NATH, ANUPAM KUMAR, Ph.D. Web 2.0 Technologies for Effective Knowledge Management in Organizations: A Qualitative Analysis (2012)
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This dissertation examines how IT organizations use Web 2.0 technologies for Knowledge Management (KM) at the individual, project, and group level. We also investigate how the use of Web 2.0 technology for KM affects organization, group, project, and individual level outcomes. Using multiple case research design, this research provides examples of uses of Web 2.0 for KM at the individual, project, group, and organization level. Using empirical data, this research also establishes a relationship between the uses of Web 2.0 for KM and its effects on individual, project, group, and organization levels.

We found that the use of Web 2.0 for KM in an organization can increase tacit knowledge sharing between employees, perceived learning of the employees. We also found that use of Web 2.0 for KM in an organization paves the way for the employees to earn the reputation of being an expert in the use of a tool and/or technology within the organizations and at the same time creates an opportunity for the employees to acquire knowledge and gain help from the expert and/or knowledgeable people within the organization. At the project level, we found that the use of Web 2.0 for KM can increase the transfer of knowledge between projects and the degree of learning achieved by a project's team. At the group level, we empirically established that the use of Web 2.0 for group level KM can increase a group's performance and/or its effectiveness.

Our research addresses a gap in the literature by empirically examining the effects of KM context variables on the effectiveness of Web 2.0 for KM at different levels. For KM

at the individual level in organizations, we empirically established the positive effect of providing incentives for participation in Web 2.0 based KM activities on the KM based outcomes. For KM at the individual level in organizations, we also empirically established the importance of supervisor and co-workers' support for participating in Web 2.0 based KM activities on KM based outcomes. For KM at the project level in organizations, we empirically established the importance of project managers' leadership in the transfer of knowledge between projects. While we could not empirically establish any direct relationship between a project team's stability, familiarity, and a project manager's leadership with project level outcome variables such as project completion in time or the success of a project's product, through interpretation of our rich qualitative data we showed that these context variables play an important role in adopting Web 2.0 for project level KM. For KM at the group level in organizations, we empirically established that a group's social capital plays an important positive role in the relationship between the use of Web 2.0 for group KM and a group's performance and/or effectiveness. At the organization level, we were able to show that organizational level KM context variables, such as technical KM resources and social KM resources are important for adoption of Web 2.0 for KM at different levels within the organization.

Since there is dearth of theory based and rigorous research on Web 2.0 based KM, especially in organizational setups, we believe that our findings will address the gap in the academic literature as well as help different organizations to adopt Web 2.0 for KM.

WEB 2.0 TECHNOLOGIES FOR EFFECTIVE KNOWLEDGE MANAGEMENT IN ORGANIZATIONS: A QUALITATIVE ANALYSIS

by
Anupam Kumar Nath

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APPROVAL PAGE

This dissertation has been approved by the following committee of the faculty of the Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

INTRODUCTION

This dissertation examines how IT organizations use Web 2.0 technologies for Knowledge Management (KM) at the individual, project, and group level. We also investigate how the use of Web 2.0 technology for KM affects organization, group, project, and individual level outcomes. Using multiple case research design, this research provides examples of effective use of Web 2.0 for KM at the individual, project, group, and organization level. Using in-depth qualitative data, this research also examines a relationship between the uses of Web 2.0 for KM and its effects on individual, project, group, and organization levels. The extant literature has yet to examine such relationships. In addition to addressing this research gap in the literature, this study provides guidelines for effective use of Web 2.0 for KM based on multiple case studies. Through our exploratory case study we also identify and reported the lessons learned by organizations that have adopted and utilized Web 2.0 for KM. Our research also examines the relationship between the uses of Web 2.0 for KM and different outcome variables at the individual, project, group, and organizational level. In addition, we also study the effects of KM context and understand the context of KM to identify appropriate KM context for effective use of Web 2.0 for KM. Since there is dearth of theory based rigorous research on Web 2.0 based KM, especially in organizational setups, we believe

our research addresses a critical gap in the academic literature as well as help different organizations to adopt Web 2.0 for KM effectively at different levels.

The rest of this introductory chapter of this dissertation is organized as follows. In the next section we describe organizational knowledge and KM—a domain of interest in this research—and challenges for current KM. We then introduce and describe the Web 2.0, another focal point of this study, leading to our research questions. In sections that follow we state our research approach. Then we provide an overview of our research outcomes and conclude the introductory chapter by providing an outline of the rest of the dissertation.

1.1 Organization Knowledge and Knowledge Management

Huber (1991) defined *knowledge* as "a justified belief that increases an entity's capability of effective action." Researchers have conceptualized *organizational knowledge* as the way an enterprise can leverage the know-how of its employees, trading partners, and outside experts for the benefit of the enterprise such as meeting customers' needs, solving critical problems, and maintaining customer relationships (Ackerman et al., 2003; Bellaver & Lusa, 2001; Choo, 1998). Others have conceptualized organizational knowledge as the processes through which organizations generate value from their intellectual and knowledge-based assets (Santosus & Surmacz, 2001).

Organizational knowledge lies at the heart of organizational performance (Alavi & Leidner, 2001). Drucker (1993) identified it as one of the strongest sources of competitive advantages in modern markets. Hence, effective management of

organizational knowledge represents a critical organizational capability (Simon, 1992; Drucker, 1999; Davenpot & Prusak, 1998; Teece, 1998; Yeung et al., 1998; Lubit, 2001; Zahra & George, 2002).

KM signifies the process through which organizations generate value from their intellectual and knowledge-based assets (Levinson, 2006); further, KM consists of four major activities: *Generation, Codification, Transfer,* and *Realization* (Grover & Davenport, 2001). Organizations know that they should consciously pay attention to the importance of KM. In a survey, the Economist Intelligence Unit (2006) found that CEOs ranked KM (36%) second to sales and marketing (56%) as the most important business function in realizing corporate strategy goals in the coming years. In fact, 30% of CEOs considered KM the most important investment for the year 2007 (Economist Intelligence Unit, 2007). While organizations realize the importance of KM, different aspects of KM remain unresolved and/or need improving due to technology limitations or the nature of the KM paradigm itself (Lee & Lan, 2007). These challenging aspects of KM linger for organizations.

1.2 Knowledge Management Challenges

1.2.1 Capturing Tacit Knowledge

KM signifies an important antecedent to the successful management of organizational activities within or outside the boundaries of an organization (Balaji & Ahuja, 2005). However, organizational boundaries have important implications for KM activities and subsequent organizational performance (Argote et al., 2003). Hence, in

modern business environments where organizational boundaries have become less rigid and less comprehensible because of outsourcing and offshoring practices, organizations face the challenging task of managing globally dispersed knowledge. Thus, KM requires managing both explicit and tacit knowledge in the project, as well as within and across partner firms (Wagner, 2006).Tacit knowledge, an important source of competitive advantage, represents a major part of overall organizational knowledge (Frappaolo & Wilson, 2003). However, articulating tacit knowledge becomes difficult as it derives from direct experience and action and usually needs sharing through highly interactive conversation (Frappaolo & Wilson, 2003).). One of the major challenges for KM is to convert tacit knowledge to explicit knowledge in a way that it passes along to others (Carroll et al., 2003). Such conversion is challenging as it requires understanding the context, such as individuals' perception and experience of the knowledge (Von Krogh, 2000).). While existing KM to some extent has succeeded in capturing explicit knowledge, still it remains very difficult to acquire tacit knowledge because of (a) the narrowness in existing channels to convert organizational knowledge from its source (either experts, documents, or transactions); (b) slow speed of acquisition due to a delay between the creation of the knowledge (or the underlying data) and when the acquired knowledge becomes available for sharing; (c) inaccuracy in the captured tacit knowledge due to errors in acquiring and "tacit to explicit" transferring processes; and (d) maintenance overhead due to size of knowledge base (Wagner, 2000; Waterman, 1986). Hence, unlike capturing explicit knowledge, capturing tacit knowledge raises a

challenge that current KM has yet to address adequately, and this remains a problem (Wagner, 2000, 2006).

1.2.2 Knowledge Sharing and Collaboration

Grant (1996) defined *knowledge sharing* as a process of strengthening organizational effectiveness by maximizing the utilization of knowledge shared by organization members. Chakravarthy et al. (1999) viewed knowledge sharing as a necessary process of a work unit in an organization to access useful knowledge of other work units to improve o rganizational effectiveness. Others consider knowledge sharing very important for collaborative projects (Fedor et al., 2003). For example, multiple engineers working collaboratively on a project might need to collaborate on design development and project documentation. In that scenario, an effective collaboration requires all stakeholders, including engineers, project managers, designers and test teams, to view, comment on, and edit, as well as introduce more data as needed. Such an exercise requires knowledge sharing, the necessary information, and the cooperation of all group members working interactively to reach the goals of the project. Rich collaborative interaction and knowledge sharing remain critical for the success of collaborative processes where the efficacy of the exchange of ideas and information affects the quality of the result (Kang et al., 2008). Knowledge sharing for collaboration goes beyond simple transfer of new knowledge as an object like a physical, tangible product. Knowledge sharing remains challenging in the area of KM because knowledge

sharing in such a broader concept—one that emphasizes the necessity of social interaction for knowledge exchange—has not yet been achieved (Kang et al., 2008).

1.2.3 Facilitating Innovation

Thinking resides at the heart of innovation, and promoting innovation requires more than just sharing information (McDermott, 1999). Effective KM should promote innovation by encouraging the development of tacit knowledge for problem solving (Barlow, 2000). Hence, KM not only facilitates information sharing but also provides a platform where required development of knowledge for innovation can happen through "collaborative thinking" (McDermott, 1999). While current KM has achieved reasonable success in providing static knowledge, facilitating the evolution of knowledge through "collaborative thinking" of the participants remains a challenge.

1.2 Knowledge Management and Web 2.0

While knowledge management (KM) is not about technology, technology plays an important role in KM, as it facilitates the process of capturing, representing, and exchanging knowledge (Al-Hawamdeh, 2002). KM tools are technologies that enhance and enable knowledge acquisition, codification, transfer and realization (Ruggles, 1997). Currently, organizations utilize Internet-based technologies as KM tools to manage organizational knowledge. A new generation of Internet-based collaborative tools, commonly known as *Web 2.0*, has increased in popularity, availability, and power in the last few years (Kane and Fichman, 2009). Web 2.0 is a set of Internet-based applications

that harness network effects by facilitating collaborative and participative computing (O'Reilly,2006).Web 2.0 has the potential to deliver rich peer-to-peer interactions among users, enable collaborative value creation across business partners, and create dynamic new services and business models(Ganesh and Padmanabhuni, 2007). Web 2.0 technologies include *Wikis*, *blogs*, *RSS*, *aggregation*, *mash-ups*, *audio blogging and podcasting*, *tagging and social bookmarking*, *multimedia sharing*, and *social networking*. Ensuring a rich user experience is a critical aspect of Web 2.0, and plays an important role in encouraging collaborative information exchange; Web 2.0 attracts a large number of participants by enabling rich interactions between users. These interactions have a significant impact on customer-driven innovation, maintaining market orientation, addressing customer concerns, and the development of the product-service mix (Eccleston and Griseri, 2008). Web 2.0 technologies—through rich peer-to-peer user interactions to support collaborative value creation—combine the best elements of traditional KM, such as suitability for business environments, and overcomes many of the limitations, like limited opportunities for simultaneous collaboration (Wagner and Majchrzak, 2006).

Traditional KM tools, such as expert systems, essentially capture the explicit knowledge of a single expert or source of expertise in order to automatically provide conclusions or classifications within a narrow problem domain. This is in stark contrast to the Web 2.0 KM paradigm (Lee and Lan, 2007), which enables knowledge communities to share knowledge of a more practical or experiential nature, to enable individuals and groups to arrive at their own conclusions (Richards, 2009). An effective way to capture

tacit knowledge is to enable knowledge creation through conversation (Von Krogh, 2000). Web 2.0 technology, like Wikis, facilitates such required conversational KM through social interactions (Wagner, 2006).For example, through Wikis, multiple people with different areas of expertise and roles can interact "socially" and work toward a common goal (Mindel and Verma, 2006). Hence, Web 2.0 has great potential to solve one of the great challenges of KM: capturing tacit knowledge and converting it into explicit knowledge (Wagner, 2006). Conceptually, Web 2.0—with its ability to combine traditional KM tools' features with social computing, where knowledge is evolved through social interactions (Parameswaran, 2007)—has been identified as an effective KM paradigm (Fitch, 2007; Mindel and Verma, 2006).With such a capability, Web 2.0 technology has the potential to address many of the KM challenges that organizations face (Minocha and Thomas, 2007; Wagner, 2006).

Realizing this potential for effective KM, a few leading IT organizations have adopted Web 2.0for KM at different levels in the early stages of innovation, while other organizations are considering Web 2.0 for KM. The latter group of organizations is actively seeking information and details about the innovation in order to make their decision about adoption (Jones, 2008). As per the Innovation Diffusion Theory (Rogers, 1964), the organizations in the first group are *early adopters*, and the organizations in the second group are *early majorities*. Through his Innovation Diffusion Theory, Rogers (1964) states that the early majority organizations are in the *persuasion* stage of adoption. Such organizations need information to effectively adopt and implement new technology (Beatty et al., 2001). Hence, like any other technology adoption, organizations that are in

the early majority of adopters of Web 2.0 for KM need information for effective adoption and implementation. However, in the existing literature, there is no clear understanding of how to effectively use Web 2.0 for KM. Rel+ying on the Innovation Diffusion Theory, we believe that the early majority organizations can learn from the early adopters the best ways to effectively adopt and use Web 2.0 for KM; that is, the ways of using Web 2.0 affect traditional KM activities and outcomes on different levels. Hence, in our study, we want to understand the lessons learned by the early adopter organizations and inform the early majority organizations how to effectively adopt Web 2.0 for KM at the individual, project, group, and organization levels. We have derived our research questions based on this goal.

1.3 Research Questions

Our research is guided by the following research questions:

- How do organizations use Web 2.0 technologies for knowledge management at the individual, project, and group levels?
- How does use of Web 2.0 for KM affect individual-, project-, group-, and organization-level outcomes?

We adopt following definitions of individual, group, and project-level KM in our study to conceive the scope and goals of Web 2.0-based KM activities, listed below.

We conceptualize an individual in an organization as a person who works in that organization. Based on this delineation, we describe individual-level, Web 2.0-based KM as KM activities that rely on Web 2.0 to reach and support the individuals in an

organization; these individuals do not necessarily belong to any particular group and/or project. Such individual-level KM can be initiated by the upper management of an organization for all the individuals working in that organization, regardless of group or project. For example, if the upper management of an organization creates a Wiki to help individuals working in that organization learn a new technology or work process, then, according to our conceptualization, the organization has adopted a KM initiative that are categorized as an individual-level KM. In our framework, individual-level, Web 2.0-based KM also includes Web 2.0-based KM activities, initiated by any individual within an organization, for others working in that organization, regardless of being part of any particular group or project. For example, if an individual working in an organization creates and maintains blog(s) to share his knowledge with everyone working in that organization, according to our conceptualization, this KM initiative is categorized as an individual-level KM.

We define *a project* as a series of activities and tasks that (a) have a specific objective to be completed within certain performance specifications (e.g., cost, quality, or schedule), (b) have limited resources (e.g., time or personnel), (c) have defined start and end dates, (d) have a project manager and a project team with the authority and responsibility for accomplishing the project objectives, and (e) have knowledge needs (Kerzner, 2005). Based on this definition, we describe project-level, Web 2.0-based KM as Web 2.0-based KM activities to manage the knowledge required in a project. This includes the generation, codification, transfer, and realization of the knowledge needed for a project.

We define *a group* as a collection of individuals who have regular contact and frequent interaction, mutual influence, a common feeling of camaraderie, and who work together to achieve a common set of goals (Business Directory, 2009). Based on this definition, we describe group-level, Web 2.0-based KM as Web 2.0-based KM activities to manage knowledge for a group; that is, the generation, codification, transfer, and realization of knowledge required by a group. It is important to note that, in our conceptualization of *project* and *group*, there is a "many-to-many" relationship between them. That is to say that a group could work on more than one project. On the other hand, there could be projects where more than one group is participating.

An *organization* is a group of people intentionally organized to accomplish a common set of explicit and/or implicit goals (McNamara, 1998). We conceptualize that an organization consists of individuals, projects, and groups. As all the KM activities reside within the organization, any KM activity at the individual, project or group level that affects individual-, project-, or group-level outcomes affect an organization's overall outcome. We essentially capture that notion in our framework.

1.4. Research Approach

Our research approach has three major phases. Figure 1shows the steps of our research.

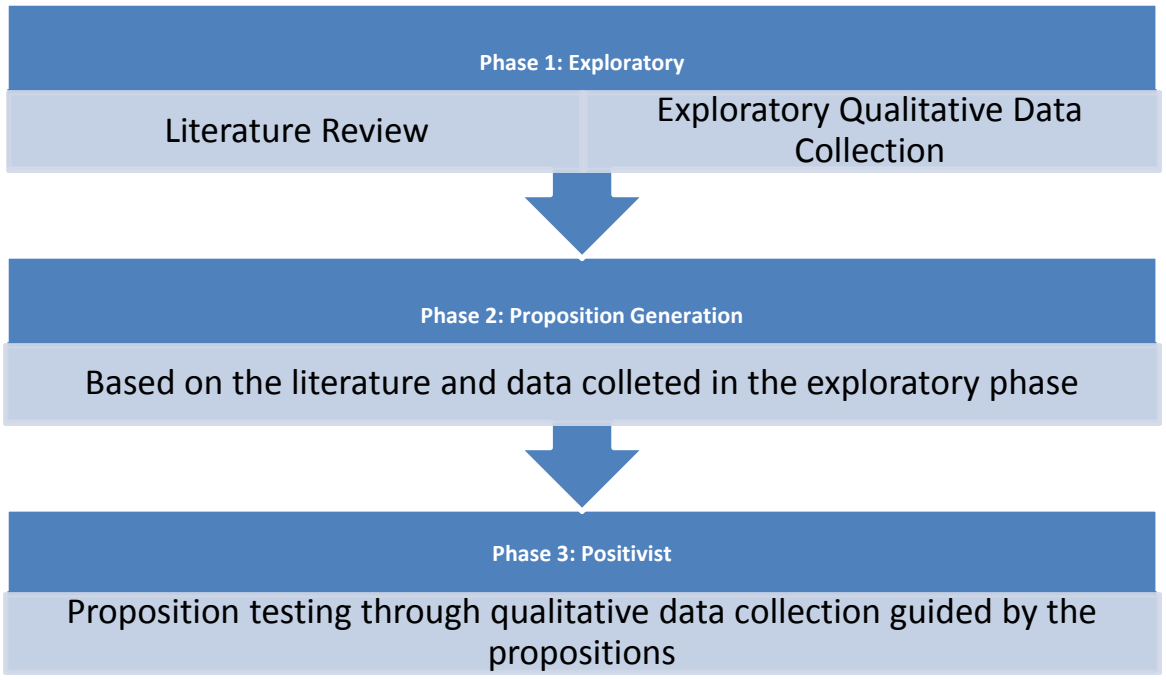

Figure 1: Research approach

There is a dearth of existing research theory on the use of Web 2.0 technology in the KM literature at the organizational, project, group, and individual levels. Ideally, case study research designs are appropriate for "how" and "why" questions. Hence, in the first phase of our research we adopt an interpretive, exploratory case study strategy to identify and understand *how* organizations are using Web 2.0 technology for KM at different levels, together with the contexts, mechanisms, and effects associated with those uses. We follow the guideline suggested by Eisenhardt (1989) in the Phase1 exploratory stage. In accordance with these guidelines, we have a strong foundation in the existing KM literature to conduct the exploratory case study, and to identify and understand the uses and effects of Web 2.0-facilitated KM at the individual, project, group, and organization levels.

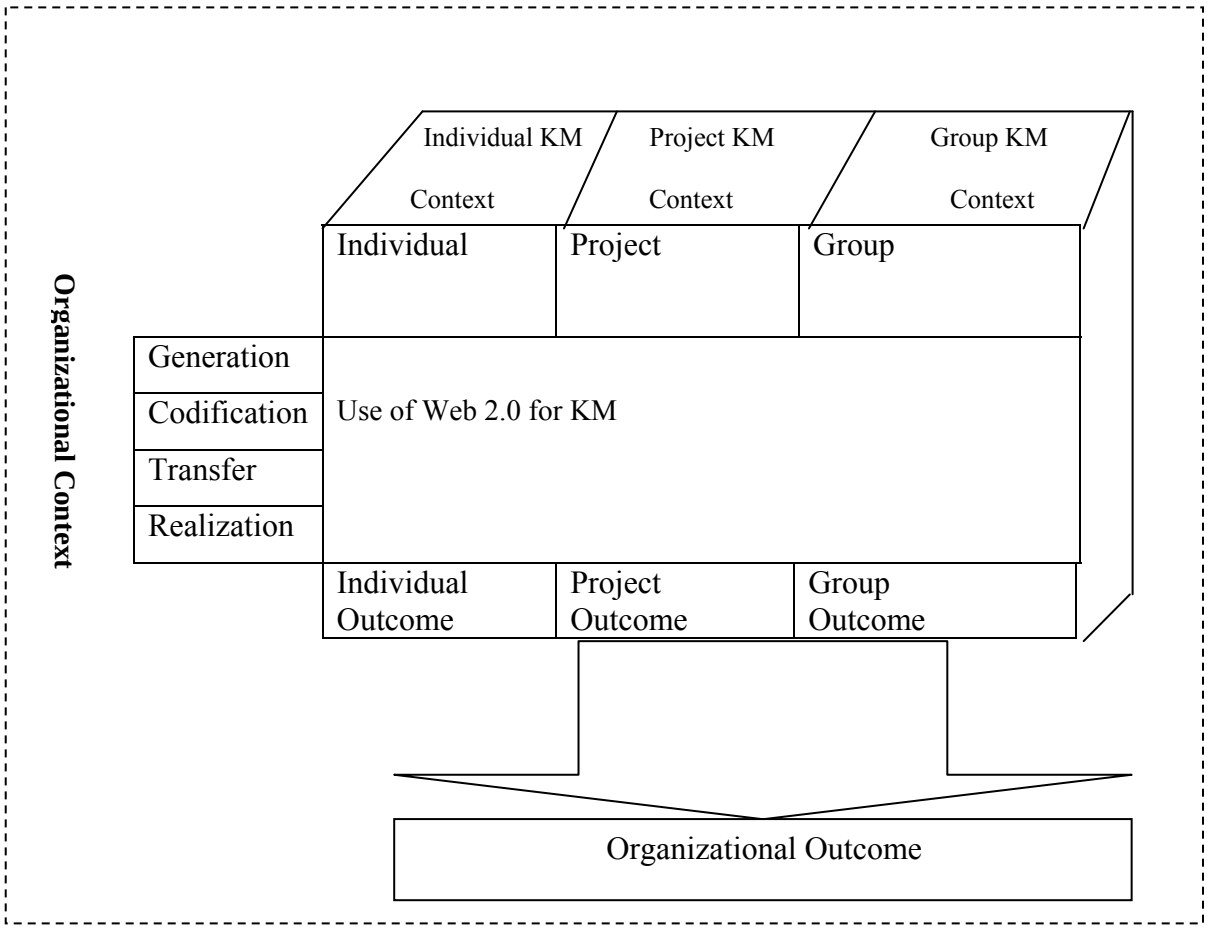

Figure 2: Research framework

We develop our research framework (shown in Figure 2) by adapting the pragmatic framework for KM research proposed by Grover and Davenport (2001). This framework serves as the theoretical guideline required in our case study. Since the first phase of our research is exploratory, this framework helps us to theoretically identify different aspects that need to be explored and understood in order to study KM. This framework differentiates between scopes of KM activities, such as individuals, groups, and projects. This differentiation is required in our case study, since we are interested in studying the uses and effects of Web 2.0 technology on all of these levels.

As proposed in Grover and Davenport's (2001) framework, our research framework identifies and differentiates between KM activities: generation, codification, transfer, and realization. Each of these activities poses unique challenges in different scopes of KM. To study the use and effectiveness of a KM tool, we need to study the tool within the scope of different KM activities.

In Grover and Davenport's (2001) framework, another dimension is *KM context*. Grover and Davenport (2001) conceptualize *KM context* as the surrounding environment—consisting of technology, culture, structure, and strategy—where KM activities are embedded. All KM activities reside in a duality with the context; that is, KM activities influence the context and are influenced by the context (Grover and Davenport, 2001). Hence, it is important to understand the context of KM, including the structure of the organization, group, or project that we are studying; the technology infrastructure associated with the KM; the KM culture; and the strategic position of KM within the KM scope. For example, when we study the use of Web 2.0 for organizational KM and its effects, we identify and understand different aspects of an organization, such as the organization's structure, culture, and technology infrastructure. This allows us to identify in the organizational context where certain uses of Web 2.0 for organizational KM are effective. Likewise, while studying the use of Web 2.0 for group KM, we understand group KM contexts, such as the group structure (Gold et al., 2001). For projects, we understand the project contexts, such as the project team's characteristics (Gibson et al., 2003).

In our study, by taking these contextual dimensions into account, we understand their role in, and influence on,the effective use of Web 2.0 for KM, such as how these contextual variables affect the outcome of using Web 2.0 for KM at different levels. Through this we are able to identify the current uses of Web 2.0 technology at the different levels we are studying, within the appropriate context, and with the accompanying effects.

In our case study research, we adopt an exploratory approach in Phase1 to identify and understand the use of Web 2.0 for KM, then implement a qualitative approach to draw and test our conclusions in the later stages.

In Phase 1 (the exploratory stage) of the research, we investigate and identify how Web 2.0 is in use for KM at the individual, project, and group levels. This exploration is guided by the framework (shown in Figure2) that we developed, based on the extant literature.

In the Phase 2, based on the existing literature on KM and our findings in the exploratory stage of the study, we propose a set of propositions. These propositions signify the relationship between the use of Web 2.0 in KM in different stages of KM and its effect on the organization, group, project, and individual levels.

In Phase 3 of this research, we adopt a qualitative positivist case study based interpretive research approach to confirm the relationships between the use of Web 2.0 technology and KM, and its effectiveness. Our approach essentially helps us to examine the proposed relationships as well as identify noteworthy interesting aspects pertinent to

the propositions through interpretation of the qualitative data. To ensure the rigor of phase 3, we adopt the guidelines suggested by Dube and Pare (2003) and Shanks (2003).

The finding from Phase 1 answers our first research question by providing real-life examples of the use of Web 2.0 in organizations at the individual, project, and group levels. Through Phase 2 and Phase 3 of our research we address our second research question by empirically examining the relationship between the uses of Web 2.0 for KM and different individual-, project-, group-, and organization-level outcome variables.

In selecting the companies to study, we take into consideration two major aspects. First, the chosen organizations have been using Web 2.0 technologies for KM for more than two years, so that we can study their effects on different aspects. Second, for practical reasons, the organization has to provide, and allow us to use, the required resources for conducting our intended case study. Based on these two criteria, we include three leading IT industry firms, with multiple projects and groups in each firm in our case study. The principal data collection method is face-to-face, semi-structured interviews with individuals at different levels—including, but not limited to, the managerial level—in these organizations.

1.5. Research Outcome

Despite the widespread popularity of Web 2.0 tools at the consumer level, it is still not well-understood how Web 2.0 can be effectively managed by enterprises for KM. Using a multiple-case research design, our research addresses this critical gap in the literature. We provide examples of the effective use of Web 2.0 for KM at the individual, project,

and group levels. All three organizations in our study are technology-focused and use Web 2.0 technology for KM in innovative ways. Our findings highlight innovative and effective uses of Web 2.0 in KM at the individual, project, and group level in those organizations. Through our exploratory case study we also identify and reported the lessons learned by organizations that have adopted and utilized Web 2.0 for KM. We believe that this information would be very helpful for organizations that are planning to adopt Web 2.0 for their KM at different levels.

Through our research, we also examine the relationship between the uses of Web 2.0 for KM and different outcome variables at the individual, project, group, and organizational level.

In addition, we also study the effects of KM context and understand the context of KM as it allows identification of the KM context where certain uses of Web 2.0 KM are effective. As there is lack of such study in the extant literature, our research addresses this gap in the literature by empirically examining the effects of KM context variables on the effectiveness of Web 2.0 for KM at different levels. As there is dearth of theory based and rigorous research on Web 2.0 based KM, especially in organizational setups, we believe that our findings address the gap in the academic literature as well as help different organizations to adopt Web 2.0 for KM effectively at different levels.

