”, involving four modes of knowledge conversion between tacit and explicit – socialization, externalization, internalization and combination. Tsoukas (2009) provides further explanation of the way in which new organizational knowledge emerges through dialogical

interaction. Specifically, dialogue allows for the elaboration of existing background knowledge and the creation of new distinctions through conceptual combination, conceptual expansion and conceptual reframing. The generation of these new distinctions enables individuals to deal with the “unsettledness” created by novelty (p. 952). Therefore, I propose that:

H3: In complex knowledge work, when the task is novel, use of interactive sources will be associated with more effectiveness and learning than codified sources.

### Reanalysis

In the preceding discussion, I suggested that when the task is novel, use of interactive sources is more effective than codified sources. As outlined, some of the reasons include the difficulty of codifying complex knowledge and the ability to describe the problem in detail and engage in dialogue with individuals who have the right expertise. However, with the prevalence of digitized information sources, codified sources may be easier to access and more available. Accessibility has been shown to be a significant factor in the evaluation of sources by individuals (Culnan, 1983). This is especially true in several different kinds of professional work such as specialized legal work, where individuals belong to solo practices or 2-3 person firms. Despite the role played by professional associations, access to the expertise of other practitioners may not be as easy as that of codified sources. Further, information seekers may also prefer not to impose on colleagues and other experts. Therefore, despite the greater effectiveness of interactive sources in the presence of novelty, individuals may rely on codified sources to solve problems. I argue, however, that use of codified sources is nevertheless not unproblematic when novelty is present. To be effective, large volumes of information may need to be sifted through as well as

the quality and applicability of the information evaluated. I suggest that the effectiveness of codified sources is dependent on these processes.

A further justification for proposing additional processes to make effective use of codified sources relates to how they are conceptualized in this study. Historically, in the knowledge sharing literature, codified sources have been equated with explicit knowledge. For example, Nonaka (1995) suggests that “‘explicit’ or codified knowledge refers to knowledge that is transmittable in formal, systematic language. On the other hand, ‘tacit’ knowledge has a personal quality, which makes it hard to formalize and communicate” (p. 16). Interaction and dialogue between individuals are viewed as essential to the conversion of tacit knowledge into an explicit form in order to render it more useful. Use and combination of explicit knowledge, often through the use of computers, though it can lead to new knowledge, is considered to be unproblematic. In this study, however, codified sources are not considered synonymous with explicit knowledge. In the context of legal work, documents and other kinds of codified sources can often include complex knowledge. For example, legal briefs can contain intricate arguments and practice advisories can presuppose a great many contextual details and both can build on a significant amount of background knowledge. Therefore, because codified sources can contain more than simple, ‘explicit’ knowledge, I suggest that individuals need to engage in specific processes to benefit from them, especially when novelty is present.

The widespread use of information technology in knowledge work, both for organizing as well as creating knowledge, has created a surplus of codified sources. For managing organizational knowledge, repositories and databases have been supplemented, lately, with ‘peer-to-peer’ collaboration technologies such as wikis (Preece, 2000; Wagner & Majchrzak, 2007). In addition to the emphasis on knowledge management within organizations, the use of

distributed and virtual teams has created the need to codify knowledge in order to share it across distances (Griffith, Sawyer, & Neale, 2003). Moreover, a great number of physical processes have become virtual (Overby, 2008). While virtual processes create efficiencies and transparency, they also call for an ability to codify knowledge.

The availability of a large number of codified sources in knowledge work creates several challenges. First, the need to process large volumes of information may exceed individual abilities and result in information overload (Jones, Ravid, & Rafaeli, 2004). Therefore, researchers have suggested that, given the proliferation of codified information sources, the scarce commodity in modern organizations is no longer information but rather, attention (Hansen & Haas, 2001). Second, the task of distinguishing between reliable and unreliable information sources is made more difficult. This is especially true given that newer technologies such as blogs and wikis allow anyone to create and publish their own material online (Christian & Narasimha, 2005). Finally, the situated knowledge view would suggest that codifying knowledge may cause it to lose the essential context surrounding it in practice.

In knowledge intensive environments, therefore, it follows that use of codified information sources, by itself, is unlikely to result in desirable outcomes. This is especially true of situations where individuals confront novel problems resulting in high levels of ambiguity and uncertainty. Individuals will need to reassess the knowledge gained from codified sources, before it is applied to their circumstances. I call this process 'reanalysis'. For example, other peoples' experience may be codified in documents such as sales proposals, which may be reused after some rework to customize and create new sales proposals (Haas & Hansen, 2007). However, in addition to the idea of customization, my notion of reanalysis also includes the processes of verification to ensure that the information is reliable. For example, knowledge from experts as



well as from individuals higher in the hierarchy has been linked to perceptions of validity and legitimacy (Cross & Sproull, 2004). Similarly, individuals are likely to assess whether knowledge from codified sources is valid and legitimate before they can apply it to their situation. Therefore, I propose:

H4: In complex knowledge work, when the task is novel, the extent of reanalysis increases the positive association between codified knowledge source use and effectiveness and learning.

### *Dialogic Practices*

The use of codified sources in knowledge work has several limitations. First, given the tacit dimension of professional practice, insights gained from deep experience are difficult to share in codified form (Sternberg & Horvath, 1999). Second, in dynamic environments, practitioners are required to continuously monitor changes and adjust their mental models, actions and expectations. Therefore, given the provisional nature of knowledge in use, in such conditions, researchers have suggested that expertise and competence should be viewed not as a set of rules or procedures that can be documented but rather, as an ongoing, practical accomplishment (Faraj & Xiao, 2006; Orlikowski, 2002). Finally, the paradoxical effect of greater availability of codified information sources may be that individuals react to overload by ignoring information (Jones et al., 2004). For these and other reasons, organizations emphasize informal interaction between members to promote knowledge sharing.

However, merely creating opportunities for interaction may not be enough to enable knowledge sharing between individuals, as a range of studies have documented. Just as individuals can benefit from the mere use of codified sources in routine cases but not in novel

cases, similarly, the use of interactive sources can be beneficial in routine cases but less so in novel cases without the requisite processes. For example, in the context of collaborative problem solving in electronic networks, Kudaravalli and Faraj (2008) show that ‘how’ members interact has a greater impact on collaboration effectiveness than ‘who’ the individuals in the network are. In other words, even when individuals have access to others with the right expertise (interactive sources), they cannot benefit from the others’ expertise without engaging in dialogical interaction within the group.

This is especially true in cross-functional settings, where the existence of different thought worlds creates interpretive barriers and makes communication difficult (Dougherty, 1992). Researchers have suggested that the use of dialogic practices overcome such barriers and enable collaboration (Boland, Tenkasi, & Te'eni, 1994). These practices facilitate communication by surfacing differences, promoting consideration of multiple perspectives and the discussion of contextual information. For example, dialogic practices have been found to improve knowledge collaboration among professionals protecting national security, where individuals have mixed motives for contribution and differing goals (Jarvenpaa & Majchrzak, 2008). While the predominant concern in this literature has been on overcoming challenges to collaboration across practice or functional boundaries (Boland & Tenkasi, 1995), I suggest that knowledge sharing within individual practices is also difficult when knowledge is highly contextualized and when there is considerable novelty.

The increasingly dispersed forms of modern organizations are being enabled by newer information technologies that support collaboration at a distance. For example, discussion forums have emerged as an important venue for knowledge sharing within and outside traditional organizations (Wasko & Faraj, 2005). While researchers have suggested that virtual

organizational forms offer several advantages over face-to-face interaction such as flexibility, most organizations are not entirely virtual or co-located but rather employ both kinds of interactions (DeSanctis & Monge, 1999; Martins, Gilson, & Maynard, 2004). On the other hand, researchers have also documented the advantages of face-to-face interaction and the limitations of mediated communication (Kiesler & Cummings, 2002). Communication theorists have suggested that mediated communication is difficult due to the lack of grounding or common ground (Clark & Brennan, 1991). However, such limitations can be overcome by developing dialogic practices that allow individuals in virtual contexts to engage in ‘deep discussion’ and dialogue (DeSanctis, Fayard, Roach, & Jiang, 2003; Kudaravalli & Faraj, 2008).

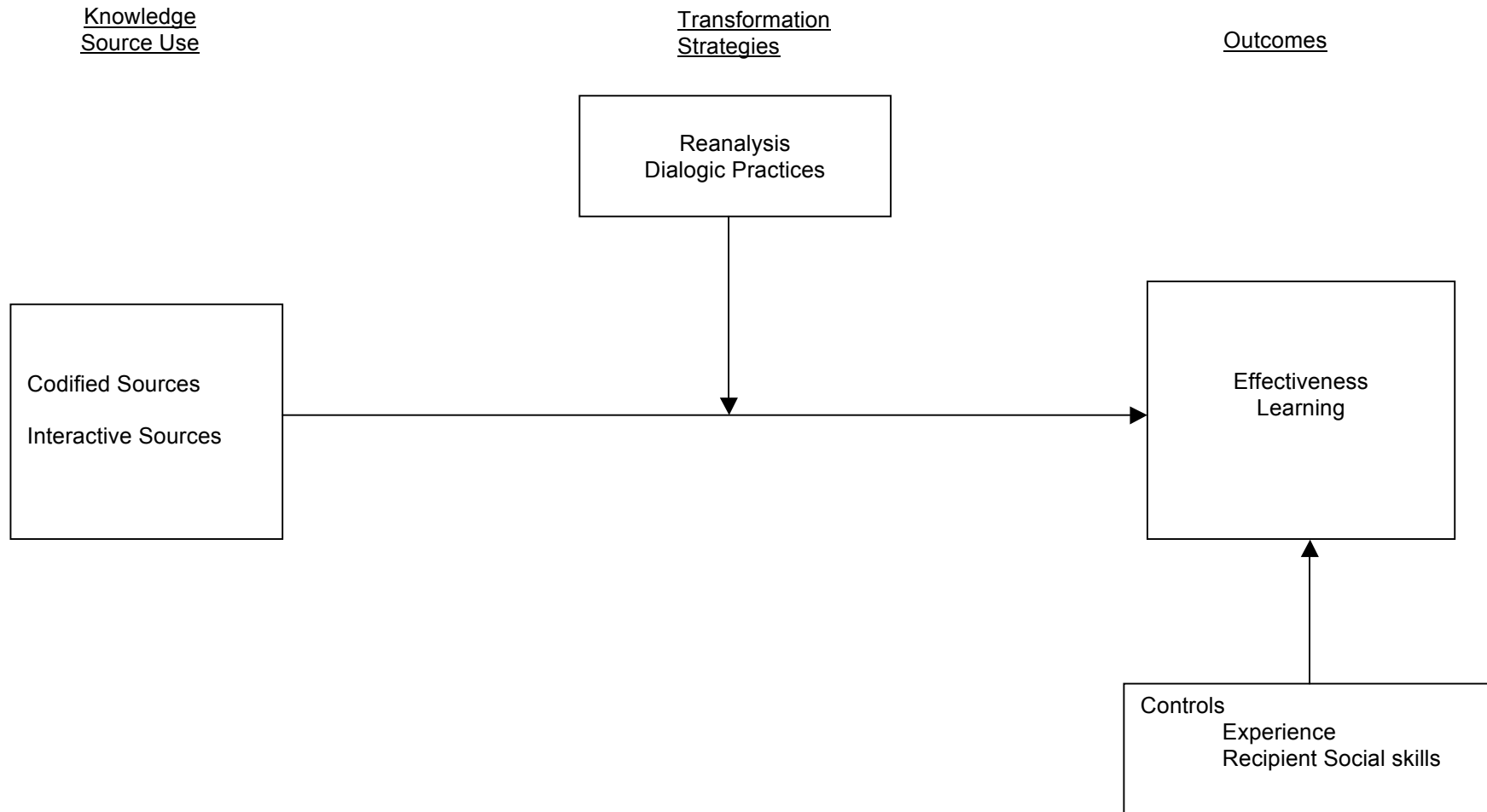
Therefore, whether individuals interact in face-to-face or mediated settings, there are challenges to communication that hinder collaboration and can be mitigated with dialogic practices. Recently, researchers have suggested that in addition to the semantic or interpretive boundaries that have received attention, pragmatic boundaries in knowledge work also need to be taken into account (Carlile, 2004). Even if interpretive barriers are removed, it does not mean that individuals are either willing or able to change their interpretations. Since knowledge is often contested and ‘won’, individuals are invested in their interpretations and may resist considering alternatives (Carlile, 2002; Faraj & Xiao, 2006). Further, Carlile (2004) suggests that as the degree of novelty increases, progressively more complicated boundaries need to be managed in the context of product development – “...the transition from a syntactic to a semantic boundary occurs when novelty makes some differences and dependencies unclear or some meanings ambiguous”, while “the transition from a semantic to a pragmatic boundary arises when the novelty presents results in different interests among actors that have to be resolved” (p. 558-559). Distributed settings present additional challenges since individuals

collaborating at a distance may lack common ground and, local knowledge presents another barrier (Cramton, 2001). In the presence of novelty, I suggest that dialogic practices in distributed settings need to take all these different types of boundaries into account.

H5: In complex knowledge work, when the task is novel, the extent of dialogic practices increases the positive association between interactive knowledge source use and effectiveness and learning.

The research model for the study is presented in Figure 2. To summarize the previous discussion, I distinguish between two key types of knowledge sources that individuals rely on in distributed knowledge work – codified sources and interactive sources. I hypothesized that the use of both types of knowledge sources lead to desirable outcomes. However, when faced with novelty, individuals will need to transform the knowledge gained from such sources. Finally, I hypothesized specific transformation strategies of reanalysis and dialogic practices for codified and interactive sources respectively and suggested that they moderate the relationship between knowledge source use and outcomes in the presence of novelty. In the next section, I describe the research methodology used to test this framework.

**Figure 2: Research Model**



## Research Methodology

### Research Setting and Data Collection

Our research model hypothesizes about the strategies used to adapt knowledge to individual circumstances in distributed settings characterized by ambiguity and uncertainty. The research setting, a national lawyers association (Alpha), is uniquely suited to test these hypotheses. Legal work brings to the surface the kinds of issues related to knowledge that I have focused on in this study. Like many other kinds of professional work such as medicine, management and technology development, legal work involves its own unique kind of tacit knowledge (Sternberg & Horvath, 1999). However, what is distinctive about legal work in comparison to other kinds of professional work is the nature of rules, regulations and statutes. While laws are drafted in broad terms, they have to be applied to specific situations. However, given the complexity of social reality and its changing, evolving character, application of the law is fraught with ambiguity and uncertainty.

Lawyers depend on many sources in their work. In order to advise their clients knowledgeably, lawyers have to be informed about an ever changing number of statutes, regulations and case law. New laws, regulations, recent legal decisions coming from various courts – information that is constantly changing and evolving – create a large need for knowledge access, distribution, and interpretation. Alpha performs a central role in such information dissemination within this legal community. Alpha serves as a repository and distribution center for various legal documents, forms, manuals, and regulation interpretation. In addition, Alpha is the primary source for information related

to the regulations (interpretation, summary and analysis), agency updates (processing times, administrative changes), in addition to organizing efforts such as advocacy and lobbying.

In addition to the codified sources listed above, the association also offers a number of face-to-face as well as mediated settings for interaction between the members. The face-to-face interaction opportunities include events such as conferences and other meetings for lobbying and advocacy; technology-based venues include online forums, specialized and geographically-based listservs, teleconferences and online presentations. In addition, there are a number of local chapters whose structure and work resembles that of the national association.

The empirical approach involved surveying a random sample of members at Alpha. I organized the survey around scenarios to elicit individual cases and the details, such as knowledge sources used, in relation to the cases. Since I am interested in situations where there is novelty, I gathered information about two different cases from each individual – one routine and one novel. In the first scenario, I asked the respondents to think about a recent routine case. In the second scenario, I asked the respondents to think about a novel case. In order to assist in recall and generate responses that are as accurate as possible, I asked the respondents to think of a specific case within the past six months. The scenarios were pilot tested together with the constructs as described below. For each scenario, the survey queried them about the knowledge sources used and the reanalysis and dialogic practices followed as well as how effective they were and whether they learned from the experience. The survey questions are described in Appendix A.

The survey was sent to a random sample of 3561 attorneys drawn from the membership of the legal association. The association has a standard procedure, through its marketing department, for sending out surveys electronically to members using the software SurveyGold. A staff member at Alpha entered the items into the software during which it went through an extensive period of testing by the author to correct errors, make sure it was easy to read, was uncluttered and questions were spaced evenly, that it was of reasonable length, and finally to ensure that there were no programming errors. Subsequently, the full length survey was tested by the author and two other staff members at Alpha.

We implemented the procedures suggested by Rogelberg and Stanton (2007) to reduce non-response bias. Consistent with their recommendations, an upfront incentive was provided (one year of free membership in the association for one respondent selected from a drawing and respondents are entered in the drawing if they answer the survey within a month). A week before the survey was sent out, an announcement was posted on Alpha's website briefly describing the survey and how it would help Alpha. Subsequently, the survey was also announced in the weekly email news bulletin sent to all Alpha members. Finally, the survey was sent out in the Fall of 2009. The respondents received a link for the survey in an email describing the survey and the incentive. Clicking on the link took the member to the organization's webpage where they answered questions. The response rate was monitored from the very first day. After two weeks, a reminder email was sent to those who did not answer. After a further two weeks, the deadline for the incentive was extended and another email reminder was sent and an announcement was posted on the website and the weekly news bulletin. The survey was



closed after a total of eight weeks. The total number of members who responded from the original sample was 160, for a response rate of 4.5%.

### Scale Development

The origin of this study focusing on knowledge sources and transformation processes employed by individuals in distributed work can be traced to the qualitative study of knowledge practices at the organizational level at Alpha. During the course of those interviews and observations, I found that the attorneys at Alpha dealt with specific cases and often utilized local knowledge. Which raised the question, how is such local knowledge shared by individuals and applied to other unique situations. An examination of the literature revealed that even though the idea of situated and local knowledge has been discussed (Carlile, 2002; Sole & Edmondson, 2002), most studies were concerned with elucidating the concept and empirical research was lacking. Therefore, through unstructured interviews with attorneys at Alpha, I explored how individuals dealt with unique cases, the sources of knowledge they relied on and how they benefited from such knowledge sources.

These initial interviews helped me in developing a more specific research question as well as the subsequent theoretical framework. In developing the measures for the study, I turned back to the literature but found only a couple of isolated studies that used related notions. In distinguishing between the different types of knowledge sources, I found that similar distinctions existed in the literature (Haas & Hansen, 2007; Zimmer et al., 2007), but were not directly useful for the context at Alpha. For the knowledge transformation processes, I drew on elements from existing studies (Haas & Hansen, 2007; Jarvenpaa &

Majchrzak, 2008), but had to adapt those scales to my setting. Therefore, based on the interviews and my understanding of the setting, I developed an initial list of items. These were subsequently refined by dropping some items and rewording others following reviews by several staff members at Alpha, university faculty and three Ph.D. students. The questionnaire was then sent to 11 attorneys who had considerable expertise at Alpha and 8 responses were received. I interviewed those who responded and used their comments to further refine the items for clarity and ease of reading and eliminated redundant items. After a further review by two university faculty members and two senior staff members at AILA, I arrived at a final set of questions that were included in the survey. The instrument that respondents finally received is in Appendix A.

### *Nonresponse Bias*

Non-response bias can be a significant problem in data collection using the survey methodology (Armstrong and Overton 1977). Despite the expectation that use of technology (i.e., web-based survey administration, handhelds) could alleviate the problem by making it easier for respondents to fill out the survey, response rates have continued to decline in recent years (Cook, Heath, & Thompson, 2000). It is possible that the increasing use of surveys and opinion polls by practitioners and researchers alike, in part because technology also makes it easier to administer surveys, has contributed to worsening response rates. A low response rate could make the evaluation and assessment of study results problematic. First, the threat to validity is that the data collected may be skewed and does not represent the population. It is possible that the respondents who answer are typically those who are interested in the research or the survey and this could

bias the data in that direction. Second, the difference may depend on respondents' tardiness – only those who respond to the survey on time are included.

I took several response facilitation steps to address non-response bias, following the recommendations of a recent article on the topic (Rogelberg & Stanton, 2007). These include pre-notifying participants, publicizing the survey, sending reminder notes, monitoring survey response and establishing survey importance. The specific steps taken are described in a previous section. In addition, proper design of the instrument can also play a critical role. Rogelberg and Stanton (2007) also recommend that researchers conduct a nonresponse bias impact assessment and I followed some of their suggested techniques. First, I compared the tenure in the organization for the respondents with the membership and there were no significant differences. Second, the data from early and late respondents can be considered to belong to different “waves” and the responses were compared between waves and were found not to be significantly different.

#### *Common-method Bias*

Finally, a possible measurement issue in the study could be common method bias since I am using a single survey to measure all the variables. However, researchers have suggested that even when predictor and criterion variables cannot be obtained from different sources, common method bias can be reduced by other procedural and statistical remedies (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). First, the respondents were not primed to connect the predictors to the outcomes because the questionnaire was described as focused on knowledge sharing at Alpha. Second, the careful construction of the items to reduce ambiguity and vagueness should also reduce bias. Third, the questions

about the knowledge source use variables and the knowledge transformation strategies preceded the questions about the outcomes (Podsakoff & Organ, 1986). However, since questions for both cases followed the same structure, it is possible that there may be some bias. To address this possibility, I used two statistical remedies. First, I conducted Harman's single factor test by entering all the reflective constructs in the study (Lindell & Whitney, 2001). If a single factor emerges, it may be evidence of common-method bias. I obtained a number of factors that equaled the number of constructs entered, thus indicating no evidence of common-method bias. Second, additional variables about the use of web 2.0 tools and technologies were included in the survey but were theoretically unrelated to the study. If common method bias was a significant concern in the study, these would be highly correlated with the study variables, but that was not found to be the case. Therefore, common-method bias is unlikely to be a serious concern.

A recent study has examined the effect of common method bias, specifically, in IS research (Malhotra, Kim, & Patil, 2006). The authors reanalyzed the correlations from past studies in the areas of technology acceptance and concern for information privacy and find that the inflation in correlation caused by common method bias may be on the order of 0.1 or less and that most significant correlations remained significant after correcting for method bias. Further, the authors also draw the conclusion from their study that common method bias in the IS domain is not as serious as in other disciplines and offer the explanation that this may be due to the fact that "IS studies focus on concrete targets (e.g., systems or information)" (p. 1879, Malhotra et al., 2006).

### Power Analysis

In order to assess what an appropriate sample size is for the study, it is necessary to conduct a power analysis. Statistical power is the probability that a null hypothesis will be rejected by the statistical test, given that the null hypothesis is false (Cohen, 1988). Power analysis can be used to calculate the sample size required to accept the findings of the statistical test at a given confidence level. Power analysis can be conducted either a priori to determine appropriate sample size or post hoc to determine what power was obtained with the sample size used. Following standard conventions, I use a power level of .8 and an alpha level of .05 to calculate the sample size for a given effect size. Table 1 summarizes the different sample sizes needed for a given number of variables and effect sizes. Generally, an effect size of .02 is considered small, effect size of .15 is considered medium and finally, an effect size of .35 is considered large.

**Table 1: Power Analysis: N required for a power level of .8 at alpha level .05**

Number of Independent Variables	Effect Size: Small (.02)	Effect Size: Medium (.15)	Effect Size: Large (.35)
4	597	84	39
5	643	91	43
6	684	97	46
7	721	103	49
8	755	108	52
9	788	113	54
10	818	118	57
11	847	122	59
12	874	127	61
13	901	131	63
14	926	135	66

The calculation can also be performed by anticipating an R square level for the study. In general, a level of .2 can be considered reasonable for social science research (Cohen, 1988). Therefore, assuming a power level of .8, an alpha level of .05 and a model

consisting of all the thirteen predictor variables, I obtain a required sample size of 84. Although this is the minimum required sample size for a reasonable R square level, given the significant number of items in the constructs in my model, a larger sample size than the minimum is desirable. The sample size of 160 used in the study clearly meets these requirements.

### Measures

#### *Effectiveness*

We measure effectiveness in this study using three different indicators. These are task-based indicators to evaluate how this case fared compared to other cases they have dealt with in the past. Savings in time and effort have been used in studies of knowledge work in the past (Haas & Hansen, 2007). However, in legal work, developing the right idea or strategy that is appropriate for the case can also save clients from damaging consequences such as, in extreme cases, separation from family or deportation. Therefore, indicators were included that measure the outcome of the case, perhaps indicating how effective the knowledge sources and transformation strategies were. The individual items are listed in Appendix A.

#### *Member Learning*

A second category of dependent variable in the study is member learning. I measure learning as an outcome that is a result of the specific case in question. Similar measures have been used in the literature to measure outcomes (Levin & Cross, 2004). However, the learning measure used here was developed in consultation with the association members, who suggested items that appeared to be valued specifically in this setting.

These included whether the case honed the skills of the individual as a lawyer and allowed her to deal with similar cases more efficiently.

### *Knowledge Sources*

The organization makes a wide variety of knowledge sources available to its members. These include a great number of codified sources posted on its website as well as books produced by its publications department. They include a variety of content ranging from procedural information regarding, for example, where and when to file a certain application to highly complex interpretations of laws and statutes, included in documents such as analysis and summary. Irrespective of the complexity and interpretive element of these products, I classified them as codified knowledge sources. In addition, this category also subsumes media classifications. For example, agency memos and summary and analysis could be posted on the website, mailed as CD-ROMs or included in books.

The second category of knowledge sources included in this study is interactive sources. I use this label to refer to interactive exchanges with others, whether in face-to-face settings or mediated settings. The association organizes one annual conference as well as several regional or special topic conferences throughout the year. These form the predominant face-to-face interaction opportunities. In addition, several technology mediated interaction opportunities are available through discussion forums, listservs, teleconferences and web seminars. Individuals may also communicate with colleagues over the phone or email. Finally, experienced members also volunteer to be part of the mentor network in specific areas of the law. Individuals who have a question about a

specific area of the law can email mentor network volunteers to get their question answered.

### *Reanalysis*

The reanalysis measure is designed to capture the way individuals use codified knowledge sources in legal work. Very often, these sources are used to confirm, validate or find legitimacy for their positions. For example, in legal arguments, other codified sources such as regulations and statutes become reference points with which comparisons are drawn and differences or similarities are highlighted, based on whether similarities or differences are more supportive of the case and the argument. However, since the codified rules are not designed for this specific case alone, their application to the existing case or each new case, has to be analyzed anew or ‘reanalyzed.’ I adapted several items from existing literature (Cross & Sproull, 2004) for this measure and developed new ones based on interviews with respondents from the research setting. The idea that codified sources, specifically electronic documents, can be reused with customization has also been tested in a previous study (Haas & Hansen, 2007). The individual items for this measure are listed in Appendix A.

### *Dialogic Practices*

This measure captures practices that can turn knowledge from interactive sources into effective outcomes. Often, when support cannot be marshaled from codified sources, individuals turn to other professionals for advice. Others may be able suggest a new direction for the case or point out alternative interpretations that were not considered. As described earlier, since knowledge is situated and localized in practice, it makes knowledge sharing difficult. Unless one knows who the stakeholders and interested



parties are, it will be difficult to devise a strategy to achieve successful outcomes. Similarly, individuals acquire extensive local knowledge in their practice, which is seldom codified. For example, if a case has to be filed in a local government office, attorneys who are familiar with officials in that office may be able to suggest how the case should be framed and presented in order to achieve desirable outcomes. This measure is built from the literature that outlines these ideas in different settings (Carlile, 2004; Faraj & Xiao, 2006; Jarvenpaa & Majchrzak, 2008). The proposed items for the measure are listed in Appendix A.

### *Controls*

Members will also be asked in the survey how long they have been practicing law. Experience variable will be calculated as the number of months since they started practicing law. While interactive sources provide access to deep experience and expertise, benefiting from them requires social skill, defined as ‘interpersonal perceptiveness and the ability to adjust behavior according to situational demands’ (Ferris, Witt, & Hochwarter, 2001). In voluntary, distributed knowledge work, where traditional coordination mechanisms such as reporting structures are not present, interacting with others is even more challenging. Therefore, in order to seek and receive help from other colleagues, individuals who have good social skill are in an advantageous position. I suggest that better social skill also helps dialogic practices since knowledge at the pragmatic boundary, given its contentious nature, may not be communicated readily. Such knowledge sharing requires perceptiveness and self-monitoring behavior.

In this setting, since most attorneys do not work for large firms but rather practice either independently or as part of a 2-3 member group, opportunities for developing

relationships with other attorneys are limited. While the association offers opportunities to meet and interact with other attorneys, due to the lack of sustained working relationships as in traditional organizations, individuals with better social skill have an advantage in seeking and receiving help. I use a measure of social skill that has received good support and is widely used in the literature (Ferris et al., 2001). The items are included in Appendix A.

## Results

### *Convergent and Discriminant Validity*

As described in the measures section, even though the two knowledge transformation variables of reanalysis and dialogic practices are loosely based on concepts used in the literature (Haas & Hansen, 2007; Jarvenpaa & Majchrzak, 2008), new items were added and the constructs adapted to the setting. I conducted an exploratory factor analysis with oblimin rotation for the knowledge transformation variables, which resulted in a two-factor solution. All the items loaded well (.69 or greater) except for one reanalysis item (Rean1: Adapt relevant samples, forms or templates). The mean of this item (3.35) is also lower than the other four items in reanalysis (4.39 to 5.56). It is possible that adapting other forms has a negative connotation as indicated in the interviews and received a lower score. Therefore, I decided to drop this item from further analysis.

We then included all the reflective constructs in the study in order to test for discriminant validity, using principal component factor analysis with oblimin rotation. I obtained a four factor solution with most items loading on to its own factor, except for one item in effectiveness (Effec1: I reasoned extremely well in this case). In examining the relationship of this item to the others in effectiveness, I decided that this item was conceptually distinct from the other two and decided to drop it from further analysis. I conducted another factor analysis with these changes and all items loaded cleanly on to their own factors with no cross loadings greater than .37 (Table 2). The factors accounted for 73.6% of the cumulative variance and had eigen values of 5.7, 4.2, 2.5 and 1.6.

**Table 2: Factor Analysis**

	<b>Factor 1</b>	<b>Factor 2</b>	<b>Factor 3</b>	<b>Factor 4</b>
Rean2			0.77	
Rean3			0.86	
Rean4			0.78	
Rean5			0.63	
Dial1	0.82			
Dial2	0.85			
Dial3	0.73			
Dial4	0.80			
Dial5	0.76			
Dial6	0.84			
Dial7	0.85			
Dial8	0.73			
Effec2				0.85
Effec3				0.83
Learn1		0.89		
Learn2		0.91		
Learn3		0.89		
Learn4		0.76		
Learn5		0.83		

Method: Principal-Component Factors  
Rotation: Orthogonal Oblimin (Kaiser Off)  
Loadings below .38 are not shown

### Construct Reliability

All the constructs used in the study include multiple items. The Cronbach's Alpha for the variables are presented in Table 3 and indicate that the constructs possess good reliability. Generally, a reliability coefficient of 0.7 or higher is considered good, indicating good internal consistency and evidence that the items are a measure of the same construct (Nunnally & Bernstein, 1978). Since the key reflective indicators in this study all have Alpha .84 or higher, they demonstrate good internal consistency.

We do not present the Alpha for the codified and interactive knowledge sources, since the use of Alpha for formative constructs may not be appropriate (Edwards, 2001). In fact, high reliability, indicating good internal consistency, is not considered desirable for formative constructs, since it suggests that the items are tapping into the same aspect of the construct (Petter, Straub, & Rai, 2007).

Following the reliability analysis of the constructs, I calculated the mean of the items included in each construct and used these in all further analyses.

**Table 3: Reliability**

Construct	Number of Items		Cronbach's Alpha
	Before Factor Analysis	After Factor Analysis	
Reanalysis	5	4	0.84
Dialogic Practices	8	8	0.93
Effectiveness	3	2	0.83
Learning	5	5	0.93

## Analysis Approach

In choosing the appropriate data analysis approach for this study, we have to consider the structure of the data. The study design involves responses from each individual on two different cases, one routine and one novel. Therefore, given that there are two observations from each individual, the analysis approach has to take this fact of non-independence of observations into account. This is important because this particular structure of the data violates assumptions underlying the standard analysis techniques. For example, a basic assumption in ordinary least squares regression is the independence of observations. Violation of this assumption in ordinary least squares regression generates biased estimates of the standard errors, resulting in smaller p-values. In essence, the standard error calculation inflates the observations by ignoring the non-independence of observations.

Several different types of approaches are used in practice for addressing the non-independence of observations. Clustering of data is common in many multilevel domains when multiple lower level observations are collected within a higher-level unit. For example, individuals are clustered within teams and teams are clustered within organizations. Two methods often recommended for these types of clustered data structures are clustered standard errors and multilevel modeling (Petersen, 2009; Snijders & Bosker, 1999). Of these, the former is considered a more straightforward and practical approach. Multilevel modeling is preferable when cross-level effects are the focus or

separate estimates for the higher-level unit are desired or when the cluster sizes are different (Primo, Jacobsmeier, & Milyo, 2007). Since these are not true for this study – we are not interested in studying cross-level interactions except for controlling for some individual level variables, all clusters in the data are of the same size (two) – I chose the clustered standard error approach. Moreover, compared with multilevel modeling, clustered standard errors make use of fewer assumptions. Finally, in practical terms, clustered standard errors are easily handled in common statistical packages, while multilevel models are harder to setup and may not converge in many cases.

Our theoretical model includes two different types of hypotheses, which affects the choice of analytical strategy. Hypotheses 1 & 2 concern the average effects of the two types of knowledge sources, across the two cases, routine and novel, on the outcome variables. As such, testing these hypotheses requires analyzing a sample that includes both routine and novel cases. Since, as discussed, this presents the problem of clustered data, I chose to test hypotheses 1 & 2 using ordinary least squares regression with clustered standard errors. However, hypotheses 3, 4 and 5 make predictions about the novel case alone. To test these three hypotheses, therefore, we need a sample of novel cases alone. Consequently, I chose to analyze these hypotheses using ordinary least squares regression on the sub-sample of novel cases. Since this implies one observation from each individual to test hypotheses 3, 4 and 5, clustering of data is no longer an issue unlike the earlier case.

### Statistical Analyses

The descriptive statistics and inter-correlations of the variables used in the study are presented in Table 4. All the variables are measured using a 1-7 Likert scale. I examined the distribution of the variables and found that most did not deviate significantly from a normal distribution, based on skewness and kurtosis tests. The experience variable had a long right tail, although not enough to suggest a transformation. The interactive sources variable also had a moderate leftward skewness but again, not enough to suggest that a variable transformation was required. However, the regression diagnostics during the hypotheses tests indicated that the error terms deviated from normality. Applying a transformation to the experience and interactive sources variables improved the distribution of the error terms. I examined the effect of the commonly used transformations on these variables and chose square root for the experience variable and log transform for the interactive sources variable.

Table 4 shows that the knowledge sources and knowledge transformation variables are moderately correlated. For example, codified sources is moderately correlated with reanalysis ( $r = .55, p < .001$ ) and interactive sources is moderately correlated with dialogic practices ( $r = .64, p < .001$ ). This follows from the fact that the knowledge transformation variables ask how individuals use the knowledge sources. More importantly, the two knowledge sources themselves, codified and interactive sources, are moderately correlated ( $r = .5, p < .001$ ). This suggests, perhaps, that in this setting, individuals use both knowledge sources in tandem in their work.



**Table 4: Descriptive Statistics and Correlations**

	Min	Max	Mean	Std. Dev.	Experience	Social Skills	Codified	Interactive	Reanalysis	Dialogic	Effectiveness
Experience (Sq. Root)	1.0	7.14	3.59	1.23	1						
Social Skills	1.5	7	4.57	1.15	-0.178**	1					
Codified Sources	1.0	7	5.07	1.39	-0.0155	0.257***	1				
Interactive Sources (LN)	0.0	1.95	1.03	0.47	-0.165**	0.172**	0.500***	1			
Reanalysis	1.0	7	5.36	1.41	-0.0220	0.196***	0.554***	0.349***	1		
Dialogic Practices	1.0	7	4.34	1.70	-0.139*	0.312***	0.445***	0.640***	0.434***	1	
Effectiveness	1.0	7	5.20	1.67	-0.0166	0.266***	0.131*	0.126*	0.296***	0.221***	1
Learning	1.0	7	5.57	1.34	-0.110*	0.349***	0.331***	0.348***	0.412***	0.408***	0.534***

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

When the correlations of the key variables (knowledge sources and transformation processes) with the outcome variables are observed, in particular learning, we find that the transformation processes ( $r = .41$  and  $r = .4$  respectively,  $p < .001$ ) are more highly correlated than the knowledge sources ( $r = .35$  and  $r = .35$  respectively,  $p < .001$ ). This would suggest that the specific way in which the knowledge sources are used (reanalysis and dialogic practices) is associated more with learning than the simple use of the knowledge sources, thus supporting the key idea in the theoretical model.