Usually, managerial advice, such as the need for user and management buy-in, is common across all levels of technology adoption. However, Web 2.0 tools present fundamentally new management challenges, such as ensuring the participation of the members and effectively controlling the flow of information. Guidelines to address those

challenges are currently missing in the extant literature. Our research addresses this gap by identifying patterns of effective Web 2.0 use for KM across these cases. With these findings from the companies that have implemented Web 2.0 for KM for longer periods of time, we provide recommendations to IS managers. We believe that these recommendations—along with examples of the best practices for adopting and using Web 2.0 technology at the individual, project, group, and organizational levels—will help managers to more effectively deploy Web 2.0 technology for KM in their work domain.

This dissertation has eight chapters. The first chapter introduces the topic of the dissertation and depicts its importance in the context of current technology and business environments, together with the research approach. This chapter first presents the motivation for the proposed research, briefly lays out the theoretical foundation for the research development, presents the research questions, and outlines the research approach addressing the research questions.

In the second chapter, we provide an extensive review of the extant research on KM, drawing from literature on Information Systems, education, marketing, and management.

In the third chapter, we provide an in-depth description of different Web 2.0 technologies with their features, followed by a review of the current literature on Web 2.0 in KM.

In the fourth chapter, we present our research approach to address the research questions. This essentially requires us to describe why we adopt two different research epistemologies—exploratory and positivist—in our research.

In the fifth chapter, we describe the research methodology for the exploratory part of our research and the findings of the exploratory case study.

In the sixth chapter, based on the extant literature and the findings of the exploratory case study, we develop a set of propositions that essentially highlights the relationship between the use of Web 2.0 in KM in different stages of KM, and its effect on organizational, group, project, and individual levels.

In the seventh chapter, we provide details of the positivist phase of our research, with the data collection and analysis process, as well as different steps to make this research process rigorous, by following the guidelines provided by Eisenhardt(1989) and Dube and Pare(2003). In this chapter we also present proposition testing results together with discussion based on the findings.

In the last chapter of the dissertation, we discuss the contribution of research together with limitations and future research plan.

CHAPTER II

LITERATURE REVIEW

Our research question is to examine the effects of Web 2.0 for KM at the individual, project, group, and organizational levels. As suggested by Eisenhardt (1989), we need to have a firm theoretical foundation to guide our exploratory research. There are three objectives of our literature review aimed at achieving the desired theoretical foundation:

1. We review different conceptualizations of KM activities in the extant literature to develop a comprehensive understanding of KM activities and to study the use of Web 2.0 for different KM activities.

2. We want to identify different outcome variables that have been studied in the extant literature as effects of KM at the individual, project, group, and organization levels. In our exploratory case study, we specifically look for the effects of Web 2.0 based KM on these outcome variables together with new ones that we identify in our exploratory case study.

3. KM context, or the surrounding environment of KM activities, plays an important role in the effects and outcomes of the KM (Coakes, 2004; Grover & Davenport, 2001). Hence, to study the effects of KM with the context variables, we identify those variables that have been studied in previous literature. Studying these

contextual variables helps us to understand their role in the use and effect of Web 2.0 for KM at individual, project, group, and organization levels.

Based on these three objectives, we have three major sections in our literature review. We review the different conceptualizations of KM activities that have been studied and then synthesize them in the first section. In the following section, we review the extant literature to identify the KM contextual variables that have been studied to have a comprehensive understanding of KM and its effects. In the last section of this chapter, we conduct a literature review to identify different outcome variables that have been studied as effects of KM at individual, project, group and organizational levels**.**

2.1. Knowledge Management Activities

KM activities have been conceptualized in different ways based on the domain and scope of research (Chen & Chen, 2005). Nonka and Takuchi (1997), identifying the characteristics of knowledge generating organizations, conceived KM activities as creating knowledge, storing knowledge to provide access, disseminating that knowledge, and finally implementing that knowledge to achieve goals. Alavi et al. (1997), in their case study of KM in an organization, came up with a refined and more specific categorization of KM activities consisting of *acquisition* and *indexing* of knowledge, *linking* indexed knowledge after *filter*ing, and then *distribution* of knowledge leading to the *application* of the distributed knowledge. Wiig's (1997) categorization of KM, in his work on KM evolution, is similar to Alavi et al.'s (1997) conceptualization of KM activities. Chen et al.'s (2001) conceptualization of KM activities is also quite similar to

Alavi et al. (1997) where they conceptualized *conversion* of knowledge through "*collaboration"* and "*correction" of* activities. Beckman (1997) had a more refined categorization of KM activities where he conceptualized *application* of knowledge as a sequence of three activities—*applying* the earned knowledge to *create* something (e.g. product) salable and actual s*ale* of the created product. Interestingly, Davenport et al. (1998), in their study of KM in projects, have not considered intermediate steps between knowledge generation and dissemination.

While these conceptualizations are not clearly delineated in the literature, their definitions share overlapping elements. In Table 1, we present the common conceptualization of these KM activities from the literature.

Table 1: Overview Of The Current Conceptualizations Of KM Activities

KM Activity									**Source**
Generation *(KM activities for knowledge acquisition and development*)		Codification *(KM activities for knowledge conversion in accessible and applicable formats)*		Transfer *(KM activities for moving knowledge from the point of generation or codification to the point of use)*	Realization *(KM activities for making use of the available knowledge to generate value)*				Grover & Davenport, 2001
Creation		Conversion		Circulation	Completion				Chen & Chen, 2005
Creation		Storage		Transfer	Application				Alavi et al., 2006
Identify	Capture	Store		Share	Apply	Sell			Chen et al., 2001
Creation				Transfer	Asset Management				Davenport et al., 1998
Create	Maintain	Renew	Organize	Transfer	Realize				Wiig., 1997
Identify	Capture	Select	Store	Share	Apply	Create	Sale		Beckman, 1997
Acquisition	Indexing	Filtering	Linking	Distribution	Application				Alavi, 1997
Creation		Access		Dissemination	Application				Nonaka & Takeuchi, 1995

Grover and Davenport (2001) as well as Chen and Chen (2005) synthesized these conceptualizations of KM activities to define four major KM activities that essentially capture different KM activities that have been defined and studied in the extant literature. In accordance with Grover and Davenport's (2001) conceptualization, our synthesis of KM activities consist of four major activities:

(a) Knowledge Generation: KM activities for knowledge acquisition and development.
(b) Knowledge Codification: KM activities for knowledge conversion in accessible and applicable formats.
(c) Knowledge Transfer: KM activities for moving knowledge from the point of generation or codification to the point of use.
(d) Knowledge Realization: KM activities for making use of the available knowledge to generate value.

Knowledge transfer and realization are the central focus in most individual level KM literature. We found that in most studies, researchers are interested in identifying the factors that affect the KM activities: transfer and realization. For example, to understand individual level knowledge transfer activities, Desouza (2003) studies how tacit knowledge sharing can be increased by providing an informal knowledge sharing environment. Chiu et al. (2006) examine the factors that influence individuals' knowledge sharing in a community. In studying individual level knowledge realization, Oz et al. (1994) study the ways availability of knowledge can increase decision quality. While in our study we focus more on knowledge transfer and realization at the individual

level, we include important aspects of individual level knowledge generation and codification.

In project level KM literature, much research is devoted to developing a comprehensive view of KM activities where all the project level KM activities are studied together. Most of the extant literature has studied different project level KM activities together instead of concentrating on one particular activity (Fedor et al., 2003; Janz & Prasarnphanich, 2003; Mukherjee et al., 1998). For example, Fedor et al. (2003) examine the impact of KM on product and process development in a project where they took into account knowledge generation as well as knowledge dissemination activities. Similar to the trend in the existing literature, we take a comprehensive and inclusive view of KM activities where all the project level KM activities are studied together.

Researchers have studied group level KM activities comprehensively in most cases to understand the effects of KM on group processes and group performance (Bieber et al., 2002). While specific KM tools for specific KM activities has not been the focus of investigation in most of the individual and project level KM studies, GDSS as a KM tool has been studied quite frequently in the group level KM literature with different setups and different goals (Fjermestad & Hiltz, 2001). In accordance with the existing literature, we study group level KM activities comprehensively to understand the effects of KM on group processes and group performance.

We found a similar trend in the organizational level KM literature to the group level. The goals of the studies are quite diverse; they range from developing matrices to measure effective KM (Lee et al., 2005), to understanding the importance of different

organizational capabilities for KM (Gold et al., 2001). Irrespective of the goal, all major KM activities have been taken into account in most of the organizational level KM literature. We also study all of the KM activities within an organization to get an overall picture of Web 2.0 uses for KM and its effects.

2.2 KM Outcome

Based on the goals of their research and scope of KM initiative under examination, researchers have studied different KM outcome variables to understand the effects of KM. In this section, we identify the outcome variables studied in the extant literature at the individual, project, group, and organization levels. In our exploratory research, we specifically identify the effects of Web 2.0 based KM on those outcome variables.

2.2.1 Individual Level

In our literature review, we found individuals' "satisfaction" as the most frequently studied outcome in prior research on individual level KM. Satisfaction has been measured in a variety of ways in the literature. For example, in their study comparing effectiveness of two learning environments, Alavi et al. (2002) use individual satisfaction as an indicator of KM's affect. Janz and Prasarnphanich (2003) study the factors that affect cooperative learning in KM and measure the effectiveness of cooperative learning KM through job satisfaction and personal growth satisfaction. Their results indicate that effective cooperative learning through KM positively affects job

satisfaction as well as growth satisfaction. These studies show that the learning environment and learning procedure play an important role in individual satisfaction. Satisfaction of the individuals with the Web 2.0 facilitated KM is relevant outcome variable in our study too.

KM's effect at the individual level has also been studied in terms of individuals' perceived knowledge gain (Alavi et al., 2002, 2006; Bieber et al., 2002) and their dependence on available knowledge (Kulkarni et al., 2007). An overview of these studies is provided in Table 2.

Desouza (2003) specifically studies the gain of *"tacit"* knowledge in their study determining the effects of *informal* knowledge sharing opportunity on KM. Desouza (2003) found that informal knowledge sharing can effectively facilitate tacit knowledge sharing. Oz et al. (1994) measure how that knowledge affects decision quality rather than measuring "gained knowledge," and Alavi et al. (2006) found that the knowledge gained thorough KM can increase the innovativeness of the individuals working in an organization. Capturing and sharing tacit knowledge is a challenge for KM (Wagner, 2000; Waterman, 1986). Web 2.0 technology through conversational KM has the potential to address this challenge (Wagner, 2006). Hence, it is an important aspect of our research to understand the effects of Web 2.0 facilitated KM in terms of tacit knowledge sharing, perceived knowledge gain of the KM participants, and their performance.

Table 2: Overview Of Individual Level Outcome Variables				
Source	**Outcome Variable Studied**	**Measures**	**Study Description**	**Findings**
Oz et al., 1994	Decision quality	Absolute difference between predetermined correct answer and an individual's response on a scale of 1-5 Time taken to make the decision	Studied how availability of the knowledge of the expert in the organization affects an individual's decision quality	Access to knowledge through expert systems can increase confidence in decisions, not the time taken to make decisions
Alavi et al., 2002, 2006	Learning outcome	New information gain New skill gain	Studied the use of two different learning environments on users' learning experience	Initially, learning is higher through older and less sophisticated KM tools
	Satisfaction	Satisfaction with the learning		Newer and sophisticated KM tool initially increases cognitive load of the individuals
Desouza, 2003	Tacit knowledge sharing	Subjective judgment of "gained knowledge" by the interviewee	An in-depth case study to determine the role played by informal interactions in the exchange of tacit knowledge	Informal interaction can increase tacit knowledge sharing
Janz & Prasarnphanich, 2003	Work satisfaction	General job satisfaction Growth satisfaction	Studied the organizational factors that affect cooperative learning	Empirically proved that cooperative learning can increase job and growth satisfaction
Kulkarni et al., 2007	KM satisfaction	Availability of useful knowledge Easy access to the knowledge	Theoretical development and empirical validation of a KM success model	Empirically proved the importance of KM satisfaction in KM success
	Use of knowledge	Relying on the shared knowledge Using the shared knowledge as an integral part of workflow		Empirically proved the importance of knowledge use for KM success

Verkasalo & Lappalainen, 1998	Knowledge utilization	Efficiency index for knowledge utilization measured through the following: Process width = number of employees reached Process delay = time taken to spread / distribute Process effort = time to document, distribute	Study to determine the effectiveness of knowledge transfer activities	Effective knowledge transfer can increase knowledge utilization
Chiu et al., 2006	Individuals' outcome expectations	Developing friendship Developing reputation satisfaction from accomplishment Gain better cooperation from the outstanding members in the virtual community Strengthen the tie between members	Integrates the Social Cognitive Theory and the Social Capital Theory to construct a model for investigating the motivations behind people's knowledge sharing in virtual communities	All the individual outcome expectations positively affect quality and quantity of peoples' shared knowledge in a community

In their study investigating the factors that influence knowledge sharing in a community, Chiu et al. (2006) study individual level outcome variables such as developing friendship, developing reputation, gaining better cooperation from the outstanding members in the virtual community, and strengthening ties with other members of the community. Chiu et al. (2006) articulate that these factors would motivate a person to share knowledge in a knowledge sharing community as these outcomes can be achieved through active participation in KM activities. Web 2.0 based KM essentially creates a community for the individuals to share knowledge. Therefore, we believe that the set of individual level outcome variables identified by Chiu et al. (2006) are pertinent to our study.

These aforementioned outcome variables are mostly subjective measures. Verkasalo and Lappalainen (1998) empirically identify objective measures such as the number of individuals reached through a KM initiative, time taken to prepare the knowledge for dissemination, and time taken to reach those individuals after dissemination, to measure the effectiveness of KM at the individual level. Web 2.0 technologies essentially provide a new way of reaching individuals within an organization. Hence, we believe it would be relevant to our study to identify the effects of Web 2.0 for KM on the time and effort required for knowledge dissemination.

2.2.2 Project Level

Existing studies have assessed the effects of KM on projects in two major ways: the project output's success (Fedor et al., 2003) and team performance (Janz & Prasarnphanich, 2003). Both have been measured in the same study too (Akgu¨n et al., 2005). An overview of these studies has been provided in Table 3. One criterion that has been used to determine a project's success is goal achievement (Akgu¨n et al., 2005; Fedor et al., 2003). For example, Akgu¨n et al. (2005), in their study to identify the antecedents of creating an effective transactive memory for projects' KM, measured the effects of KM in terms of success of the new product created in a project using financial indicators (e.g., Return On Investment (ROI)) and non-financial indicators (e.g., satisfaction of management and customers with the new product). They found that KM positively influenced product success. Effects of KM on a project have also been measured in terms of project completion time (Mitchell, 2006). Specifically, Mitchell

(2006) found that effective KM can reduce delays and help to finish a project as per schedule.

Table 3: Overview Of Project Level Outcome Variables				
Source	**Outcome Variable Studied**	**Measures**	**Study Description**	**Findings**
Fedor et al., 2003	Project success	Goal achievement Team performance Satisfaction with individual performance Satisfaction with project outcome Exceeding initial expectations of the project	Studied the impact of KM on team member's perspective on product and process development in a project	Effective knowledge generation and dissemination positively impact team members' perception of project success
	Expected impact	Positive impact on the later projects Positive impact on the organization Transfer of "lessons learned"		Effective KM positively impacts team members' perception of expected impact of project(s)
Mitchell, 2006	Project completion time	Comparison between expected project completion time and actual project completion time	Studied the impact of existing knowledge integration capability on IT projects	Effective KM can reduce project completion time
Janz & Prasarnphanich, 2003	Project team performance	Efficiency (adherence to budget, amount of work operation) Effectiveness (ability	Studied antecedents of effective KM	Effective KM positively affects different aspects of project team

Table 3: Overview Of Project Level Outcome Variables				
Source	**Outcome Variable Studied**	**Measures**	**Study Description**	**Findings**
		to meet the goals, communication with people outside group, quality of the work the team produces) Timeliness (adherence to schedule, ability to produce quality work in less time, meeting the goals in less time)		performance
Mukherjee et al., 1998	Project performance	Goal achievement	Studied the effect of Total Quality Management (TQM) on KM	Use of TQM in KM can positively affect project performance
Akgu¨n et al., 2005	New product success	Met the expected sales Met the expected ROI Met the expected profit Met the market share expectation Met the management's expectations Met the customers' expectations	Identified the antecedents of creating transactive memory and its effect on the project outcome	An effective transactive memory can positively affect new product's success
	Team learning	Team doing a better job of identifying customers' dissatisfaction Team doing a better		An effective transactive memory can positively affect a project

Table 3: Overview Of Project Level Outcome Variables				
Source	**Outcome Variable Studied**	**Measures**	**Study Description**	**Findings**
	Speed to market	job of correcting the problems related to customers' dissatisfaction		team's learning
		Met the expected completion time of the project to create the product Met the expected launch time of the product Met the management's expected time frame for the project to develop the product		An effective transactive memory can positively affect *speed to market*

KM's effect on projects has also been studied in terms of performance of a project team, measured in terms of efficiency (i.e. the efficiency of team's operation), effectiveness (i.e. quality of the work a team produces) and timeliness (i.e. a team's adherence to schedule) (Janz & Prasarnphanich, 2003). Effects of KM on a project team's performance have also focused on a team's learning measured by the extent to which KM has helped a team gain knowledge to improve performance (Janz & Prasarnphanich, 2003); and how much of that knowledge has been transferred to later projects (Akgu¨n et al., 2005). Both studies found a positive influence of KM on dependent variables establishing the importance of KM for projects.

Gold et al. (2001) argue that objective measures such as financial indicators are significantly confounded by many uncontrollable business, economic, and environmental factors. Hence, using measures less confounded by uncontrollable factors will provide a clearer insight into the value-added aspect of KM capability. In this research, we are interested in learning how Web 2.0 facilitated KM affects a project team's performance in terms of efficiency, efficacy, timeliness and team learning, as well as KM's affect on the project's success.

2.2.3 Group Level

Much group level KM literature studies the effect of KM on group processes. Table 4 presents an overview of group level KM outcome variables.

Table 4: Overview Of Group Level Outcome Variables

Source	Outcome Variable Studied	Measures	Study Description	Findings
Kanawattanaet al., 2007	Performance in a game designed to study group performance	Stock price	Studied the importance of knowledge coordination on a virtual team's performance	Knowledge coordination can increase virtual teams' performance
Robert et al., 2008	Decision quality	Objective measure developed exclusively for the study	Studied the effect of social capital and knowledge integration on teams	ive ation of ledge can se decision y
Bieber et al., 2002	Use of available resources	Number of repeat visit, relying on the resource	Studied the use of a digital library in a virtual community and	Hypothesized that the digital library

Table 4: Overview Of Group Level Outcome Variables				
Source	**Outcome Variable Studied**	**Measures**	**Study Description**	**Findings**
	Promoting collaboration among community members New role creation and more active participation Higher critical mass	Number of sharable artifacts created	knowledge evolution	will positively affect all the outcome variables
		Analysis of roles and artifacts created		
		Higher minimum number of people to be available for the solving of various problems (Licklider, 1968)		
Easley et al., 2003	Group work quality	Team Work Quality Metrics (communication, coordination, cohesion, balance of contribution, support, effort) developed by Hoegl and Gemuerrden (2001)	Studied the effects of collaborative tool on group performance	Collaborative tool positively affects group work quality
	Group performance in decision making Group performance in creative work	Grade earned Grade earned		
Fjermestad & Hiltz, 2001	Effectiveness of group and group processes	Flexibility in group process Enriched	Summarized the effects of GDSS on groups and found in the extant	GDSS affects all the mentioned

Table 4: Overview Of Group Level Outcome Variables				
Source	**Outcome Variable Studied**	**Measures**	**Study Description**	**Findings**
		communication Improved focus of the group members Increased number of ideas Reduced work stress of the group members Active participation in KM Increased information exchange between group members Increased a group's ability to deal with a task Increased cohesiveness among group members	GDSS literature	aspects positively to different extent
Becerra-Fernandez & Sabherwal, 2001	KM satisfaction	Availability of necessary knowledge Effect of KM on group effectiveness Increased knowledge sharing	Studied the effectiveness of KM processes	Effective KM positively affects satisfaction of the group members with KM
Thomas-Hunt et al., 2003	Unique knowledge contribution/sharing by the group members	Amount of unique knowledge contributed	Investigated the effects of social status and perceived expertise on the emphasis of unique and	Social status and expertise of a group member positively affects

Table 4: Overview Of Group Level Outcome Variables				
Source	**Outcome Variable Studied**	**Measures**	**Study Description**	**Findings**
			shared knowledge within functionally heterogeneous groups	his/her knowledge sharing
Alavi et al., 2006	Collaboration among group members	Expansion of group knowledge base Effective knowledge sharing and reuse	Studied the effects of organizational culture on KM outcome	Organizational cultures that promote KM increase collaboration among group members

While most of the extant research examines the effects of KM and the use of collaborative tools for KM on group processes, some studies have investigated KM's impact at the group level by measuring the group's performance using group performance indicators (Easely et al., 2003; Kanawattanachai & Yoo, 2007; Robert et al., 2008). Bieber et al. (2002) study a collaboration tool -*"enhanced digital library"*. The features of this tool include computer-mediated communications, community process support, decision support, dynamic hypermedia, and conceptual knowledge structures. They asserted that such collaboration tool based KM should positively affect different aspects of a group such as increased collaboration among group members, more active participation of group members in KM, creation of new roles in the group, and the availability of a number of people to solve a problem.. Like this collaborative KM technology, Web 2.0 tool such as Wikihas the ability to provide an online knowledge

repository to facilitate knowledge sharing and collaboration. Hence, we believe the group level outcome variables studied by Bieber et al. (2002) are pertinent to our study.

Knowledge is an important factor in group decision- making. GDSS is used by organizations as collaborative KM tool to provide knowledge required for group decision-making (Hsia et al., 2006). Fjermestad and Hiltz (2001) review the effects of GDSS in the literature and identify increased participation and collaboration as effects of using GDSS at the group level. Alavi et al. (2006) in their study of KM culture and effective KM, also found that effective KM can increase group collaboration which is reflected in the expansion of a group's knowledge base and more effective knowledge reuse. Web 2.0 technology, like GDSS, has features such as simultaneous information sharing that facilitates collaboration among group members but in a rather asynchronous way (Hsia et al., 2006). We believe that it would be useful to examine the effects of Web 2.0 facilitated KM on outcome variables that have been studied to understand the effects of GDSS as a collaborative tool.

2.2.4 Organizational Level

Effects of KM on organizations are frequently measured in terms of organizational performance. Objective measures such as different financial performance indicators (Alavi & Leidner, 1999; Lee et al., 2005; Tanriverdi, 2005), as well as subjective measures such as identifying opportunity, coordination between different units, reducing redundancy and process streamlining (Gold et al., 2001), better service for the customers, increased customer focus (Alavi & Leidner, 1999) are used to study the

effects of KM on the overall organizational performance. Studies found that KM has a positive effect on multiple aspects of an organization's performance. These confirm the importance of KM for an organization.

Table 5: Overview Of Organization Level Outcome Variables

Source	Outcome Variable Studied	Measures	Study Description	Findings
Yli-Renko et al., 2001	Organization's efficiency	Technological distinctiveness New product development Lower sales cost	Studied effect of social capital on external knowledge acquisition and exploitation in young technology based firms	Effective knowledge acquisition positively affects all the measured aspects
Lee et al., 2005	Organization's financial performance	Stock price Price earnings ratio (PER), R&D expenditure	Developed a metric for KM performance and studied KM's effect on an organization's financial performance	Found a strong positive relationship between KM performance and financial performance
Tanriverdi, 2005	Organization's financial performance	Tobin's Q	Studied the relationship between KM capability and firms' financial performance	Found a positive relationship between KM capability and financial performance
Gold et al., 2001	Organization's effectiveness	Innovation and commercialization Better coordination between different business units	Studied different issues associated with the effective KM from the perspective of organizational capabilities	KM capabilities positively affect organizations' effectiveness

Table 5: Overview Of Organization Level Outcome Variables				
Source	**Outcome Variable Studied**	**Measures**	**Study Description**	**Findings**
		Effective anticipation and identification of opportunities Speed and faster adaptation to market Less redundancy and streamlining		
Alavi & Leidner,1999	Organizational performance	Greater profit Increased sales Better service Increased focus on customer needs	Studied the benefits gained by 50 organizations who were doing formal KM	Most found KM positively affecting organizational performance
Chuang, 2004	Competitive advantage	Innovativeness Better market positioning Mass customization Developing difficult to duplicate features	Studied the effect of KM resources on organizations' competitive advantage	KM resources can provide organizations with competitive advantage

Chuang (2004) examines competitive advantage as the outcome variable at an organization level and uses the innovativeness of an organization as an indicator of competitiveness. Other studies (Gold et al., 2001, Yli-Renko et al., 2001) also identify innovativeness as an indicator of KM's effect at the organization level and found a positive relationship. Together with innovativeness, Chuang (2004) also studies the

capability of engaging in mass customization, market positioning, and creating products and/or processes that are difficult to duplicate, as measures of competitive advantage that an organization gains through KM. Similarly, Gold et al. (2001) and Yli-Renko et al. (2001) consider innovativeness as an indicator of organizational effectiveness, together with other indicators such as better coordination between different business units, effective anticipation and identification of opportunities, faster adaptation to market, less redundancy, and lower sales costs. These studies conclude that an organization's KM ability affects these organizational level outcomes. Since the use of Web 2.0 for KM adds a new capability to an organization's existing KM, the effect of this additional KM capability on an organization's performance, effectiveness, and competitiveness become important dimensions to study.

2.3 KM Context

KM is not a technology-driven 'fix'. The surrounding environment where KM activities are embedded, including social and cultural elements of the organization, plays an important role in the outcome of KM (Coakes, 2004). Grover and Davenport (2001) conceptualize the KM context as comprised of technology infrastructure, KM culture, organizational structure, and strategy. All KM activities reside in duality with the context; that is, KM activities influence the context and are influenced by the context (Grover & Davenport, 2001). Hence, it is important to understand the context of KM, including the structure of the organization, group, and project we are studying, the technology infrastructure associated with the KM, the KM culture, and the strategic position of KM

in the organization. For example, when we study the use and effects of Web 2.0 for organizational KM, we need to identify and understand different aspects of an organization such as organizational structure, culture, and technology infrastructure. This allows us to identify the organizational context where use of Web 2.0 for organizational KM is effective. Similarly, while studying the use of Web 2.0 for group KM, we need to understand the group KM context, such as group structure (Gold et al., 2001), and for projects we need to understand project context, such as the project team characteristics (Gibson, 2003). In our study, we consider these contextual dimensions in studying the effective use of Web 2.0 for KM. We identify the current use and effect of Web 2.0 technology in the projects, groups, and organizations we are studying within its context. In the following sections, we review the KM literature to identify the contextual variables at different levels to guide our exploratory case study and the overall research.

2.3.1 Individual Level

Our literature review identifies two very distinct types of contextual variables that are studied at the individual level. The first type of contextual variable essentially captures different characteristics of an individual participating in KM, such as an individual's expertise (Thomas-Hunt et al., 2003). The second type captures an individual's surrounding environment, such as immediate coworkers' support to participate actively in a KM initiative (Kulkarni et al., 2007). In addition to expertise, an individual's social status (Thomas-Hunt et al., 2003) and his/her identification with the community and/or organization (Chiu et al., 2006) have been studied as contextual

variables to understand the relationships between individuals and the effects of KM. These aspects of understanding a participant of KM activity are applicable to Web 2.0 facilitated KM. These dimensions of a person help us to understand behavior, response, and participation in Web 2.0 facilitated KM environments. As there are different Web 2.0 based KM activities (e.g., maintaining one's own blog or contributing to a Wiki page) that can be considered "at will", the KM activities of individuals, individual level dimensions (e.g., social status of a person or his/her expertise) become even more important variables to be studied as individual level context variables in Web 2.0 based KM. In addition, to understand the surrounding KM environment of an individual, Kulkarni et al. (2007) studied organizational support for participating in KM using supervisor and coworkers' support for KM, KM leadership, and incentives for participating in KM, and found a positive relationship between them. There are different activities in Web 2.0 based KM activities that are not mandatory and encouragement, incentives, and recognition for participating can play an important role in individuals' participation in such activities. Hence, we consider these important contextual variables at individual level KM.

Table 6: Overview Of Individual Level Contextual Variables

Source	Context Variable Studied	Variable Description	Findings
Kulkarni et al., 2007	Incentive	Incentive refers to formal appraisal and recognition of efforts by knowledge workers for furthering knowledge sharing and reuse.	All the mentioned context variables significantly affect KM's success
	Immediate co-workers' and supervisor's	Supervisor and coworker support is a subjective measure of the extent of	

Table 6: Overview Of Individual Level Contextual Variables			
Source	**Context Variable Studied**	**Variable Description**	**Findings**
	support	encouragement provided to and experienced by a knowledge worker in sharing/using solutions to work-related problems, openness of communication, opportunity for face-to-face and electronic meetings to share/use knowledge, and so on.	
	Leadership	Leadership is a subjective measure of commitment to KM by the top levels of management, exhibited via understanding of the role of KM in business, strategy, and goals set with respect to KM.	
Thomas-Hunt et al., 2003	Social status in the network of an individual	The extent to which a person is connected to other members of community and/or organization	
	Expertise of an individual	The level of expertise of a person on the subject matter	

2.3.2 Project Level

Our literature review reveals a lack of consensus among contextual variables studied to explain KM's impact on projects. Based on the scope and the interest of the study, different contextual variables have been studied. We found team characteristics to be the most frequently studied contextual variable in project level KM studies, however,

the studies examine different characteristics of the team. For example, in their study identifying the antecedents of project team members' knowledge network, Hoegl et al. (2003) considered project team size; Akgu¨n et al. (2005) project team members' proximity, familiarity, and interpersonal trust level and Fedor et al. (2003) examine team leader's ownership of KM initiatives as contextual variables at the project level. As these team characteristic variables are not specific to any particular project's KM activity or technology, we believe these contextual variables may play a role in any project level KM initiative, including Web 2.0 based initiatives. Project type (inventing vs. upgrading) (Hoegl et al., 2003), and organizational support for KM at the project level (Fedor et al., 2003) have also been studied as project level KM context variables. These variables are applicable to any project and are considered Web 2.0 based project level KM context variables in our study.

Table 7: Overview Of Project Level Contextual Variables

Source	Context Variable Studied	Variable Description	Findings
Fedor et al., 2003	Team leadership	Extent to which the team leader is able to provide a common vision to the team members while simultaneously providing a team environment for open communication	Plays an important role in project success
	Organizational support	Level of required resource and training provided to a project team by the organization	Plays an important role in project success

Table 7: Overview Of Project Level Contextual Variables			
Source	**Context Variable Studied**	**Variable Description**	**Findings**
Akgu¨n et al., 2005	Team members' proximity	Average physical distance between team members' locations	Other then team members' proximity, other context variables are found to have significant effect on creating a transactive memory system for projects, which, in turn, affects project success
	Team members' familiarity	The degree of prior interaction between group members	
	Team stability	Project managers and team members are on the team remained on it from pre-prototype through launch	
	Team trust	Average level of trust in team members that exist among team members	
Hoegl et al., 2003	Project team size	Number of members in each project team	Does not affect knowledge network significantly
	Project type	Inventing new product vs upgrading	Affects knowledge network significantly

2.3.3 Group Level

The organizational KM culture affects the KM outcome of any group within the organization (Alavi et al., 2006). In addition, specific group characteristics have been studied as KM contextual variables at the group level. For example, Robert et al., (2008) study group size while (Becerra- Fernandez & Sabherwal, 2001) examine the nature of tasks a group handles as group level contextual variables.

Table 8: Overview Of Group Level Contextual Variables			
Source	**Context Variable Studied**	**Variable Description**	**Findings**
Robert et al., 2008	Group size Social capital	Number of members in each group Relational capital: nature and quality of the relationships among group members (Nahapiet & Ghoshal 1998) Cognitive capital: the extent to which members share a common understanding about their group work and/or task (Mathieu et al., 2000). Structural capital: exiting level of social interactions between group members as well as the number of intermediaries in the communications ((Rulke & Galaskiewicz, 2000).	Found to have no affect on decision quality Found to have a significant relationship with a group's knowledge integration
Easley et al., 2003	Group size Average expertise level of the group members	Number of members in each group Average score in a standardized test used in that study	None of them are associated with group performance
Kanawattanachai & Yoo, 2007	Expertise location Level of trust among members of group	Clear understanding of who knows what among group members Level of cognition based trust that exist between the group members	Both have significant relationships with knowledge coordination

Variables that help to understand the behavior of members of a group are important to study group level effects of KM activity. For example, Easley et al. (2003) study the average expertise level of the group members as a KM context variable. Kanawattanachai and Yoo (2007) suggest that the group members' understanding of *"who knows what"* (the expertise within their group) are important group level context variables and state that the level of common understanding and the level of trust that exists between members must be studied as a KM context variable at the group level. Robert et al. (2008) took a more holistic view in understanding group level context variables that affect knowledge integration. In accordance with Nahapiet and Ghoshal (1998), Robert et al. (2008) took into account existing social capital (i.e., relational, cognitive, and structural capital in a group) and its effect on knowledge integration in a group. The study found that this capital positively impact a group's knowledge integration. Integration of knowledge through social interactions between group members is important for Web 2.0 based KM (Minocha & Thomas, 2007). These variables can essentially help us to understand the group members and their relationships with one another. Hence, we believe that these variables are important to understand KM's effects at the group level.

2.3.4. Organizational Level

Research has frequently studied the organizational culture of KM and found it to have a significant effect on the outcome of KM at the organization level (Alavi et al., 2006; Chuang, 2004; Gold et al., 2001; Janz & Prasarnphanich, 2003). The existence of a

supportive culture in the organization is vital to the adequacy of the KM structures (Pentland, 1995) where a supportive culture is characterized by organizational members' recognition of the value and importance of KM to organizational performance and, more importantly, their willingness to engage in KM related activities and use corresponding technology (Alavi, 1997; Gopal & Gagnon, 1995). Janz and Prasarnphanich (2003) conceptualize KM culture in terms of risk, reward, warmth, and support (definitions of these variables have been provided in Table 9) and study their effects on different aspects of KM.

Table 9: Overview Of Organizational Level Contextual Variables

Source	Context Variable Studied	Variable Description	Findings
Janz & Prasarnphanich, 2003	Organizational culture (risk, reward, warmth, support)	Risk: orientation of the organization towards an innovative approach Reward: how good an organization is at identifying and rewarding good performance by an employee Warmth: level of friendly environment that exists within an organization Support: an organization's interest in the welfare of its employees	Organizational culture plays a key role in the overall effectiveness of KM
Gold et al., 2001	Knowledge infrastructure capability and technology capability Culture capability	Capability of technical KM contributions to daily operations, abilities to retrieve and use knowledge The extent to which an organization is supportive	Organizational capability plays an essential role in the overall effectiveness of KM

Table 9: Overview Of Organizational Level Contextual Variables			
Source	**Context Variable Studied**	**Variable Description**	**Findings**
	Structure capability	and encouraging of knowledge-related activities The extent to which an organization depends on interactions among employees, the importance of knowledge sharing, and creation of new knowledge	
Hansen, 1999	Strength of tie between different groups and units of the organization	The weakness of an interdivisional tie as the average of the frequency and closeness scores as reported by the managers	The main finding of this study is that neither weak nor strong relationships between operating units lead to efficient sharing of knowledge among them. Weak and strong inter-unit ties have their respective strengths and weaknesses in facilitating search for and transfer of useful knowledge across organization subunits
Chuang, 2004	Cultural resource Technical resource Human resource Structural resource	The extent to which an organization is supportive and encouraging of knowledge-related activities Capability of technical KM contributions to daily operations, abilities to retrieve and use knowledge Knowledge domains of employees and their various applications in particular products The extent to which an organization depends on	The results show that technical KM resource is found to have no associations with the competitive advantage. The structural KM resource, cultural KM resource variables are found to be essential for competitive advantage

Table 9: Overview Of Organizational Level Contextual Variables			
Source	**Context Variable Studied**	**Variable Description**	**Findings**
		interactions among employees, the importance of knowledge sharing, and creation of new knowledge	
Tanriverdi, 2005	Firm size Organizational structure KM capability	Number of employees in an organization Whether management of an organization organizes their business units by products, customers, geographic regions, or functional areas The extent to which firms create, transfer, integrate, and leverage related product, customer, and managerial knowledge resources across their business units	Other then organizational structure all are found to affect KM based organizational performance
Alavi et al., 2006	Organizational KM culture	The extent to which an organization is supportive and encouraging of knowledge-related activities	Organizational KM culture plays an extremely important role in the overall effectiveness of KM

Gold et al. (2001) and Chuang (2004), study the available technical, cultural, and structural resources for KM as KM context variables. In addition Chuang (2004) studies human resources or the expertise available within an organization, as a contextual variable of KM at the organizational level. As all the KM activities in an organization are embedded in the cultural, technical, and structural elements of an organization (Grover & Davenport, 2001), these contextual variables remain quite relevant for the study of Web 2.0 based KM.

Other than these KM contextual variables, while Tanriverdi (2005) conceptually identifies an organization's size and structure as potential contextual variables that might affect KM outcome, Hansen (1999) found empirical evidence that ties between different units of the organization affect KM outcomes. These organizational level context variables are also sufficiently generic to be considered contextual variables while studying the effects of Web 2.0 based KM at the organizational level.

2.4 Summary

The literature review presented in this chapter we identified the outcome and contextual variables that have been studied in the extant literature. We also synthesized different conceptualizations of the KM activities that have been studied in the extant literature. However, these variables have not been studied in depth in prior research in the context of Web 2.0 based KM. Our literature review helps us to identify the variables that should be studied in our intended exploratory case study of different KM activities at the individual, project, group, and organizational levels.

CHAPTER III

WEB 2.0 AND KM

In this chapter we provide an overview of different Web 2.0 technologies and review extant literature on Web 2.0 for Knowledge Management (KM).

3.1 Overview of Web 2.0 Technology

Web 2.0 is a set of Internet-based applications that harness network effects by facilitating collaborative and participative computing (O'Reilly, 2006). Web 2.0 technologies include *Wikis*, *blogs*, *RSS*, *aggregation*, *mash-ups*, *audio blogging and podcasting*, *tagging and social bookmarking*, *multimedia sharing*, and *social networking*. In this section we briefly describe these technologies.

3.1.1 Wiki

A Wiki allows users to collaboratively develop content based on the principle of collaborative trust and contribution (Anderson, 2007). With Wikis, a user with sufficient privilege can use a regular web browser to edit the content of the site including other users' contributions. Visitors can also create new content and change the organization of existing content. The simplest Wiki programs allow editing of text and hyperlinks only while more advanced Wikis facilitate adding or changing images, tables and other interactive components. In addition, Wikis provide a history function that allows

previous versions to be examined and a rollback function to restore the content to previous versions (Anderson, 2007).

Key capabilities of a Wiki include the ease with which with multiple users can collaboratively create and update content. A Wiki provides a decentralized approach to managing information where all involved parties can view, add, edit or comment on the information on the Wiki pages simultaneously in an asynchronous manner.

3.1.2. Blog

A typical blog comprises multiple 'posts', which may contain text, images as well as links to other blogs, web pages or other media related to a central topic that the blog is focused on. The blog is usually arranged in chronological order from the most recent posts to older entries. Blogs often center on a single topic or theme and are usually written by one person or a group, and updated in a fairly regular manner (Anderson, 2007).

Blogs harness valuable network effects by allowing readers to leave comments at will. Archiving posts and the ability to provide comments on posts are common features in a blog. Blogs facilitate bi-directional and transparent communication between users. In other words, a visitor on a blog site can simultaneously assume the roles of reader and writer, which is not possible in a traditional web application. Organizations use blogs for both internal and external communication wherever transparent bidirectional communication is needed. Transparent bidirectional communication facilitated by blogs

can help businesses reach and communicate with their customer base directly and identify customer needs through direct posts made by customers (Nath et al, 2010).

Another interesting aspect of a blog is that it can facilitate electronic Word of Mouth (eWOM) communications coveted by marketing strategists (Novak and Hoffman, 2000). Customers often discuss product(s) on the blog and recommending it for other readers of the blog. Blogs are emerging as a useful component of educational technology too. The literature discusses a number of interesting possibilities for the use of blogs in education (Flatley, 2005; Huffaker, 2006; Perschbach, 2006; Quible, 2005; Richardson, 2006; Selingo, 2004). For example, it is suggested that students can use blogs to publish their own writings, discuss group assignments, peer review each other's work, collaborate on projects and manage their digital portfolios.

3.1.3 RSS and Syndication, Aggregation, Data mash-ups

RSS (Really Simple Syndication) is a Web 2.0 technology that allows users to receive updates to the content of RSS-enabled websites, blogs or podcasts without actually having to visit the site. Using RSS, an organization can gather information into a feed and send it out to users in a process known as "syndication". This is in contrast to the traditional web where a user would have to visit a website to get any updates. Aggregation services facilitate gathering RSS and syndicated feeds that the user chooses from diverse sources, and aggregates them in a single place.

Data mash ups are similar and build upon the capabilities of aggregation services. Data 'mash-ups' are web services that pull together data from different sources to create a new

service by aggregation and recombination. Usually, data are combined based on a particular theme or area of interest specified by the user. On the conventional web a user would have to visit different websites to collect the necessary information. However, using Web 2.0 technology, based on user specifications, data is collected from different sources, aggregated, recombined and delivered. Typically, the content used in mash ups is sourced through a third party via a public interface or API (application programming interface) such as Google (http://api.google.com/), Amazon(http://www.amazon.com/), Flickr (http://www.flickr.com/services/api/), and Yahoo! APIs (http://developer.yahoo.com/).

Essentially RSS Syndication, Aggregation and Data mash-ups provide a way for the business to customize their digital product, service or promotion for each customer and engage in mass customization. These technologies give businesses the capability to customize their product promotion together with the service they provide for each customer. Unlike traditional email based product promotion, Web 2.0technology based product promotion is not generic . In traditional e-mail based product promotion same message is sent to all subscribers. However, through Web 2.0 technology, products are promoted based on customers' expressed interest. Hence they are more effective. Amazon is a prime example of this strategic approach to customized product promotion using Web 2.0 technologies. When customers use Amazon's services (e.g. RSS feed, search engine), Amazon promotes customized products based on each customer's interest.

3.1.4 Tagging and Social Bookmarking

A tag is a descriptive keyword added to a digital object such as website, picture or video clip to describe it. However, it is not a part of a formal classification system. Social bookmarking systems share a number of common features (Millen et al., 2005). Social bookmarking systems allow users to create lists of 'bookmarks' or 'favorites', to store these centrally on a remote service (rather than within the client browser) and to share them with other users of the system (the 'social' aspect). These bookmarks can also be tagged with keywords, and an important difference from the 'folder'-based categorization used in traditional, browser-based bookmark lists is that a bookmark can belong in more than one category.Tagging and Social Bookmarking create a unique way to arrange and share knowledge in an organization as well as in a social network (Wu and Gordon, 2009).

3.1.5 Multimedia Sharing

One of the biggest Web 2.0 based growth areas has been in services that facilitate the storage and sharing of multimedia content. This popular Web 2.0 based service takes the idea of the 'writeable' Web (where users are not just consumers but contribute actively to the production of Web content) and enables it on a massive scale. Well known examples include YouTube (video), Flickr (photographs) and Odeo (podcasts). Multimedia sharing provides organizations a way to train their employees. It also creates a unique opportunity for the business to promote their products through viral marketing and electronic Word Of Mouth (eWOM).

3.1.6 Audio Blogging And Podcasting

Podcasts are audio recordings of talks, interviews and lectures that can be played either on a personal computer or on a wide range of handheld MP3 and other mobile devices. Usually theses audio files are in MP3 format, Theses audio files were originally called audio blogs and they have their roots in efforts to add audio streams to early blogs (Felix and Stolarz, 2006). These technologies give businesses a way to train their employees as well as provide support for their customers.

3.1.7 Social Networking

Social Networking is facilitated by professional and social networking sites for meeting people, finding like minds, sharing content. Social networking uses ideas from harnessing the power of the crowd, network effect and individual production user generated content. Primarily, businesses use social networking for knowledge management and expertise location. Providing access to extended profiles that include competencies, project experience, past positions, and even the ability to share bookmarks or tags can make it easier to harness an enterprise's internal knowledgebase, not to mention the potential of additional valuable network effects (Anderson, 2007).

Table10: Overview of the Web 2.0 tools	
Web 2.0 tool	**Features**
Wiki	• Collaborative tool that facilitates the production of a group work • History function, which allows previous versions to be examined, and a rollback function, which restores previous versions. • The ease of use (even playfulness) of the tools, their extreme flexibility and open access
Blog	• Opinion, information, or links, called *posts*, arranged chronologically • 'Weighted' conversation' between a primary author and a group of secondary comment contributors, who communicate to an unlimited number of readers • Linking is an important aspect of blogging • Facilitates syndication, in which information about the blog entries, for example, the headline, is made available to other software via RSS
RSS and syndication	• Allow users to find out about updates to the content of RSS-enabled websites, blogs or podcasts without actually having to go and visit the site
Aggregation services	• Gathers information from diverse sources across the Web and publishes in one place. • Includes but not limited to news and RSS feeds
Data "Mash-ups"	• Web services that pull together data from different sources to create a new service (i.e. aggregation and recombination).
Multimedia sharing	• People participate in the sharing and exchange of these forms of media by producing their own podcasts, videos and photos
Audio blogging and podcasting	• Audio recordings, usually in MP3 format, of talks, interviews and lectures, which can be played either on a desktop computer or on a wide range of handheld MP3 devices
Social Networking	• facilitate meeting people, finding like minds, sharing content—uses ideas from harnessing the power of the crowd, network effect and individual production/user generated content

3.2 Overview of The Web 2.0 For Km Literature

Researchers have identified and emphasized the potential of Web 2.0 technologies for KM in different studies. Table 11 has an overview of these studies. Most of these studies have focused on a particular Web 2.0 technology-Wiki (Kane & Fachman, 2009; Minocha & Thomas, 2007; Mindel & Verma, 2006; Wagner, 2006). Specifically, Mindel and Verma (2006) suggest that Wiki can be effective in teaching and learning. Similarly,

Minocha and Thomas (2007) found that Wiki can be an effective collaboration tool if there is socialization among participants. Kane and Fachman (2009) suggest using Wiki specifically for IS research collaboration. There are several studies that focus on other Web 2.0 technologies such as Blogs (Hsu & Lin, 2007) and social tagging (Wu & Gordon, 2009). In addition, there are a few studies that focus on the Web 2.0 technology in general. For example, Lee and Lan (2007), and Richards (2009) study Web 2.0 and emphasize the potential of Web 2.0 for effective collaboration. Existing research recognizes that Web 2.0 has the potential to solve many of the existing challenges of KM, very little empirical work has been done to evaluate the effectiveness of Web 2.0 for KM. In one study, Wagner and Majchrzak (2006) have empirically validated the effectiveness of Wiki for conversational KM to enable customer centricity. In another study, Wagner (2006) empirically demonstrates Wiki's potential to overcome the bottlenecks of knowledge acquisition. Minocha and Thomas (2007) also find evidence for the strength of a Wiki as a collaborative authoring tool to facilitate learning. However, with the exception of thes few studies, very little empirical work exists in the extant literature on Web 2.0 for KM, particularly for organizations.

Table 11: Overview Of The Web 2.0 For KM Literature

Description of Study	**Findings/ Outcome**	**Source**
Studied the effectiveness of Wiki as a collaborative learning tool	Wiki is an effective collaborative learning tool. However, socialization among the participants needs to be ensured for effective collaboration.	Minocha & Thomas, 2007
Studied the potential of Wiki for IS research collaboration.	Conceptually proved that Wiki can effectively facilitate research collaboration.	Kane & Fachman, 2009
Studied enabling customer-	An examination of three cases	Wagner & Majchrzak, 2006

Table 11: Overview Of The Web 2.0 For KM Literature		
Description of Study	**Findings/ Outcome**	**Source**
centricity using Wikis.	where Wiki is in use to promote customer centrality revealed six characteristics that affect customer engagement—community custodianship, goal alignment among contributors, value-adding processes, emerging layers of participation, critical mass of management, and monitoring activity.	
Conceptually evaluated Wiki's potential for teaching and learning.	Collaboration is a fundamental aspect of the academic environment and collaboration in academic courses with Wikis is an experiment worth continuing.	Mindel & Verma, 2006
Evaluated the potential of Wiki in diminishing knowledge acquisition bottlenecks through conversational KM.	Knowledge acquisition through collaboration and conversation facilitated by Wiki can lead to super-linear knowledge asset growth and continuous quality improvement.	Wagner, 2006
Studied the acceptance of blog usage.	The results indicated that ease of use and enjoyment and knowledge sharing were positively related to one's attitude toward blogging. On the other hand, social factors (community identification) and attitude toward blogging significantly influenced a blog participant's intention to continue to use blogs.	Hsu & Lin, 2007
Developed a theoretical model to argue for potential benefits of sharing deeper structural knowledge in an electronic document repository through social tagging and personal document hierarchies.	Exploratory study confirmed the benefits of sharing personal hierarchies in a collaborative knowledge work environment.	Wu & Gordon, 2009
Studied the Web 2.0 technology as a mean to achieve collaborative intelligence.	Theoretically proved that Web 2.0 can facilitate collaborative intelligence.	Lee & Lan, 2007

Table 11: Overview Of The Web 2.0 For KM Literature		
Description of Study	**Findings/ Outcome**	**Source**
Studied Web 2.0 for collaborative knowledge engineering.	Developed a Web 2.0 approach for collaborative knowledge engineering.	Richards, 2009

Our literature review demonstrates that prior researchers have identified and emphasized the potential of Web 2.0 technologies to make different aspects of KM more effective. However, the existing literature does not provide clear understanding of how organizations can adopt Web 2.0 for KM effectively at different levels for various purposes. We plan to address this gap in the literature through our research.

CHAPTER IV

RESEARCH APPROACH

Given that Web 2.0 is a relatively new phenomenon, there is dearth of existing research on the use of Web 2.0 technology in KM at organizational level as well as project, group and individual levels. Case study research designs are appropriate to answer the "how" and "why" questions we address in this research (Yin, 1994). We adopt an interpretive, exploratory case study strategy in the first phase of our research. This is appropriate to understand contexts, mechanisms and effects associated with the use of Web 2.0 technology for KM at individual, project, group, and organization levels. In the subsequent part of our research, we adopt a principally positivist case study based interpretive research approach to confirm the relationships between use of Web 2.0 technology for KM and its effects on individual, project, group, and organization levels which we observe and develop in the first part.

A case study is "an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" and it "relies on multiple sources of evidence" (Yin, 1994, p. 13). Case study research investigates pre-defined phenomena without involving any type of explicit control or manipulation of variables. The goal of a case study is to develop an in-depth understanding of a phenomenon situated in its context (Cavaye, 1996). Case studies combine data collection techniques such as

interviews, observation, questionnaires as well as document and text analysis. Both qualitative data collection and analysis methods (which are concerned with words and meanings) and quantitative methods (concerned with numbers and measurement) may be used in case studies (Yin, 1994). Case study research might involve inductive theory building or have clear *a priori* definitions of variables to be studied and the ways in which they can be measured (Benbasat et al., 1987; Yin, 1994). Case study research has been used in both the positivist and the interpretive philosophical traditions (Cavaye, 1996; Doolin, 1996) and has been used to achieve various research goals including describing phenomena as well as developing and testing theories. It has also been associated with description and theory development where it is used to develop bases for hypothesis generation and exploration of areas where existing knowledge is limited (Cavaye, 1996).

Our research approach has three major phases. Figure 3 shows the different phases in our research.

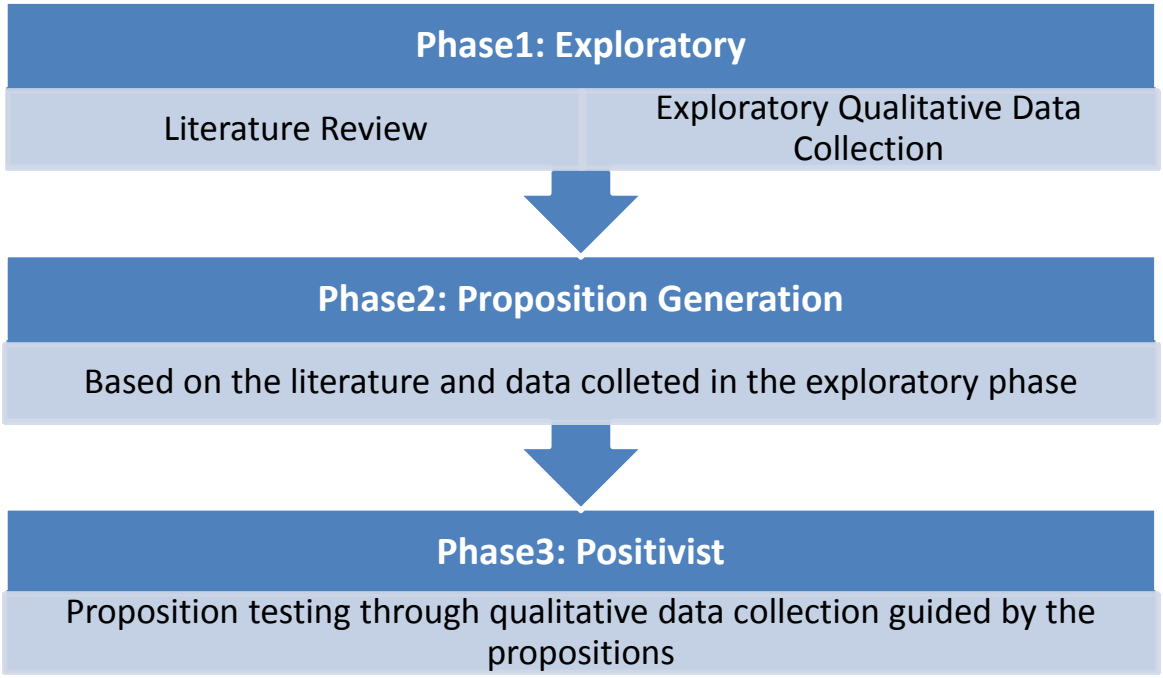

Figure 3: Research Approach

In *phase 1* of our research, we adopt an exploratory research approach because: First, we want to identify and understand how organizations are using Web 2.0 for KM at individual, project and group levels and its subsequent effects. Second, there is no established theory to study the uses of Web 2.0 for KM and its effects at different levels. Therefore, an interpretive exploratory case study is an appropriate research strategy in the early stage of research, as ideally case study research designs are appropriate for "how" and "why" questions (Yin,1993; Benbasat et al., 1987).

Phase 2 of the research is essentially a transition phase for the intended positivist approach in *phase 3* of our study. In *phase 1*, the exploratory phase of our research, we investigate and identify how Web 2.0 tools are used for KM at individual, project and group levels in the organizations and its subsequent effects. In *phase 2*, based on the

extant literature and our findings of the exploratory stage of the study, we develop a set of propositions. These propositions describe the relationship between the use and effects of Web 2.0 for different KM activities at individual, project, group, and organization levels. In *phase 3* of this research, we employ an interpretive positivist approach to examine propositions regarding relationship between the use of Web 2.0 technology for KM and its effects on individual, project, group, and organization levels. We describe our approach in each of these phases in the following sections.