### Hypothesis Testing

Hypotheses 1 and 2 concern the effect of knowledge source use on the outcome variables of effectiveness and learning. Following the justification provided earlier, I tested the hypotheses using regression with clustered robust standard errors since the analysis uses both cases from each individual ( $n=320$ ). The variables were entered in a stepwise fashion, with control variables followed by knowledge sources. I first regressed the variables on effectiveness and then learning as shown in Table 5. The control variables model of effectiveness, with case type and experience, was not significant. When the knowledge source variables are added as shown in Model 2, the model is significant ( $F=3.15$ ,  $p < .05$ ). However, the effect of knowledge sources on effectiveness is not significant. When the variables are regressed on learning, the model is significant ( $F=8.95$ ,  $p < .001$ ). In addition, the knowledge sources variables have a significant effect on learning. Although the contribution of interactive sources to learning ( $\beta=.232$ ,  $p < .01$ )

is very similar to that of codified sources ( $\beta=.228, p<.001$ ), the effect of codified sources is slightly larger. Therefore, hypotheses 1 and 2, which predicted that the use of codified and interactive sources will be positively associated with effectiveness and learning, is supported for learning but not effectiveness.

In order to test Hypotheses 3, 4 and 5, which concern the knowledge transformation processes individuals use in novel cases, subsample analysis was used that included only the novel cases. Since this analysis amounts to one case per individual, data clustering is no longer an issue. Therefore, ordinary least squares regression was used to test these hypotheses. Since hypotheses 4 and 5 test the moderating effect of reanalysis and dialogic practices, the variables were mean centered before creating the interaction terms. The variables are entered stepwise, with knowledge sources, followed by transformation processes, which together comprise the main effects, and finally, the interaction terms. The analysis for the two outcome variables is presented in Table 6.

**Table 5: Combined Analysis for All Cases, Tests for Hypotheses 1 & 2\***

	<b>Effectiveness</b>		<b>Learning</b>	
	Model 1	Model 2	Model 3	Model 4
<b><i>Control Variables</i></b>				
Case	-0.087*	-0.144**	0.059 <sup>+</sup>	-0.050
	(0.140)	(0.157)	(0.0922)	(0.104)
Experience (Sq. Root)	-0.017	-0.002	-0.110	-0.069
	(0.104)	(0.101)	(0.0794)	(0.0717)
<b><i>Knowledge Sources</i></b>				
Interactive Sources (LN)		0.077		0.228***
		(0.277)		(0.191)
Codified Sources		0.139		0.232**
		(0.104)		(0.0814)
<b><i>Model Statistics</i></b>				
$R^2$	0.008	0.041	0.016	0.161
Adjusted $R^2$	0.002	0.028	0.009	0.150
F	2.172	3.149	2.275	8.956
$\Delta R^2$		0.033**		0.145***
Observations	320	320	320	320

\* Regression with Clustered Standard Errors

Standardized beta coefficients; Standard errors in parentheses

<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 6: Subsample Analysis for Novel Case, Tests for Hypotheses 3, 4 and 5**

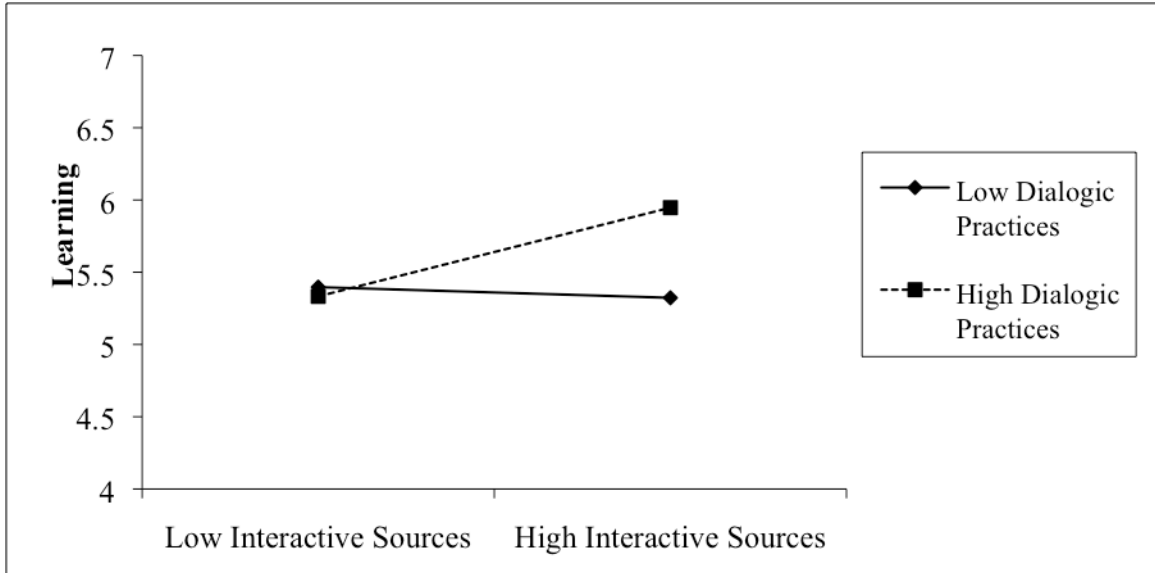
	Effectiveness				Learning			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Experience (Sq. Root)	-0.016 (0.122)	-0.008 (0.123)	-0.035 (0.119)	-0.021 (0.116)	-0.006 (0.0785)	0.002 (0.0796)	-0.031 (0.0709)	-0.019 (0.0675)
Interactive Sources (LN)	0.162 <sup>+</sup> (0.380)	0.046 (0.405)	0.059 (0.379)	0.036 (0.381)	0.173 <sup>*</sup> (0.228)	0.053 (0.253)	0.069 (0.223)	0.045 (0.232)
Codified Sources	0.214 <sup>*</sup> (0.151)	0.157 (0.152)	0.052 (0.146)	0.037 (0.135)	0.356 <sup>***</sup> (0.108)	0.296 <sup>**</sup> (0.105)	0.165 <sup>+</sup> (0.0999)	0.151 <sup>+</sup> (0.0886)
Dialogic Practices		0.240 <sup>*</sup> (0.115)	0.155 (0.120)	0.187 <sup>+</sup> (0.111)		0.250 <sup>**</sup> (0.0707)	0.143 (0.0726)	0.180 <sup>+</sup> (0.0757)
Reanalysis			0.304 <sup>**</sup> (0.155)	0.291 <sup>**</sup> (0.144)			0.381 <sup>**</sup> (0.111)	0.367 <sup>***</sup> (0.107)
Interactive Sources x Dialogic Practices				0.092 (0.174)				0.107 <sup>+</sup> (0.0890)
Codified Sources x Reanalysis				-0.187 <sup>**</sup> (0.0597)				-0.173 <sup>**</sup> (0.0358)
$R^2$	0.100	0.135	0.204	0.238	0.205	0.243	0.350	0.382
Adjusted $R^2$	0.083	0.113	0.178	0.203	0.190	0.224	0.329	0.354
F	4.865	4.836	5.823	8.696	9.901	9.319	16.32	21.94
$\Delta R^2$		0.036 <sup>*</sup>	0.069 <sup>***</sup>	0.034 <sup>*</sup>		0.038 <sup>**</sup>	0.107 <sup>***</sup>	0.032 <sup>*</sup>
Observations	160	160	160	160	160	160	160	160

Standardized beta coefficients; Standard errors in parentheses; <sup>+</sup>  $p < 0.10$ , <sup>\*</sup>  $p < 0.05$ , <sup>\*\*</sup>  $p < 0.01$ , <sup>\*\*\*</sup>  $p < 0.001$

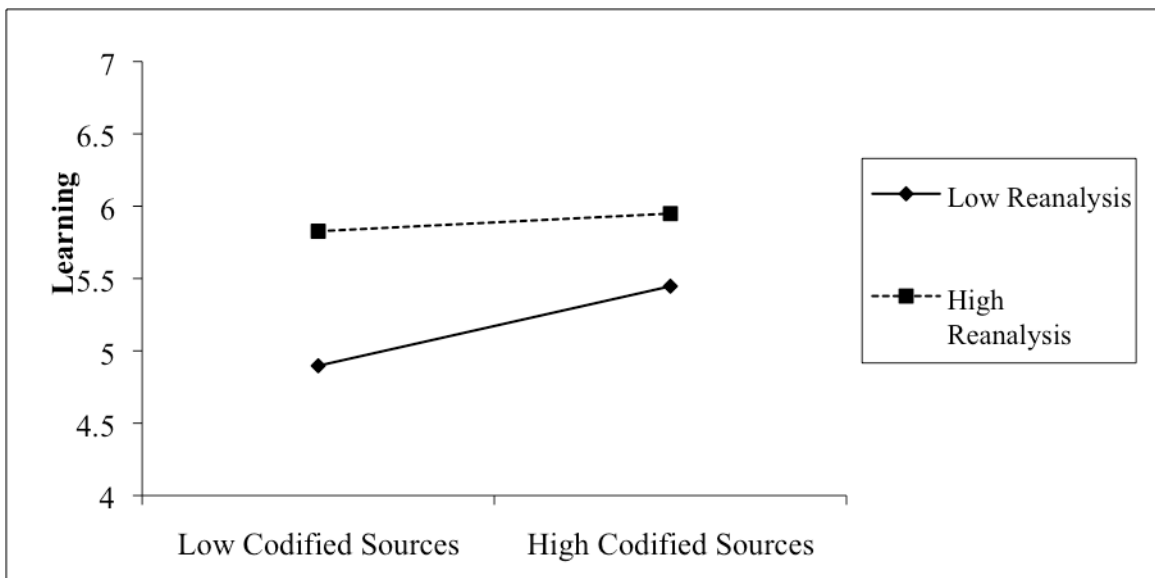
When the case is novel, use of codified sources is associated with both effectiveness ( $\beta=.21$ ,  $p<.05$ ) and learning ( $\beta=.36$ ,  $p<.001$ ). The use of interactive sources is also associated with both effectiveness ( $\beta=.16$ ,  $p<.1$ ) and learning ( $\beta=.17$ ,  $p<.05$ ) as shown in Models 1 and 5. Examination of the above coefficients for knowledge source use indicates that the use of codified sources makes a greater contribution to effectiveness and learning than the use of interactive sources. Therefore, hypothesis 3 is not supported, which suggested that in novel cases, greater use of interactive sources is associated with effectiveness and learning.

Although not hypothesized formally, a key argument in the study was that the use of knowledge sources alone is insufficient for desirable outcomes when individuals face novel circumstances. I suggested that knowledge from different sources has to be transformed to adapt to the novel circumstance. Models 2 and 3 as well as 6 and 7, where the transformation processes of reanalysis and dialogic practices are added stepwise, support this notion. The models are significant and show significant improvement over previous ones, especially for reanalysis, as indicated by the change in  $R^2$  of nearly 7% and 10% respectively, for effectiveness and learning. While both processes are associated with the outcomes, reanalysis makes a greater contribution to effectiveness ( $\beta=.3$ ,  $p<.01$ ) and learning ( $\beta=.38$ ,  $p<.01$ ) than dialogic practices.

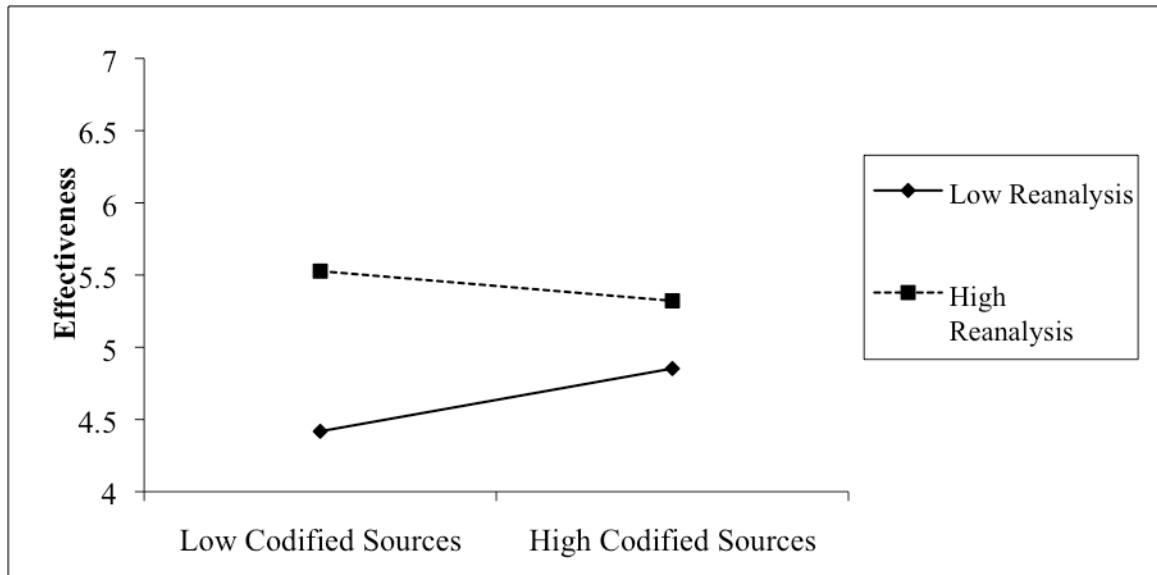
**Figure 3: Interaction Plot of Interactive Sources and Dialogic Practices (Learning)**



**Figure 4: Interaction Plot of Codified Sources and Reanalysis (Learning)**



**Figure 5: Interaction Plot of Codified Sources and Reanalysis (Effectiveness)**



In the final step, the interaction terms were entered, as shown in Models 4 and 8. The models are significant for both effectiveness ( $F=8.7$ ,  $p<.001$ ) and learning ( $F=21.94$ ,  $p<.001$ ). The interaction between interactive sources and dialogic practices is not significant for effectiveness but is significant for learning ( $\beta=.107$ ,  $p<.1$ ) but at the level of  $p=0.055$ . The interaction plot supports the argument made earlier that the mere use of interactive sources does not lead to desirable outcomes. Therefore, when dialogic practices are low, greater interactive source use does not produce any beneficial impact on learning. However, when dialogic practices are high, higher use of interactive sources is positively associated with learning, thus supporting hypothesis 5. The interaction between codified source use and reanalysis is significant for both effectiveness and learning, however, in the opposite direction. Therefore, hypothesis 4, which predicted that reanalysis positively moderates the relationship between codified source use and the outcomes, is not supported. The interaction plot for this moderating effect shows that



higher codified source use is beneficial to learning when reanalysis is low. However, the marginal benefits of higher codified source use with high reanalysis, are negligible for learning. While the benefits are negligible for learning, higher codified source use leads to a reduction in effectiveness, with increased reanalysis.

### Additional Analyses

The previous section reported on the hypotheses tests conducted to verify the theoretical framework proposed in this study. I also outlined the rationale for the analysis approach chosen, given the data structure of the study. However, in light of the specific study design and data structure reported here, there is a need to conduct further tests to verify the robustness of the findings reported earlier. In this section, I report on two different kinds of robustness checks. First, I conducted additional analyses using alternative techniques. Second, I added additional control variables to the models reported earlier to examine how the findings may change.

In justifying the analysis approach I chose for the study, I suggested that another technique that is commonly used to analyze clustered data is multilevel modeling. Although I chose regression with clustered standard errors as the primary analysis for the study, I also ran multilevel models to test the robustness of the findings reported in the previous section. Several different names are used in the literature to refer to multilevel modeling, such as hierarchical linear modeling, random coefficient modeling and mixed effects modeling. Some of these (e.g., hierarchical linear modeling) refer to not only specific techniques but also the software and tools. Although you can choose to vary only the slopes or intercepts when conducting multilevel analysis, I chose a slopes and intercepts model (Snijders & Bosker, 1999). I chose the xtmixed procedure in Stata with the full maximum likelihood option to run the multilevel models.

The results of the random coefficient modeling are reported in Table 7 for effectiveness and learning. We use the AIC and BIC (Bayesian information criterion) measures as well

as the likelihood ratio test to assess model fit. In general, in comparing two models, the model with the lower value of the information criterion is considered to be better. The variables are added stepwise, with only the control variables in Model 1 and the control variables and knowledge sources in Model 2. The model statistics indicate insufficient improvement in model fit with the addition of the knowledge source variables when regressing on effectiveness (AIC reduced from 1208 to 1206; BIC increased from 1234 to 1240;  $\text{Chi}^2 = 10.23, p < 0.1$ ). Therefore, hypotheses 1 and 2 are not supported for effectiveness. However, models 3 and 4, which regress the variables on the learning outcome produce different results. The addition of the knowledge source variables in model 4 produces a significant improvement in model fit (AIC reduced to 989 from 1025; BIC reduced to 1023 from 1051;  $\text{Chi}^2 = 50.35, p < .001$ ). In addition, codified ( $\beta = .157, p < .01$ ) and interactive sources ( $\beta = .677, p < .001$ ) are significant and positively associated with learning. Therefore, hypotheses 1 and 2 are supported for learning but not effectiveness. This finding is consistent with that reported in the previous section.

**Table 7: Random Coefficient Modeling – Robustness Tests for Hypotheses 1 & 2**

	Effectiveness		Learning	
	Model 1	Model 2	Model 3	Model 4
Case	-0.291 <sup>*</sup>	-0.430 <sup>**</sup>	0.157 <sup>+</sup>	-0.0767
	(0.139)	(0.153)	(0.0917)	(0.0991)
Experience (Sq. Root)	-0.00664	0.00450	-0.112	-0.0853
	(0.0981)	(0.0959)	(0.0787)	(0.0704)
Codified Sources		0.121		0.157 <sup>**</sup>
		(0.0814)		(0.0577)
Interactive Sources (LN)		0.216		0.677 <sup>***</sup>
		(0.243)		(0.177)
<i>AIC</i>	1208.0	1206.4	1025.3	989.5
<i>BIC</i>	1234.4	1240.3	1051.6	1023.4
Chi-squared	4.384	10.23	4.976	50.35
Prob > chi2		0.0586		2.30e-09
Observations	320	320	320	320

Standard errors in parentheses

<sup>+</sup>  $p < 0.10$ , <sup>\*</sup>  $p < 0.05$ , <sup>\*\*</sup>  $p < 0.01$ , <sup>\*\*\*</sup>  $p < 0.001$

The models that I have used so far in dealing with the clustered data in the study, regression with clustered standard errors and multilevel modeling, use the combined sample including both the novel and routine case, but take into account the fact that each individual reports on two cases. However, in order to examine how the two cases differ from each other, it may be more useful to utilize a multiple equation model, which estimates separate models for the routine and novel case, while taking into account that the two models are not independent. Therefore, I utilized a seemingly unrelated regression (SUR), which is recommended when the separate models (for the cases) have correlated errors, as in the present context since two cases come from each individual. Typically, in these models, the coefficients are similar to those in ordinary least squares regression, however, the standard errors are different due to the correlated residuals. I conducted a Breusch-Pagan test of independence to see whether the residuals are correlated. The test indicates that the residuals are not independent ( $\text{Chi}^2(6) = 206.34, p = 0.000$ ). The correlation matrix for the residuals indicates high correlation between the cases ( $r = .41$  for effectiveness and  $r = .57$  for learning).