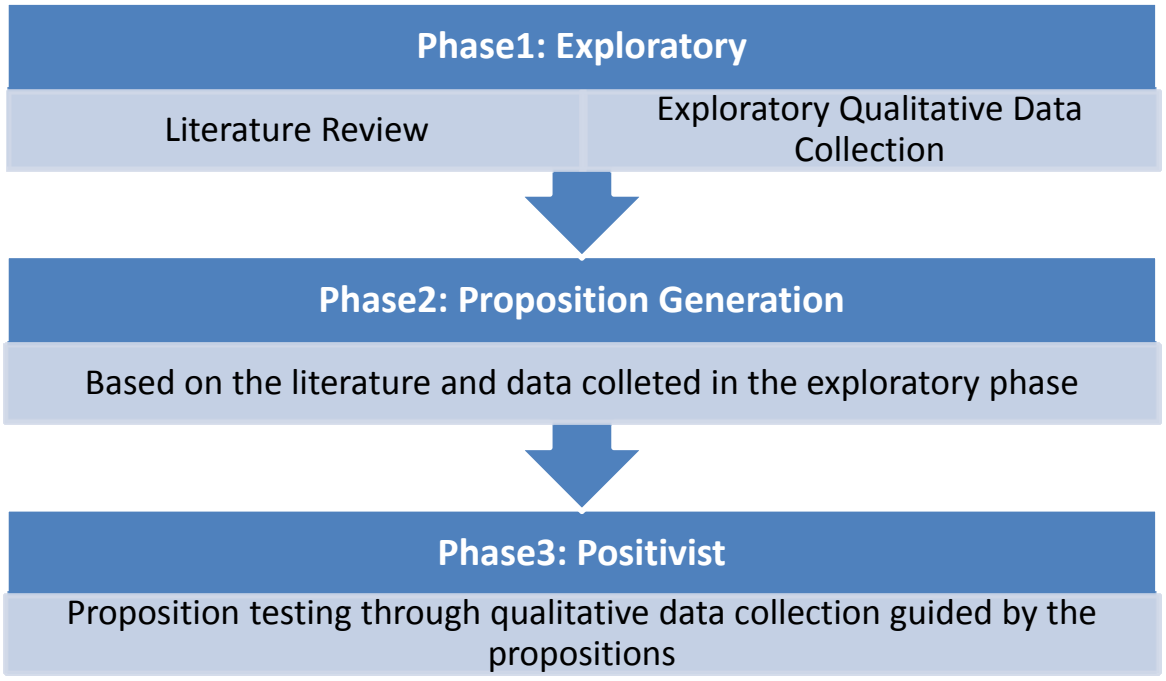

Figure 4: Research Approach

4.1 Phase 1: Exploratory

In the exploratory stage of our research, we follow the guidelines suggested by Eisenhardt (1989). Per this guideline, we developed a strong grounding in the existing KM literature of organizational, group, project and individual level to guide the exploratory case study to understand the uses of Web 2.0 for KM and the subsequent effects of Web 2.0 facilitated KM on individual, project, group and organization level.

We develop our research framework (shown in Figure 2) based on the pragmatic framework for KM research proposed by Grover and Davenport (2001). This framework serves as the theoretical guideline required for our case study by pointing out the different aspects of KM we need to study to identify and understand the uses and effects of Web 2.0 for KM. A very important characteristic of this framework is that it identifies and differentiates between the scope of KM activities at the individual, project and group levels in an organizational context. This is required in our case study to study the uses and effects of Web 2.0 technology at each of these levels.

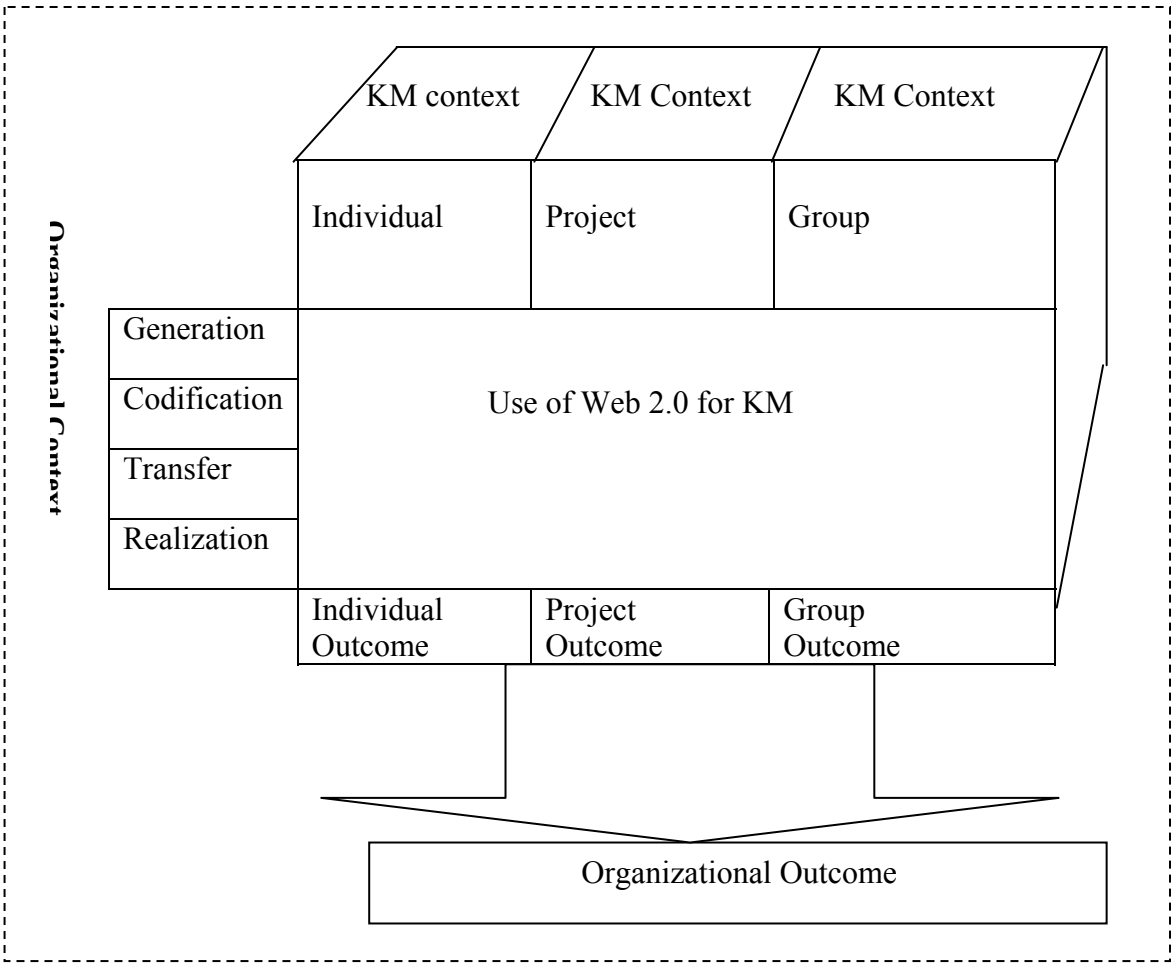

Figure 5: Research Framework

Another important aspect of our research framework is that, like Grover and Davenport's (2001) framework, it identifies and differentiates between KM activities - generation, codification, transfer, and realization. As each of these activities poses different challenges, in order to study the use and effectiveness of a KM tool we need to study the tool within the scope of different KM activities.

This framework also includes the KM context as an essential aspect to be studied to understand KM. Grover and Davenport (2001) conceptualize KM context as the surrounding environment that consists of technology, culture, structure and strategy

where KM activities are embedded. All KM activities reside in duality with the context; that is, KM activities influence the context and are influenced by the context (Grover and Davenport, 2001). Hence, it is important to understand the context of KM, including the structure of the organization, group and project we are studying, the technology infrastructure associated with the KM, the KM culture, and the strategic position of KM within the KM scope. For example, when we study the use of Web 2.0 for organizational KM and its effects, we identify and understand different contextual aspects of an organization, such as its structure, culture and technology infrastructure. This allows us to identify the organizational context where certain uses of Web 2.0 for organizational KM are effective. Similarly, in studying uses of Web 2.0 for group KM, we need to understand the group KM context, such as group structure (Gold et al., 2001). For projects we need to understand the project context, such as the project team characteristics (Gibson, 2003). In our study, we carefully identify and understand these contextual dimensions to comprehend their role in the uses of Web 2.0 for KM and their effects. Through this we identify the current effective uses of Web 2.0 for KM in the projects, groups, and organizations within its context.

4.2 Phase 2: Propositions Development

The second phase of our research is essentially an intermediate stage where we analyze the findings of *phase 1*, the exploratory case study, and to make the transition to positivist approach to test our propositions.

In phase 2, we develop testable propositions based on the extant literature and the findings of the exploratory case study. These propositions describe the relationship between the use of Web 2.0 for KM and different outcome measures at individual, project, group and organization levels. These propositions are developed based on the extant literature and findings of the exploratory case study done in phase1.

4.3 Phase 3: Qualitative Positivist Case Study

Broadly speaking, theoretically-grounded case studies are categorized as being positivist (Devers, 1999; Guba, 1985). Case study research in the positivist tradition is designed and evaluated according to the criteria of the natural science model of research; that is, controlled observations, controlled deductions, replicability, and generalizability (Lee, 1989). While manipulation of variables in the experimental sense is not possible in case study research, theoretical constructs can be defined and empirically evaluated and measured and naturally occurring controls can be identified (Lee, 1989; Cavaye, 1996). Literal and theoretical replication in multiple case study research provides for generalizability of case study research findings (Lee, 1989; Yin, 1994). In our multiple case study, we define the constructs theoretically and we also identify the context variables as the naturally occurring controls to attain generalizability.

Positivist studies are epistemologically premised on the existence of prior fixed relationships within phenomena which can be identified and tested using "*hypothetico-deductive*" logic and analysis (Dubé & Paré, 2003)."*Hypothetico-deductive*" logic and analysis is essentially a combination of three traditions (Sarker and Lee, 2003):

(a) The Empiricist Tradition: This tradition has the view that the foundation of human knowledge is “the indubitable experience of the external world’’ and it thus relies on ‘‘publicly verifiable, observable sensory data, systematically collected and collated, as the route to knowledge’’ (Ackroyd and Huges,1992);

(b) The Rationalist Tradition: According to this tradition of conceptualization, the way to find indubitable knowledge is “ . . . through logical, that is rational, principles which are beyond doubt’’ (Ackroyd and Huges, 1992);

(c) The Critical Rationalist Tradition: The underlying belief of this tradition is that instead of ‘‘positive evidence” or ‘‘confirmation’’, ‘‘negative evidence’’ or ‘‘falsification” through “deduction” is at the ‘‘core’’ of science (Ackroyd and Huges, 1992).

Propositions, developed in the second phase of our research, are tested by comparing their predictions with observed data. In order to test the propositions through deductive testing, as per suggestion by Lee (1989), we look for observations that confirm a prediction to establish the truth of a proposition as well as we involve looking for disconfirming evidence to falsify hypotheses. Falsified propositions might need to be refined based on the reasons for falsification and subjected to further empirical testing (Shank, 2002).

As the third phase of our research has positivist component, it is very important that we satisfy the four criteria of rigor in positivist study (Shanks, 2002). They are:

(a) *Construct validity:* This is the issue of whether empirical data in multiple situations lead to the same conclusions, and is improved by using multiple sources of evidence (Yin, 1994).

(b) *Internal validity:* This is the issue of whether empirical data provide information about the theoretical concept, and is achieved by using pattern matching to ensure that case study data cannot be explained by rival theories with different independent variables in the propositions (Yin 1994).

(c) *External validity:* This is the issue of the generalizability of the findings of the study and is ensured by selecting a "typical" case; that is, a single case that is representative of a large number of other cases, and selecting a case that is likely to confirm the hypotheses, so that disconfirming evidence can be considered decisive (Markus 1989).

(d) *Reliability:* This is the issue of the stability and consistency of the study over time and is ensured by creating and maintaining a case study database and developing a clear case study protocol (Yin 1994).

Validity and reliability in positivist case study research involves using clearly defined methodological guidelines to ensure construct validity, internal validity, reliability and external validity (Lee 1989, Yin 1994).In our research , we also take necessary steps to ensure the validity and reliability requirements. We provide a detailed description of these steps in chapter 7. Following Sarker and Lee (2003), we adopt a ''realist'' ontology in our positivist case study; that is we focus on what interviewees said

or did, rather than on what we thought they might have meant through our interpretation of symbols (Sarker and Lee,2002).

We adopt the discussed guidelines provided in the extent literature to develop the research methods for exploratory and positivist case study of our research. We provide detailed description of these research methods in chapters 5 and 7.

CHAPTER V

RESEARCH METHOD: EXPLORATORY PHASE AND FINDINGS

In this chapter, we describe the research method for the exploratory phase of our research followed by the findings of the exploratory case study.

We follow Eisenhardt's (1989) guidelines for qualitative studies for the exploratory phase of our research. Per these guidelines, it is important to have an initial research question to have control over the volume of data and overall data collection. In our case, the research question that guided this phase of our research is:

How do organizations use Web 2.0 technologies for Knowledge Management at the Individual, Project, and Group levels?

This research question broadly defines the goal of the exploratory case study. Each of the levels defines the scope of each case. For example, while studying uses in projects, we consider project as a case. Similarly, while studying uses in groups, we consider a group within an organization as a case.

It is also important to look for a priori constructs to ensure that they are measured accurately (Eisenhardt, 1989) and can act as guideposts during data collection (Wagner & Majchrzak, 2007). As described in detail in Chapter 2, we adopted the pragmatic

framework for KM research proposed by Grover and Davenport (2001) to develop our research framework. Based on this framework, we identified the literature domain we need to review to identify a priori constructs. These aspects are KM outcomes at the individual, project, group, and organization levels, and KM context variables for each of these levels. We reviewed extant literature to identify those variables. For example, we identified individuals' satisfaction as an effect of KM at the individual level (Kulkarni et al., 2007), timely project completion as an effect of KM at the project level (Mitchell, 2006), increased collaboration as an effect at the group level (Bieber et al, 2007) and organizational innovativeness as an organization level effect (Gold et al., 2001). Similarly, we identified context variables for different levels, such as a person's expertise at the individual level (Hunt et al., 2003), a project's team size at the project level (Hoegl et al., 2003), level of shared understanding among group members at the group level (Easley et al., 2003), and KM infrastructure capability at the organization level (Gold et al., 2001). In our study, by taking these dimensions into account and gathering information about these contextual variables by asking specific questions during the interview, we understand their role and influence in the effective use of Web 2.0 for KM at different levels. Through this we identify the current use of Web 2.0 technology at different levels we are studying within its context and their effects.

5.1 Selection of Cases

Case selection is a critical aspect of conducting a case study. Not only does the population define the set of entities from which the research sample is to be drawn, but

the selection of an appropriate population also controls extraneous variation and helps to define the limits for generalizing the findings (Eisenhardt, 1989). According to the recommendations by Glaser and Strauss (1967), Yin (2003), George and McKeown (1985), and Eisenhardt (1989) we based the case selection for our study on two factors-theoretical background and feasibility).

The first factor includes theoretical relevance, purpose, similarities and differences across data sources with regard to the data sources' appropriateness for the study. In our case, we want to study uses and effects of Web 2.0 based KM at the individual, project, group, and organization levels. Hence, we selected three organizations which have been using Web 2.0 for KM at different levels for a sufficient length of time (in this case more than 4 years) to identify and understand the effects of Web 2.0 based KM. All three organizations are leading firms in their respective fields in the IT industry and have branches/offices in many countries. However, they are different in terms of the type of business they conduct within IT industry. Organization A is mainly involved with IT services, organization B manufactures and sells computer hardware and software with a focus on the latter, and organization C concentrates on networking and communications technology and services. For groups, we selected different functional units such as research, design, and testing groups. Similarly, for projects, we selected projects that have different goals and team formation. For example, in our selected project teams, we have teams that only consist of people working in that organization as well as teams whose members are from different organizations (e.g. offshore vendor).

The second factor, feasibility, was largely determined by each organization's willingness to participate in the study and to provide the required information. In our research, the organizations we selected had to be willing to provide us the necessary information and share their experience so that we could study the uses and effects of Web 2.0 for KM,

5.1.1 Brief Description of the Selected Organizations

Organization A is an information technology services company headquartered in India. It is one of the largest IT companies in India with more than 100,000 professionals. The company has offices in 22 countries and development centers in India, China, Australia, UK, Canada, and Japan. In 2009, organization A was identified as one of the best performing and most innovative companies in the software and services sector in the world by Forbes and Business Week. Organization A has a strong focus on KM and has won several prestigious awards for its organization-wide KM efforts. It has been using Web 2.0 for KM for approximately 5 years.

Organization B is a multinational computer, technology, and IT consulting corporation. Organization B is one of the Fortune 100 companies. The company is one of the few information technology companies with a continuous history of being recognized as a leading IT company, dating back to the 19th century. Organization B manufactures and sells computer hardware and software, and offers infrastructure, hosting, and consulting services in areas ranging from mainframe computers to nanotechnology. The company has more than 400,000 employees worldwide, with sales exceeding 100 billion

US dollars. The company has scientists, engineers, consultants, and sales professionals in over 170 countries. Organization B has been using Web 2.0 for KM for since 2003-2004.

Organization C is an American multinational corporation that designs and sells consumer electronics, and networking and communications technology and services. Organization C has been identified as one of the Fortune 100 companies. C has more than 70,000 employees and annual revenue of more than 36 billion dollars. It has more than 190 branches worldwide and has been using Web 2.0 for KM for approximately 5 years.

5.2 Data Collection and Analysis

Our principal data collection method was semi-structured interviews. We interviewed six managerial level persons from the selected organizations. All interviewees have previous experience using Web 2.0 for KM at different levels. Therefore, they were in a position to describe how Web 2.0 is used for KM at the group, project, and individual levels in their respective organizations and their experience using it at these levels. Each interview had an average duration of 45 minutes to 1 hour. We interviewed one person from organization C twice, as he had a significant amount of information to share and it was not possible to gather all the information in one interview. We also conducted several short interviews with these interviewees later to clarify some aspects of their responses during the first round of interview. We recorded all of these interviews whenever possible and transcribed all sessions before starting the data analysis. To enhance the validity of the answers, whenever possible, we verified summaries of the major findings with the interviewee after the interview session.

Furthermore, to ensure consistency and reliability, we used a structured interview guide for all interviews. The interview guide includes several open format questions based on our research framework and the identified effects of KM at different levels from the existing literature. However, to allow the participants flexibility in their responses, we used open-ended questions. We also included questions on organizational and interviewee demographics to obtain a more complete understanding of the firms and individuals interviewed.

As a second data source, wherever possible, we also investigated the Web 2.0 technologies (e.g. blogs, Wikis, social networking platform) that the organizations use for KM. Existing literature suggests that it is preferable to have multiple investigators in such case studies. Hence, wherever possible, we made sure that at least two researchers were present for the interviews.

In our analysis of data, we categorized the uses of Web 2.0 for KM based on the level where they are intended for use (i.e. individual/ project /group). As we specifically asked the interviewees to describe the uses of Web 2.0 for KM at a particular level, categorizing them was a relatively straightforward task. However, as it was not a tightly structured interview, in more than a few instances, interviewees unintentionally mentioned uses that are not applicable to the level mentioned in the question. For example, in some cases, the interviewee mentioned an individual level use of Web 2.0 while answering a question related to project level uses. We took note of those during interviews using side notes. In addition, we carefully selected and categorized Web 2.0 uses at different levels during the transcription process. In our conceptualization of

projects and groups, there is a many to may relationship between them. That is, there were groups working on multiple projects, and there were projects where more than one group in the organization was working together. Hence, in terms of the uses of Web 2.0 for KM at the project and group levels, we found significant overlap.

Another important aspect of our analysis is to categorize the uses into particular KM activities (i.e. generation, codification, transfer, and realization). The conceptualizations of the KM activities are not clearly delineated in the literature and their definitions share convergent elements. Moreover, in our initial interviews we noticed that interviewees had their own interpretation and understanding of KM activities and that were not always in accordance with our working definitions of KM activities. Hence, we modified our questions to ask more open-ended question about uses of Web.0 for KM. Subsequently, we categorized them into a certain KM activity based on our working definition.

A salient feature of our exploratory research is the overlap of data analysis and collection. We accomplish this desired overlap through field notes. Field notes are an ongoing stream-of-consciousness commentary about what is happening in the research, involving both observation and analysis—preferably separated from one another (Van Maanen, 1988). We transcribed whatever impressions we had as interviewers during the interviews. As it is difficult to know what will and will not be useful in the future, we took notes on everything that seemed to be important at the time of interview. We used these notes and ideas for cross-case comparisons, intuition about relationships, anecdotes, and informal observations.

Overlapping data analysis with data collection was important because it gave us the ability to have an early start on analysis (Harris & Sutton, 1986). This overlap also allowed us to take advantage of a flexible data collection method. In general, this flexibility provides researchers with the freedom to make adjustments during the data collection process. For example, we made adjustments in the form of adding cases to investigate a particular interesting aspect, modification of data collection instruments, such as the addition of questions to an interview protocol or questions to a questionnaire.

5.3 Exploratory Study Findings

In this section, we first provide an overview of the Web 2.0 based tools used in the three studied organizations and the organizational KM context. Then, we describe the uses of Web 2.0 based tools for KM activities at the individual, project, and group levels in those organizations. We also describe the KM context we found in three organizations at individual, project, and group levels.

5.3.1 An Overview of Web 2.0 Based Tools and the Context for KM in the Organizations

Web 2.0 based KM tools at organization A.

Organization A facilitates its own platform for employees to host blogs and regular Wiki pages. On this platform, an employee can create and maintain blogs on a wide range of topics, technical as well as non-technical, to share his/her knowledge and/or opinions. Similarly, the content of Wikis created on this platform can be technical (e.g. a materials to help learning a new programming tool) as well as non-technical (e.g.

tips related to relocation). Usually, all employees working in organization A have access to these blogs and Wikis.

Organization A uses a third party provided tool with Web 2.0 features for KM. We will denote that as "WikiA." WikiA has regular Wiki features along with RSS feeds and additional project management capabilities, such as tasks and deadline allocations. As one interviewee explained,

> WikiA does other things- you can allocate tasks, you can set alerts so that the moment a team member walks in, he knows what the works need to be done, you can plan your calendars, you can plan your meetings and upload whole bunch of docs in lot more organized way.

WikiA facilitates conversational KM where much of the knowledge generation and transfer are carried out through collaborative editing.

Organizational KM context at organization A.

Organization A has more than 100 thousand employees and most are IT professionals. Organization A has a strong KM focus. In order to excel in KM at different levels, this organization has adopted different innovative KM initiatives such as the use of new KM tools and/or processes. As a result, organization A won several prestigious awards that recognize its organization-wide KM efforts. Organization A is supportive and encouraging of knowledge-related activities at all levels. As a reflection, they have a formal reward mechanism in place to encourage their employees to participate in KM activities. As per this formal reward mechanism, employees receive financial rewards for their "volunteer" participation in KM activities.

Being one of the largest and most prestigious IT companies in India, organization A is able to hire a tech savvy and skilled workforce. As organization A has a strong KM focus and realizes the importance of interactions between employees, it promotes interactions between employees through different initiatives. Such initiative includes the use of a Facebook-like social networking platform. However, most of their KM tools are third party provided.

Web 2.0 based KM tools at organization B.

Organization B has developed a customized sophisticated Wiki-like tool for KM in collaboration with another organization. We will denote the tool as "WikiB." Together with regular features of a Wiki, WikiB has advanced search mechanisms and RSS feeds. It also facilitates access to files stored in different formats without having to install additional software. As one interviewee described,

> I used to spend a lot of time giving access to the people to documents. Moreover, it used to take a lot of time, even up to 15 minutes to open a big attachment. Now all those are gone. Moreover, it is an open format in which anybody can open all the files.

Organization B has also developed a Facebook=like social networking platform in collaboration with a third party vendor. We will denote that as "FacebookB." FacebookB facilitates interactions and knowledge sharing between the employees in a rather informal setting. As one project manager described,

> As most of us work from home, it has become very difficult to socially interact. So, this social networking platform helps us to do that.

Organization B also provides a platform to host blogs and regular Wiki pages for its employees. Anybody working in organization B can use this platform to host a personal blog or Wiki. Similarly, any employee of organization B has access to these blogs and Wikis. On these blogs and Wikis, technical as well as non-technical subjects are posted, shared, and discussed. Based on the content, while some of the Wikis are open for contribution, several are not. These are described in more detail later in the chapter. Table 12 has a brief overview of these tools.

Organizational KM context at organization B

Organization B is pro-active in different KM efforts and activities at different levels. To reflect this, the organization has separate functional units to manage different KM activities at various levels. Moreover, organization B has strong technical resources for KM. Together with the industry's standard KM tools, they have developed their own tools with enhanced capabilities. As described, many of these enhanced KM tools are Web 2.0 based.

While organization B does not have a formal reward mechanism in place to promote participation in different KM activities, employees who participate voluntary in different KM activities are recognized by the head of the group and/or project team as "thought leader." As per the interviewees, such recognition can lead to a higher salary and/or internal hiring. Together with voluntary participation, in order to ensure that the employees participate in different KM activities there are certain KM activities, such as learning a new tool, which are mandatory for employees' professional development.

Web 2.0 based KM tools at organization C

Organization C has developed a Web 2.0 based tool for KM which we will denote as "WikiC." Along with Wiki capabilities, WikiC has extensive multimedia and file sharing support. Support for "High Definition" (HD) video sharing support is an important aspect of WikiC. In addition, WikiC has the ability to fine tune access rights. While WikiC is currently just being used internally, organization C plans to roll-out WikiC as a commercial product in near future. At the moment, the organization is beta testing WikiC through internal use at different levels. The organization believes that WikiC, with its additional capabilities, can be an industry leading Web 2.0 based KM tool. Organization C has its own platform to host blogs and regular Wiki pages for all company employees. Anybody working in organization C can use this platform to host a personal blog or a Wiki. These blogs and Wikis can have technical as well as non-technical content. Individuals essentially use these blogs and Wikis to share their knowledge about a particular subject(s). In most cases these blogs and Wikis are open to all and all employees have access.

Organizational KM context at organization C

Being one of the largest networking and communications service providers, organization C is working extensively towards facilitating Web 2.0 based next generation KM where the required amount of information sharing would be a challenge as well as opportunity for them. Organization C has state-of-the-art technical KM resources and tools that they have developed in house and, as of now, are only being used within their organization. Using these KM tools is mandatory in many cases. The company is

organized based on functional units, which often participate in knowledge collaboration for a common goal such as developing a new product line. Organization C does not have a formal reward mechanism that will encourage the individual working for them to participate in different voluntary KM activities such as contributing to blogs and/or Wikis. However, for some projects and groups, team and/or group members are required to share their learning through blogs and/or Wikis.

5.3.2 Web 2.0 for KM Activities at the Individual, Project, and Group Levels

In our research framework, we conceptualize individual level KM activities as the knowledge *generation, codification, Ttransfer*, and *realization* activities for all employees irrespective of any particular group and/or project. Per the framework, we describe project level KM as KM activities to manage knowledge required in a project. This includes the Generation, Codification, Transfer, and Realization of knowledge needed for a project. We describe group level KM as KM activities to manage required knowledge for a group. Per our conceptualization of project and group, there is a many-to-many relationship between them. In other words, a group could be working on more than one project, or multiple groups could be participating in one project. Together with the uses, we describe the individual, project, and group level KM context where the KM activities occur.

Table 12: An Overview Of Web 2.0 Tools		
Organization A	Organization B	Organization C
• Regular Wiki with hierarchical organization of knowledge, search function, history and version control mechanism that facilitates collaborative editing •Third party provided enhanced Wiki-*WikiA* with additional functions: (a) Organized uploading of large number of documents (b) Task and associated deadline allocation for a project (c) Calendar planning (d) Meeting scheduling	•Sophisticated Wiki like tool-*WikiB* for KM developed in collaboration with a third party, with: (a) Advanced search mechanism (b) File sharing support in different formats (c) Open file format i.e. facilitating access to files stored in different formats without having to install additional software	•In-house developed advanced wiki like tool-*WikC* for KM, with: (a) Advanced search mechanism (b) Extensive multimedia file sharing support (c) HD audio/video format support (d) Fine tuned access rights to authorize each user for specific read/write rights on a Wiki page
• Blogs • Internal platform to host blogs and Wikis initiated by management or employees	• Blogs • Internal platform to host blogs and Wikis initiated by management or employees	• Blogs • Internal platform to host blogs and Wikis initiated by management or employees
• RSS feeds support for blogs and WikiA	• RSS feeds support for blogs and WikiB	• RSS feeds support for blogs and WikiC
• Currently developing a Facebook- like social networking platform and considering several options	• In-house developed Facebook- like social networking platform FacebookB where all employees can participate	• Currently developing a Facebook- like social networking platform and considering several options

5.3.2.1. Individual Level

Individual level KM context at organization A

Being one of the major forces in the IT service sector, organization A is quite a prestigious organization to work for (The Times of India, 2011). Organization A is committed to having a high employee retention rate and has taken many steps to maintain this rate (Trent, 2007). Hence, as described by the interviewee, most of organization A's employees tend to have a clear understanding of the norm and vision established by the top management. Organization A strongly supports individual level KM activities within the organization. Organization A has an incentive, in the form of a certain dollar amount, in place to encourage their employees to participate in different KM activities, including active participation in the company's blogs and Wikis. However, as per an interviewee from organization A, the incentive amount is not sufficiently large to ensure that all the employees actively participate and contribute to the company blogs and Wikis. This interviewee also added that while the monetary incentive is not extremely effective, other indirect incentives such as recognition in the organization play an important role in the employees' participation in KM activities.

Individual level KM context at organization B

Organization B prioritizes KM activities and emphasizes that their employees actively participate in KM activities within the organization. Consequently, group leaders and project managers encourage individuals working in their group and/or team to be active participants of different KM activities. While organization B does not have a

formal incentive mechanism in place for employees to promote KM activity participation, individuals' participations are identified and often indirectly rewarded in the form of internal hiring and/or promotions.

As noted, organization B is a well known, prestigious IT company. However, organization B's employee retention rate has been consistently low throughout the last decade. Moreover, as our interviewees have pointed out there are limited social interactions between employees even if they are in the same group. Hence, it could be inferred that many individuals working in organization B might not share the same norm and vision.

Individual level KM context at organization C

Like organizations A and B, organization C's top management values individual level KM activities within the organization and they consider Web 2.0 based KM the future of KM. This vision is shared throughout the organization and all the project managers and group leaders are encouraged to embrace Web 2.0 based KM for the individuals working in their group and/or project team. However, there is no formal incentive mechanism for individuals participating in KM activities.

Organization C is an industry leading prestigious IT company to work for and has a good employee retention rate. Hence, as described by the interviewees, most individuals working in organization C identify with the organization's goals, norm, and vision. However, since many of the employees of organization C are situated in different countries, they have limited face to face, informal interactions.

Knowledge generation activity at the individual level

At organization A:

Organization A uses a Wiki-based knowledge repository that employees can use for different purposes. There are Wikis on technical topics to help individuals to learn new technologies. In addition, there are Wikis on non-technical topics such as suggestions to find good local restaurants. These Wikis are often initiated by the upper management to disseminate information on a particular topic (e.g., Wikis that would help individuals to learn a new tool that the organization has adopted). These Wikis are subsequently enriched by the contributions and collaborative editing of other individuals in the organization. Most of these Wikis are open and any individual working in organization A has the privilege to retrieve as well as contribute knowledge to these Wikis.

A blog is another medium of Web 2.0 based communication and knowledge generation at the individual level. Organization A provides a platform where individuals working in their organization can host blogs and Wikis internally. It empowers the individuals to share their ideas and knowledge with other individuals working in the organizations. Each blog usually has a person who plays the role of the initiator, moderator as well as principal content provider. Other individuals visiting a blog can also contribute and participate in the knowledge generation process. In organization A blogs are used by the upper management to share their views on technical and non-technical subjects with the employees. Some individuals also use it to share their knowledge and views with others in the organization. On the blogs, knowledge is generated often in the

form of questions and answers. An individual visiting a blog can ask questions (or make comments) which are usually directed to the blog's owner. Visitors might also address questions or opinions left by other visitors. The answers are visible to everyone who visits the blog.

At organization B:

Organization B uses their enhanced version of Wiki-WikiB for KM at the individual level. The basic uses of WikiB for knowledge generation at the individual level in organization B are quite similar to organization A. WikiBs are often initiated by the upper management and then individuals working in the organization participate in the collaborative editing process to enrich the knowledge base. Organization B also facilitates a platform where individuals working in organization B can host their own Wikis and blogs. The uses of blogs at the individual level KM in organization B are also comparable to organization A: individuals use blog to share their knowledge, ideas, and opinions on technical and non-technical subject matters.

At organization C:

WikiC is used for generating required knowledge at the individual level in organization C. WikiC's uses for individual knowledge generation in organization C parallel organizations A and B. Like organizations A and B, C is globally dispersed. Therefore, Wikis and blogs create a platform for people working in distant parts of the world to generate knowledge collaboratively.

Knowledge codification activity at the individual level

At organization A:

Wiki has an inherent hierarchical structure. Information stored on Wiki is organized and stored based on category, sub-category, and/or topic; sub-topic and related topics are linked with each other through hyperlinks. The knowledge stored on a Wiki page and different individuals' contributions follow that structure. Tutorials generated by the experts on different topics are stored on Wikis. The stored knowledge on Wikis is simultaneously accessible to all employees.

Knowledge generated on the blogs is loosely structured. Together with storing the principal content that has been provided by the owner and/or creator of a blog, related discussions are also stored in the form of questions and answers. The contents are simultaneously accessible to all employees irrespective of time and location, and are searchable based on keywords and/or subject terms for easy access.

At organization B:

The generated knowledge is stored on WikiB in various file formats (e.g. video tutorials, podcasting) that is simultaneously accessible by all the individuals working in organization A. On blogs, the knowledge generated is primarily stored in text format. While knowledge on WikiB has a built-in hierarchical structure, the knowledge on blogs is mostly unstructured in the pattern of Q&A and/or comments with replies.

At organization C:

The generated knowledge (e.g. tutorials on a new technology) for individuals is stored on WikiC in various file formats including HD audio and video files. Blogs also contain generated knowledge at the individual level.

Knowledge transfer activity at the individual level

At organization A:

Knowledge stored on Wiki is transferrable to individuals through simultaneous access. Essentially, everyone can access the knowledge on Wikis and blogs simultaneously irrespective of time and location as long as they have proper rights. Moreover, as the knowledge stored on Wiki is hierarchically structured, it becomes easier for individuals to locate and attain the required knowledge from WikiA.

Transferring knowledge from blogs is somewhat tricky because of the organization of the generated knowledge. The principal content of a blog (e.g. blog owner's contribution) is easy to locate and access. However, the knowledge generated on a blog through discussions, comments, and Q&A does not have a linear, organized structure. Hence, it can be difficult at times to locate a useful piece of information from the knowledge stored on blogs.

At organization B:

To transfer knowledge, it is essential to locate the appropriate knowledge in the knowledge repository. In organization B, a searching mechanism is in place that helps

employees locate potentially helpful Wiki(s) that are hosted on organization B's platform. The searching could be based on a topic and/or an author. Similar types of searching can be done to locate blogs with relevant knowledge. An individual can also subscribe to RSS feeds from selected Wikis and Blogs that inform him about any update on a particular topic and/or by a specific expert member within the organization. Moreover, for the effective transfer of knowledge to individuals, WikiB facilitates simultaneous access to required knowledge stored in alternative file formats without installing additional software.

Together with Wikis and blogs, organization B also provides a Facebook- like social networking platform FacebookB. FacebookB creates a unique opportunity for informal interactions among organization B's employees. As the KM literature suggests, informal interactions can facilitate tacit knowledge sharing between individuals. Organization B is globally dispersed in more than 150 countries and there is an upward trend in employees working from remote location. Hence, this platform essentially becomes an effective way for employees to interact informally and transfer knowledge.

At organization C:

The files stored in WikiC are simultaneously accessible to all the employees/ While blogs at the individual level are mostly open to all individuals in organization C, there are some Wikis that are more restricted than others due to the sensitive nature of their content. Depending upon designation and job description, certain individuals obtain specific rights to access those WikiCs.

Knowledge realization activity at the individual level

At organization A:

There are two major aspects of Web 2.0 based KM realization that occur at the individual level in organization A. First, through the contents of the Wikis and blogs, individual employees have an opportunity to gain both technical and non-technical knowledge. Individuals can use this knowledge to perform different tasks, such as learning a new tool, learning about company culture, or simply finding a good restaurant near the office. Second, it empowers individuals working in the organization to share their knowledge and become visible within the organization. As described by one interviewee,

> Some of the people down in the chain write blogs to get noticed by the boss and super boss. So that could be a qualitative measure of what did they get from doing that- promotion, salary hike, visibility within the group and so on.

In addition, it gives the upper management (e.g. CEO, CIO) to interact with the individuals working in their organization in a rather informal setting to share each other's opinions. Such informal interactions permit the upper management to understand different employees' perspectives. As depicted by another interviewee,

> There are internal blogs. In fact, the CEO of the company maintains an internal blog and you will be surprised to see the questions people ask the CEO of the company and he responds to them as well.

At organization B:

Through use of Web 2.0 based KM at the individual level, organization B has essentially created an avenue for their employees to learn a new technology and/or process. Organization B's management is relying more and more on such use of Web 2.0 based KM to provide informal training to their employees as a substitute for a more formal and structured training program. Moreover, it gives individuals an opportunity to seek help and gain required knowledge from other employees without having to know them personally. For example, if someone is struggling with a technical problem, s/he can search the related Wikis and blogs for a possible solution. If a proper solution is not found, then that person can post the problem asking for a solution on a relevant Wiki or blog. At the same time, such Web 2.0 based KM creates an opportunity for the *"skilled"* individuals within the organization to make themselves visible to the upper management, which, in turn, can help them to grow within the company. As described by an interviewee,

> …I would say that people who are very actively contributing there (i.e. Wikis, blogs) would be the people that will be considered as thought leaders within the organization and these are the people who tend to rise to the top.

Moreover, blogs and social networking site FacebookB introduce a unique opportunity for the individuals within organization B to interact in an informal setting. Such informal interactions can facilitate sharing of tacit knowledge to perform different tasks.

At organization C:

Individuals use the knowledge gained through WikiC to learn new technologies and/or processes. The management promotes Web 2.0 for KM internally as a method of training and a potential substitute for formal training. Our initial finding shows that it has been quite successful so far. As one interviewee noted,

> Formal training sessions are decreasing as people are using this (i.e. Web 2.0 based KM tools-WikiC) to learn newer stuff.

At the same time, such Web 2.0 based KM where individuals share their knowledge with others has created an opportunity for employees to make themselves visible and grow within the organization by using these platforms to showcase their expertise.

Table 13: Summary Of Exploratory Study Findings

Individual Level KM Activity	**Individual Level Uses of Web 2.0 for KM**		
	Organization A	**Organization B**	**Organization C**
Generation (KM activities for knowledge acquisition and development)	▪ Generation of knowledge on blogs through informal interactions between employees ▪ Generation of knowledge through collaborative editing on WikiA ▪ Generation of tutorials by experts on Wiki for training purposes, enriched by	▪ Generation of knowledge on blogs through informal interactions between employees ▪ Generation of knowledge through collaborative editing on WikiB and participants in the generation process could be *situated in different locations around the world*. ▪ Generation of multimedia based tutorials by experts for training purposes, enriched by	▪ Generation of knowledge on blogs through informal interactions between employees ▪ Generation of knowledge through collaborative editing on WikiC and participants could be from *different functional units of the organization and*

Table 13: Summary Of Exploratory Study Findings			
Individual Level KM Activity	**Individual Level Uses of Web 2.0 for KM**		
	Organization A	**Organization B**	**Organization C**
	collaborative editing by employees	collaborative editing employee collaboration	*from globally dispersed locations* ▪ Generation of multimedia (including HD audio/ videos) based tutorials by experts for training purposes, enriched by collaborative editing
Codification (KM activities for knowledge conversion in accessible and applicable formats)	▪ Storing generated knowledge on Wiki that is simultaneously accessible to all employees ▪Storing the knowledge generated on the blog in the form of Q&A that is accessible to all employees ▪ Storing tutorials on Wiki that is simultaneously accessible to all employees	▪ Storing generated knowledge on WikiB that is simultaneously accessible to all employees ▪Storing the knowledge generated on the blog in the form of Q&A that is accessible to all employees ▪ Storing tutorials on WikiB in different multimedia formats that is simultaneously accessible to all the employees	▪ Storing generated knowledge on WikiC that is simultaneously accessible to all employees ▪Storing the knowledge generated on the blog in the form of Q&A that is accessible to all employees ▪ Storing tutorials on WikiC in different multimedia formats, including HD audio/video format, that is simultaneously accessible to all employees
Transfer (KM activities for moving	▪ Individuals simultaneously accessing required knowledge stored on	▪ Individuals simultaneously accessing required knowledge stored on WikiB in different file formats *without installing*	▪ Individuals simultaneously accessing required knowledge stored in

Table 13: Summary Of Exploratory Study Findings			
Individual Level KM Activity	**Individual Level Uses of Web 2.0 for KM**		
	Organization A	**Organization B**	**Organization C**
knowledge from the point of generation or codification to the point of use)	Wiki ▪Gaining appropriate knowledge from Wiki through hierarchical knowledge organization and searching based on topic as well as author	*additional software* ▪Gaining appropriate knowledge from WikiB through hierarchical knowledge organization and searching based on topic as well as author ▪Gaining appropriate knowledge from WikiB through subscription of RSS feeds ▪Transferring knowledge through *informal interaction* between individuals on FacebookB	different file formats on WikiC ▪Gaining appropriate knowledge from WikiC through hierarchical knowledge organization and searching based on topic as well as author
Realization (KM activities for making use of the available knowledge to generate value)	▪Using knowledge generated and stored on Wikis to train oneself on a new technology and/or process ▪Using knowledge generated and stored on Wikis and blogs to perform different activities	▪Using knowledge generated and stored on WikiB in different formats to train oneself on a new technology and/or process ▪Using knowledge generated and stored on WikiB and blogs to perform different activities ▪Using tacit knowledge gained through informal interactions with other employees on FacebookB to perform different activities	▪Using knowledge generated and stored on WikiC in different formats to train oneself on a new technology and/or process ▪Using knowledge generated and stored on WikiC and blogs to perform different activities-official as well as non-official, technical as well as non-technical

5.3.2.2 Project Level

Project level KM context at organization A

The projects we studied in organization A were of similar size and had 10-20 members in each project. The team members were quite familiar with each other as most of them belonged to the same R&D group. Most of the members on these projects were part of the project(s) from the initial phase. While the project team members were mostly collocated, in some phases of the project team members participated from remote locations. Specifically, we studied R&D projects and the project teams were working on developing a new product. Knowledge generations tasks were an integral part of these projects. In the projects, the team leader played a key role by setting up a common goal and vision for the team members.

Project level KM context at organization B

In the studied projects in organization B, most team members were not collocated and they worked from remote locations. The majority of the team members on a given project belonged to the same group and they had worked together on more than one project. However, they had limited face to face interactions in informal settings. Most members on these project teams had been involved from the initial phase. As per the interviewees, the team leaders played an important role in deploying several KM tools in projects and ensuring that the team members were using those tools effectively. Organization B also encourages using the new tools and facilitates training, whenever possible, for the project team members.

Project level KM context at organization C

The projects we studied in organization C consist of members from multiple groups. We studied a routine maintenance project as well as a new product development and marketing project. In the routine maintenance project, participants were not co-located. While the new product development project we studied had members from different groups, most members were collocated. As per the interviewees, while the project team members from the same group were familiar with each other, they had limited interactions with the members from other group(s) prior to the project.

Knowledge generation activity at the project level

At organization A:

In organization A's projects, the project team members are often not collocated and they have diverse sets of skills. As one interviewee in organization A described

> My team is spread across Bombay, Pune, and Hyderabad. Effectively, my team is spread across four states of India, and of course, they have diverse sets of experience and skill sets.

Therefore, it is critical to have an effective tool for KM in projects to facilitate collaboration among team members. Organization A uses Wiki to generate (or acquire and develop) knowledge for its projects. Through Wiki, team members collaborate in an asynchronous, simultaneous manner. As posited by Wagner (2006), collaborative editing can facilitate knowledge generation through conversation. To facilitate such conversational knowledge generation, dedicated Wiki page(s) is created for each project

in the beginning of a project and the team members are given access to it. If a project has a sufficient budget to afford WikiA then WikiA is used for the project's KM. Otherwise, generic and less expensive open source Wiki is used in a project. One interviewee mentioned,

> ….that's when (i.e. after budget sanction for a project) we decided to stop 'regular' wiki and move completely to WikiA as WikiA gives much more control for coordination.

All of the project team members are given access to the WikiA by the project manager so that they can start contributing and generating knowledge required for the project they are working on. As described by the interviewee,

> We used WikiA where 12 of our team members had access. So what we did right from literature survey to creating the products and the patent scanning- whatever we had downloaded are kept here(Wiki); all the ACM,IEEE publication we downloaded are stored there, all the mp3 files or video files regarding accessibility are stored there. Even all the minutes of the meetings were captured and stored there.

The Interviewee from organization A has also emphasized the importance of other WikiA functions such as history and rollback. These features of Wiki are very useful in projects' knowledge generation as they help to identify the evolution of knowledge and to backtrack if required. The project managers in organization A rely largely on WikiA to manage required knowledge in their assigned projects. One interviewee commented, " Our team won't survive if WikiA is down for 3-4 days."

At organization B:

WikiB is used for different KM activities in projects. The basic uses of Wiki in knowledge generation activities in organization B's projects are quite similar to organization A. The principal use is for facilitating conversational knowledge generation through collaborative editing, and it is also quite common for both organizations to have project team members who are situated in different parts of the world. Therefore, sharing the documents with the team members in real time is an essential aspect of knowledge generation for their projects. Before using WikiB, sharing the required documents in an effective way among the project team members was a major challenge. For instance, one project manager noted,

> Sending the documents as email attachment was creating space issues. Sharing with public was also a problem in the previous systems." With the use of WikiB, it has become easy for the project managers to provide a platform for their team members to collaborate and generate knowledge required for a project.

Another manager stated,

> I used to spend a lot of time giving access to the people to documents. Moreover, it used to take a lot of time, even up to 15 minutes to open a big attachment. Now all those are gone.

Organization B has many ongoing and completed projects. The similar previous projects are an effective source of knowledge required for a project. The management of organization B realizes that. Hence, a goal in organization B is to generate knowledge of lessons learned for future projects. Organization B uses WikiB for this purpose as well. Organization B maintains a WikiB based central repository of "Lessons learned" from

different projects. This repository is maintained by a group of *experts* However, this WikiB based repository is not as open and free-flowing as other Wikis in the organization as materials posted here are not immediately published. Rather, experts extensively review submitted materials to evaluate the importance of an article before it is published on the repository.

At organization C:

WikiC is used to generate required knowledge in organization C's projects, and the uses are similar to both organizations A and B. Specifically, organization C's projects also have project teams consisting of members who are situated in geographical dispersed locations. Hence, WikiC plays a key role in team members' knowledge generation through collaborative editing.

Fine-tuned access rights also play an important role in knowledge generation as well as in overall KM at the project level. The project managers find the ability to provide *"fine-tuned"* access rights to the project participants to be quite useful. Through this feature, a project manager can ensure that a team member gains specific rights to read and/or write certain parts of the project Wiki based on his/her role. This feature guarantees that no project participant misuses a project's WikiC. As one project manager in organization C mentioned,

> Sometimes we have so many people from different groups in one project and with different roles, it is very important for me to be able to give them very specific rights on the Wiki so that nobody can mess up the content anyway.

Another important aspect of WikiC is that it is easy for any project participant to comprehend and participate in the knowledge generation process on WikiC even if s/he joins the project after the initial phase. As one project manager described,

> There is an implicit understanding of how the document should be updated and/or presented for all the participants in a project. Even if someone new comes in, s/he can take a look at one of the existing ones and use it as template.

Organization C uses WikiC for generating "lessons learned" knowledge for future projects. However, their use of Wiki for this purpose is less organized and structured than organization B. While organization C has WikiC for storing "lessons learned," like organization B, they do not have a central repository or governing body to ensure the "lessons learned" are stored meaningfully and can easily be found. Organization C encourages project managers to create Wiki for each project that is accessible to all employees of organization C. Project team members essentially use WikiC to generate "lessons learned" that could be useful for future projects.

Knowledge codification activity at the project level

At organization A:

The structure of knowledge stored on WikiA is more organized compared to a regular Wiki. While collaborative editing is possible, there is a basic structure for editing. As described by the interviewee,

> As far as 'regular' Wiki goes, it was Ad hoc. But on WikiA it is much more formalized. There are categories and sub categories. For example, there are categories for literature review; there are categories for future ideas, categories for future road map of the products and so on.

At organization B:

The knowledge generated for a project is stored on WikiB in various file formats (e.g. audio files of conference calls, video tutorials, podcasting) that are simultaneously accessible by all project team members. Similarly, *lessons learned* from different projects are also stored on WikiB in different file formats.

At organization C:

The generated knowledge for a project is stored in WikiC in various file formats including HD audio and video files. This WIkiC based repository maintains the basic Wiki structure where information is organized in hierarchal order based on topics and sub-topics. These files are simultaneously accessible by all project team members. Different project teams also use WikiC to store their lessons learned in different file formats.

Knowledge transfer activity at the project level

At organization A:

Knowledge stored on WikiA is transferred, or "pushed," to the project team members, who can access, or "pull," this stored knowledge through simultaneous access. Essentially, all team members can access the information on WikiA simultaneously irrespective of time and location as long as the project manager has given them the proper right to access it. Moreover, as the knowledge stored on WikiA is quite structured, it becomes easier for the team members to locate and attain the required information.

At organization B:

Locating appropriate knowledge on the repository is essential for the effective transfer of knowledge. WikiB's hierarchical knowledge organization helps a project team member to locate the required information. WikiB also has a sophisticated searching and version control mechanism that permits the team members to locate and transfer the required knowledge for their project. Moreover, for effective knowledge transfer, WikiB facilitates simultaneous access to required knowledge stored in different file formats without installing any additional software.

While the transfer of knowledge through WikiB is quite formal in nature, it also happens through informal interactions between the project team members on FacebookB. As the project team members interact in a rather informal manner on FacebookB, it opens up the door for *tacit knowledge* transfer among team members. FacebookB also creates an opportunity to transfer lessons learned from people who previously worked on similar projects through informal interactions. The formal lessons learned knowledge transfer happens at the project level through the WikiB based central repository of *lessons learned* described earlier. Based on the requirements of a project, project team members search this highly structured repository to locate and transfer knowledge for their current project.

At organization C:

Knowledge stored on a project's WikiC is transferred to the project team members through simultaneous access. However, depending on a project team member's

particular role, s/he gains specific rights to access knowledge on WikiC. However, the WikiCs to store lessons learned from previous projects are mostly open to all the employees of organization C. The knowledge stored on WikiC is very structured has a powerful search engine. These features make it easier for the project team members to attain the required information from WikiC.

However, as knowledge transfer through Wiki is *"pull"* and not *"push,"* it is not always the most effective knowledge transfer mechanism. That is, team members have to be proactive to ensure that they are accessing the Wiki to gather the required information, unlike communication tools such as email where information can be sent directly to the team members by the project manager. As described by one project manager in organization C,

> Whenever I have to make sure that the project members have got the information posted on Wiki, I still have to communicate with them through traditional email.

Knowledge realization activity at the project level

At organization A:

Once the team members gather the required information from WikiA, they use it for project related activities. Such activities can include tracking a project's progress as well as finalizing a product design. As described by an interviewee,

> My team has used it extensively in the development of XX. We used WikiB extensively to manage all our project activity.

At organization B:

Project teams use transferred knowledge through WikiB for various project activities. The WikiB based central repository of lessons learned permits the teams transfer knowledge from previous projects and to address the shortcomings of the ongoing projects. The knowledge transferred through informal interactions on FacebookB also helps project teams perform activities to reach project goals.

Web 2.0tool such as blog and Facebook-like social networking platforms can also facilitate informal interactions. By maintaining personal blogs and by having a proactive presence on FacebookB, some employees within organization B become experts of certain tools and/or technologies. At times, project managers use that knowledge to locate a person with the skill set required for their projects and internally hire that person to provide the required support. That person could be physically located in any of the 150 countries where organization B has establishments. Therefore, facilitation of personal blog platforms and the social networking site FacebookB opens up an unique opportunity for the project managers in organization B to realize knowledge for a project in terms of acquiring (i.e. hiring) people with the specific knowledge and expertise required for a particular project.

At organization C:

After the required knowledge transfer (i.e., pull and push) through WikiC, the team members use it for several project related activities. In a new product development project we studied, different functional units (Designing, Marketing, and Sales), had to

provide their input to finalize the new product. As an interviewee commented regarding the requirement analysis of a project,

> The use of WikiC in collaboration between different functional units (e.g. Designing, Marketing, Sales) not only saved us time, the requirement analysis was way more comprehensive." The project team members also use the transferred "lessons learned" transferred from previous projects to reach the ongoing projects' goals.

Management of organization C promotes Web 2.0 for KM internally. Interestingly, the company prohibits the use of Web 2.0 technology such as Wiki in projects where they have an outside partner. The upper management believes that through the use of Wiki, they lose control over the outgoing information flow as project team members often post information on Wiki without realizing who will have access to it. This can lead to confidential information being exposed to the outside partners. Therefore, email is still the preferred method of communication and knowledge sharing in projects involving an outside partner.

Table 14: Summary Of The Exploratory Study's Findings

Project Level KM Activity	**Project Level Uses of Web 2.0 for KM**		
	Organization A	**Organization B**	**Organization C**
Generation	Generation of knowledge through conversations on WikiA where in many cases project team members *are not collocated*.	▪ Generation of knowledge through conversations on WikiB where in many cases project team members are *situated in different parts of the world*. ▪ Generating "lessons learned" from different projects on WikiB based central repository	▪Generation of knowledge through conversations on WikiC where project team members might be from *different functional units of the organization and*

Table 14: Summary Of The Exploratory Study's Findings			
Project Level KM Activity	**Project Level Uses of Web 2.0 for KM**		
	Organization A	**Organization B**	**Organization C**
		through participation of different project teams' members where upper management initiates repository creation.	*are from globally dispersed locations*. ▪ Generating "lessons learned" from projects on WikiC through contribution from project team members, which is a KM policy in the organization C
Codification	▪ Storing generated knowledge on WikiA that is simultaneously accessible to all project team members ▪Storing "lessons learned" from project(s) on WikiA that are simultaneously accessible to all employees	▪ Storing generated knowledge on WikiB in various file formats *(e.g. audio files of conference calls, video tutorials, podcasting)* that is simultaneously accessible to all project team members ▪Storing "lessons learned" from different projects on a WikiB based central repository that is simultaneously accessible to all employees	▪ Storing generated knowledge on WikiC in a wide variety of multimedia formats *(e.g. video tutorials in HD format)* that is simultaneously accessible to all the project team members ▪Storing "lessons learned" from project(s) on WikiC that are simultaneously accessible to all employees
Transfer	▪ Project team members accessing required knowledge stored on project Wiki/WikiA	▪ Project team members accessing required knowledge stored on project WikiB *without installing additional software*	▪ Project team members accessing required knowledge stored on project WikiC

Table 14: Summary Of The Exploratory Study's Findings			
Project Level KM Activity	**Project Level Uses of Web 2.0 for KM**		
	Organization A	**Organization B**	**Organization C**
	▪Gaining appropriate knowledge from project Wiki through hierarchical knowledge organization, searching and version control mechanism	▪Gaining appropriate knowledge from project Wiki through hierarchical knowledge organization, searching and version control mechanism ▪Transferring "lessons learned" from previous projects stored on the WikiB based central repository to a current project ▪Transferring knowledge through *informal interaction* between the project team members on FacebookB	▪Gaining appropriate knowledge form project Wiki through hierarchical knowledge organization and search mechanism
Realization	▪Using knowledge generated and stored on WikiA to perform different project related activities	▪Using knowledge generated and stored on WikiB to perform different project related activities ▪ Using "lessons learned" from previous projects stored on WikiB based central repository to address a current project's shortcomings ▪ Using personal blogs and "FacebookB" to identify necessary expertise	▪Using knowledge generated and stored on WikiC to perform different project related activities ▪ Using "lessons learned" from different projects' stored on WikiC in a current or active project

5.3.2.3 Group Level

As mentioned earlier, per our conceptualization of projects and groups, there is a "Many-to-Many" relationship between them (i.e., a group could work on more than one project, or one project could involve multiple groups).

Group level KM context at organization A

We studied an R&D group with approximately 20 members in organization A. As stated by the interviewee who ran the group, all of his team members were technologically savvy and had ample expertise, knowledge, and experience in IT. Most of the group members had worked on more than one product and/or project together. They had a good understanding of the group's goal, norm, and vision, as well as the expertise of different group members.

Group level KM context at organization B

The members of the studied groups in organization B worked from dispersed locations. The group members were US as well as non-US based. In many cases, although the group members were situated in the same city, they had few face to face interactions. Most were technologically savvy IT professionals. The groups were fairly unstable, as it is quite common practice in organization B for employees to be transferred between groups based on the requirements.

Group level KM context at organization C

We studied three different groups in organization C representing different functional units: Design, Testing, and Marketing. Each group had around 20 members, and many worked outside of the US mostly in India. However, most of the managerial level members were co-located in the US and had some informal interactions beyond their official duties. Since the hiring process in organization C is rather extensive, all team members are considered IT savvy and have adequate expertise in their respective field. While few core members had been working together for more than 2 years, others were comparatively new in these groups, or in some cases had been transferred from other group(s) in organization C.