The results for the seemingly unrelated regression model are reported in Table 8. The model fit for effectiveness in routine case is poor ( $\text{Adj. } R^2 = .4\%, \text{Chi}^2 = 0.56$ ). However, the learning model in the routine case shows good fit ( $\text{Adj. } R^2 = 15.64\%, \text{Chi}^2 = 35.42$ ). In addition, interactive sources make a significant contribution to learning in the routine case ( $\beta = .845, p < .001$ ). The model for effectiveness in novel case shows a reasonable fit ( $\text{Adj. } R^2 = 9.45\%, \text{Chi}^2 = 12.07$ ). Again, as in the routine case, the learning model in the novel case shows good fit ( $\text{Adj. } R^2 = 19.1\%, \text{Chi}^2 = 31.61$ ). Moreover, both codified

( $\beta=.281$ ,  $p<.001$ ) and interactive sources ( $\beta=.436$ ,  $p<.05$ ) make a significant contribution to learning in the novel case.

To summarize, the seemingly unrelated regression presented in Table 8 shows the differences between the routine and novel case in the use of knowledge sources and their effect on the outcomes. While codified sources make a significant contribution to the outcomes in the novel case but not in the routine case, interactive sources make a significant contribution to learning in both routine and novel cases. In other words, both kinds of knowledge sources are useful in novel cases, while only interactive sources are useful in the routine case.

As an additional step, I repeated the random coefficient modeling and seemingly unrelated regression reported here, but with the added variable of social skills. This variable was added together with the experience and case variables in the first step for random coefficient modeling and with experience variable in the seemingly unrelated regression analysis. The remaining steps remained the same and the results showed no meaningful change from the earlier analyses and therefore, have not been included here.

In addition to the tests for hypotheses 1 & 2 with the inclusion of the social skills control variable, I also conducted subsample analyses to test for hypotheses 3, 4 and 5 by including the social skills variable. The results showed no appreciable difference and therefore, have not been included here.

**Table 8: Seemingly Unrelated Regression – Robustness Tests for Hypotheses 1 & 2**

	Routine Case		Novel Case	
	Model 1	Model 2	Model 3	Model 4
	Effectiveness	Learning	Effectiveness	Learning
Experience	0.015 (0.0968)	-0.138 <sup>+</sup> (0.08875)	-0.03245 (0.11231)	-0.01146 (0.0759)
Codified Sources	0.0539 (0.08875)	0.0629 (0.07085)	0.2579* (0.11704)	0.281*** (0.0720)
Interactive Sources (LN)	0.00128 (0.2714)	0.845*** (0.2189)	0.5054 (0.3272)	0.4359* (0.2049)
Model Fit				
Adj. $R^2$	0.0044	0.1564	0.0945	0.191
Chi2	0.56	35.42	12.07	31.61
P	0.91	0.000	0.0071	0.000
Observations	160	160	160	160

Standardized beta coefficients; Standard errors in parentheses  
<sup>+</sup>  $p < 0.10$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.00$

## Discussion

In this study, I began by distinguishing between two major approaches to knowledge sharing in the literature – one that emphasized knowledge transfer and the other that emphasized knowledge transformation. I developed a theoretical framework that integrates these two approaches using the notion of novelty. In the present section, I first summarize and discuss the results of the empirical test of the proposed theoretical framework and subsequently outline the theoretical contributions of the study as well as the limitations and future research directions.

### Overall Findings

The results of the hypothesis tests are summarized in Table 9. Even though I did not develop separate hypotheses for the two outcome variables in the study – effectiveness and learning – the table summarizes the results separately for greater clarity and since the results show divergence between the two outcomes. It is clear from the preceding section as well as Table 9 that the models for effectiveness are weaker, in comparison with the models for the learning outcome. A possible explanation may be related to the kind of professional work that is the focus here. The effectiveness items asked whether the case was adjudicated favorably and whether the respondent felt that the outcome of the case was superior. In legal work, it is often difficult to define effectiveness in a way that most actors can agree on. Clients often seek an attorney's help when they run into thorny issues and when a solution or outcome is not immediately obvious. In such instances, it is rarely the case that the eventual outcome is to everyone's satisfaction. More likely, all parties involved may feel that the case had a solution that



was sub-optimal. Moreover, at any given point in time, a great number of factors, many outside the control of the attorney or the client, can affect the outcomes in legal cases. These include policy climate, time taken for adjudication, who the adjudicator was and the kinds of evidence that can be gathered. In addition, cases often take a long time to find resolution. In many areas of the law, such as immigration law, such delays can have severe adverse consequences for those involved, leading to family separation and deportation. Therefore, even when cases are resolved favorably, legal procedures can take a toll, leading to negative assessments of effectiveness. Finally, it is also possible that respondents did not always have the information about the case outcomes they were asked to recall while answering the survey.

However, the two key arguments made in this study do find support. First, the fundamental argument in the study was that the use of knowledge sources alone is not sufficient for effectiveness and learning in professional work when individuals are faced with novel situations. I suggested that knowledge from such sources has to be transformed for beneficial outcomes and, further, proposed specific transformation processes for each type of knowledge source (codified vs. interactive). As shown in Tables 5 and 6 (as well as Tables 7 and 8), this argument finds support - while codified and interactive sources are associated with the outcomes, the impact of the transformation processes of reanalysis and dialogic practices on the outcome variables is above and beyond the knowledge sources. Second, I proposed that in novel tasks, the transformation processes of reanalysis and dialogic practices moderate the relationship between the knowledge sources and the outcomes. This argument also finds support as shown by Models 4 and 8 in Table 6.

**Table 9: Summary of Hypotheses and Results**

<b>Hypothesis</b>	<b>Result</b>
H1 (a): In distributed environments, use of codified sources will be associated with effectiveness.	Not Supported
H1 (b): In distributed environments, use of codified sources will be associated with learning.	Supported
H2 (a): In distributed environments, use of interactive sources will be associated with effectiveness.	Not Supported
H2 (b): In distributed environments, use of interactive sources will be associated with learning.	Supported
H3 (a): In distributed environments, when the task is novel, use of interactive sources will be associated with more effectiveness than codified sources.	Not Supported
H3 (b): In distributed environments, when the task is novel, use of interactive sources will be associated with more learning than codified sources.	Not Supported
H4 (a): In distributed environments, when the task is novel, the extent of reanalysis increases the positive association between codified knowledge source use and effectiveness.	Not Supported (Support for moderation, but in the opposite direction)
H4 (b): In distributed environments, when the task is novel, the extent of reanalysis increases the positive association between codified knowledge source use and learning.	Not Supported (Support for moderation, but in the opposite direction)
H5 (a): In distributed environments, when the task is novel, the extent of dialogic practices increases the positive association between interactive knowledge source use and effectiveness.	Not Supported
H5 (b): In distributed environments, when the task is novel, the extent of dialogic practices increases the positive association between interactive knowledge source use and learning.	Supported

However, the moderating effect of reanalysis is in the opposite direction (negative) to what was proposed in the study (positive). Again, a possible explanation relates to the nature of the setting. In legal work, there is significant reliance on documentary sources to meet evidentiary standards, as shown by the emphasis on primary sources (statutes, regulations), case histories and precedent. This is also an explanation for the lack of support for H3, which suggested that interactive sources are associated with more effectiveness and learning than codified sources. In fact, the finding is the opposite – codified sources have a greater impact on the outcomes than interactive sources.

Nevertheless, when faced with novel circumstances, reliance on codified sources may have limitations. As the framework in the study suggests, codified sources have to be reanalyzed to be of any value in novel situations. However, while some reanalysis can be beneficial (for example, seeing how similar cases have been resolved) more reanalysis cannot provide guidance on the course of action in a situation that has not been encountered before. Moreover, it may even bias the expectations of the individual in the direction of the historical precedent. Therefore, more reanalysis decreases the benefit provided by codified sources after a point and what may be needed is a creative approach to fit the facts at hand. In interviews, Alpha members also suggested that work in this area of the law involved considerable skill and in particular, emphasized creativity as an important characteristic of some of the more successful attorneys. As one respondent noted:

“...because it is a matter of advocacy and strategy and argument and persuasion, that’s the art around a particular specific discrete set of facts, your client’s facts, the law, the interpretation, *how do you fit your clients facts to this legal frame work, it all depends on how you interpret*, what’s the meaning of the

word is is, you know what I mean, its like an interpretation of that statutory language or regulatory scene, *then the creativity is coming up with ways to fit your client into the most favorable interpretation and make the argument and persuade the decision maker...*” (emphasis added)

Therefore, while a certain amount of reanalysis is essential to understand the facts of your client’s case, interpret the law as it currently exists, and understand how one fits with the other, the attorney may have to go beyond that for a successful outcome. Perhaps this may involve creating and supporting new interpretations, justifying why facts that are favorable to your client deserve greater emphasis, etc., which all require moving beyond reanalysis.

### Theoretical Implications

This study makes several theoretical contributions. First, despite the considerable interest in knowledge sharing and knowledge management in recent years, there has been scant agreement on even the basic terms or approaches. For instance, literature adopting the knowledge transfer perspective, rooted, implicitly or explicitly, in the information processing view, continues to grow even as other studies have identified different kinds of boundaries and suggest that knowledge and understanding is not transferred as much as transformed among individuals (Argote et al., 2003; Bechky, 2003; Carlile, 2002). Researchers have proposed integrative frameworks to reconcile these seemingly contradictory views. Carlile (2004) suggests that increasing novelty introduces progressively complex knowledge sharing barriers – from syntactic (requiring a transfer or information processing approach) to pragmatic (requiring a transformation approach).

However, despite the suggestion that the presence of novelty necessitates the transformation of knowledge, empirical examination of this idea has been lacking. This is

important for the research on knowledge sharing because, if the idea has validity, novelty can be the boundary condition for choosing between the knowledge transfer and knowledge transformation perspectives. Therefore, in empirically examining whether, in the presence of novelty, knowledge transformation processes contribute to outcomes beyond the simple use of knowledge sources, this study contributes to the identification of the conditions for the different approaches to knowledge sharing. This is an important contribution for research in this area since, for any given study, the adopted perspective determines the approach to use as well as the methodology to employ.

Second, despite the suggestion that knowledge sharing involves the transformation of understanding, there has been very little examination of the processes involved in the transformation of knowledge. This study contributes by distinguishing between the different types of knowledge sources and identifying the knowledge transformation processes for each. In the first instance, I distinguish between codified and interactive sources to highlight the different strategies needed to adapt knowledge from written materials and advice from colleagues. Given the proliferation of information repositories and networks in contemporary organizations, the importance of considering different types of sources in knowledge sharing research cannot be overemphasized. While some studies employ similar distinctions such as electronic documents vs. personal advice (Haas & Hansen, 2007) and relational vs. nonrelational information sources (Rulke et al., 2000), most studies focus on one or the other (e.g., Kankanhalli et al., 2005). As a result, the relative effect of different types of knowledge sources on outcomes remains under investigated (Haas & Hansen, 2007).

One reason for considering a single type of knowledge source in most studies is related, perhaps, to the perspective those studies adopt towards knowledge sharing. As described in an earlier section, studies that adopt a knowledge transfer perspective tend to focus on knowledge that is codified (Kankanhalli et al., 2005), whether it is in documents or repositories, while others that emphasize the context and knowledge in practice, tend to focus on the social as well as the tacit dimension of knowledge sharing, for example, in communities of practice (Brown & Duguid, 2000). In this study, I do not equate codified sources to explicit knowledge sharing and interactive sources to tacit knowledge sharing since individuals do not turn to interactive sources for tacit knowledge alone, as described in the setting. Focusing on only one type of knowledge or source may leave such distinctions intact, thereby ignoring knowledge work in practice. The theoretical framework developed here, in considering both codified and interactive sources, offers a more comprehensive and inclusive view of knowledge work by integrating both the knowledge transfer and transformation approaches as well as the widely deployed distinction between explicit and tacit dimensions of knowledge.

Although Carlile (2004) suggests that increasing novelty creates the need for knowledge transformation by introducing more complex knowledge sharing boundaries, the knowledge transformation process itself has received limited attention. While boundary objects have been used to illustrate the notion of knowledge transformation (Bechky, 2003; Carlile, 2002), an exploration of transformation processes in the context of distributed work has been lacking. The boundary objects perspective offers many valuable insights into how knowledge and understanding is transformed in overcoming the boundaries present in cross-functional and collocated settings. However, in dispersed

settings where there is limited face-to-face interaction, boundary objects, even those developed for such settings, are of limited value (Sapsed & Salter, 2004).

By including two key types of knowledge sources in the framework that individuals rely on in distributed work, I investigated how knowledge transformation processes vary for each source. This study contributes to the literature in this area with the identification of reanalysis and dialogic practices as the respective knowledge transformation process for codified and interactive sources. Given the proliferation of different types of media and information sources in contemporary organizations, the investigation of the specific way in which knowledge sources are used in practice is a valuable contribution to the literature.

### *Implications for Practice*

In addition to the above key theoretical contributions, the study also makes several contributions to practice. First, the present study shows that knowledge source use cannot be presumed to naturally lead to favorable outcomes. Even though lack of information can still be a problem in many organizations, advances in information technology over the past decade have made it much more likely that organizations today have many more, rather than fewer information sources. Therefore, the findings support the suggestion made by Haas and Hansen (2001) that the scarce commodity in contemporary organizations is no longer information but attention. Further, this study offers guidance on when the mere provision of information is likely to be of value with the suggestion that task novelty can be used to identify when knowledge source use can be beneficial without the intervening processes.

Second, the knowledge transformation strategies studied here offer useful heuristics for organizations that are becoming more distributed as a result of globalization and advances in technology. Varying cultural, geographic and other differences in dispersed organizations create challenges for sharing knowledge. How can the organization benefit in one context from the knowledge gained in another? The processes of reanalysis and dialogic practices provide insight into the knowledge transformation processes as well as the kinds of technology support needed to benefit from codified and interactive sources for knowledge sharing across the contexts.

#### *Limitations and Future Research*

This study has several limitations. These relate to the theoretical distinctions used in the study and sample selection. I will address each in turn. First, in my theoretical framework, I distinguish between codified and interactive sources and suggest different processes for each - reanalysis and dialogic practices. While the distinction between codified and interactive sources is widely supported in the literature (Haas & Hansen, 2007), the distinction loses some of its clarity in the newer collaborative technology enabled settings, especially since I do not distinguish between face-to-face and mediated interaction for interactive knowledge sources. For example, use of some wiki pages may be seen to encompass both codified and interactive sources. Nevertheless, I believe that the distinction has empirical value in allowing us to analyze the separate processes that support them.

The distinction between reanalysis and dialogic practices could be contentious in some theoretical approaches. For example, in the hermeneutic approach, the word 'text'



is used more expansively and thus supports a richer notion of interaction with the text (Boland et al., 1994; Myers, 1997). Within such a worldview, the interaction with a text could be said to also involve dialogic practices. Similarly, in practice, knowledge gathered from interactive sources also involves a reanalysis process. Nevertheless, I believe that these broad categories serve an analytical purpose in allowing us to examine the processes for different knowledge sources separately.

Given the characteristics of the study setting, the generalizability of the findings to other settings is unclear. This setting is uniquely suited to the research questions posed in the study. Legal work in this setting tends to be highly contextualized and operates in an ambiguous and uncertain environment. Moreover, the findings show that there is significant reliance by attorneys on codified sources. In settings where the work is different, or individuals face other circumstances, the processes of reanalysis and dialogic practices may be different or absent. For example, Cross and Sproull (2004) report on a setting where codified sources were not deemed important in comparison to network ties, leading them to focus on ties alone in their study. Therefore, the character and importance of codified and interactive sources will differ for each setting.

Some other methodological limitations of the study should also be acknowledged. The study includes both predictor and outcome variables in the same instrument and may be subject to common-method bias. However, I have addressed the kinds of mitigating strategies used to address this issue in a previous section and the post-hoc tests confirm the effectiveness of these strategies. Future studies can overcome this limitation by collecting data from different sources. Finally, I develop new constructs for

transformation strategies in this study whose validity and reliability needs to be further established through subsequent use of these constructs in other studies.

## Conclusion

Despite the interest in how individuals share knowledge and collaborate in groups, a variety of, often conflicting, approaches have been used to study knowledge sharing. At the same time, technology has enabled distributed work on a large scale and created a proliferation of information sources. In this study, I proposed a framework that integrates multiple approaches to knowledge sharing by considering the role of task novelty, in addition to the processes used by individuals to transform knowledge from different sources. Data gathered from a unique, distributed, professional community largely support the framework. As technology enables distributed work on an increasingly large-scale, examination of the specific strategies that individuals can use to benefit from different types of knowledge sources is essential and this study provides the initial step in that direction.

# PRACTICES OF DISTRIBUTED KNOWLEDGE

## COLLABORATION

### **Abstract**

Information Technology is now making distributed collaboration possible on a very large-scale and across many different kinds of boundaries, thereby transforming professional work. Yet, our understanding of how such work is accomplished in large, distributed environments is limited. Professional work tends to be complex, uses established procedures, and is rooted in specific historically and materially situated practices. Approaches that take the social and situated nature of knowledge and learning into account, such as the literature on communities of practice, have been developed largely in relation to small, collocated groups and their applicability to large, distributed environments is not clear. Therefore, in this study, I focus on the practices that are used to accomplish distributed collaboration and incorporate the interests of many stakeholders in the development of knowledge. I undertook an investigation of the practices through which work is accomplished in a professional legal association, whose more than ten thousand members are scattered around North America and play an essential role in shaping how the laws related to their practice areas are developed and implemented.

## Introduction

In recent years, we have seen the emergence, supported by information and communication technologies, of novel forms of collaboration that enable collections of individuals to organize toward shared goals, across organizational, geographic and temporal boundaries. Some researchers have used the label ‘new organizational forms’ to describe such groups (Fulk & DeSanctis, 1995) while others have even suggested that they represent “new forms of organizing” (Zammuto et al., 2007). Such new organizational forms tend to be distributed, loosely-coordinated, self-organizing and voluntary (Moon & Sproull, 2000). The accomplishments of such collaborative forms have become evident in many different areas. For example, open-source has revolutionized the production of software (Lakhani & von Hippel, 2003); online communities have transformed knowledge sharing, product innovation and social relationships (Preece, 2000); new media has upended the business models of traditional media companies; and collaborative content creation, with Wikipedia being a prominent example, is redefining knowledge production (Wagner & Majchrzak, 2007).