Knowledge generation activity at the group level

At organization A:

In organization A group members are not often collocated. Hence, it is important for them to have an effective KM tool to facilitate collaboration. Organization A uses Web 2.0 based KM tools, especially Wiki, for this purpose. Group members collaborate in an asynchronous, simultaneous manner through Wiki, which can facilitate knowledge generation through conversation. Different Wiki pages are created within a group for a variety of purposes. For example, a group working on multiple projects can have dedicated Wiki page(s) for each project. In organization A, a group usually uses WikiA for projects that have sufficient budgets to allocate money for WikiA. Sometimes, Wiki is also used in a group to facilitate a platform to collaboratively generate ideas. For

example, one interviewee described an instance where his group used Wiki to collaboratively generate product(s) ideas that can lead to a project(s).

At organization B:

WikiB is used for different KM activities at the group level in organization B. WikiB's basic uses in group level knowledge generation activities at organization B are quite similar to organization A. WikiB is used for facilitating conversational knowledge generation through collaborative editing by the group members. As organization B's groups consist of individuals who are not collocated, sharing the documents with group members in real time is an essential aspect of knowledge generation. WikiB facilitates the required sharing of documents among the group members for collaborative editing based knowledge generation.

Organization B has different groups (e.g. the group responsible for a product line) working within the organization. Groups perform different activities and at times, some groups fail to meet the organization's standard. To help these "less performing" groups, the upper management has initiated a Wiki based central repository of best practices that can help different groups to improve their performance. Essentially, a group of experts within the organization identify the best practices based on various aspects of the groups and put them in that repository. Group managers then use the repository to explore ways (i.e., best practices) to address the identified shortcomings of their groups. Unlike many Wikis in organization B, this Wiki based central repository is not *"open to all"* and *"free*

flowing" for publishing and/or editing. However, almost all employees can retrieve information from this repository.

At organization C:

The uses of WikiC for knowledge generation at the group level in organization C are comparable to organization A's groups. Many consist of members who are situated in geographical dispersed locations. Hence, a collaboration tool is required for knowledge generation and WikiC facilitates the required platform through the collaborative editing of group members.

Knowledge codification activity at the group level

At organization A:

Information is stored on the Wiki using its inherent hierarchical structure. While group members participate in collaborative editing, the basic structure that usually has been set forth by the group leader must be maintained. As one manager of the R&D group described,

> There is a part in the Wiki I have created and have made it mandatory for the team members to contribute there. It is mandatory for them to add 8 to 9 ideas for new product development time to time. It is a good tool for idea collection and capturing for future.

At organization B:

The generated knowledge for a group is stored on WikiB in various file formats (e.g. audio files of conference calls, video tutorials, podcasting), which are

simultaneously accessible to all group members. Similarly, best practices are also stored on the WikiB based repository in different file formats.

At organization C:

The group members' generated knowledge is stored on WikiC in various file formats including HD audio and video files. As one interviewee described,

> As our organization (i.e. organization C) is an advocate of high definition formats, naturally WikiC is capable of storing high definition formats and we encourage our group members to use that facility.

Knowledge transfer activity at the group level

At organization A:

Knowledge stored on Wiki is transferred to the group members through simultaneous access. Essentially, all members can access stored information on a group Wiki simultaneously based on the access rights assigned by the group leader. Group members can use the built-in search mechanism and/or the hierarchical structure of Wiki (or WikiA) to locate the required information on Wiki.

Organization A's management realizes the importance of having a Facebook-like social networking platform to facilitate knowledge transfer through informal interactions between the group members. However, currently organization A does not have one in place and they are working on developing one. As described by one interviewee,

> There is a big initiative to build a 'Facebook' type application. This internal social networking platform has been building in a ground up approach for facilitating better collaboration.

At organization B:

To have an effective transfer of knowledge, locating appropriate knowledge is important. WikiB has an inherent hierarchical organization of knowledge that allows group members to browse in an orderly fashion to locate the required information. In addition, WikiB has a built-in sophisticated searching and version control mechanism. These help the group members to locate and transfer the required knowledge. Moreover, for effective transfer, WikiB facilitates simultaneous access to required knowledge stored in different file formats without installing any additional software. This feature guarantees that group members can access the files without being concerned about the file format.

Group members are not collocated in most groups. Therefore, the opportunities for informal interactions required for tacit knowledge transfer are limited. However, FacebookB offers the possibility for informal interactions and the transfer of *tacit knowledge* among group members through such interactions.

The formal knowledge transfer of best practices occurs at the group level through the WikiB based central repository of best practices described earlier. Based on the problems identified (i.e., aspect(s) in which a group is not performing adequately), group leader search this highly structured repository to locate and transfer best practices that can improve group performance.

At organization C:

Knowledge stored on a group's WikiC is transferred to the group members through simultaneous parallel access. Based on the designation and job description, a group member gets specific rights to access knowledge on WikiC. WikiC has a highly structured organization of knowledge and a powerful search engine. These features make it easier for the group members to identify and retrieve the required information from WikiC.

Knowledge realization activity at the group level

At organization A:

Once the required knowledge is transferred to the group members through Wiki and/or WikiA, group members use it for different group activities including their group's project activities. This is an essential tool for groups' task performance. As one interviewee noted, "It (Wiki/WIkiA) is a very, very critical tool. It is an absolute must for us."

At organization B:

Groups use transferred knowledge through WikiB in diverse group activities. This WikiB based repository provides groups with an informal training mechanism and environment where their members can train themselves on a particular technology and/or process required to perform different group activities.

The WikiB based central repository of best practices facilitates the transfer knowledge from other groups that are performing efficiently in identified dimension(s). This knowledge helps groups to address their identified shortcomings and performance bottlenecks. As described by an interviewee who regulates of the best practices repository in organization B,

> If they (groups) see lacking in a given area, they can now look directly into our WikiB (of "best practices") for our best practice for that area and this will give them guidance on how they can improve their capability in that one area.

Together with the knowledge gained from the formal knowledge transfer mechanism, knowledge transferred through informal interactions on FacebookB also helps groups to perform different group activities efficiently.

At organization C:

The group members use the knowledge transferred through WikiC for different group activities such as idea generation for new products and developing product designs. Another important aspect of realization activity is inter-group understanding. In organization C, there are some groups that frequently collaborate on different projects. Hence, it is important that the groups that work together have a clear understanding of each other's work processes and activities. A project's WikiC open nature of knowledge generation, codification, and transfer helps the groups to have a better understanding of the others' internal activities. This, in turn, encourages the groups to collaborate more effectively on a project(s). As one interviewee described,

... now not only we understand what they (i.e. other groups in the collaboration) want, we also understand their approach and where they are coming from.

Table 15: Summary of the Exploratory Study's Findings			
Group Level KM Activity	**Group Level Uses of Web 2.0 for KM**		
	Organization A	**Organization B**	**Organization C**
Generation	Generation of knowledge through conversations on Wiki where in many cases group members *are not collocated*.	▪ Generation of knowledge through conversations on WikiB where in many cases group members are *situated in different parts of the world*.	▪Generation of knowledge through conversations on WikiC where group members might be from *different functional units of the organization and are from globally dispersed locations*.
Codification	▪ Storing generated knowledge on Wiki that is simultaneously accessible to all group members	▪ Storing generated knowledge on WikiB in various file formats *(e.g. audio files of conference calls, video tutorials, podcasting)* that is simultaneously accessible to all group members ▪Storing best practices from different groups on a WikiB based central repository that is simultaneously accessible to all employees	▪ Storing generated knowledge on WikiC in a wide variety of multimedia formats *(e.g. video tutorial in HD format)* that is simultaneously accessible to all group members
Transfer	▪Accessing required knowledge stored on group Wiki simultaneously ▪Gaining appropriate knowledge from Wiki through hierarchical knowledge organization,	▪ Simultaneously accessing required knowledge stored in different file formats on group WikiB *without installing additional software* ▪Gaining appropriate knowledge from group Wiki through hierarchical knowledge organization,	▪ Simultaneously accessing required knowledge stored on WikiC ▪Gaining appropriate knowledge from group Wiki through hierarchical knowledge

Table 15: Summary of the Exploratory Study's Findings			
Group Level KM Activity	**Group Level Uses of Web 2.0 for KM**		
	Organization A	**Organization B**	**Organization C**
	searching and version control mechanisms	searching and version control mechanisms ▪Learning about groups' best practices from the WikiB based central repository ▪Gaining knowledge from group members through *informal interactions* on FacebookB	organization and search mechanisms
Realization	▪Using knowledge generated and stored on Wiki to perform different activities	▪Using knowledge generated and stored on WikiB to perform different activities ▪ Using central repository of best practices to identify ways to address group shortcomings	▪Using knowledge generated and stored on WikiC to perform different group activities

Findings from our exploratory phase highlight that these three organizations are extensively using Web 2.0 based tools for KM at different levels. Some of their uses are innovative and they are also incorporating new features to enhance the existing Web 2.0 tools. Irrespective of how the organizations are currently using Web 2.0 for KM, it is quite evident from our exploratory case study that all three organizations perceive Web 2.0 as having the potential to increase KM's effectiveness.

5.3.3 Lessons Learned from the Organizations

In this section, we describe the lessons learned the studied organizations during the adoption of Web 2.0 technology for KM at different levels.

Web 2.0 tools need to be developed and/or customized

One of the lessons learned by the organizations is that off-the shelf Web 2.0 tools are not very useful and/or effective for KM, as they might lack some of the required features in a particular KM context. There are many Web 2.0 off-the-shelf tools available in the market. However, in most of the cases, these tools are not useful in their existing form. In our case study, we found that organizations B and C are using their own in-house developed (in some cases in collaboration with third party vendor) Web 2.0 based tools. These tools have additional features together with regular features. For example, organization B has added open format support for document sharing in their developed Wiki. Organization C has facilitated extensive multimedia sharing through their developed Wiki. Organization C has also added the capability for fine tuned access rights to their Wiki to authorize specific users for read/write rights on a Wiki page. Such features are important to have for the respective organization to effectively adopt and use Web 2.0 tools for KM at different levels.

Based on the experience of these organizations, one suggestion for organizations that are considering adopting Web 2.0 tools for KM is that they might have to develop their own Web 2.0 tool and/or customize an existing tool in the market to serve their specific purpose/s.

Openness is not always a good thing

While "openness" in communication is one of the desired features of Web 2.0 KM tools, in many cases some level of restriction is required in order to use Web 2.0 tools for KM in the business environment. We found that some Wikis and blogs in these three organizations are open to all employees for reading and/or writing. However, in many cases, these Wiki pages are only editable by a designated group of people. For example, in organization B, there are Wikis on technical topics that are maintained by a select group of people who are known to be "experts" of the Wikis' focus areas. If an employee wants to contribute to one such Wiki, then s/he must first submit it the group of people who are maintaining that Wiki. Then, the group will evaluate the merit of the contribution and consequently decide whether it is worth publishing. According to the interviewees, these processes are necessary for some Wikis to do "quality control" and to ensure the Wiki pages' content is going to be helpful.

Together with editing, there are several restrictions on reading as well. There are Wikis and blogs that are developed to be used by only members of a project team and/or group. For example, some Wikis are created for a particular project and only members of that project team can read and/or edit their content. Not only that, it often becomes necessary for every team member to have specific access rights depending upon his/her role in the project. Therefore, each organization has to decide what level of openness they want to use Web 2.0 tools for KM.

A Facebook- like social networking platform needs to be developed, which is a difficult task

In our study, all three organizations expressed the necessity of a Facebook-like social networking platform within their organization to facilitate informal interactions between the individuals working in their organization. However, having such a social networking site within an organization is not an easy task. In our study, the organizations all expressed concern regarding two issues. First, "Facebook" itself does not allow its site to be used in a closed fashion by any organization which other "Facebook" members cannot access . One of the organizations in our study proposed "Facebook" management to create a dedicated closed group on the "Facebook" platform that could be accessed only by their employees. However, "Facebook" management was not interested in providing such a service through the "Facebook" platform. Therefore, this organization has begun developing its own Facebook-like social networking platform. However, they are finding that developing such a platform is an uphill battle, as it hard to embed the "Fun" element to encourage employees to use it regularly for social interactions. Another organization in our study has already developed its own Facebook- like social networking platform. However, since it is relatively new, use of that platform has not taken off yet.

Web 2.0 tools will not substitute conventional email communication in the near future (if at all)

While it might sound obvious, these three organizations have learned this lesson firsthand. The organizations we studied have been using Web 2.0 based tools for KM at

different levels for the last few years. In many cases, such tools like Wikis have become more prevalent in sharing knowledge and, to a large extent, have substituted email in that regard. However, for regular day-to-day communications and operations, email is still the ubiquitous channel. Web 2.0 tools such as Wikis act "passively" and rely on individuals to "pull" information from the Wiki. This sort of information dissemination differs from traditional email where information is "pushed" rather than waiting to be collected. In an organizational setup, in addition to making information available, it is also important to confirm that people have actually received the information in a timely manner. Hence, email is still one of the most prevalent modes of communication and Web 2.0 tools are not a replacement for conventional email.

The findings of the exploratory allow us to identify the ways organizations currently use Web 2.0 for KM. These findings also help us to develop propositions for the next phase of our research.

CHAPTER VI

DEVELOPMENT OF PROPOSITIONS

In this chapter, we use the extant literature along with the findings of our exploratory case study to develop propositions that capture the relationships between the use of Web 2.0 for KM, and its effect at the individual, project, group, and organization levels. The development of our propositions is in accordance with the studies of Sarkar and Lee (2003) and Darke (1997), in which they developed propositions and then tested them by means of a positivist case study of organization(s).

6.1 Individual-Level Proposition

6.1.1. Role of Individual-Level Context Variables

Grover and Davenport (2001) conceptualize the KM context as surrounding an environment consisting of technology, culture, structure and strategy, in which KM activities are embedded. It is important to understand the context of KM since its activities are essentially influenced by context (Grover & Davenport, 2001).

To understand the surrounding KM environment and its effect on the individual, Kulkarni et al. (2007) studied supervisor and coworker support for KM, as well as their incentive for participating in it. Incentive refers to the formal appraisal and recognition of efforts by knowledge workers for furthering knowledge sharing and reuse (Kulkarni et

al., 2007). Through empirical study, Kulkarni et al. (2007) found that incentive can positively affect individuals' participation in KM activities.

Kankanhalli et al. (2005) and Bock et al. (2005) also found that extrinsic rewards such as increased pay, bonuses, job security, or career advancement can positively affect individuals' KM participation.

Along with extrinsic motivators such as incentive, Kulkarni et al. (2007) found that supervisor and coworker support positively affect an individual's KM participation. Kulkarni et al. (2007) conceptualized supervisor and coworker support as attitudes toward knowledge sharing and use within an employee's work team, which consisted of coworkers and immediate supervisors.

In our exploratory study, we found that only organization A has a formal reward mechanism in place for participating in KM activities. While organizations B and C have no such formal reward mechanism, active participation in KM activities by individuals is recognized by the management in a rather informal fashion. Such recognition helps individuals to advance their career within their organizations.

There are different Web 2.0-based KM activities that are not mandatory. Web 2.0-based KM has room for many voluntary activities such as maintaining one's own blog or contributing to a Wiki page. Hence, based on the findings of Kulkarni et al. (2007), we infer that different incentives, as well as supervisor and coworker support, will positively affect individuals' participation in Web 2.0-based KM activities, and that this will, in turn, positively affect individual-level outcomes. We want to examine the effects of these context variables. Hence, we add these context variables to the subsequent propositions

as factors that positively affect the relationship between uses of Web 2.0 for KM, and different individual-level outcome variables.

6.1.2. Web 2.0 for KM and Tacit Knowledge Sharing

Tacit knowledge is deeply rooted in each individual's actions and experiences, as well as in his/her ideals, values, and emotions. Hence, it is difficult to formalize, communicate, or share (DeSouza, 2003). Sharing knowledge means both contributing to and using available knowledge (Kulkarni et al., 2007). Because of the subjective and intuitive nature of tacit knowledge, such sharing is very difficult to achieve through any systematic process (DeSouza, 2003). While tacit knowledge exchange among workers could be enhanced through the use of information technology, overall it requires a more "people-centric" approach by means of which individuals can have more "dialogue" between them instead of merely distributing and receiving information (DeSouza, 2003). Nonaka and Takeuchi (1995) also emphasize the process of socialization for sharing experiences and exchanging tacit knowledge, and DeSouza (2003) has shown empirically that informal dialogues can increase tacit knowledge sharing. Such dialogue can be encouraged through deliberate, planned interactions (DeSouza, 2003). We believe that Web 2.0 for KM can facilitate the required dialogue, socialization, and informal interactions for the following reasons:

First, Wagner (2006) has shown empirically that Wiki can be used effectively for conversation-based KM, by means of which individuals create and share knowledge

through question-and-answer dialogue. However, Wagner (2006) has not specifically investigated whether Wiki can positively affect tacit knowledge sharing.

Second, Facebook-like Web 2.0-based social networking platforms are designed and set up to facilitate the *informal* interactions and dialogues between individuals in relatively informal environments (Poynter, 2008). In our exploratory case study, we found that organization B is using Facebook-like social networking platforms quite extensively in order to facilitate informal socialization between individuals working within their organization. In fact, organization B has created its own social networking platform. Upper management of organization B encourages all employees to actively participate in this social networking platform . Organization A is also working on creating its own social networking platform. Interestingly, while an existing literature blog has not been identified as a tool for informal socialization and knowledge sharing, we found that in all three organizations, blogs are in use to facilitate rather informal interactions between different individuals within the organizations. In such instances, not only the owner of the blog provides his insights on a topic, it also simultaneously facilitates an informal "dialogue" between the owner and the readers through questions and answers, which are required for effective tacit knowledge sharing.

Therefore, we assert that Web 2.0 for KM can provide the required informal conversational knowledge-sharing environment for effective tacit knowledge sharing and posit that:

P1: Use of Web 2.0 technology for KM in an organization positively affects tacit knowledge sharing between individuals working in that organization.

P1a: Incentive for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and tacit knowledge sharing between individuals working in that organization.

P1b: Supervisor's and co-workers' support for participating in KM activities positively affects the relationship between the use of Web 2.0 technology for KM in an organization and tacit knowledge sharing between individuals working in that organization.

6.1.3. Web 2.0 for KM and Perceived Learning

Alavi et al. (2002) define perceived learning as changes in a learner's perceptions of skill and knowledge levels before and after the learning experience. Ausubel (1968) suggests that structuring the sub-process of learning can be enhanced through advance organizer, which provides additional information such as explanations, principles, background, and supplementary material, as well as the support to properly structure that information, which is form, flow, presentation mode, sequence, and organization. Alavi et al. (2002) posit that such an *"Advance organizer"* for KM should provide easy-to-use capabilities for sharing information in various forms, such as spreadsheets and multimedia documents, access to additional information through search and filtering features, and structured information exchange among group members through threaded discussions and workflow models.

By analyzing Wikis, we can infer that standard Wiki has the capability to provide all the required features to be considered an *"Advance Organizer."* Wiki can facilitate information sharing in various formats and provide a search engine to find required information. It also has a structured organization of knowledge, and incorporates threaded discussions. In our exploratory case study, we found that all three organizations are using Wiki quite extensively for KM at different levels. In fact, organizations B and C have developed their own "enhanced" Wiki technology, which has more functionalities, such as a wider range of file format support, for knowledge sharing.

Alavi et al. (2002) posit that the use of such an *"Advance Organizer"* can facilitate an *"advanced"* environment for learning for individuals and, therefore, individuals' perceived learning will be higher. As Web 2.0 technology, especially basic Wiki and its enhanced versions, provide the required functionalities of an *"Advance Organizer"* for KM, we posit that the use of Web 2.0 for KM in an organization will positively affect the perceived learning of the individuals working in that organization.

P2: Use of Web 2.0 technology for KM in an organization will positively affect perceived learning of the individuals working in that organization.

P2a: Incentive for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and perceived learning of the individuals working in that organization.

P2b: Supervisor's and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and perceived learning of the individuals working in that organization.

6.1.4. Web 2.0 for KM and Social Capital

Zhang and Hiltz (2003) posit that the primary reasons that individuals would share knowledge within virtual communities are the expectations of enriching knowledge, seeking support, and making friends. Butler et al. (2002) suggested that the primary reason for individuals to share knowledge is their expectation of earning positive reputation such as being skilled and knowledgeable at a particular technology(s). Chiu et al. (2006) also suggest these personal outcome expectations as the reason behind people's knowledge sharing in a virtual community.

Earning "social capital" such as creating reputation, making friends, and getting support, is one of the major expectations of individuals who participate in an internet facilitated community (Chiu et al., 2006). However, a rich medium is necessary to facilitate earning of such "social capital" (Preece, 2002). As Web 2.0 facilitates a rich medium that enables people to collaborate (Lee & Lan, 2007; Richards, 2009), we believe that the use of Web 2.0 for KM in organizations can facilitate a required rich medium by means of which individuals can earn intended social capital.

In our exploratory case study, we found that several individuals in organization B have earned the reputation of being skilled at certain types of technology by maintaining blogs and contributing to the Wiki-based knowledge repository on the company-

facilitated Web 2.0 platform. Such a reputation is recognized and rewarded in organization B in the form of internal hiring when certain expertise is required. Organization B has thousands of employees who work in globally dispersed locations. Hence, the management of organization B considers this as an opportunity to identify the skills required within their organization. On the other hand, the employees consider this as an opportunity to earn a reputation for themselves and to be noticed in a big organization.

P3: When Web 2.0 technology is in use for KM in organizations, individuals in those organizations can earn positive reputation by participating in KM activities.
P3a: Incentive for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and an individual's earning reputation by participating in KM activities.
P3b: Supervisor's and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and an individual's earning reputation by participating in KM activities.

In addition, in our exploratory case study, we found that such use of blogs and Wiki gives the employees an opportunity to identify *"where"* the *"knowledge"* is; that is, who the knowledge expert is for a certain problem domain, and from whom to seek help. Hence, we posit the following:

P4: When Web 2.0 technology is in use for KM in organizations, individuals in those organizations can gain help from the knowledgeable and/or expert members of the organization.

P4a: Incentive for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and an individual's acquisition of knowledge from the expert members of the organization.

P4b: Supervisor's and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and an individual's gaining knowledge from the expert members of the organization.

6.1.5. Web 2.0 for KM and Individual's Satisfaction

Kulkarni et al. (2007) define an individual's satisfaction with KM as the "subjective evaluation of the various outcomes due to the knowledge sharing and/or retrieval capabilities existing within the organization, including ease of getting the information/knowledge needed, satisfaction with the access to knowledge, adequacy of the information/knowledge to meet one's needs." In line with the IS success model (Doll & Torkzadeh,1998; Devraj et al., 2002), Kulkarni et al. (2007) propose that knowledge content quality, KM system quality, and perceived usefulness of knowledge sharing determine the level of overall user satisfaction. We have posited that the use of Web 2.0 for KM can result in an effective KM by means of which tacit knowledge is shared *(P1)*, higher perceived learning is achieved *(P2)*, and, by sharing knowledge, individuals can achieve social capital *(P3)*. Hence, we conjecture that individuals will have a higher level

of satisfaction with Web 2.0-based KM in comparison to the previous non-Web 2.0-based KM.

In our exploratory study, we found that, as individuals, all the interviewees from all three organizations were satisfied with Web 2.0-based KM. An interviewee from organization B was particularly excited about and satisfied with the opportunity to learn new technology through Wiki and multimedia sharing. She emphasized how Web 2.0-based KM's learning opportunity reduces the need to have conventional training, and allows her to learn a new technology at her own convenience. An interviewee from company C was excited about and satisfied with the learning opportunity from Wiki that enables people from different business units to contribute. He mentioned that Wiki gives him a chance to understand and know about skills and perspectives related to solving the problems of different units, which was impossible in previous email-based communications for knowledge sharing.

Hence, based on Kulkarni et al.'s (2007) KM success model and the findings of our exploratory case study, we posit that:

P5: Use of Web 2.0 technology for KM in an organization positively affects an individual's satisfaction with KM.

P5a: Incentive for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and an individual's satisfaction with KM.

P5b: Supervisor's and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and an individual's satisfaction with KM.

6.2 Project-Level Propositions

6.2.1 Role of Project-Level Context Variables

The members of a project team are involved in that project's KM and, therefore, their familiarity with each other is an important project-level KM context variable. Project team members' familiarity can be defined as the degree of prior interaction between team members. Gruenfeld et al. (1996) found empirically that team members who were familiar with each other were significantly more successful at sharing than a team of strangers. Janz et al. (1999) also highlighted the importance of the team environment in effective KM in which team members are familiar with each other.

In addition to team members' familiarity, team-level studies have also noted the importance of team stability as regards effectively allowing the interchange of data, information, and knowledge in project teams. Research has found that project team's stability has a positive impact on team learning and overall project success (Akgu¨n & Lynn, 2002). Blau (1964) highlighted reciprocity as a benefit for individuals who engage in social exchange. Several studies have empirically shown that individuals participating in online KM activities perceive reciprocity as a strong motivating factor (Kankanhalli et al., 2005). Based on the results of existing studies, we can infer that if a project team is stable and its team members are familiar with each other then there will be a higher sense

of reciprocity. This higher reciprocity will have a positive effect on team members' participation in Web 2.0-based project-level KM, and this will, in turn, positively affect the different project-level outcome variables. Another context variable that plays a role in the effective sharing of information in a project team is a team leader's ability to provide an open environment for communication Fedor et al., 2003). A team leader sets up a tone for the whole team by providing ongoing directions and guidance (Nemeth, 1992). A team leader is also the key person to establish the information sources both within and outside the team for his team. Moreover, a team's leader essentially facilitates or constraints free flow of information and ideas for his team's KM, (Beer, 1999). Hence, in using Web 2.0 tools for a project team's KM, it is important that the project team leader facilities an open environment where project team members participate in Web 2.0 based KM activities to share their knowledge. Therefore, we assert that a project team leader's ability to provide an environment for communication and information sharing will increase team members' participation in their team's Web 2.0 based KM activities and that will, in turn, positively affect the different project-level outcome variables.

Based on this conjecture, we consider these context variables in the subsequent propositions as factors that positively affect the relationship between uses of Web 2.0 for KM and different project-level outcome variables.

6.2.2. Web 2.0 for KM and Transfer of Knowledge Between Projects

Knowledge management in projects includes the policies, tools, and knowledge processes that projects and project-based organizations can use to take advantage of the

knowledge that is available within and outside of projects (Kotnour, 1999). Throughout its life cycle, every project faces uncertainty and ambiguity due to lack of knowledge (Pavlak, 2004; Hallgreen & Maaninen-Olsson, 2005; Yang, 2005). Hence, transfer of knowledge from previous projects can help in predicting and facing the uncertain factors related to the current projects (Landaeta, 2008). Knowledge is shared and transferred from a source project to a project recipient through formal and informal networks contained within knowledge management systems (Hansen, 2002; Blackburn, 2002; Leenders et al., 2003; Sense, 2003; Bresnen et al., 2003). One of the major ways in which such knowledge transfer can occur is through documents (Grant & Gregory, 1997). Instead of using static pages to transfer knowledge between projects that have knowledge that is related to other projects, the use of Wiki for sharing knowledge has two major advantages.

First, as a project goes through different stages, the knowledge related to that project keeps on evolving (Landaeta, 2008). By its very nature, Wiki allows the knowledge base to evolve through conversation since it is possible to keep track of how the knowledge has evolved (Wagner, 2006). Hence, we believe that through the use of Wiki, the evolution of knowledge in a project could be captured more efficiently. Second, instead of a project team representative being the only source of knowledge gathered in a project, through the use of Wiki, all team members get to share their knowledge based on the role that they have in the project (Brown et al., 2007).

In our exploratory study, we found that all three organizations use Wiki-like Web 2.0 technology in their projects' internal KM. Along with Wiki for a project team's internal use, it is company policy in organization C to create a Wiki page for each project (with a few exceptions). This page is available to all the people working in the organization, and allows users to share different aspects of a project, especially lessons learned, which might help other teams with their projects. Even though it is not mandatory, we found that companies A and B also use Wiki share project-related knowledge with others in their own organization. Apparently all three companies in our case study realize the importance of knowledge transfer from one project to another and perceive Web 2.0 technology, especially Wiki, as an effective tool to attain the required knowledge transfer. Therefore, based on the existing literature and the findings of our exploratory case study, we posit that:

P6: Use of Web 2.0 technology for KM at project level positively affects transfer of knowledge between projects.