New organizational forms are also transforming knowledge production in many occupational communities. For example, researchers have suggested that, in addition to the community, market and hierarchy approaches to organizing professional work, a new form called “collaborative community” is emerging to meet the need ‘for more effective knowledge generation and diffusion’, for which neither market nor hierarchy structure is adequate (Adler et al., 2008). Moreover, despite being loosely connected and lacking formal structures, these communities develop complex practices to accomplish

knowledge-intensive work. For instance, Adler et al. (2008) suggest that the characteristics that distinguish the new professional collaborative form in medicine are social structures that support horizontal coordination of interdependent work processes and collaborative learning.

Despite recent interest, however, research examining the practices that accomplish knowledge work in new organizational forms has been limited. For example, Kellog et al. (2006) described the use of display, representation and assembly practices that are used to structure coordination across boundaries in postbureaucratic organizations. Similarly, Orlikowski (2002) finds that sharing identity, interacting face to face, aligning effort, learning by doing and supporting participation are important practices that support distributed organizing. Although these studies provide valuable insight into how knowledge work is coordinated in changing contexts, most of this research has been conducted in traditional organizations, while the new organizational forms characterized by loose-coordination, self-organization and voluntary membership have not received attention.

While the communities of practice literature provides valuable insights (Lave & Wenger, 1991; Wenger, 1998), this approach emerged from the study of small, co-located and craft-based communities and therefore the applicability of those insights to large-scale, dispersed groups using information technology is not clear. For example, Lave and Wenger's (1991) notion of legitimate peripheral participation describes the process of new member socialization and identity development through apprenticeship and "assembling a general idea of...how masters talk, walk and work, and generally conduct their lives" (p. 95). How might these ideas apply to large-scale, distributed practice-based

communities? Knowledge sharing has been a central concern in this literature (Brown & Duguid, 2001), however, researchers have suggested that there are structural and epistemic constraints to communities of practice as they grow (Thompson, 2005). What practices are used to overcome such constraints in large-scale collaborations?

Contemporary organizations, especially new organizational forms, operate in fast-changing environments (Rindova & Kotha, 2001). What structures are used to allow flexible adaptations to such changing conditions? Unlike formal organizations, such forms are more susceptible to outside influences since their members belong to multiple organizations (Brown & Duguid, 2001). How do they respond to external influences and changes in their environment? While IT allows far-flung individuals and groups to be connected, research also shows that situated activity in different geographic settings produces “unique locale-specific knowledge”, which is, “at the same time a valuable resource and a source of communication difficulty” (Sole & Edmondson, 2002). How can distributed collaborations benefit from such local, geographically situated knowledge in different locations? Finally, given that membership is voluntary (Wasko & Faraj, 2005), how are members mobilized for collective action?

Therefore, in this study, I focus on the following research questions:

1. What kinds of practices are used to accomplish knowledge work in large-scale, distributed, voluntary collaborations?
2. What kinds of practices and structures allow such groups to: (a) Adapt to changes and uncertainty in their environment? (b) Mobilize members for collective action? (c) Benefit from locale-specific knowledge from dispersed locations?

I undertook a field study in the context of a professional legal association to examine these questions. Given our limited understanding of these topics, I adopted a grounded theory approach to develop useful concepts and theory that can be applied to the study of this phenomenon. I also took a practice view and focused on the everyday activities that resulted in the accomplishment of this work (Schatzki, Knorr-Cetina, & von Savigny, 2001). Legal work is extremely knowledge-intensive, fast-changing and lawyers have to operate in conditions of uncertainty and ambiguity. Associations, consisting of voluntary members, play a crucial role in organizing professional knowledge and responding to changing legal environment. The findings will shed light on how knowledge work is done in a professional community and the role technology plays, especially, in accomplishing work that involves complex knowledge that is not easily codified or readily interpreted.



## Literature Review

In this section, I review the literature in key areas that are relevant to this study. Research on distributed work has been pursued in many related areas such as virtual teams, open-source development, online communities and the effects of computer-mediated communication. I review select studies in these areas. This review is not intended to provide an overview of research in these areas but rather highlight some of the relevant issues that have received varied treatments in different areas of the literature.

First, I outline recent developments in the literature on distributed work, specifically examining the effects of mediated communication on collaboration. Then I outline how knowledge work has been investigated in specific virtual contexts such as online communities and virtual teams. I then describe the developments in the areas of two theoretical approaches, which are not separate areas in practice – communities of practice and the practice lens. The literature on all of the above topics is extraordinarily large and the discussion here is not intended as an overview of the topic but merely aimed at bringing out the strands that prepare the ground for the investigation into the specific research questions.

### *Knowledge Work in Distributed Settings*

Although distributed work has been studied in many areas, perhaps due to the increased use of Internet-enabled technologies to organize such work, a predominant concern in many areas has been technology-mediation and how that affects communication and group processes. Researchers have documented, through elaborate experiments and field studies, the different ways in which the lack of face-to-face communication has negative consequences for collaboration (Nardi & Whittaker, 2002;

Olson, Teasley, Covi, & Olson, 2002). The lack of proximity in virtual organizations, by reducing chance encounters and the ability to initiate conversations, makes communication more effortful and therefore organizing more difficult (Kraut, Fussell, Brennan, & Siegel, 2002). Other characteristics of co-located work and face-to-face communication that have been shown to have positive consequences for group work include shared context promoted by the setting that is common to participants, visibility of social context cues, maintenance of team and task-awareness, and opportunities for spontaneous communication (Kiesler & Cummings, 2002; Kraut et al., 2002). Such communication also promotes common ground between participants, helps co-ordination of turn-taking and the repair of misunderstandings (Clark & Brennan, 1991).

Given the various negative consequences of mediated-communication, researchers have investigated the different ways in which they can be overcome. For example, it has been suggested that structured management techniques have enabled successful collaboration in large-scale open-source projects such as the development of the Linux operation system, which include standard procedures, modularization and task decomposition (Kiesler & Cummings, 2002). Similarly, researchers have also suggested that organizing in distributed environments is achieved through communicative structures appropriate for each specific context (Orlikowski & Yates, 1994). Through the use of an appropriate set of communicative practices, called “genre repertoire,” members “not only signal and reaffirm their status as community members, but they also reproduce important aspects of that community’s identity and its organizing process” (p. 546, Orlikowski & Yates, 1994).

Summary: Distributed work has been a fertile area of interest to researchers investigating changing technological context of work and organizations. However, the predominant focus in this stream tends to be on organizational work groups that collaborate at a distance. This research has documented the negative consequences of mediated communication for group communication and processes. More importantly, some studies also investigate how distributed groups can overcome these limitations and collaborate effectively. Although it provides a good starting point, this literature has yet to investigate the practices that allow large-scale groups that combine different media to engage in knowledge-intensive collaboration.

### *Virtual Teams*

There is a large body of literature in organizational studies that examines virtual teams and how the varying degrees of “virtualness” affects performance outcomes. While earlier research had attempted strong distinctions between virtual teams and collocated teams, lately, researchers have suggested that virtual teams exist on a continuum (Martins et al., 2004). Research in this area has also been concerned with the kinds of issues that arise from the lack of face-to-face communication and the affordances it provides. For example, in geographically distributed teams, the failure to establish common ground or mutual knowledge has been shown to lead to failures of information exchange, failures of interpretation, and incorrect attribution, thus creating roadblocks to effective collaboration (Cramton, 2001). In addition, researchers have also found that group members in face-to-face settings were more satisfied with their leaders than those in virtual groups (Hoyt & Blascovich, 2003).

Researchers have also studied how virtual communication affects the processes, roles and organization of teams. For example, one study found that individuals who were central in virtual R&D networks outperformed others (Ahuja, 2003). Because technology allows widely dispersed members to be connected in virtual teams, such groups tend to be more diverse than collocated teams (Jarvenpaa & Leidner, 1999). Moreover, due to greater diversity, more diverse ties to outside members are created, which, in addition to bringing more unique knowledge into the team, result in increased knowledge sharing in global organizations (Cummings, 2004). Researcher have also found that virtual teams experience higher levels of conflict and lower levels of trust (Hinds & Mortensen, 2005; Jarvenpaa & Leidner, 1999). However, researchers have suggested that using technology appropriate to the task can mitigate some negative consequences for group processes (Maruping & Agarwal, 2004).

Summary: It should be noted, however, that even though the recent interest in virtual teams is relevant to this study for some of its similarities, it also differs in significant ways. Despite being distributed and using computer-mediated communication, virtual teams are very different from the kinds of groups that are the focus here since they invariably involve reporting relationships and well-defined tasks and goals. For instance, unlike virtual teams, voluntary groups often do not have clearly defined interdependent tasks or reporting relationships. Moreover, voluntary groups, when they can be clearly identified, have very different group developmental stages – membership termination is voluntary based on group effectiveness, but otherwise continues without an end.

### Online Communities

The proliferation of studies on online communities offers important insights for distributed work in the kinds of voluntary settings we are interested in. Early research on online communities focused on social and community aspects of online interaction (Rheingold, 1993). Researchers continue to investigate such questions (Blanchard, 2004; Wellman & Gulia, 1999). Increasingly, however, the focus has shifted to examining knowledge work in online communities (Constant, Sproull, & Kiesler, 1996; Wasko & Faraj, 2005). Various issues relevant to such work have been examined such as motivation of members to contribute (Wasko & Faraj, 2005), technology characteristics that facilitate group identification (Ma & Agarwal, 2007), examination of individual information overload response (Jones et al., 2004) and sustainability of online social structures (Butler, 2001).

Since many of these communities are formed informally and lack any administrative structures, it is difficult to enforce or regulate appropriate knowledge sharing behavior. Research has therefore focused on identifying who contributes (Constant et al., 1996) and what their motivations are for contributing to online communities (Wasko & Faraj, 2005). In essence, it is assumed that if we understand member contribution in terms of member attributes or motivations, we also understand how greater member contribution can be generated. Greater contribution is invariably formulated in terms of greater number of responses to online communities. Researchers using this discourse have uncovered many insights into how knowledge can be managed in organizations. As a result, we now understand what kinds of ties are most useful in

generating useful responses as well as some of the individual motivations for contributing to online communities.

However, research has yet to seriously consider online communities as group settings for collaborative knowledge work. Finholt and Sproull (1990), in their study of electronic distribution lists, found that groups formed by participation in such lists exhibited group behavior and processes that are similar to those in face-to-face groups. Research in a number of other fields has also investigated electronic groups to examine whether they exhibit similar processes or confront similar issues as face-to-face groups (Valacich, Dennis, & Nunamaker, 1991). For example, research has found that, just as in face-to-face groups, electronic groups display a preference for discussing information that is common to the participants (Hightower & Sayeed, 1995). However, electronic groups also differ from face-to-face groups in significant ways. For example, because social cues and status characteristics are less visible in electronic groups, it is possible that such groups may be less hierarchical and less formal and encourage greater participation. However, the same reasons could also produce deindividuation, thereby producing extreme behavior in some circumstances (Postmes & Spears, 1998). Therefore, to effectively study knowledge work in online communities, researchers have to investigate how individuals in such groups interact to create knowledge.

Summary: This stream offers important insights for new organizational forms and online communities themselves have been labeled new organizational forms. Since membership is voluntary and structure is emergent, they have many similarities with the kinds of groups we are interested in. However, while the literature on online communities has grown in recent years, there are many areas of open investigation. Most studies treat

online communities in isolation and do not consider their context. For example, online communities can be part of a larger organization, where this form of interaction can be one of many, including face-to-face interaction. There has been very little examination in this stream of how face-to-face communication interacts with online communities since most studies assume that groups never meet offline. This is a significant limitation when it comes to application of insights from this stream to the research questions.

### *Communities of Practice*

The knowledge-based view of the firm holds that the ability of firms to create and use knowledge is fundamental to achieving a sustainable competitive advantage in the marketplace (Grant, 1996; Nonaka, 1994). Perhaps in recognition of this importance, the last decade in organizational studies has seen a steady stream of literature exploring knowledge in organizations. Under the broad umbrella of organizational knowledge literature, the idea of communities of practice has achieved a high level of popularity, both in organizational studies research and practitioner-oriented literature (Lesser & Everst, 2001; Marshall, Shipman III, & McCall, 1995; Pan & Leidner, 2003; Wenger, McDermott, & Snyder, 2002). Lave and Wenger (1991) are generally credited with having coined the term in their study of situated learning in the context of Yucatec midwives, Vai tailors, naval quartermasters, meat cutters and alcoholics anonymous. Through an examination of these specific case studies, Lave and Wenger proposed a new, socially situated approach to learning. In the communities they examine, new members, through peripheral participation, exposure and access to resources, gradually become full participants. Brown and Duguid (2001) adapted this approach for the organizational context. Subsequently, Wenger (1998) further expanded this approach by including

consideration of not only processes within communities of practice, but also the boundary and practice implication of belonging to multiple communities of practice.

It has been suggested that not only does the idea of communities of practice reflect more closely how knowledge work is done in groups, but it also captures the social nature of learning. Therefore, this emphasis has been closely linked to recent, alternative views that emphasize the importance of a shared, social basis and the interpretive aspect associated with knowledge creation in organizations. This approach has been a fertile ground for research by presenting several new and interesting issues. For example, the shared tools, representations and perspectives, in addition to facilitating knowledge creation within the groups, also create epistemic differences between the groups. Several authors have outlined the importance of identification to the shared discourse of communities of practice (Brown & Duguid, 2001). The construction of shared identities within the community helps create a shared perspective that in turn facilitates knowledge sharing within the community. On the other hand, due to distinct identities of different communities, knowledge flows across them are problematic. Even though identity can play an important role in enabling or obstructing knowledge exchange in organizations, it remains under-explored in the area of knowledge work in organization studies and researchers have called for more attention to this area (Orlikowski, 2002).

An issue of recent interest for researchers is related to whether these ideas can be applied to virtual groups and communities online. The Internet has given rise to new forms of organizing that enable groups of geographically dispersed individuals with common interests to share information. Such online communities span organizational boundaries and are increasingly playing a significant role in organizational innovation by



supporting knowledge flows across boundaries. Some have questioned whether such online communities are indeed communities of practice (Kimble, Hildreth, & Wright, 2001). However, researchers have recognized the prevalence of a large number of loosely connected and dispersed communities, which have been called Networks of Practice to distinguish them from smaller, cohesive and co-located groups which represented communities of practice (Brown & Duguid, 2001). Similarly, in the context of virtual groups, partly to distinguish them from communities of practice, when such communities are associated with practice, they have been called “electronic networks of practice” (ENP) (Wasko, Faraj, & Teigland, 2004).

#### *Limitations of the Communities of Practice Approach*

While the popularity of the notion of communities of practice has been a fruitful avenue of research in highlighting the social and situated nature of knowledge work, it has also generated some avenues that have not been promising for research. Some of the most common of these are well known. For example, most research continues to emphasize the ‘community’ component rather than the ‘practice’ component in communities of practice (Brown & Duguid, 2001). This emphasis lies behind the rush to create new communities of practice within organizations and the proliferation of consultants that have appeared to guide such efforts. Organizations often make the mistake of assuming that simply getting together people from different parts of the organization results in the creation of a ‘community’ in which individuals are helpful to each other and share knowledge. Similar assumptions have guided the labeling of a wide range of online communities and virtual groups as communities of practice. Moreover,

research has also not been sufficiently attentive to the fact that the same characteristics that make communities of practice successful, such as shared identity and trust, also serve as a trap by making them insular and closed to new ideas. In addition, research has yet to explore in any detail how communities of practice function in practice. Research has only now begun to open the black-box of communities of practice (Thompson, 2005).

Although there have been some studies that empirically examine structural aspects of communities of practice, empirical studies of the epistemic aspects of communities of practice are more scarce. For instance, theories of learning, practice and identity have been employed in describing the epistemic characteristics of communities of practice, however, much empirical work is yet to be done in examining these characteristics (Wenger, 1998). In the remainder of this section, I detail some of these limitations of communities of practice that have received attention.

Power: Although Lave and Wenger's original proposal included the idea of power differential, which could have negative consequences for the group, such concerns have largely been ignored in subsequent research. For example, in the case study of butchers, which they describe, new members employed in stores are not provided opportunities to participate in practice, resulting in their inability to progress in their training. It is clear that the core members in most of their case studies control the resources and therefore hold the power to decide how much and what kind of access to those resources should be allowed to new members. Without access to resources, it is unlikely that the new members can make the transition to full participation and may, instead, be relegated to peripheral participant status indefinitely. How and when access is expanded for peripheral members to include greater roles can create opportunities for conflict and

misunderstanding. Despite the importance of this issue, however, researchers have not given enough attention to the role of power in communities of practice (Contu & Willmott, 2003).

Predispositions: The centrality of the social nature of learning to the communities of practice view is often interpreted to indicate that when the right environment is created, learning is unproblematic. However, this ignores the idea that individuals and groups may have their own ingrained capacities and predispositions acquired from previous experiences in the life course (Roberts, 2006). For example, Bourdieu (1990) suggests that individuals are conditioned to think and behave in certain ways by their experience and moreover, that they are unaware of their conditioning. This notion, which Bourdieu labels 'habitus', includes the idea that since the individuals are unaware of their tendency to act in predisposed ways, such behavior is also difficult to change. This suggests that individuals as well as entire communities of practice may be predisposed to absorb only certain types of knowledge or interpret knowledge in specific ways. Related views have been offered, based in part on Kuhn's description of the practice of science (Boland & Tenkasi, 1995). In Kuhn's model of how science works, scientific facts are meaningful only when interpreted within a dominant paradigm or socially shared worldview (Kuhn, 1970). There are two principal outcomes of this model – first, such a shared social understanding and agreement makes normal science within the paradigm more efficient and second, the same facts would be interpreted differently in a different paradigm. This notion of the incompatibility of different dominant theories was labeled paradigm incommensurability. In a similar vein, the notion of communities of practice, when applied to organizational knowledge creation, highlights the importance to organizations

of shared understanding and worldview of groups which can also make them less open to new knowledge (Brown & Duguid, 2001).

Size and Dispersion of Members: Lave and Wenger's original conceptualization of communities of practice was based on small, co-located, apprenticeship and craft-based communities which formed their case studies. Therefore, the applicability of those ideas to large, distributed settings involving complex knowledge work is not entirely clear. Recent advances in IT have made the formation of such large, loosely connected groups increasingly common. Researchers have only recently started exploring the structural limits to communities of practice. For example, Thompson (2005) finds that, in a study of a community of practice in a large global service organization, the structure and organization of the community impacted the epistemic activity, thus suggesting that the structural and epistemic parameters of communities of practice need investigation. This suggestion has assumed greater importance in light of the recent application of the communities of practice approach to many different kinds of groups online. Despite attempts to delineate the differences between the groups with the use of different labels such as "constellations of practice", "networks of practice" and "electronic networks of practice", a fuller investigation of the processes supporting knowledge work in such large, dispersed, technology-mediated groups is still outstanding. For example, how are ideas developed in relation to small groups in materially situated settings applicable to virtual groups devoid of any face-to-face interaction and history of shared experience?

### The Practice Lens

An increasing number of studies recently have begun to adopt a practice lens to study knowledge work (Carlile, 2002; Orlikowski, 2002; Schatzki et al., 2001). The practice approach provides a counter point to traditional approaches that have relied on an objectified view of knowledge and, consequently, distinctions between different types of knowledge and highlights the essential role of human action and agency. Moreover, the inseparability of knowledge and action is also emphasized, thereby focusing on the “knowledgeability of action, that is on *knowing* (a verb connoting action, doing, practice) rather than *knowledge* (a noun connoting things, elements, facts, processes, dispositions)” (Orlikowski 2002, p.250-251). Therefore, competence in activities cannot be understood as the result of the possession of requisite knowledge but “rather, knowing is an ongoing social accomplishment, constituted and reconstituted in everyday practice” (Orlikowski 2002, p. 252).

More broadly, the practice approach seeks to dissolve such long-standing distinctions in social sciences as subjectivism/objectivism, macro/micro and structure/agency. It does so by focusing on the everyday, situated practices of agents. It is argued that the traditional approaches emphasize, either subjective experiences and perceptions on the one hand, or on the other hand, material and structural facets of social life. Bourdieu, in particular, in order to transcend the subjective/objective dichotomy, “proposes a two-step model of epistemological reflection that integrates subjectivist and objectivist forms of knowledge into a more comprehensive, third form of knowledge which he calls a ‘general science of practices’” (Swartz, 1997). However, it should be pointed out that there is not a single practice approach. Although most theorists think of

practices as “arrays of human activity”, they disagree about the nature of the entities that mediate activity and how such practices are embodied (Schatzki et al., 2001). Despite such differences, most theorists agree that issues such as knowledge and social institutions, among others, have to be studied as a set of interconnected practices.

Despite the recent popularity of the practice approach, researchers have only made use of a narrow interpretation of this approach in studying knowledge work. For example, a predominant concern in this stream has been the analysis of boundary processes in cross-functional settings. Researchers have studied how the use of boundary objects facilitates knowledge integration and consequently, innovation, in heterogeneous environments (Carlile & Rebentisch, 2003). While such studies have provided valuable insights, their focus on boundary objects risks regression towards a static and objectified view of knowledge. Moreover, such a focus also glosses over the processes at work within a functional area or more homogeneous environments and the challenges presented by them. A second limitation has arisen from the limited number of settings that have been investigated for knowledge work, which tend to be traditional organizations. Voluntary and large-scale distributed settings have not received enough attention. Finally, the attendant concepts surrounding the practice approach and which give it much of its explanatory power have been all but ignored. For example, Bourdieu suggests that practices should be thought of as occurring in a field where competing interests are in a constant struggle for legitimation (Bourdieu, 1990). Similarly, the role of individual predispositions, also called habitus, in shaping practices has largely been ignored.

## Methodology

Our study seeks to investigate the practices that support distributed knowledge collaboration in new organizational forms. My further interest is in examining the structures used by such organizational forms to respond to external impacts and adapt to changing environments. I chose to examine my research questions in the context of a professional legal association whose national offices are located in the mid-atlantic region, whereas its members are spread all over North America and some parts of the world. The association is an ideal setting to examine my research questions since it is distributed, comprised of voluntary members, who are professionals working in a continuously changing legal environment, uses a variety of communication technologies and complex structures to organize its activities. Moreover, the association's scale – it has more than 11000 members – also provides an opportunity to study large-scale distributed collaboration.

Since my interests involve questions about practices, I have undertaken a field study using an inductive, grounded theory approach (Glaser & Strauss, 1967). This approach is especially well suited for studying phenomena that are not well understood (Strauss & Corbin, 1990). Further, given the paucity of theories that explain this phenomenon, this approach allows the researchers to build new theory. I collected data from multiple sources including archival material, interviews and observations. Since this study involves a single organization, data from multiple sources allows us to triangulate between them and mitigate problems with validity (Yin, 1994). Moreover, each source has its own limitations and biases, which are in some measure reduced by using multiple

sources. In the next few sections, I describe the research setting in more detail and outline the data collection and analysis procedures.

### Research Setting

The research setting is a national lawyers association (referred to as Alpha) that is more than eleven thousand members strong. It is a non-profit organization that provides its members with continuing legal education, information and professional development opportunities such as workshops, training, mentoring services for all members, to name a few. The lawyers are scattered all over the country and practice different aspects of one specialization. Most lawyers working in this specialization are members of the association since it is the primary source for information related to the regulations (interpretation, summary and analysis), agency updates (processing times, administrative changes), in addition to organizing efforts such as advocacy and lobbying. Most of the work is performed by the members themselves - who volunteer for various tasks and roles. The work on regulations and liaison with the agencies is accomplished through the use of committees, currently a total of 61, whose membership changes periodically. The association uses several avenues for information disseminated in this professional community including face-to-face events such as conferences; technology-based venues such as: the association website, online forums, specialized and geographically-based listservs, teleconferences and online presentations, distribution of CD-ROMs as well as traditional strategies such as mailers and newsletters. Alpha also publishes several books and newsletters, which are in wide use. In addition, Alpha organizes several conferences throughout the year on various topics but the yearly, annual conference covers all topics,



with an emphasis on new developments in terms of changes to the law. The annual conference is attended by, on an average, more than three thousand members.

In addition, there are more than 35 local chapters whose structure and work resembles that of the national association. Most members belong to the national association as well as their local chapter. However, based on their interests, they may or may not take an active role in the local chapter related activities. Those who do, however, may have access to specialized knowledge and expertise related to implementation of the law in the state or local agency related information. In terms of governance, elections are held at the annual conference where the directors and national officers are elected. The national officers form the executive committee and are the primary representatives for the association and are responsible for its activities. The national office employs a staff of 50 people, who initiate and monitor many activities. However, the members themselves, whose contributions to these activities are voluntary, accomplish most of the activities. The chapters elect their own chapter chairs and resemble the national office in many activities as well as governance. In addition to the face-to-face interaction provided by the conferences, Alpha also offers its members other virtual interaction opportunities on the bulletin board, which is organized as a large number of topic based threads (many of them moderated) as well as a great number of ad-hoc listservs.

#### *Sources for Data Collection*

The data for this project was collected from several different sources such as archival records, interviews and observations. Archival records provide such things as the ability to trace the evolution of the regulations, which embody the work of the various actors and interest groups by recording the history of the changes. Interviews provide the

background material for understanding the changes by eliciting the various interests, concerns and negotiations that resulted in the changes. Finally, observations provide yet another way to study the various interests of the actors and negotiations and thus help triangulate the findings from the interviews and archival records.

Archival Data: I collected a variety of archival material for this study. These include data from the association website on legal interpretation material (allowing us to trace the activities and actors involved in the work on regulations), meeting minutes and announcements. In addition, I collected information about the organization structures and processes, including such things as organization charts, historical election records, board membership, etc.

Interview Data: Through out the duration of the project, I conducted unstructured and semi-structured interviews with the staff of the association, leaders in the association and regular members. The initial interviews were general, but as I collected more data and my interests narrowed, I correspondingly became more focused in the interviews. The interviews were conducted both in person, when possible, and over the phone, since the members are geographically dispersed. Whenever possible, the interviews were recorded and all recordings were transcribed. The key respondents are listed in Table 10.

Observations: Observation opportunities included meetings and social activities at the association headquarters. In addition, the association's many conferences provided opportunities to observe member interaction in the sessions, panels and social events. I took extensive field notes whenever these opportunities arose.

**Table 10: Key Actors**

Class of Actors	Description	No. interviewed
Senior Staff	This group represents the senior management of the association and includes members of the executive committee, directors and board of governors.	5
Junior Staff	This category includes staff members with titles such as associate, senior associate	10
Administrators	This groups includes administrative staff that may not be involved in work with the regulations but may be managing issues such as member services and marketing.	3
Beginning Members	This group includes all those who have joined the association within the last year.	6
Regular Members	This group includes attorneys who have been members of the association for more than a year.	16
Paralegal Members	This group includes those who work in attorney offices in an assistant or paralegal capacity.	2
IT Personnel	This group includes staff members who tasked with running the IT systems for the association.	3

Analysis

I followed an iterative analysis procedure to analyze the data. I cycled through the data, developing theory and comparing with current literature. As recommended by Miles and Huberman (1998) and Glaser and Strauss (1967), I developed initial coding categories by cycling through the interview transcripts and observation field notes. These categories were aimed at identifying the different practices that are used for collaboration. After this phase of open coding, the developing categories were analyzed for recurring themes. If consistent support emerged for a theme, it was retained. This iterative process was continued until we reached theoretical saturation, when no new categories emerged from the data. In the final phase of the analysis, selective coding, categories were integrated and used to develop theory.

### Analytical Tools

Several specific grounded theory analytical tools were used for data analysis. I describe each one in turn. The first analytical tool in my grounded theory building was questioning and constant comparison of data – both with accumulating data as well as emerging codes. Therefore, the analysis phase is not distinct from the data collection phase but proceeded simultaneously (Glaser & Strauss, 1967). Following this approach, I started analyzing the data from the first day of data collection and continued it along with on-going data collection efforts.

A second analytical tool that was used in the analysis was the creation of memos and field notes. While studying interview transcripts and archival documents, I developed memos whereas I prepared extensive field notes as I made observations in the field. Memos were used to keep a record of the comparative analysis, thoughts about potential future directions and to clarify emerging theoretical concepts (Corbin & Strauss, 2008). Memos helped force the researcher to apply an analytical lens to the data and discover and clarify connections between emerging concepts. In addition, existing literature was surveyed throughout this process to compare and clarify developing concepts with existing theory. Though field notes are often considered descriptive recordings of observations, they are seldom purely descriptive. For as Corbin and Strauss (2008) point out, “whenever observations of events are made, the observations are filtered through the eyes of the researcher who can’t help but start thinking about and classifying the information.” While attempt was made to accurately and precisely document descriptions of people and events in the field notes, they also included a record of insights, ideas and

personal impressions that occurred during observations. These ideas and insights were later expanded into memos.

Theoretical sampling was yet another key analytical tool used in my grounded theory building. It involved following the trail created by the emerging concepts during the analysis and the questions that arose in relation to the concepts. Corbin and Strauss (2008) define theoretical sampling as:

“A method of data collection based on concepts/themes derived from data. The purpose of theoretical sampling is to collect data from places, people, and events that will maximize opportunities to develop concepts in terms of their properties and dimensions, uncover variations, and identify relationships between concepts.”  
(p. 143)

Accordingly, data was collected to clarify the developing concepts and answer related questions. Since theoretical sampling is concept driven, intended to expand and clarify them, it is in contrast to traditional sampling in quantitative approaches, where the aim is ensuring that the sample is representative of the target population. In fact, variation is important for theoretical sampling in grounded theory because “it increases the broadness of concepts and scope of the theory (Corbin & Strauss, 2008, p. 156). Further, while the sampling strategy is predefined in quantitative approaches, the data related to persons or events collected in theoretical sampling is determined by the concepts that need to be illuminated and questions that need clarification. While theoretical sampling very often involves the collection of new data, it may also involve analyzing previously collected data to illuminate new categories or expand existing categories, although there may be limitations on the kinds of explorations that can be undertaken.

How far theoretical sampling can be taken is dependent on the developing concepts and theory. The aim is not just to identify categories or themes and stop when no new categories can be discovered. Rather, the objective is to flesh out the categories across variations in subjects and events. Data are gathered as long as the concepts and categories can be further deepened by identifying the constituent dimensions. When the concepts have been sufficiently well developed, the data collection can stop and the analysis can be said to have reached “theoretical saturation,” - “no additional data are being found whereby the (researcher) can develop properties of the category. As he sees similar instances over and over again, the researcher becomes empirically confident that a category is saturated “ (Glaser & Strauss, 1967, p. 65).

### Analyzing Data

Following the grounded theory approach, analysis, data collection and literature survey proceeded in an iterative fashion (Corbin & Strauss, 2008; Glaser & Strauss, 1967). I began the study with my first research question, which asks how knowledge collaboration is organized in large, distributed, professional communities. In order to answer this question, I began interviewing staff and members of the association using some of the preliminary questions in the interview guide listed in the Appendix. My interviews were initially open and exploratory, designed to elicit information about the organization of the community and the processes of knowledge collaboration. The questions were mainly used as an outline of the topics to be covered, while also being open to the other topics that may arise during the conversation. During this time I also attended the association’s Annual Conference, where I conducted observations of formal

events such as sessions and panels as well as more informal events. I prepared field notes based on these observations.

These initial interviews and observations provided me with an overview of the organization of the community, its culture and the key actors. I learned about the governance structure and elections, local chapters, types of knowledge shared and how information is shared with members. Since I am interested in the specific structures and practices that allow knowledge collaboration in this distributed community, I began coding for them in the interview transcripts and field notes after multiple readings of the materials in their entirety. These codes included both my own labels as well as in-vivo codes, borrowed from the interview transcripts or archival materials themselves. During this phase of open coding, I also started collecting archival data, looking to find support for these codes or further clarification. I began to find evidence for a wide variety of elaborate structures and practices in this community. I started exploring these preliminary concepts by drafting memos.

Corbin and Strauss (2008) suggest that it is a mistake for researchers not to differentiate, in the early stages of the analysis, between the “lower-level explanatory concepts from higher-level concepts that seem to unite them”, which could lead to “pages and pages of concepts and no idea how they fit together” (p. 165). In addition, differentiating between them can help in fleshing out the dimensions of the upper-level concept as well as the identification of qualifying conditions. My analysis highlighted key themes from the early stages such as the role played by the association in knowledge sharing, privileging expertise and the importance of local knowledge and I began to document their relation to the different lower-level codes. For example, concepts such as

“core/periphery structure”, “reputation” and “expertise hierarchy” were related to the higher-level concept of “privileging expertise”. The concepts of “promoting cross-fertilization”, “ramping up for leadership role” and “making room for new blood” were related to the higher-level concept of “member socialization”.

As I developed the key higher-level concepts in the analysis, I continued to ask questions to elaborate these concepts and explore how they linked to each other. I conducted further interviews and collected archival data to answer the questions, which led to not only further questions but also more categories, which led to more data collection. For example, a question that needed to be explored was how privileging expertise was manifested in the structures and processes of Alpha, what form it took. Further data collection revealed how the committees were structured, the hierarchy among them, and the progression members often made from lower-level committees to higher-level committees with experience. These structures and processes related not only to privileging expertise but also member socialization. As a result, I coded yet another higher-level concept to subsume privileging expertise, called “expertise-based structuring”.

An important distinction emerged between the higher-level concepts as the analysis progressed – that between internally-focused practices and externally-focused practices. I continued to refer back to the literature through the analysis and data collection. The survey of the literature revealed the limited attention externally-focused practices have received, especially in the context of distributed collaboration and new organizational forms. For example, despite the importance of context and environmental influence, literature on communities of practice has focused almost entirely on their



internal structures and processes (Østerlund & Carlile, 2005; Wenger, 1998). In contrast, the findings in this study suggested that both internal-focused practices (what I call sustaining practices) and external-focused practices (what I call generative practices) were essential for the viability of distributed communities. During this time, I attended Alpha's annual conference a second time, where I gathered more evidence for these distinctions through interviews and observations.

## Findings

In this section, I report on some findings from the field study. In order to set the stage, I describe some salient characteristics of legal work by first outlining the lifecycle of the regulation from the perspective of the association and this particular, specialized legal community. Then, I describe the complexity involved in this kind of legal work. This prepares the ground for the subsequent reporting on two sets of practices that have been identified in the preliminary analysis. The first category, which is labeled *sustaining practices*, encapsulate the practices that this community needs to support everyday activities and are essential for its continued viability. The second category, which are labeled *generative practices* represent the practices that allow this community to deal with the external forces from its environment. I conclude by outlining how this community balances its efforts between the internally focused sustaining practices and externally focused generative practices.

### *The Lifecycle of a Regulation*

In this section, I describe the lifecycle of the regulation in broad terms to set the stage for an examination of the practices that relate to the work on regulations. It should be noted, however, that the description is drawn from a specific subfield of the law and therefore may include details that may be peculiar to this context. Other legal communities may have very different perspectives based on, among other things, their participation in the production of the law. My interviews and investigation suggests that there are very often rumors that a regulation is in the pipeline before it comes into

existence. It eventually appears in the Unified Agenda, produced by the specific federal agency twice a year. The regulation then moves to the Office of Management and Budget (OMB), where it is published on their website and appears in the Federal Register. Subsequently, comments from various stakeholders are invited. At this point, Alpha forms a taskforce, which may be an existing committee that deals with related topics or a new team that is formed, specifically, to draft comments on this regulation. After the feedback is received from various stakeholders, the final regulation is published. The association follows this with, possibly, another team formed to provide summary and analysis of the regulation, generating what is essentially a “colleague’s take” on the regulation. Based on the complexity and the new information in the regulation, a teleconference may be organized to discuss it or possibly, even specialized and regional conferences. These are supplemented by discussions in various technology-mediated settings such as discussion boards and listservs. When questions arise in practice about the implementation of the regulation, they are accumulated by the liaison department and taken to the originating agency with possible suggestions or solutions. Information about the meetings held with the agency is communicated to the members through liaison meeting minutes and other communication procedures. The agency, after considering the issues that have been raised, releases its response, which may take the form of guidance memos. The legal community may then produce a response to the agency response – “does it really mean that?” This may produce a stalemate, which may result in litigation in the court or attempts to lobby congress to change the law. Finally, as officers of the agency adjudicate cases, Alpha also collects trends and points out discrepancies to the agency. This occasionally leads to unannounced changes to the regulation. In extreme

cases, when the regulation is considered very problematic, attempts are even made to “kill” the regulation.

### *Characteristics of Legal Knowledge*

Legal work in many areas of the law can be complex and dynamic due to, among other things, the large number of stakeholders involved, elaborate codes, exceptions and frequent changes. In order to illustrate the complexity of this work, let us consider three key aspects of the law – legislative, administrative and judicial. The legislative aspects deal with the law as drafted by congress, the administrative aspects deal with the regulation as implemented and enforced by the federal agencies and the judicial aspects relate to the case law deriving from the adjudications in courts. Each aspect adds another dimension to an area of the law and makes the knowledge related to it progressively more elaborate and complex. For example, the Immigration and Nationality Act, Title 8, Code of Federal Regulations (CFR), is about 500 pages long, while the regulations related to this law are about 1100 pages. At Alpha, the increasing complexity of the law has been very consequential for their community. In particular, as one staff member in the association commented: "We're seeing a vast increase in (specialization) having to do with information overload..."