P6a: Project team members' familiarity with each other positively affects the relationship between use of Web 2.0 technology for KM at project level and transfer of knowledge between projects.

P6b: Stability of the project teams positively affects the relationship between use of Web 2.0 technology for KM at project level and transfer of knowledge between projects.

P6c: Team leadership positively affects the relationship between use of Web 2.0 technology for KM at project level and transfer of knowledge between projects.

6.2.3. Web 2.0 for KM and Project Completion on Time

A key indicator of process performance is on-time project completion for a given budget and set of specification (Mitchell, 2006). On-time completion is considered one of the most important requirements of projects (Hansen, 1989). Knowledge integration capability from external sources can play a positive role in process performance in terms of the completion of a project on time (Mitchell, 2006). This knowledge transfer permits knowledge reuse, and the recombination of existing knowledge, which can, in turn, resolve related uncertainty (Marjchrzak et al., 2004; Terwiesch & Loch, 1999). Coupled with this reduction of the uncertainty of the projects, the integration of knowledge from previous similar projects can help executives and project planners to avoid *"unrealistic optimism"* related to future events and outcomes (Taylor & Brown, 1988), as this leads to an unrealistic project completion time. Such wrong estimation of project completion can be reduced if executives make their estimation based on the experience of a reference class of similar projects (Lovallo & Kahneman, 2003). Such knowledge integration from external sources and previous projects has a positive effect on timely project completion (Mitchell, 2006).Therefore, based on the earlier proposition *(P6)* that Web 2.0-based KM at project level has the potential to facilitate effective transfer of knowledge between projects, we believe that Web 2.0-based KM at the project level will, in turn, lead to better assessment of project completion time.

In addition to external sources, it is very important for a project to introduce individually held information and know-how into a common stock of knowledge that can be applied to solve problems. Mitchell (2006) found that this sort of "internal" knowledge

integration capability also positively affects the project completion schedule. However, such knowledge integration processes require knowledge transfer through social interactions among individuals using internal communication channels to reach a common perspective for effective problem solving (Mitchell, 2006). Web 2.0 technology such as Wiki enables people working on a project to collaborate and share knowledge through social interaction (Minocha & Thomas, 2007) based on the fact that knowledge evolves through conversation (Wagner, 2006). Hence, we can infer that conceptually, Web 2.0 technology can facilitate effective integration of knowledge from both internal and external sources including previous projects, and this will positively affect completion of a project in time. Therefore, we posit that:

P7: Use of Web 2.0 technology for KM in a project positively affects completion of the project in time.

P7a: Project team members' familiarity with each other positively affects the relationship between use of Web 2.0 technology for KM at project level and project completion time.

P7b: Stability of the project team positively affects the relationship between use of Web 2.0 technology for KM at project level and project completion time.

P7c: Team leadership positively affects the relationship between use of Web 2.0 technology for KM at project level and project completion time.

6.2.4. Web 2.0 for KM and Effective Transactive Memory System

Alavi and Tiwana (2002) pointed out that knowledge networking in groups or teams is effective if members know who has the required knowledge and expertise, where the knowledge and expertise are located, and where and when they are needed (Cannon-Bowers & Salas ,2002). The idea of such knowledge networking and interpersonal awareness of others' knowledge has been studied, and is referred to as the transactive memory system (TMS) (Hollingshead, 1998). In TMS, individuals who are in continuing relationships, utilize each other as memory sources or aids to supplement their own limited and unreliable memories and knowledge (Wegner, 1985). A TMS occurs when two or more people cooperatively store, retrieve, and communicate information and knowledge, and it provides a knowledge network among individuals, thereby allowing the interchange of data, information, and knowledge (Haseman, 2005). TMS has three principal components (Akgu¨n et al., 2005):

Specialization: The differentiated structure of member knowledge, which is facilitating the availability of different sorts of knowledge, especially complimentary.

Credibility: Members' beliefs about the accuracy and reliability of other members' knowledge.

Coordination: Effective and orchestrated knowledge processing.

We believe that Web 2.0 technology has the potential to deliver all three components at the project level due to the following:

First, on Wiki, a Web 2.0 technology, people with different knowledge base and expertise can share their knowledge (Hohman & Saiedian, 2008). In our exploratory study, we found that Wiki is in use at the project level in all three organizations to facilitate the knowledge sharing of different people with diverse skills and expertise in a project team.

Second, in our exploratory phase, we found that all three organizations, especially B, are using Facebook-like social networking platforms to facilitate social interaction between the employees in the organization, and to provide employees an opportunity to know each other on a personal level. Interviewees from all three organizations also emphasized that many employees maintain their personal blogs on the organization-provided Web 2.0 platform, and share their expertise through blogging. Consequently, many employees manage to create an image of being an "expert" at certain technology within the organization. We found that in organization B, it is not uncommon to hire people internally for projects based on their expertise and the reputation that they have earned through blogs and social networking. At the project level, the use of Wiki for KM, with contributed knowledge, contributor's identity is also shown. Hence, it is easier to trust and act on the knowledge provided by a team member who already has a certain reputation and credibility.

Third, Wiki can facilitate asynchronous, simultaneous collaboration of multiple people by means of which knowledge can evolve through conversation (Wagner, 2006). The version-control feature of Wiki is also a very useful feature of IT projects as in addition to storing the information, it helps to identify the evolution of knowledge and to

backtrack if required (Louridas, 2006). All these features of Wiki can help to ensure effective coordination (Brown et al., 2007).

The positive influence of a TMS on team performance is well established in the extant literature (Yoo & Kanawattanachai, 2001). Akgu¨n et al. (2005) found that effective TMS will positively influence success of a project's product. A product's success refers to the performance of the product (Cooper & Kleinschmidt, 1987), which can be measured in terms of its acceptance by the stakeholders such as management and customers (Akgu¨n et al., 2005). As we assert that Web 2.0 technology can effectively facilitate TMS, we posit that the use of Web 2.0 for KM will also have a similar positive effect on a project team's learning and a product's success.

P8: Web 2.0 technology for KM in a project will positively affect the project's product success.

P8a: Project team members' familiarity with each other positively affects the relationship between use of Web 2.0 technology for KM at project level and success of a project's product.

P8b: Stability of the project teams positively affects use of Web 2.0 technology for KM at project level and success of a project's product.

P8c: Team leadership positively affects use of Web 2.0 technology for KM at project level and success of a project's product.

6.3. Group-Level Propositions

6.3.1. Role of Group-Level Context Variables

Several studies have highlighted the importance of the existing relationship between group members in a group's KM activity (Kanawattanachai & Yoo, 2007). In accordance with Nahapiet and Ghoshal (1998), Robert et al. (2008) conceptualized the existing relationship between group members as social capital, which consists of three dimensions: structural, relational, and cognitive. The structural dimension essentially captures the ties among actors and reflects the potential resources available to an actor of a group (i.e., "who knows whom"). The relational dimension captures the nature of social relations developed through interactions over time among a group's members. The cognitive dimension refers to shared representations, interpretations, systems, and language in a group. These three dimensions essentially facilitate the creation and exchange of knowledge (Nahapiet & Ghoshal, 1998).

Following the conceptualization by Rulke and Galaskiewicz (2000), Robert et al. (2008) viewed structural capital as a function of intensity and decentralization. Intensity represents the extent of the social interactions among team members. Such interactions among individuals have been found to be an important determinant of knowledge sharing and use in groups (Ahuja et al., 2003). In addition to the number of interactions, the nature of the interactions—that is, the number of communicators and intermediaries in communications—is also important for understanding the structural capital of a group. Higher interactions and a smaller number of intermediaries in those interactions among group members essentially indicate higher structural capital (Rulke & Galaskiewicz,

2000). A group with higher structural capital essentially has a history of more open and participative group discussions, and this positively affects knowledge integration within that group (Robert et al., 2008).

The relational dimension of social capital captures the nature of the relationships that exist among group members (Nahapiet & Ghoshal 1998). Relational capital consists of four sub-dimensions: identification, trust, obligations, and norms (Nahapiet & Ghoshal, 1998; Wasko & Faraj, 2005). Relational capital can positively affect KM activities in a group. Provided group members identify with the group (identification), trust the group members (trust), perceive an obligation to the group and group members (obligation), and are willing to abide by the group norms (norms), then the group's KM activities will be more effective. Higher relational social capital has been empirically shown to enhance knowledge exchange among scientists (Bouty, 2000) and to enhance inter-unit interactions in multinational organizations (Kostova & Roth, 2003).

Cognitive capital essentially captures the extent to which group members share a common understanding of their group's work and/or task (Mathieu et al., 2000). As per Li (2005), higher cognitive capital can facilitate the exchange of meaningful communication needed for knowledge creation. Robert et al. (2008) also empirically established that the cognitive capital dimension of the social capital of a group can positively affect knowledge integration in that group.

As the existing literature suggests that a group's higher social capital, which is captured in terms of structural, relational, and cognitive capital, can positively affect KM activities and group-level KM outcome variables, we can infer that social capital of a

group will also positively affect the group's Web 2.0-based KM activities and subsequent outcomes. Hence, we include social capital of a group as a context variable in the following group-level propositions related to the uses of Web 2.0 for a group's KM and outcome.

6.3.2 Web 2.0 for KM as a Group Support System (GSS)

In our exploratory phase, we found that almost all the groups in the organizations are using Web 2.0-based technology, especially Wiki, for different purposes. Organizations B and C have developed Web 2.0 technology that they use in different groups. For example, both organizations have developed their own enhanced Wiki technology with additional features that they use for different purposes. In organization A, we found that whereas they use a *"less sophisticated"* Web 2.0 technology for their regular use, once they get budget approval for a project, they use a more sophisticated third-party-provided Web 2.0 technology for group communication and information sharing. However, the interviewee from organization A thought that while the third-party-provided *"sophisticated"* Web 2.0 technology had added features and benefits, the regular Web 2.0 technology was also an effective medium for communication and information sharing. In the exploratory phase, the general consensus among the interviewees was that they found Wiki to be a convenient way for information sharing among group members.

Knowledge is an important factor for making decisions. The Group Decision and Group Support System (GSS) is used by different organization as a collaborative KM tool to provide the required knowledge for group decision making (Hsia et al., 2006). In their efforts to develop an integrated framework to explain the success of GSS, Fjermestad and Hiltz (2001) identified different outcome variables that are improved by an effective Group Support System (GSS). These variables include information exchange in a group, a group's ability to deal with a task, flexibility in group processes, group cohesiveness, and communication among group members. Web 2.0-based tools such as Wiki can provide the necessary features required by an effective GSS, such as simultaneous information sharing, which facilities collaboration among group members (Wagner, 2004), though in a rather asynchronous way (Hsia et al., 2006). In fact, Wagner (2006) posits that in addition to providing the services enabled by a GSS, Web 2.0-based KM can overcome many of the bottlenecks of traditional structured GSSs for KM as it allows the knowledge to evolve through social interactions and conversations. Hence, we assert that Web 2.0-based KM tools serve as an effective GSS and will positively affect a group's performance and/or effectiveness, which is measured in terms of effective communication among group members, participation of group members in group KM, the group's ability to deal with a task, flexibility in the work process, and group decision quality. Therefore:

P9: Use of Web 2.0 technology for KM in groups within an organization will positively affect groups' performance and/or effectiveness.

P9a: A group's social capital positively affects the relationship between use of Web 2.0 technology for KM in a group and that group's performance and/or effectiveness.

6.4. Organization-Level Propositions

6.4.1. Organization-Level KM Context Variables

Organization-level KM context variables can be grouped into two major categories: technical KM resource and social KM resource (Chuang et al., 2004). The technical KM resource includes "IT assets and KM capability that are a shared knowledge delivery base, the business functionality of which has been defined in terms of its business intelligence, collaboration, distributed learning, knowledge discovery, knowledge mapping, and knowledge generation" (Gold et al., 2001). Studies have shown that technical KM resources can help an organization to enable facilitation of rapid collection, storage, and exchange of knowledge (Lee & Choi, 2003); integration of fragmented flows of knowledge (Gold et al., 2001); and conversion and creation of knowledge (Raven & Prasser, 1996). Studies have also found that these technical KM resources positively affect 9; Chuang et al., 2004). Hence, we consider the availability of technical KM resources, especially Web 2.0-based ones, in the subsequent organization-level propositions.

According to Lee and Choi (2003), the critical dimensions of Social KM resources include:

(a) Structural KM resource, i.e., "an organization's encouragement (or inhabitation) for knowledge management" (Hedlund, 1994; Nonaka & Takeuchi, 1995),

(b) Cultural KM resource, i.e., "an appropriate culture encourages humans to create and share knowledge within an organization" (Barney, 1986; Holsapple & Joshi, 2001), (c) Human KM resource, i.e., "employees task knowledge not only have a deep knowledge of a discipline, but also know how their discipline interacts with other disciplines" (Iansiti, 1993).

Knowledge management capabilities embodied in humans are very often associated with structural or cultural KM resource capabilities (Chuang et al., 2004). Several studies identified and highlighted the importance of organizational culture for having an effective KM within a company (Alavi et al., 2006). Liwin and Stringer (1968) have defined organizational culture in terms of a company's value system, which includes, but is not limited to, its organizational reward system and the ability to provide a cooperative and supportive environment.

While reward and recognition are an important aspect of an organization's social KM resources, Chuang et al. (2004), in accordance with Gold et al. (2001), highlighted the requirement of an overall organizational culture and social KM setup in which the importance of KM is clear to all individuals and groups within an organization. In other words, in attaining effective KM, it is important to have social KM where an organization-wide climate of knowledge sharing is promoted (Kulkarni et al., 2007). Web 2.0-based KM is a relatively new approach in the organizations and this KM approach requires voluntary participation of the various organizational entities (i.e., individuals, project teams, and groups) in KM activities (Richards, 2009). Hence, we can infer that social KM resources will positively affect the relationship between the use of

Web 2.0 for KM and different organization-level outcomes. Based on this assertion, we include social KM resources as context variables that positively affect the relationship between the uses of Web 2.0 for KM and organizational level outcome in the following propositions.

6.4.2. Web 2.0 for KM and Organization level outcomes

While organizational learning is not merely an accumulation of each member's learning (Fiol & Lyles, 1985), organizational learning happens through the members of an organization (Simon, 1991), and its final effect is eventually on the organization (Hurley & Hult, 1998; Slater & Narver, 1995). A member of an organization undergoes several experiences and faces both positive and negative outcomes, and that knowledge becomes embedded in the organizational memory (Argyris & Schon, 1978). Nonaka's (1994) Knowledge Creation theory *also* emphasizes such a relationship between individual-level learning and organizational impacts. Huber(1991) states that an organization learns if any of its units acquires knowledge that is potentially useful to the organization. Hence, in accordance with Sabherwal and Becerra-Fernandez (2003), and based upon the synthesis of these conceptualizations, we can conclude that learning or knowledge creation originates at the individual level, and then moves up through groups, and then to the overall organization. According to the knowledge-based theory of the firm, knowledge begins with individuals, and organizations need to integrate this knowledge using a combination of mechanisms and technology. Similarly, Grant (1996a)

argues that performance and competitive advantage depend on a firm's ability to integrate specialized knowledge from different sources.

The primary reason for the existence of an organization is its superior ability to integrate multiple knowledge streams, for the application of existing knowledge to tasks, as well as for the creation of new knowledge (Conner, 1991). An organization must arrange, consolidate, and structure knowledge, thereby making it easier to access and distribute it within the organization (Nonaka & Takeuchi, 1995). Gold et al. (2001) showed empirically that an organization's capability to perform KM activities effectively has an impact on its effectiveness. One such capability is to facilitate collaboration among different individuals in the organization in order to generate knowledge (Coles, 1998). Another important knowledge-processing capability for organizations is the ability to convert tacit knowledge to explicit (Edmondson et al., 2003). In addition to generating and converting knowledge, an organization's KM-required capability of effective storage and retrieval mechanisms allows for quick and easy access (Gold et al., 2001). In earlier sections, based on the literature and findings of our exploratory case study, we posited that Web 2.0-based KM has the potential to facilitate collaboration and conversion of tacit knowledge to explicit and effective retrieval of knowledge as an *"Advanced organizer"* at different levels. Therefore, we assert that Web 2.0-based KM will enhance the overall KM capability of an organization.

A central tenet underlying the existence of knowledge management capabilities is the association of those capabilities with aspects of organizational effectiveness (Nonaka, 1994; Nonaka & Takeuchi, 1995). Like any organizational resource, effective knowledge

management through the development of capabilities contributes to key aspects of organization level outcome (Gold et al., 2001). Different studies (Huber, 1991; Kelly & Amburgey, 1991; Kogut & Zander,1993) have pointed out that through KM and its capabilities, organizations experience a learning effect in which they improve over time in regard to their capability to create value. Many studies, such as Alavi and Leidner (1999), Lee et al. (2005), and Tanriverdi (2005), have used objective measures, such as return on investment (ROI) and return on equity (ROE), to capture the contribution of KM capabilities. However, Gold et al. (2001) argue that these objective measures are significantly confounded by many uncontrollable business, economic, and environmental factors. Hence, using measures that are less dependent on uncontrollable factors will provide clearer insight into the value-added aspect of KM capability. In accordance with Gold et al.'s (2001) recommendation, we choose subjective measures—such as improved coordination of efforts, better customer service , responsiveness to market change, and reduced redundancy of information/knowledge—that are less confounded in the uncontrollable surrounding factors to understand the Web 2.0-based KM's effect on organizational outcome. These outcome variables are not directly linked to the financial measures. However, they certainly provide a way of measuring relative contribution of knowledge management capability to organizational effectiveness. Gold et al. (2001) empirically established the positive relationship between the KM capability of an organization and these organization level outcome measures. As we maintain that the use of Web 2.0 for KM will enhance an organization's KM capability, we posit the following:

P10: Use of Web 2.0-based technology for KM will positively affect organization level outcomes.

P10a: Technical KM resource positively affects the relationship between use of Web 2.0-based technology for KM and organization level outcomes.

P10b: Social KM resource positively affects the relationship between use of Web 2.0-based technology for KM and organization level outcomes.

These propositions essentially capture the relationship between Web 2.0-based KM at the individual, project, group, and organizational levels. We have also included propositions that capture the role of context variables, and intend to empirically test these propositions. In the following chapter, we will describe the research method used to test the propositions.

CHAPTER VII

QUALITATIVE CASE STUDY AND FINDINGS

In this chapter we provide a description of the positivist case-study research method together with its findings.

7.1. Methodological Guidelines for Intended Qualitative Case Study

We deploy a qualitative positivist case-study approach to test the propositions. Our adoption of positivism is consistent with the views that are held by scholars in the fields of organizational studies (Eisenhardt, 1989; Lee, 1991), and information systems (Sarkar and Lee, 2002, 2003; Lee, 1989; Orlikowski and Baroudi, 1991), and follows a similar path. "Hypothetico-deductive logic" is central to the world of positivist research today (Lee, 1999), which essentially is a synthesis of three traditions: empiricist, rationalist, and critical rationalist (Sarker and Lee, 2002, 2003). There is an empiricist influence in our positivist approach that is reflected in the rigor of our research process, drawing mainly on Yin (1994). The rationalist and the critical-rationalist traditions are reflected in the use of pattern matching to deductively test falsifiable statements derived from the literature (Sarker and Lee, 2002, 2003).

In our Qualitative case study, we interviewed three individuals from each organization. We include individuals who have been working in their respective organization long enough; that is, since the pre-Web 2.0-based knowledge-management (KM) era, to observe and understand the effects of traditional KM, as well as Web 2.0-based KM. We included individuals from top management as well as individuals who are not part of the top management in order to create a holistic picture of Web 2.0-based KM effects. For similar reasons, we included a project team leader as well as a regular project team member, along with a group leader as well as a regular member of a group.

As the third phase of this research is principally positivist in nature, using clearly define methodological guidelines we satisfy the four criteria of rigor (Shanks, 2002): construct validity, internal validity, external validity, and reliability (Lee, 1989; Yin, 1994). In the following section we describe how we address the requirements of the positivist case-study method.

7.1.1 Construct Validity

Based on Yin's (1994) suggestions, we use three tactics to improve construct validity.

Multiple sources of evidence

As stated by Yin (1994), the use of multiple data sources can contribute to a high degree of construct validity as multiple sources of evidence essentially provide multiple measures of the same phenomenon. As per the suggestion, for each case study, we interviewed multiple key stakeholders of the projects, groups, and organizations.

Additionally, whenever possible we study Wikis, blogs, and other Web 2.0 technologies that are in use for different KM activities at different levels. However, per Patton (1990), the sampling strategy that we utilize in acquiring and utilizing data for deductive testing is not random but purposeful. Hence, throughout the whole study the sampling of data is done with a particular goal in mind; that is, obtaining new information about a construct that we are interested in and enhancing confidence in the measurement of the construct through constant triangulation (Sarker and Lee, 2002). Patton (1990) suggested four tactics to employ in order to achieve such goals that we adopt in our case study. They are:

(a) Criterion sampling: This involves the selection of interviewees and of interview questions based on some pre-determined criteria. For example, during the study, in order to assess the effect of Web 2.0 for KM on project management we include project managers as well as project team members. Based on the position and role of an interviewee in a project, we modify the interview questions.

(b) Theory-based or operational construct sampling: This involves selecting appropriate interviewees and/or segments of their interviews. In our case study it is expected that the same interviewees provide responses to the questions that address propositions related to the different levels: individual, project, group, and organization levels. Hence, it is important for us to select the part of the responses of the interviewees based on which particular level their response is for and which particular proposition we are testing. It also involves, whenever possible, including documentary evidence. For example, we try to include and analyze Wiki when used for a project's KM in order to understand and test the effect of Wiki on KM at project level.

(c) Chain sampling: This is a very useful strategy that acts to identify and include additional interviewees whom other informants viewed as having useful insights regarding the issues in which the researchers were interested. For example, at the project level we include the project managers. However, we expect these project managers to help us in identifying and interviewing other key persons in the project in order to test the propositions at the project level.

(d) Opportunistic sampling: This sort of fieldwork is very dynamic in nature and it is important to take advantage of any emergent opportunity for conversing with stakeholders. Therefore, together with formal interviews, we try to get as many informal interactions as possible.

Review of the case-study report by the key informants

It is very important from a methodological viewpoint to have the case-study report reviewed by the key informants. The corrections made through this process can augment the accuracy of the case study and overall construct validity of the study. Therefore, once the case-study report is written we attempt to get it reviewed by the key informants from each of the organizations.

Chain of evidence

Another tactic to ensure construct validity is to provide the external readers with the chain of events occurring in the case study (Yin, 1994). In order to achieve that as per suggestion by Paré and Elam (1997), we provide a detailed narrative of the methodology

of the case study prior to testing the statements. By providing this detailed narrative we can give the reader a sense of the sequence of events that led to a particular outcome so that the reader makes their independent judgment regarding the validity and reliability of measures of constructs used in the case study.

7.1.2 Internal Validity

Pattern matching

Per Yin (1994), pattern matching may be used to enhance the internal validity. This technique essentially involves qualitative but logical deduction (Lee 1989), in which an empirically based pattern is compared with a predicted pattern derived from rival theoretical perspectives (Markus, 1983). The most common rival theory is the null hypothesis; that is, a hypothesis that denotes the absence of a target hypothesis (Yin, 1994). During an experiment, if the target hypothesis is a significant relationship between two variables then the null hypothesis would be the absence of this relationship; that is, the existence of the phenomena by chance alone (Yin, 1994).

However, just comparing with the null hypotheses might not be adequate (Yin, 1994). Hence, together with comparing with the null hypotheses, in accordance with Sarker and Lee (2003), we also match the predictions derived from falsifiable propositions with empirical patterns. Also, we use "natural controls" wherever feasible. Per Lee (1989), in utilizing natural controls and treatments to test predictions, the case researcher "must actively apply his or her ingenuity in order to derive predictions that take advantage of natural controls and treatments either already in place or likely to

occur." Therefore, we test our propositions by identifying the influence of the associated context variables and draw our conclusions after taking into account the effects of the context variables.

7.1.3 External Validity

External validity is the issue of the generalizability of the findings of the study and is ensured by selecting a "typical" case (that is, a single case that is representative of a large number of other cases) and selecting a case that is likely to confirm the hypotheses, so that disconfirming evidence can be considered as decisive (Markus 1989). As per suggestion by Lee (1989) and Yin (1994) we take the following steps to ensure external validity.

(a) Increased degree of freedom

Per Sarker and Lee (2003), to increase the degree of freedom we deploy two strategies. First, while testing we use multiple observations for each hypothesis. Secondly, we use embedded cases whenever feasible; that is, we study multiple individuals, projects, and groups in each organization.

(b) Replication logic

We apply the replication logic by testing all the propositions developed for different levels in two different organizations. According to Yin (1994), sample selection should be dictated by replication logic instead of by statistical means. More precisely, each site (or case) should be considered as an experiment in itself, where subsequent sites

are used either to confirm or refute previous findings. Cases should therefore be selected if, according to theory, they are expected to yield similar results (literal replication) or completely opposite results (theoretical replication). In our case, we use literal replication as we expect to find similar sorts of proposition-testing results in all three organizations.

7.1.4 Reliability

Reliability of a positivist study is the concern as to whether or not the process employed in the study is consistent, reasonably stable over time, and across researchers and methods (Miles and Huberman, 1994).

As per Yin (1994), we adopt two tactics to ensure the reliability of the study: creation of the case-study protocol and development of a case-study database.

Case-study protocol

The case-study protocol guides the investigator in conducting case-study research in a standardized manner throughout the process. We develop a protocol for the study that is created in accordance with Yin's guidelines (1994) and in the tradition of Sarker and Lee (2002, 2003).

a) A short outline of the objective of the study and the type of data required for the study.
b) A broad description of the envisioned research report and summary of content of each of the chapters.

c) A research proposal that consists of the research questions, literature review, description of the epistemology and methodology to be adopted, derivation of propositions based on the extant literature and findings of the exploratory phase, and a list of relevant readings.

d) A set of questionnaire outlines that are used to guide the interviews.

Case-study database

As per Yin's (1994) recommendation we develop a case study that has the following four components: case-study notes, case-study documents, tabular material, and a case-study narrative.

(a) Case-study notes: Our case-study notes primarily consist of hand-written notes on the margins of the interview transcripts or on the questionnaires used for interviewing. These notes highlight the important points that are relevant to the statements being tested and also provide cross-references to other interviews referring to the same issues (Sarker and Lee, 2002).

(b) Case-study documents: Our case-study documents include interview questionnaires and transcripts, as well as audio files of the interviews, documents related to companies' background information, and other related documents such as white papers that can help us to test the hypotheses.

(c) Tabular materials: Our tabular materials include a summary of all variables to be studied and the measures, statements to be tested, and the results of the testing.

(d) Case-study narrative: As per suggestion by Miles and Huberman (1994), we develop an interim case summary. In this document, we attempt to synthesize information from all of the different sources gathered up to that point. This interim summary facilitates meaningful discussion with the interviewees and validation by them. This document serves as the main data input for the deductive testing and is supplemented by additional transcribed quotations from the taped interviews (Sarker and Lee, 2002).

Table 16: Steps to Achieve Rigor of the Study as Per Qualitative Case-Research Criteria

Rigor Criterion	**Guidelines to achieve rigor based on Lee (1989), Yin (1994) and Sarker and Lee (2003)**
Construct validity	Use of multiple sources of evidence Review of the report by the key informants Chain of evidence
Internal validity	Pattern matching
Reliability	Case-study database (consists of case-study notes, documents and narratives) creation and maintenance Case-study protocol
External validity	Increased degree of freedom Replication logic

Based on this plan, we collect data to test the proposed propositions.

7.2 Findings and Results

We incorporated secondary data sources in our case study including documents, Wiki pages and blogs, but our results mostly rely on the data collected through interviews of selected individuals in the subject organizations. Four possible conclusions could have been reached for each proposition: supported, not supported or inconclusive. We drew the conclusion that a proposition was supported when almost all of the interviewees responded positively when asked about the relationship stated in the proposition. We drew the conclusion that a proposition was supported when there were some evidence and/or indications in the interviewees' responses that a proposition was supported but the evidence was not strong enough to draw a conclusion definitely. On the other hand, we drew the conclusion that a proposition was not supported when almost all interviewees responded that the proposed relationship stated in the proposition does not hold based on their experience. And propositions were deemed inconclusive in two circumstances: if the interviewees were divided in their opinions regarding the relationship in a proposition, or if the interviewees thought that the relationship in a proposition was not clearly observable from their point of view.