Many areas of the law are dynamic and constantly evolving. For example, the Title 8, CFR, was first drafted in 1958 and continues to be amended and added to in the present day. The external political and cultural environment has a significant impact on the law and as new governments take power or when the political climate changes, existing laws are amended or superseded. Therefore, in areas of the law that are fast-

changing, there is a need for the legal community to stay abreast of the latest information with timely updates. For example, one attorney commented: "I actually spend more time studying now than I did in law school, I sit here for several hours a day just sifting through the interpretations and what's happening." Amendments and changing interpretations add to the complexity already introduced by elaborate regulations and case law. As an example, one attorney observed, "These days... "the Bible of \_\_ law" ...which started with 4 volumes...stretches to 20 volumes." Further, given the broad terms in which the law is initially drafted and subsequently interpreted and clarified through the regulatory process and case law, legal work often deals with ambiguity. At the same time, since the adjudications by case officers in federal agencies or judges in courts tend to be unpredictable, legal work also involves considerable uncertainty. Finally, depending on the specifics of each case, the stakes can often be high. The consequences of unfavorable decisions may involve imprisonment, deportation or other extreme penalties.

One possible response to such increasing complexity could be the emergence of specialization accompanied by fragmentation into smaller communities. Yet, the preliminary findings indicate that information and communication technologies have played an important role in preventing fragmentation within Alpha as a result of burgeoning complexity. For example, one respondent commented:

“...when I came in to this field more than 25 years ago, it operated as a community then, but it was more, smaller sub-communities, (but) with the explosion of technology and the ability to relate nationally as though you were sitting in the same room in some instances...it's redefined that community, really in the last 10 years.” (Director, Programs)

This suggests the importance of technology-enabled distributed work to groups such as this one in allowing them to sustain themselves and grow as a large-scale community of

practice. However, despite the evidence for the existence of this phenomenon, there has been limited investigation of the practices that make this kind of distributed work possible. In the next section, I describe two sets of knowledge practices, one with an internal focus and the other with an external focus. Together, these activities allow Alpha to balance their efforts between community maintenance requirements and changes in the environment that could threaten their survival.

### *Sustaining Practices*

To remain viable, communities need practices that support everyday activities. My analysis reveals the existence of four such practices. The first two, member socialization and reinforcing shared identity are practices that replenish membership and reinforce their common purpose, thus ensuring continuity. In addition, the practices of privileging expertise and providing knowledge to members ensure the community's continued value to members. I use the labels, expertise based structuring and knowledge sharing and dissemination to refer to these practices. I describe each of these in detail and the evidence for them is also presented in Table 11.

### *Member Socialization*

Whether voluntary communities continually regenerate and sustain themselves is determined by how the groups create and structure their resources to enable new and peripheral member learning and socialization. In addition to extending the life of the group by replacing core members as they leave, beginning members bring new ideas and energy. On the other hand, how they are socialized into the group determines their ability to perform essential functions and manage continuity. This is even more important in the

continuity of long-standing professions such as law and medicine, where voluntary professional associations perform critical roles in new member learning and professional development. While technology allows such entities to scale up their membership, increased size also presents challenges in structuring their resources for member learning.

I found evidence of several different types of structures and processes for new member socialization at Alpha both at the national and local level. At the local level, chapters have their own New Member Divisions with their associated activities. The divisions often have their own listservs and brownbag lunches to encourage knowledge sharing as well as social interaction. The local chapters provide better settings for familiarization with Alpha activities, culture and members since they have smaller groups and it is easier to get to know others and therefore, are less intimidating for new members. At the national office level, Alpha provides a way for more seasoned and experienced members to participate in mentoring activities through its Mentor Network. In addition, Alpha organizes various social activities for its beginning members at the Annual Conference. To promote better knowledge sharing and learning for new members, Alpha also organizes events at the Annual Conference in tracks labeled Fundamentals and Masters with the former aimed at members who are either new to the specialization or the practice of law and the latter aimed at more experienced members.

Since Alpha is run entirely by the voluntary activities of its members, how well new members succeed and move towards full participation is based on the extent to which new members volunteer for activities as well as their ability to contribute. Member progression is based on their efforts being noticed by other senior members, who nominate them to important committees, which brings further attention. Such success at

the local level often leads to nominations at the national level. Committees are reconstituted every year in part to ensure inclusion of new members. Despite these structures, member socialization at Alpha is not without its challenges. The very structures that are designed to promote socialization of new members can inhibit knowledge sharing. For example, a senior staff member noted that:

“The (New Member Division) listserv ends up being a place where they can reach their peers and we have found...that the new members often are more willing to post their questions on their own listserv than they are to go on the (national forum) and post because they don't want to look stupid to the older and most experienced members. But the downside is if they are posting their questions on the new member division listserv, they are only getting new members to respond. Sometimes, often, may be, they are getting bad information or incorrect information.”

### Reinforcing Shared Identity

A recurring theme that emerged from observations and interviews at Alpha was the repeated emphasis on the helping and “doing good” aspect of their profession. Members often emphasized that, since practice in this area of the law, generally, has significantly less financial benefits than some other areas, they would not be satisfied unless they see helping their clients as the primary reward. Moreover, this helping behavior that constituted their shared identity was reinforced through established, institutionalized practices such as awards at the Annual Conference for pro bono work and celebrating individual life stories that illustrated their success in achieving the desired ends for their clients. These narratives often included conquering great odds to reunite with families or overcoming traumatic experiences. At public venues such as the Annual Conference, speakers often compared their work to the civil rights struggle.



While organizational identification is important in promoting cooperation among members, it is especially critical in distributed groups and has been found to be helpful in “maintaining coherence, commitment, and continuity across the multiple locations, priorities, and interests of the hundreds of people involved in the collaborative effort” (Orlikowski, 2002, p. 257). At Alpha, while members identify with the organization, their strongest identification is with their profession, specifically, its’ avowed characteristic of fighting for the rights of the underprivileged. Since most members work in solo or 2-3 person practices and have almost no face-to-face interaction with other members, the reinforcement of shared identity acts as the glue that connects them in their common efforts while working on achieving favorable regulation or interpretation of the regulation for their clients.

#### Expertise based Structuring

A key concern for researchers who have been studying new organizational forms centers around the question of how such efforts succeed despite the fact that they depend entirely on voluntary contributions of members. Therefore, researchers have studied how such projects are organized (O'Mahony & Ferraro, 2007), why members contribute to such efforts (Wasko & Faraj, 2000) and what predicts continued participation (Joyce & Kraut, 2006). Further, studies in a wide range of domains have consistently shown that a small, core group is responsible for the majority of the contributions to such groups (Moon & Sproull, 2002). A much larger percentage of members occupy peripheral positions and make occasional contributions. Therefore, researchers and practitioners

alike have been concerned with understanding how members can be motivated to contribute, which is presumed to result in active and viable communities.

Although the importance of the core group is confirmed by the findings at Alpha – the members on national committees only number between 300-400, out of the total membership of 11000, and can be considered the core – the importance of expertise in gaining membership in the core group is perhaps unique. Given the complexity of this kind of legal work as described earlier, expertise is highly valued, especially since the stakes are often high. Members gain experience at different levels of complexity before taking on important roles. For example, most of the members on the national committees gain considerable experience doing committee work at the chapter level, whose organization mirrors that of the national office. Most members work in solo practices or 2-3 person firms and depend on individual reputation for attracting clients and building their practice. Therefore, motivating members to contribute does not appear to be a significant challenge – members view the opportunity to contribute as a route to getting noticed and building reputation – and often do so at considerable cost in terms of time and effort away from their practice. However, managing motivated contributors in a voluntary organization can also be challenging when there is strict expertise hierarchy. Since wrong information and advice can have disastrous consequences, organizers of such efforts often have to find creative ways to refuse contributions from highly motivated contributors who lack the necessary abilities or expertise.

## Knowledge Sharing and Dissemination

Alpha plays a critical role in the legal practice of many of its members by providing important information and perspective on changing law and its implementation. The leadership commented that getting essential information out to the members in a timely manner was a key function of the association. Alpha uses several different types of technologies and media in their information dissemination such as websites, forums, conferences, books, magazine, webcasts and podcasts. Member reliance on Alpha for these services made their management and development especially important. For example, as one member commented, “the first thing I do every morning is check the website for new developments...and the last thing I do at night is check the website...I also find the mentor feature very useful, I can email when I have any questions”.

In addition to these formal channels organized by the central office, members developed many informal communication channels with other members. There were more immediate opportunities to develop relationships with others at the local level, depending on the chapter, in the form of regular meetings or brown bags at a member’s office. The conferences, especially the annual conference, provided opportunities to meet members working in other geographic locations and other specializations. Such informal networks were an important source of information. As one member commented:

“...if we have to go to another court or (agency) office then I’ll always call up somebody there whom I know and ask their opinion on what’s the attitude of the examiner on this issue...even in a routine case, if say we’re going to another city, I’ll probably call up somebody and say, hey, what’s the attitude generally. I think the good thing about (Alpha) is that among the members, there’s

a lot of collegiality and people will always share their time and expertise and their knowledge.”

While these examples describe how members acquire knowledge, many respondents viewed acquisition of knowledge and dissemination of knowledge as inseparable activities that formed a virtuous cycle. One member commented on how integral these activities were to his practice:

“...yeah, all of this (association activity) takes time but the thing is that you’ve integrated all this as part of your practice, you don’t see it as something that’s outside the practice. The fact that you do it adds a dimension to your practice, to your stature, so everything kind of benefits ultimately who you are as a lawyer. And that’s how you have to view it, you can’t just view it as, I’m not making so many dollars because I’m editing an article, by editing an article, somebody’s article, you’re gaining knowledge, which will ultimately help you in a future matter.”

Such knowledge sharing activities were also linked to other perceived characteristics of their profession as well as reputation building essential for their career. The former is supported by other studies in the situated learning literature that suggested that learning and identity are intertwined (Lave & Wenger, 1991; Wenger, 1998). The latter is supported by Wasko and Faraj (2005), who found that reputation seeking was an essential motivation for knowledge contribution in electronic networks of practice. However, members often emphasized both simultaneously. For example, one member discussed the opportunity cost of time spent on sharing knowledge with others:

“Obviously, you take all these into consideration, sure. But ultimately, I didn’t join a law firm that had a brand name already, big large firm...a company like IBM...where the brand name is already there and the moment you join there as an executive vice president everybody claps. I started from ground zero, so I decided to build my own brand. And in order to build the brand and sustain it this is what you have to do. But it’s not really seeing it that way, I think that’s a subsidiary benefit. You do it because you’re passionate about it and because there is an inherent obligation to be involved in every manifestation of your practice and to be part of that.” (regular member)

**Table 11: Sustaining Practices**

Category	Description	Examples
Member Socialization	The success of the organization depends on how well new members are socialized into the community, thus bringing new ideas and expertise. Different socialization processes exist.	“On all our committees, we make sure that every year there is some new blood, while also having enough of the members from the previous year for continuity” (Senior staff)
Reinforcing Shared Identity	Maintaining a shared identify in a widely dispersed group such as Alpha is challenging. This is achieved through stories and repeated narratives that highlight their common identity.	<p>•“We are waging the new civil rights battle of our times... we will prevail...”, “we speak for the voiceless...” (Executive Director, Legal Foundation)</p> <p>•“You don’t get into this profession for money, but only if you are passionate and want to help people...” (Director, Liaison)</p>
Expertise Based Structuring	There is a small, committed, core group at Alpha that is critical to its functioning. However, since expertise is critical to performance in these roles, members gain experience at different levels before taking on important roles.	<p>“We have a few die-hards who contribute regularly, have significant experience, for example this 540 page book was written by one such member...” (Director, Publications)</p> <p>“Most of our national committees are filled with members who have risen up through the chapters and gained experience at the local level...” (Senior staff)</p>
Knowledge Sharing And Dissemination	Knowledge sharing is a critical function of Alpha and different venues and technologies are used to promote it.	<p>•“The first thing I do every morning is check the website for new developments...and the last thing I do at night is check the website...I also find the mentor feature very useful, I can email when I have any questions” (Regular member)</p> <p>•“I spend 80 percent of my time at the conference attending sessions and panels and may be 20 percent of the time socializing...the sessions are critical, especially the ones with agency officials and Q&amp;A” (Regular Member)</p>

### Generative Practices

Communities of practice reside in a larger context. Therefore, they are subject to external forces from the environment. The ability of communities of practice to respond to external forces determines their survival and success. As outlined in the overview of the lifecycle of the regulation, there are many different stakeholders and organizations involved in this work – the congress, federal agencies, courts and other interested actors such as advocacy groups. Consequently, distributed communities such as Alpha have to develop practices that address external forces that impact their work and affect their interests. This ability is encapsulated in four practices that I label *generative practices* since, very often, dealing with these forces requires Alpha to generate new knowledge. I describe these in detail below and the evidence for these practices is also presented in Table 12.

### Structuring for External Shocks

Alpha has several structures in place to address changes in regulation. These include existing committees that are charged with drafting responses to agencies or preparing analyses and summaries that explain the changes to the members. However, on occasion, these structures are inadequate to foresee or respond to dramatic events or shifts in the regulatory, political environments that have significant consequences for the community or large numbers of their clients. Such shocks can either be short, localized events or longer term, expansive changes. For example, when a new administration or congress comes to power and are opposed to the current policy, it may completely overhaul the existing law instead of making incremental changes. A new administration may also replace all the political appointees at key federal agencies to institute policies it

favors. For example, one respondent at Alpha observed:

“The changes that have taken place at the agencies in the last eight years have been devastating, with the political appointees imposing their view on everyone, moving or forcing out people who do not agree with them...down to the lowest level...even if the new administration is friendlier, it may take a decade or more, assuming they are motivated, to roll back the changes...it may not even be possible...”

Alpha responds to such changes with several different types of structures. Several working groups, or committees, are formed to take on the issue on multiple fronts – for example, one to prepare a practice advisory for members to clarify the change and how the change should be interpreted, one to prepare questions for the agencies, one group to lobby congress and yet another to “take on the media and develop message points”. Members at Alpha suggested that response time is often critical when sudden, unexpected events or changes occur and described an episode during which all these different efforts were organized in two weeks. In addition, when such shocks are sustained changes, special sessions and panels are organized at the conferences to discuss the changes. Moreover, the legislative advocacy unit of Alpha organizes activities such as email or fax campaigns to congressmen or lobbying by members. The results for the advocacy efforts vary based on how wide-ranging the impacts of the proposed changes are. Some issues generate strong reactions – for example, lobbying effort for a long-standing issue generated thirty thousand phone calls as a result of support not just from Alpha members but also their attorneys’ clients and the general public.

### Disseminating Local Knowledge

While technology potentially allows geographically dispersed groups to communicate, overcoming the many differences of their geography that divide such groups is not always easy, which is needed for successful collaboration. As a result of the variations in local conditions, groups may develop differing practices that often cannot be transported to another location. Since Alpha members, in their practice, deal with state agencies and offices, members develop special expertise and familiarity with procedures in their area. As one respondent described the problem:

“...there’s a whole, like 60 different local offices of (federal agency), ...and each one does things their own way on anything you can name. And the challenge is, because, no matter where you’re sitting you can wind up in one of those offices one way or another...” (Senior staff)

Therefore, Alpha members, despite being licensed and building practices in individual states, often deal with offices in different states. There has been an effort to standardize processing and procedures at the different offices of the federal agencies, resulting in a handful of very large regional service centers. However, in some areas such as enforcement and detention, familiarity with local practices nevertheless provides an advantage. Members also described how local practices diverged even in areas where national policies exist:

“There’s all sort of things that are minor but are a big deal to a lot of the members, they want to know if you can’t bring camera phones. But there’s lots of different kinds of local rules, how do you do increase? When can you see a supervisor? How do you do reschedules? And even though they’re national policies every district office I think has their own feel of how they’re implementing that, so understanding that I think is important for at least our



chapter members...” (Chapter president)

A key challenge for the organization, then, is spreading knowledge about local practices throughout the wider community. There are several structures that facilitate dissemination of local knowledge in Alpha. Chapters serve as repositories of local knowledge since they organize the liaison with local government offices and collect information related to practice in their region. When new members join Alpha, they are automatically signed up for their local chapter and receive chapter communications and updates on activities. In addition, members whose practice deals with another region are encouraged to join the local chapter to gain access to the chapter listserv and member expertise. Moreover, the chapter chairs are automatically members of the national board of governors, thereby ensuring not only chapter representation at the national level but also communicating information about local practices. Finally, chapter members who make valuable contributions are often recruited into national committees, thus providing another conduit for sharing local knowledge.

### Deliberation and Sense-Making

Given the considerable ambiguity and uncertainty often present in legal work, Alpha needs structures and processes that promote deliberation and sensemaking. I described, in a preceding section, the many aspects that make the practice of this area of the law complex. In particular, individual attorneys have to consider many different contextual and case-specific details before making a decision on the right way to proceed. One respondent described the problem of finding the right information and making a knowledgeable decision in this area of the law:

“it’s not just a matter of, you know, taking a big law or statute or regulation and applying it to a particular case or set of facts, its what aspect of the case are you looking for knowledge about... (vis-à-vis) *strategies, procedures and legal arguments*...this supreme court case says x, y or z but here is how my case is different from that and should be distinguished, so that court case shouldn’t control, I mean there are many kinds of legal arguments that you need to make in the midst of all this but I would say (this area of the) law is unique in the *layers of procedures that people have to grapple with and it can be something as simple as, you know, what mail box do I send this application to...* and what, you know, payment do I attach to it, in what form...I mean, its bound up with all kinds of convoluted procedures and the procedures end up being different depending on the application, depending on what part of the country you are in... “ (italics added)

Given these variations in procedures and contexts, individuals look to others and the association for clarification. However, given these variations, this involves not simply a transfer of information, but a process of deliberation and sensemaking, where individuals go back and forth and clarify contextual differences and consider various strategies. In the process, members consider different examples, run through scenarios and develop rules of thumb. The need for deliberation and sensemaking is more acute when the law changes and the agencies change the rules or issue new guidance memos. The scale of the organization, however, presents a challenge to processes used to make sense of the changes. While technology mitigates some of these challenges, addressing them in face-to-face interaction is much more problematic. For instance, sessions at the conference are sometimes attended by 800 or more members. Involving as many people as possible and yet making room for public deliberation is challenging.

### Organizing for Knowledge Contestation

Alpha performed a variety of externally focused activities such as monitoring the legal environment, legislative advocacy, liaison with agencies, etc. While a significant

share of these activities involved negotiation, liaison and building relationships with different stakeholders, sometimes these are no longer enough. For example, a respondent commented on the importance given to not only externally focused activities such as liaison, but also the stakes involved in these activities by the link to larger values:

“if you look at the association overall and you look at how it allocates its resources...you could just have a knowledge based association that was entirely about when something happens we push it up to the members, we get their analysis, they share it with each other to be better lawyers, right? And you wouldn't have to have any arm that did legislative advocacy or liaison. No government advocacy with the agencies. And some associations just operate that way. But part of what (Alpha) has been from very early on is that ... (we) are more than just an internally focused knowledge community, (we are) a player in shaping the national debate and action on these kinds of issues...*what is the country and how are its values reflected in this body of law...*” (italics added)

Precisely because such stakes are involved, Alpha has to contest the position and interpretation of other stakeholder in the courts and in public opinion. Alpha has a separate division dedicated to issues such as selective involvement in high-profile pro bono cases, education and improving public awareness. However, knowledge contestation after the fact is expensive, not only in terms of the resources needed but also the consequences for the clients of Alpha. Therefore, attempt is made to get involved early in the process of drafting legislation to effect a favorable change. Failing to achieve such changes often lead to more direct knowledge contestation such as litigating the agencies and changing public opinion through media messaging.

**Table 12: Generative Practices**

Categories	Description	Examples
Structuring For External Shocks	New and changing legislation creates the need for new knowledge.	Committees as a mechanism of dealing with changes.  Evaluate threats, develop strategies and mobilize members as needed.
Disseminating Local Knowledge	Geographically dispersed activity creates locale-specific practices. Sharing knowledge about these practices is essential at Alpha.	“...there’s a whole, like 60 different local offices of (federal agency), ...and each one does things their own way on anything you can name. And the challenge is, because, no matter where you’re sitting you can wind up in one of those offices one way or another...” (Senior staff)
Deliberation and Sense-Making	Outlets for making sense of changing regulation and how it might affect their clients, their practice and profession.	•“Through out the panel discussion, a steady trickle of audience members walked up to the left side of the raised platform and gave their hand-written questions to the organizer...the questions from the audience were inserted into the deliberation...(but) never explicitly acknowledged as audience questions” (Field notes from the conference)
Organizing for Knowledge Contestation	In the drafting of regulations or when negotiation fails, knowledge and interpretation of other stakeholder is contested through litigation, long-term advocacy, public education and lobbying.	“...(we) are more than just an internally focused knowledge community, (we are) a player in shaping the national debate and action on these kinds of issues...what is the country and how are its values reflected in this body of law...” (Senior staff)

## Discussion

In the preceding section, I outlined findings from the qualitative study of knowledge practices at Alpha. I documented evidence for the existence of two sets of practices – the first has an inward focus, labeled sustaining practices, and is related to maintaining a healthy and viable community through such practices as member socialization, reinforcing shared identity, expertise based structuring, and knowledge sharing and dissemination. The second set of practices, labeled generative practices, have an external focus and are related to addressing contextual and cross-boundary challenges and therefore involve practices such as structuring for external shocks, disseminating local knowledge, deliberation and sensemaking, and organizing for knowledge contestation. The key argument from the identification of the two sets of practices is that large-scale, distributed communities such as Alpha face challenges from within and without and their success depends on how they manage both sets of challenges.

However, addressing internal and external challenges and balancing the resources needed across them is complicated by the fact that these challenges are often in conflict. In practice, different types of activities have to be modulated to balance these opposing forces. For example, when there is an external shock, resources may have to be diverted from regular activities to address an existential threat to the community, but also the focus of internal activities may have to be realigned. In the case of Alpha, when the regulatory environment turns hostile as a result of a change in administration, more lobbying, messaging and communication resources have to be assigned to address the changes. If the macro environment continues to remain challenging, members may turn their practice to other areas of the law or leave the practice of law altogether. The

turnover in membership could create a vicious cycle by reducing revenues and consequently affecting services to members, which may create further turnover or an additional loss of members.

Similar tensions exist between other practices that have internal and external focus. For example, I discussed the importance of sharing local knowledge for distributed communities in the previous section. However, differing local practices are necessarily in conflict, with the need to develop standard procedures that apply across local contexts. How autonomous can the local chapters be and how distinct can the chapter practices be without fragmenting Alpha into many smaller communities? Similar questions arise in regard to the practice of expertise based structuring. I suggested that expertise is highly valued at Alpha and members go through several years of “training” before taking on important roles. Why not allow the experts to prescribe courses of action when questions arise instead of deliberating the issue in the larger community? Yet, even novice members may suggest useful ideas or have access to information that the experts do not.

The two sets of practices described here and the importance of managing both can be illustrated further through comparison with other professional communities. Alpha shares similarities with associations that exist in almost any academic community. For example, while Information Systems researchers are employed in different institutions and often in inter-disciplinary departments, most are members of an association. These associations organize annual meetings, provide venues to present and publish research as well as opportunities for career development. In much the same way as Alpha, these associations are entirely run by the voluntary activities of its members, play an important role in knowledge sharing and information dissemination and have an expertise

hierarchy. Very often, members have stronger identification with the association or the group represented by it, such as the information systems academic community, than with the institution where they are employed. Just as Alpha is threatened by changes in the political or regulatory environment, academic communities also face challenges from economic or jurisdictional changes. For example, there has been a long-standing debate within the information systems discipline about its identity, its status as a reference discipline and whether its lack of contribution to or impact on other disciplines could threaten its survival (Hirschheim, 2006; Straub, 2006; Wade, Biehl, & Kim, 2006). Similarly, the discipline faced significant challenges when the economic climate changed and student enrolment dropped after the technology downturn.

### Contributions

In this essay, I investigated the practices that enable new organizational forms to organize in distributed environments. Specifically, I investigated how such organizations manage scale and mitigate the negative consequences of geographic dispersion, transfer local knowledge, adapt to changing environments, deal with external influences and shocks, and mobilize members. To begin the investigation, I surveyed the existing literature on distributed collaboration in a variety of areas such as virtual teams, online communities and situated learning. In the process, I also outlined how, even though all these different areas of the literature provide valuable insights, they do not answer the questions I have posed in this study.

In particular, I examined the literature on communities of practice and outlined the limitations of this approach. While these approaches take the social and situated nature of knowledge and learning into account, they have been developed largely in

relation to small, collocated groups. This is exemplified by Lave and Wenger's (1991) examination of situated learning in the context of such groups as Yucatec midwives and Vai tailors as well as Orr's (1996) study of Xerox copier repair technicians. However, the applicability of these ideas to professional work in large, distributed environments is not clear. These studies offer very little guidance on how groups such as Alpha can operate on a large-scale, given the evidence that communities of practice have structural and epistemic parameters that impose constraints on their growth (Thompson, 2005). Moreover, the literature in this area has largely focused on such issues as identity (Wenger, 1998), neglecting the practices of knowledge collaboration.

Therefore, the internal-focused practices described here (what I call sustaining practices) illustrate how some of the insights from the communities of practice literature apply to large, distributed settings. For example, while this literature describes growth and transformation of identity as evolving along with increasing competence and legitimacy (Lave & Wenger, 1991; Wenger, 1998), the practice of reinforcing shared identity at Alpha acts as a glue that connects dispersed members who seldom meet face-to-face. Similarly, the practice of member socialization at Alpha can be compared to Lave and Wenger's (1991) notion of peripheral participation, however, it uses specific structures at the chapter and national levels as well as the process of progression through and reconstitution of committees. While the sustaining practices resemble and extend the insights from the communities of practice literature, the external-focused practices described here, labeled generative practices, represent a novel contribution. For, as researchers have pointed out, despite the importance of the challenges from the environment for communities of practice, the literature has focused almost entirely on



their internal structures and processes (Østerlund & Carlile, 2005; Wenger, 1998).

Evidence from Alpha suggests the existence of different types of generative practices such as structuring for external shocks, disseminating local knowledge and organizing for knowledge contestation. The identification of these practices, therefore, is an important contribution to the literature on distributed communities of practice and new organizational forms.

The overwhelming focus in the studies on distributed work tends to be on the limitations of mediated communication (e.g., Kiesler & Cummings, 2002; Nardi & Whittaker, 2002; Olson et al., 2002) and not enough attention has been given to the question of how groups overcome such limitations, as evident from the great number of collaborative accomplishments in different areas. I depart from this focus in my study and investigate *how* distributed groups, especially occupational communities, organize, adapt to changing circumstances and create their collaborative accomplishments. As evident from the description of the study's setting, Alpha successfully organizes many initiatives to collectively address changing regulations. While the literature on online communities offers important insights, the focus in these studies tends to be on online communities in isolation and does not examine how individuals and groups organize across online and offline interaction. As I have described, Alpha uses a variety of mediated and non-mediated settings such as bulletin boards, listservs and face-to-face conferences to organize their activities. Therefore, the knowledge practices described here span all such media, settings and technologies.

Recent work that builds on the practice approach emphasizes cross-functional challenges for knowledge sharing in collocated settings and the use of boundary objects

to overcome these challenges (Bechky, 2003; Carlile, 2002). The present study has several implications for this approach. First, the focus on boundary objects and their specific features that this approach has engendered may be of limited use in studying collaboration in mediated and virtual environments. Recent work has suggested that the lack of face-to-face interaction limits the utility of boundary objects, even those that are designed to manage distributed work, such as project management tools (Sapsed & Salter, 2004). The emphasis on functional boundaries is also of limited value in examining professional work. Knowledge collaboration at Alpha shows that, community wide acceptance of standards and procedures, resembling Kuhnian notions of paradigmatic work in science (Kuhn, 1970), play a critical role in enabling a certain degree of uniformity in practices.

The last point is especially important for research in distributed professional work and deserves further elaboration. Despite some variation of practices at the local level, most of the practices described here either foster a shared culture or depend on a shared culture. For example, I described how the reinforcing of shared identity at Alpha operates as a glue to bind dispersed members. On the other hand, I described how such a shared identity motivates individuals to share knowledge. Even though these are described as two separate practices for analytical convenience, they should be viewed as operating together, in a manner described by Lave and Wenger (1991), where the progression from peripheral participation to full participation is intertwined with the construction of a shared identity.

In summary, these practices confirm a key insight from the situated learning literature – the construction of a shared culture as a requirement for knowledge sharing.

Therefore, the practices described here enable Alpha to operate as a community and not just a loose-knit association, thus allowing Alpha to share complex knowledge and deep expertise among its members. This is supported by the notion of the paradigm proposed by Kuhn (1970) to describe a shared epistemic culture essential for the doing of science. The emphasis on functional boundaries and boundary objects minimizes the importance of such a shared epistemic culture. The findings from Alpha seem to suggest a tilt back to the emphasis on the shared culture of the community as an umbrella under which complex knowledge work can be accomplished in distributed settings.

### Limitations

This study has some limitations that must be acknowledged. The knowledge practices reported here are from the study of a single distributed community and their applicability to other distributed communities needs further investigation. Since very little is known about how voluntary communities organize their knowledge collaboration in dispersed settings, I undertook an in-depth study of their practices. Future studies can uncover how other large, distributed communities balance internally and externally-oriented activities in practice. Second, in this exploratory study, I took an initial step in identifying a set of practices that allow a large group to be successful despite the negative consequences of geographic dispersion, but a longitudinal study is needed to examine how these practices change over time and are affected by contextual factors.

## Conclusion

IT-enabled new organizational forms are making an impact in many different areas and, consequently, are beginning to receive attention in the literature. However, the practices that enable such groups to engage in large-scale, distributed knowledge work have not been investigated. Given the increasing reliance of the knowledge economy on collaborative forms, the study of such practices is more important than ever before (Powell & Snellman, 2004). Work in the knowledge economy places demands of flexibility, speed and adaptability on organizations (Rindova & Kotha, 2001) and the flexible structures that constitute new organizational forms seem to be uniquely suited to meet those demands. In this study, I provided a starting point by investigating two sets of knowledge practices in a distributed community, one with an internal focus and the other with an external focus.

## Appendix A: Survey Items

### Case Scenarios

1. Consider a recent case that you worked on within the past six months, that was not unusually complicated, and that you feel represents a typical problem that you encounter in your practice. In Part I of this survey, you will be asked questions about the knowledge sources you used while working on this specific case and the outcome of the case.
  
2. Now, please consider a recent case that you worked on within the past six months, that was novel, different from the cases you routinely encounter, had complicating factors and proved challenging. In Part II, you will be asked questions about the knowledge sources you used while working on this specific case and the outcome of the case.

### Dependent Variables

#### Effectiveness

Compared to similar cases in the past:	Not at All		To a Very Great Extent				
Effec1: I reasoned extremely well in this case	1	2	3	4	5	6	7
Effec2: The case was adjudicated favorably	1	2	3	4	5	6	7
Effec3: I feel that the outcome of this case was superior	1	2	3	4	5	6	7

#### Learning Outcomes

My experience with this case will:	Not at All		To a Very Great Extent				
Learn1: Make me more comfortable in taking on similar cases	1	2	3	4	5	6	7
Learn2: Make me more competent with this area of the law	1	2	3	4	5	6	7
Learn3: Make me a better lawyer	1	2	3	4	5	6	7
Learn4: Enable me to spend less effort on similar cases	1	2	3	4	5	6	7
Learn5: Increase my confidence in my ability to help clients	1	2	3	4	5	6	7

## Independent Variables

### Knowledge Source Use

#### *Codified Sources*

Indicate the extent to which you relied on each of the following written sources for information while working on this case.	Not at All <span style="float: right;">To a Very Great Extent</span>						
	1	2	3	4	5	6	7
Cod1: Treatises (e.g., Kurzban's)	1	2	3	4	5	6	7
Cod2: Statutes, Regulations, Government Memos and Guidance	1	2	3	4	5	6	7
Cod3: Articles, Practice Advisories and Liaison Minutes	1	2	3	4	5	6	7
Cod4: Websites (InfoNet, archived discussions, etc.)	1	2	3	4	5	6	7
Cod5: Court and Administrative Decisions	1	2	3	4	5	6	7

#### *Interactive Sources*

Indicate how you sought input from colleagues in this case. Did you?	Not at All <span style="float: right;">To a Very Great Extent</span>						
	1	2	3	4	5	6	7
Int1: Seek advice in electronic discussion forums (e.g., Message Center, listservs)	1	2	3	4	5	6	7
Int2: Discuss the case with colleague(s) in person or on the phone	1	2	3	4	5	6	7
Int3: Listen to presentations or discussions at the annual or regional conference(s)	1	2	3	4	5	6	7
Int4: Discuss with colleagues at the annual or regional conference(s)	1	2	3	4	5	6	7
Int5: Watch or listen to webcasts, web seminars or podcasts	1	2	3	4	5	6	7
Int6: Contact an AILA Mentor (e.g., from the Mentor Directory)	1	2	3	4	5	6	7

## Knowledge Transformation Strategies

### *Reanalysis (Adapted from Cross and Sproull 2004)*

In using written sources (Treatises, Articles and Practice Advisories, Websites, Memos, etc.) in this case, were you able to?	Not at All <span style="float: right;">To a Very Great Extent</span>						
Rean1: Adapt relevant samples, forms or templates	1	2	3	4	5	6	7
Rean2: Verify your understanding using statutes, regulations or case law	1	2	3	4	5	6	7
Rean3: Check that your information is up-to-date	1	2	3	4	5	6	7
Rean4: Acquire applicable procedural and substantive information	1	2	3	4	5	6	7
Rean5: Identify similarities and differences with other cases	1	2	3	4	5	6	7

### *Dialogic Practices (Adapted from Jarvenpaa and Majchrzak 2008)*

In your interaction with colleagues regarding this case (in person, electronically or on the phone), did you?	Not at All <span style="float: right;">To a Very Great Extent</span>						
Dial1: Discuss how others have framed similar cases	1	2	3	4	5	6	7
Dial2: Describe the context of your case in detail	1	2	3	4	5	6	7
Dial3: Review case precedent	1	2	3	4	5	6	7
Dial4: Clarify the relevance of specific statutes and regulations	1	2	3	4	5	6	7
Dial5: Consider how local practices may impact legal strategy	1	2	3	4	5	6	7
Dial6: Generate alternative legal scenarios	1	2	3	4	5	6	7
Dial7: Brainstorm about ideas or possible strategies	1	2	3	4	5	6	7
Dial8: Change your mind about an aspect of the case	1	2	3	4	5	6	7

***Social Skills (Ferris, Witt and Hochwarter 2001)***

To what extent do you agree with these statements?	Not at All					To a Very Great Extent	
Sskills1: I find it easy to put myself in the position of others	1	2	3	4	5	6	7
Sskills2: I am keenly aware of how I am perceived by others	1	2	3	4	5	6	7
Sskills3: In social situations, it is always clear to me exactly what to say and do	1	2	3	4	5	6	7
Sskills4: I am particularly good at sensing the motivations and hidden agendas of others	1	2	3	4	5	6	7
Sskills5: I am good at making myself visible with influential people in my organization	1	2	3	4	5	6	7
Sskills6: I am good at reading others' body language	1	2	3	4	5	6	7
Sskills7: I am able to adjust my behavior and become the type of person dictated by any situation	1	2	3	4	5	6	7



## Appendix B: Guiding Themes for Interviews

### Staff

1. When did you join the organization? What is your background?
2. What are your responsibilities? What does your department do?
3. What kinds of issues do you face in disseminating information to your members?
4. What technologies do you use and what challenges do you face in using technology to communicate and share information with members?
5. How do you organize your response to change in the legal environment? What are the issues in coordinating member input for such activities?
6. How is the association organized regionally? Are most of the chapters organized the same way or is there variation in how each is structured (committees, elections, size, etc)? If there is variation, could you describe some of the prominent chapters and how they differ?
7. Is there variation in how local offices of the federal agencies operate? If so, does the association collect information about these differences and how? What are the challenges of sharing information about local practices?
8. How has the association grown over the years? What are the challenges of the increase in size? How have the organization and the association changed as a result of the growth?
9. What kind of turnover is there in membership? What are the challenges of member retention?

### Members

1. How many years have you practiced in this area of the law and what are your areas of expertise (sub-specialties)?
2. In your practice, do you find that your membership in the association has been helpful? Specifically, what resources have you found useful in your practice?
3. Do you volunteer for any activities in the association? If so, could you describe what kinds of activities you have been involved in?
4. Is your participation in the association primarily at the local chapter level or the national office level?
5. Where do you get your information while you work on cases?
6. What kinds of information technologies do you use in your practice? Do you participate in the forums? Are they helpful? Do you help others and if so, why do you do it?
7. Why do you attend the conference? Specifically, what kinds of events do you attend and why? How is this useful to you, can you give examples?
8. In your practice, do you deal with state and federal agency offices and courts outside the geographic region(s) where you are licensed? If so, do you find that you need to seek additional information about these offices and courts to help your case? How do you obtain this information?
9. Have changes in the legal environment affected your practice in recent years? If

- so, how? Please provide examples.
10. Have you had any leadership roles in the organization? What qualities are needed for an individual to become a leader in this organization?
  11. Approximately, what percentage of the time do you use published sources (websites, books) versus human sources (colleagues, online forums)?
  12. Can you give an example each of how you use published sources and human sources?
  13. How do you decide what to do in specific cases, when you get conflicting information from different sources or when there is no clear guidance?

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