In addition, in accordance with Andrade (2009) we used an interpretive approach to analyze the collected qualitative data to provide an insight into the problem under study. Through the interpretation of the collected data we were able to generate useful results even if the proposition testing results were inconclusive.

In this section we discuss the results of proposition testing based on the Qualitative case study.

7.2.1 Individual-Level Propositions

7.2.1.1 Use of Web 2.0 for KM and Tacit Knowledge Sharing

We found support for the proposition that the use of Web 2.0 technology for KM in an organization can positively affect tacit knowledge sharing between individuals working in that organization. The interviewees were unanimous that the use of Web 2.0 for individual-level KM increased tacit knowledge sharing between employees of the organization.

While interviewees thought that use of Web 2.0 at the individual level increased knowledge sharing, they found it difficult to identify specific observations of tacit knowledge sharing. Nevertheless, the interviewees did mention instances of knowledge sharing, which essentially highlighted tacit knowledge sharing. We found that tacit knowledge sharing through Web 2.0 based tools is particularly prevalent in troubleshooting. Individuals learn knowledge from experiences of solving clients' complaints and such knowledge can be categorized as tacit knowledge. We found that this type of tacit knowledge is shared through Web 2.0 based KM tools and this knowledge helps other individuals to address and troubleshoot problems faced by their clients. For example, an interviewee from organization C describes how:

> … our group needed a fast solution for that client. But, our group was struggling. We posted our problem description in the central WikiC to

> see if anyone in our organization had solved a similar problem before. In no time, someone actually suggested a solution based on his experience of working on a similar project and we solved our client's problem.

An interviewee from organization B shared a similar incident of tacit knowledge sharing from contributor's perspective,

> A new tool called "Driver" came in. I had my own knowledge about that tool. So I contributed to the Wiki to how to use "Driver" to make others life easier. These Wikis are open-ended. So when you contribute to these Wikis, anybody can see it.

We also found that employees share tacit knowledge to solve internal technical problems. For example, one such example was found in organization C's support for Mac computers and the Mac platform. Officially, organization C does not endorse Mac computers and platform for individual use, so if an employee decides to use Mac officially s/he does not get service from Mac sellers. Still, many employees in organization C use Macs for different official works. So they developed a Wiki-based community to share solutions to different problems associated with Macs. A few expert Mac users initiated this community and eventually other employees started to participate. As described by an interviewee from organization C,

> Our organization is going to pay for a Mac if you decide to have one. But they tell you that there is not going to be any further service. At first I was a little hesitant but at the same time I wanted to use a Mac. So, I went for it couple of years back and came to know about this community. Since then I have been religiously following this WikiC-based community for Mac users. It was initiated by a few expert Mac users. Now all the Mac users not only get help from it, they share their own experience of troubleshooting in Mac to help others. I have also

> shared my experience there. Over time it has become so effective that it has become an unofficially "official" support center for Macs in our organization.

Such examples underline the success of Web 2.0 based KM in facilitating tacit knowledge sharing among individuals in an organization.

Tacit knowledge is an important source of competitive advantage for organizations (Frappaolo & Wilson, 2003). However, defining tacit knowledge is a difficult task as tacit knowledge is deeply rooted in each individual's actions and experiences (DeSouza, 2003). One of the major challenges for KM is to convert tacit knowledge to explicit knowledge in a way that it can be passed along to others (Carroll et al., 2003) as tacit knowledge exchange among workers requires a more "people-centric" approach "dialogue" between individuals instead of merely distributing and receiving information (DeSouza, 2003). Our results indicate use of Web 2.0 at the individual level KM has a positive effect on the tacit knowledge sharing by creating an environment of informal interactive information sharing among individuals. This finding suggests that Web 2.0 based KM at individual level can increase sharing of tacit knowledge among employees of an organization. Capturing tacit knowledge is a concern for the management and our findings has implications for management to identify the potential of Web 2.0 in promoting tacit knowledge sharing between individuals.

Our results also indicate that it might take time for Wiki-like Web 2.0 technology to flourish and become effective in the facilitation of tacit knowledge sharing. We also found that an initiative from experts within an organization to share their expertise can eventually lead to more participation and tacit knowledge sharing by other individuals

in that organization. For example, the Mac support group Wiki was initially started by few experts, and then other individuals contributed knowledge to the Wiki. Hence, to promote tacit knowledge sharing among employees, we suggest that management should take a more proactive le in setting up a Web 2.0 based platform where individuals feel comfortable and motivated to share knowledge.

7.2.1.1.1 Use of Web 2.0 for KM, Tacit Knowledge Sharing and Context Variables

We found moderate support for the proposition that Incentive for participating in KM activities positively affects the relationship between the use of Web 2.0 technology for KM at the individual level and tacit knowledge sharing between individuals working in that organization. Interviewees thought that incentive plays a positive role in tacit knowledge sharing between individuals in the Web 2.0-based KM environment. However, interviewees also mentioned that the role of the incentive might not be noteworthy for all the individuals, as many individuals share tacit knowledge because they are excited about the subject matter.

In our study some interviewees thought that incentives, especially informal incentives such as recognition of contribution leading to better performance review, play a positive role in facilitating tacit as well explicit knowledge sharing between individuals in Web 2.0-based KM. Incentives could be via very formal routes such as monetary, or via rather informal routes such as recognition, which can lead to better performance review. Incentives encourage individuals to share their earned knowledge. For example,

an interviewee from organization B stated regarding his feeling towards incentive for sharing knowledge,

> Whenever your supervisor is doing performance reviews, one part is how much you have contributed to the WikiB. In there you can mention that you have started a Wiki/blog and showed how to do some neat stuff with Java to make other people's life easier. Let me give you another example. We used to use Lotus note for email. One of the problems with Lotus note was that it used to crash sometimes and in order to make it work again we had to restart the system. It was kind of time consuming to restart the machine, load all the programs, and losing data. But, now one person came out with a solution, posted it on the Wiki, that if you download this small program then Lotus note will not crash. Now this person will mention that this was his contribution to the WikiB which can help him to earn better review (i.e. annual performance review).

In addition, we found that while incentives have a positive effect for some people, there are individuals who share their earned knowledge just because they are passionate about the subject matter. For those people incentive is not a significant motivating factor for sharing knowledge. As stated by an interviewee from top management in organization B,

> At one time we tried giving some cash amount for their contribution. But we found that to be expensive. But even without the cash we found that some people are very passionate about their work and they provide their experience of working in projects just because they are passionate about your work.

Our results show that incentives do not always significantly affect tacit knowledge sharing of individuals. However, incentives, especially informal incentive such as recognition for contribution, can motivate some individuals to share tacit knowledge. This finding essentially informs the management that they should not rely

solely on incentive mechanism to increase tacit knowledge sharing among individuals. Nevertheless, it is important that the management creates a culture of recognizing employees' knowledge sharing as an informal incentive mechanism.

Another context variable we studied is supervisor's and co-workers' support. We found support for the proposition that supervisor's and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and individuals' tacit knowledge sharing. The interviewees thought that encouragement and recognition by supervisor motivates employees to share tacit knowledge.

In our study, we found that supervisors' and co-workers' support for participating in Web 2.0-based KM activities can increase tacit knowledge sharing. In Web 2.0 based KM, in many cases individuals' knowledge sharing, especially tacit knowledge sharing, happens due to the voluntary contribution of the employees. Hence, it encourages individuals when their co-workers and supervisors notice the contribution they have made through knowledge sharing on Web 2.0 based KM. For example, an interviewee from organization C stated regarding his feeling towards incentive for sharing knowledge,

> It always feels good to be recognized and appreciated for your work. This is no different. And this (i.e. recognition) is something you look forward to.

Our results show that supervisors' and co-workers' support can play a positive role in tacit knowledge sharing by individuals. Our finding informs the management that

the supervisors can increase tacit knowledge sharing in Web 2.0 based KM through recognition and appreciation of the individuals who enthusiastically share knowledge. Hence, the supervisors have to take an active role in identifying and appreciating the individuals who actively participate and share knowledge in Web 2.0 based KM to enhance the sharing further.

7.2.1.2 Use of Web 2.0 for KM and Perceived Learning

We found support for the proposition that the use of Web 2.0 technology for individual level KM in an organization can positively affect the perceived learning of individuals in that organization. All the interviewees responded that the use of a Web 2.0 KM has helped them in their learning.

Interviewees mentioned two major reasons for their positive response. First, interviewees thought that the use of Web 2.0 for KM provided access to knowledge that was not previously available from internal sources before. For example, there are experts in their organization in different subject matters. However, in big organizations it was not always possible to identify these experts and seek help from them. Web 2.0 technology, such as Wikis and blogs, has provided a platform where a knowledgeable person can share h8.3 Future research is/her knowledge help others to solve problems. In some cases, these experts maintain their own blogs on their area of expertise. On these blogs, they provide materials that help others learn new things about the area. They also provide solutions to specific problem(s) other employees are facing through Q&As on blogs. In addition, these experts often provide their email address on their blogs so that an

individual in their organization could directly contact them about a problem pertinent to their area of expertise.

Second, Web 2.0 provides learning convenience. All interviewees were very enthusiastic about the ease of learning in a Web 2.0-based KM environment. Web 2.0 can reduce the typical training workshops that employees attend on a fixed date and time through podcasting and other multimedia approaches. Our interviewees mentioned that due to this Web 2.0 based approach the number of formal training sessions reduced significantly in their organizations. Interviewees preferred this approach to training over the conventional face-to-face training workshops. For example, an interviewee from organization C described,

> I have missed many training sessions because I was out of town or had to reschedule other things to attend the meetings. Now all those hassles are gone. I can just watch the podcasts, download the power point slides, and all other related materials. Job done!! Because of that the number of formal face-to-face training sessions in our organization has gone down significantly.

In a similar tone, when we asked about the reason(s) for preferring Web 2.0-based training, an interviewee from organization B stated,

> We can do it at our own time and own pace. For example, if there is a formal training session and you cannot attend that due to some other meetings or so you would have missed that. Now from podcasting you can learn that on your own pace and ease and not worrying about other people.

Perceived learning can be defined as changes in a learner's perceptions of skill and knowledge levels before and after the learning experience (Alavi et al., 2002).

Results of our case study point out the positive effect of Web 2.0 based KM on individuals' perceived learning. We found that use of Web 2.0 based KM at the individual level in an organization can increase the perceived learning of the employees.

Employee training is very important for the organization to sustain competitive advantage (Vemić, 2007). Our results informs the management that individual level Web 2.0 based KM is a more effective substitute for traditional face-to-face training sessions and can positively affect individuals' perceived learning. We found that the studied organizations have successfully reduced the number of formal training sessions and increased the perceived learning of the employees through with the Web 2.0 based trainings. Hence, we believe our result should persuade management to gradually rely more on the Web 2.0 based KM for employee training to increase the perceived learning of individuals.

7.2.1.2.1 Use of Web 2.0 for KM, Perceived Learning and Context Variables

We found support for the proposition that incentive for participating in KM activities positively affects the relationship between use of Web 2.0 based technology for KM in an organization and perceived learning of the individuals working in that organization. The interviewees responded positively that in the Web 2.0 based KM environment, incentives such as positive performance reviews could increase the perceived learning of the individuals.

In the studied organizations individuals are always encouraged to learn new tools and/or technology. We found that in organization B there are incentives for learning new things. This incentive usually comes in the form of a better performance review. An individual is awarded a better annual performance review for learning new things and this review in turn helps an individual to attain salary increase, promotion and/or internal hiring. In organization B, dependency on formal face to face training for learning new things has significantly decreased due to the Web 2.0 based KM. In the Web 2.0 based training, there is no fixed time and place for attending a training session and learning new things. Individuals have to take initiative themselves to devote time and energy to use the Web 2.0 based materials to learn new things. Hence, incentives such as a better performance review become an effective motivating factor for the employees to learn new things. Moreover, by learning new things using Web 2.0 based materials when an individual earns better performance review that in turn positively affects an individual's perceived learning through establishing the importance of his learning. For example, an interviewee from organization B described,

> I use those (i.e. Web 2.0 based training materials) to learn new things. and you get rated on how many tools u have learned each year … Moreover, everyone can see your profile on WikiB and FacebookB. So anyone can see who is using it and how. It makes you look good.

Results of our case study pointed out the positive effect of Web 2.0 based KM on individuals' perceived learning. The finding of this proposition testing suggests that the

perceived learning could be enhanced further through providing incentive for Web 2.0 based learning.

It is important for organizations to make sure that their employees learn new things to remain competitive (Vemić, 2007). We found that in the studied organizations Web 2.0 based KM has been successful in training employees in newer tools and/or technology, and employees gained more perceived knowledge when their learning is valued through incentive. Our result informs an organization's management that if they are moving towards Web 2.0 based trainings for their employees then they should have an incentive mechanism in place to augment the individuals' Web 2.0 based learning.

Together with that, we found support for the proposition that supervisor's and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and perceived learning of the individuals working in that organization. The interviewees responded positively that in the Web 2.0 based KM environment supervisor's support for using Web 2.0 based KM to learn new things could increase the perceived learning of the individuals.

The studied organizations are gradually relying more on the Web 2.0 based training. As in the Web 2.0 based training an individual has to take the initiative to use the Web 2.0 based materials to learn new things, supervisor's support, encouragement and recognition play positive role in an individual's perceived learning. We found that a supervisor could effectively motivate an employee to learn new things through Web 2.0 based KM. Moreover, recognition and appreciation from a supervisor for learning new

things could positively affect the learning experience. For example, an interviewee from organization B stated,

> We have these 1 to 1 meetings with our managers. So when something new comes out. Managers say guys check this out (using Web 2.0 based learning materials). So we get a 10-day period of time to install and try those. …… Managers appreciate when you learn those new tools and share your opinion.

Timothy et al (2006) found that employees' learning through training becomes more effective when employees recognize that they would have some accountability for learning with their supervisors. Our finding confirms the same effect of a supervisor's support on employee learning when training is facilitated through Web 2.0-based KM. Hence, our finding essentially informs the management that the supervisors should take initiative in encouraging employees to learn new things using Web 2.0-based KM and that will make this relatively new method of training employees more successful.

7.2.1.3 Use of Web 2.0 for KM and Earning Reputation

We found support for the proposition that Web 2.0 technology for individual level KM results in positive reputations for individuals who participate in KM activities. Interviewees thought that the use of Web 2.0 for KM at the individual level created an opportunity to earn a good reputation for themselves.

Interviewees stated that many people in the interviewees' respective organizations were able to earn a reputation as an expert in a particular tool and/or technology by maintaining their own blogs, contributing to the Wikis, and participating in different interest-group forums. For example, an interviewee from organization C, who actively shared his knowledge through blogs and Wikis, described how Web 2.0 helped him to become recognized within the organization.

> Many people used to maintain their own webpage(s) to share their information. I had a few of them which I used to regularly update. But, mostly I was using them for my own work. Occasionally I used to refer those group members to me if they needed something I had. But mostly they were limited to those people. But, now in this Web 2.0 environment anybody in the organization can have access to my work. In one such case, I found out later that top management has used my case report on XYZ to develop a proposal for PQR. When something like this happens you know that management is noticing you and you are making a name for yourself.

We also found that the managements of the studied organizations actively recognized and valued the contributions by the individuals on Web 2.0 based KM platforms. In describing the perception towards people who actively shared their knowledge through blogs and Wikis, a high-level managerial person in organization B stated,

> … people who are very actively contributing to WikiB would be the people that will be considered thought leaders within the organization.

He also added,

> It is very likely that these people get hired internally in other projects.

Earning "social capital" such as reputation, is one of the major expectations of individuals who participate in an internet facilitated community (Chiu et al., 2006) and a rich medium is necessary to facilitate earning such social capital (Preece, 2002). Our case study results indicate that use of Web 2.0 for KM at individual level can facilitate earning the desired social capital such as reputation. Our finding suggests that Web 2.0 based KM provides the required rich medium and platform where individuals in an organization can earn reputations through their contributions. This finding informs the management of an organization that they should recognize the potential of Web 2.0 for individual level KM to identify the untapped talents and knowledge bases within the organization. Based on our findings, we believe that it is also important that the management takes a proactive role in identifying the "experts" based on their contributions on Web 2.0 based KM platforms and encourage such participations.

7.2.1.3.1 Use of Web 2.0 for KM, Earning Reputation and Context Variables

We found support for the proposition that incentive for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and an individual's earning reputation by participating in KM activities. Interviewees thought the prospect of an informal incentive such as recognition positively affects earning reputation in a Web 2.0 based KM environment.

This proposition testing highlights an interesting scenario where individuals perceived earning reputation as the most important incentive in earning reputation. That is, earning reputation itself is an informal incentive for individuals participating in Web 2.0-based KM activities that help them to earn reputation for themselves. As mentioned by an interviewee regarding earning reputation in Web 2.0 environment,

> … it is very rewarding to be recognized if not anything else.

In addition, we found that the prospect of recognition by the top management is an incentive that can motivate an employee to earn a reputation within the organization through participating in Web 2.0-based KM activities. As an interviewee from organization C stated regarding recognition from top management when they used the materials shared by him on WikiC,

> .. It is nice to be appreciated.

While we found that earning reputation and recognition motivate individuals to be active participants in Web 2.0-based KMs to earn reputation, we did not find any relationship between any other incentive such as monetary incentive and earning reputation.

Our results show that informal incentives, such as recognition, positively affect earning reputation in a Web 2.0-based KM environment. This finding essentially informs the management of the importance of informal incentives and the creation of a culture

that recognizes employees' contributions, so that employees feel more motivated to earn reputation by sharing their knowledge through Web 2.0-based KM tools.

Another context variable we studied is supervisor's and co-workers' support. We found support for the proposition that supervisor's and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0-based technology for KM in an organization, and an individual's earning reputation by participating in KM activities. Interviewees thought that co- worker's encouragement could give an individual confidence and motivation to share their knowledge with other people in the organization through Wikis and blogs, which in turn can help that individual earn an organization-wide reputation in a Web 2.0-based KM environment.

Another context variable we studied is supervisor's and co-workers' support. We found support for the proposition that supervisor's and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0-based technology for KM in an organization, and an individual's earning reputation by participating in KM activities. Interviewees thought that co- worker's encouragement could give an individual confidence and motivation to share their knowledge with other people in the organization through Wikis and blogs, which in turn can help that individual earn an organization-wide reputation in a Web 2.0-based KM environment.

> I used to keep the webpage (with the information from earlier and ongoing projects) that helped my group members. They appreciated me for this effort and a few friends actually suggested sharing this with rest of the organization. Now many people including people from top management access those information when necessary. I have a actually come to know incidents when people recommended my sharing(on Web 2.0 platform).

Based on example like this we draw the conclusion that supervisor and co-workers' support can positively affect an individual's earning reputation in Web 2.0 based KM environment.

Our finding shows that supervisors' and co-workers' support positively affects knowledge sharing by an individual that can help him earn reputation. When an individual earns organization wide reputation for himself through Web 2.0 based KM platforms, it essentially means the individual is helping the organization and the people working in that organization by sharing his knowledge. Therefore, our finding informs the management to promote a KM culture in their organization where co-workers motivate each other to share their knowledge with the whole organization if they think many employees and the organization itself can benefit from that knowledge.

7.2.1.4 Use of Web 2.0 for KM and Acquiring Knowledge from the Experts

We found support for the proposition that Web 2.0 technology for KM in an organization can assist individuals gain help, and acquire knowledge from knowledgeable and/or expert members of the organization. The interviewees all responded positively that the use of Web 2.0 for individual-level KM has created an effective way to gain knowledge and help from the experts in their respective organizations

Our case study results show that use of Web 2.0 for KM empowers employees to share their knowledge. At the same time, it creates an opportunity for other individuals within an organization to acquire knowledge from the knowledgeable and/or expert

members of the organization. A major challenge in acquiring knowledge and/or seeking help is actually locating the expert(s) in the subject matter. Web 2.0-based individual-level KM provides several opportunities to identify and seek help from an expert within the organization. First, many employees maintain their own blogs on the subject matter in which they are expert. In a Web 2.0-based KM environment, an employee can locate an expert's blog on the company provided platform through a simple keyword-based search. Employees can ask a question to the expert through the blog's discussion section and the owner of a blogger usually also provides their email address. Therefore, a person can also seek help from that person through email communications.

An individual can also acquire knowledge from experts through a Wiki. Each Wiki concentrates on a particular subject area, and experts in a subject area contribute share their knowledge on the related Wiki to share with others. An employee can search the organization-facilitated Wiki platform to locate a Wiki of interest. Then they can browse the content of the Wiki to acquire knowledge that has been contributed by the experts in the subject matter An employee can also post a question(s) on the relevant Wiki page and it usually receives an answer from one of the experts within organization.

In addition, an employee can identify an expert based on their contributions on Wiki and seek additional help and/or knowledge from that expert through email. For example, an interviewee from organization B described,

> Our organization has different Wiki-based communities where you can go for help. For example, there is a community for J2E. There you can go and ask questions, look for important information, and so on. For example, I am good at Java reporting. So people come to me with questions through community. I answer their questions to make their life

> easier. I can have my own documentation and best practices there. People might now come to these Wikis and look for who is an expert and then look for the information. That is the advantage of these Wiki-based communities.

Similarly, an interviewee from organization C stated,

> I follow his (i.e. an expert of the subject area the interviewee is interested in) blog and sometimes ask him questions. He (i.e. the expert) always responds promptly.

The results of our study show that Web 2.0 based KM at individual level create different avenues for the employees of an organization to acquire and use knowledge from experts in their own organization. This finding highlights Web 2.0 based KM's ability to create an environment where employees of an organization can share expertise to address different technical challenges.

It is important for organizations to utilize the knowledge available within the organization to gain competitive advantage (Frappaolo & Wilson, 2003). However, when an organization grows, it becomes very challenging for the management to identify and utilize all of the available expertise within the organization (Argote et al., 2003). Web 2.0 based KM tools at individual level is an effective way to address this challenge. In the Web 2.0 based KM environment, employees identify and utilize the expertise within their own ranks to accomplish their goals. The management of an organization should implement Web 2.0 based KM at the individual level to effectively utilize the expertise available within their own organization.

7.2.1.4.1 Use of Web 2.0 for KM, Acquiring Knowledge from Experts and Context Variables

We found moderate support for the proposition that incentive for participating in KM activities positively affects the relationship between use of Web 2.0-based technology for KM in an organization and acquiring knowledge from the experts within the organization. Interviewees thought that incentive plays a positive role that facilitates the acquisition of knowledge from the experts in the Web 2.0-based KM environment. However, interviewees also mentioned that the role of the incentive might not be significant for all the individuals, as many experts are self-motivated to help other people with their expertise.

Web 2.0-based KM in an organization opens up an avenue through which an individual can identify an expert within his organization and seek help. We found evidence that experts usually do respond to such requests and share their knowledge to help other individuals solve their problems. However, we did not find any conclusive evidence as to whether incentives motivate an expert to help when it is requested. For example, an interviewee from organization B states,

> I would say it is kind of both. As I have said, as you move up in the hierarchy, it is kind of required from you that you will help other people out. For example, I am PMI certified. So it is required that I contribute to society and/or mentor someone. I can do it in many ways. One way is this Wiki. You can then mention that in your performance review that this is what you have done. People also go to the blogs and answer the questions because it is their hobby. So it is a mixture of both. People do it for work, people do it for fun.

Another interviewee stated,

> Why do you think some people help others in Web 2.0 based environment even when they do not know that personally or work for the same organization? They just like to help.

Our finding shows that while incentive could be a motivating factor for some experts to help others, in general many experts help others in Web 2.0-based KM environment as a gesture of benevolence and for the satisfaction gained from that act. This finding informs the management that in the Web 2.0-based environment, it is not significantly important that they provide incentive to the experts so that other employees can gain help and acquire knowledge from them. As long as the management can provide a proper Web 2.0-based KM environment at the individual level so their employees can interact with each other, individuals should be able to acquire knowledge from the experts in their organization through interactions on that Web 2.0-based KM environment.

A different context variable we studied is supervisor's and co-workers' support and its effect on acquiring knowledge from experts. We did not find support for the proposition that supervisor's and co-workers' support positively affects the relationship between use of Web 2.0-based technology for the individual level KM and acquiring knowledge from experts. In our study, interviewees did not think supervisor's and co-workers' support has a significant role to play in the relationship between the use of Web 2.0-based technology for KM and acquiring knowledge from experts.

In our study we found that co-workers' and supervisor's support play an important positive role in motivating individuals to share their knowledge. However, we could not find any direct relationship between co-workers' and supervisor's support and acquiring knowledge from experts in Web 2.0-based KM environment. We found that co-workers often recommend experts' blogs where they obtain necessary information to each other. For example, an interviewee from organization B described,

I knew he (i.e. the expert) is good in Java. So, I suggest X to check out his blog.

However, interviewees did not think that an expert is motivated by supervisor and/or co-worker's support to help other individuals when they seek help. As put by an interviewee, "…… it is just their (i.e. the experts') passion. "

Our findings show that while co-workers can help each other in locating an expert who would be helpful, a supervisor's and/or co-worker's support does not directly affect the intention of the experts to help others. This finding essentially informs the management that the experts they have in their organization are in general self-motivated to help others and therefore management's responsibility is essentially just to facilitate a favorable Web 2.0-based KM at the individual level, where individuals can locate and seek help from experts.

7.2.1.5 Use of Web 2.0 for KM and Satisfaction

We found support for the proposition that the use of Web 2.0 based technology for KM in an organization positively affects an individual's satisfaction with KM. All

interviewees from the studied organizations responded that they are very satisfied with Web 2.0 based individual level KM.

We found that individuals' satisfaction with KM is essentially a culmination of different factors such as perceived knowledge gain, gaining help from the expert members of the organization, as well as earning a reputation for them. For most of the individuals, satisfaction was due to the ease of access to the knowledge. The interviewees were unanimous about the better learning opportunities that are created by the use of Web 2.0 based technology. For example, an interviewee from organization C stated, when asked about how satisfied he was with the use of Web 2.0 for KM:

> Oh!! I absolutely love it. It is like what I have been trying to do with the regular tools for ages. But, there were so many limitations that somehow knowledge sharing was not done by everyone even though I kept on trying and kept on sharing. But, with these tools everyone participates and we are really sharing knowledge.

In a similar tone, an interviewee from organization B stated,

> Now it is very easy to find anything they want to learn or know about. They can search by topic, they can search by profile, name. So someone might want to see that what the latest post by a particular person is and can read that. It is a lot quicker way of retrieving information.

However, interviewees expressed their concerns and pointed out a couple of aspects of Web 2.0 based KM with which they were not satisfied.

First, in some cases, management made contribution to the Web 2.0-based repository mandatory and to some employees such a requirement appeared as an

additional work in their already busy schedule. For example, an interviewee from organization B stated,

> You know, all of us have lots of things to do each day. I know it has some good outcomes. So often it felt like extra work. You have to do it in addition to your regular work.

Second, the social-networking tools in the studied organizations were not yet up to the current standards in comparison to popular social-networking sites such as Facebook. Therefore, employees were not very enthusiastic about participating on the social-networking platforms even though there was a push from the top management to participate. For example, one of the interviewees quoted his colleague regarding the management's requirement of participating in this social-networking platform,

> … we should let them (i.e. management) know that it (i.e. the Web 2.0 based platform in their organization) is not Facebook.

In spite of such complaints, we found that the overall feeling towards Web 2.0 was very positive and the individuals we interviewed were more satisfied with the Web 2.0-based KM tools in comparison to previous non-Web 2.0-based tools.

Our results show that use of Web 2.0 for KM in an organization can lead to more satisfied employees. This finding has implications for management to recognize the potential of Web 2.0 at individual level KM to satisfy employees. Since employees and their participations in KM activities are very important aspects of an organization's overall KM and learning (Trainor et al., 2008), our results should encourage the management to implement Web 2.0 for individual level KM in their organization.

Our results also indicate that efforts from the management to push the employees into making contributions to the Web 2.0-based KM environment have a negative impact on employee morale. Therefore, in the Web 2.0-based KM environment, management should rely more on creating a culture where employees feel motivated to contribute instead of instituting rules to make the employees contribute.

In addition, our results signify the importance of quality in the Web 2.0-based tools used in an organization. Our findings show that if a Web 2.0-based tool used in an organization is not on par with other available Web 2.0 tools, then the tool can cause employee dissatisfaction. Hence, management needs to put in place Web 2.0-based KM tools that are on par with, if not superior to, the quality of the industry standard Web 2.0-based KM tools. This will make the KM tools acceptable to the employees of their organization.

7.2.1.5.1 Use of Web 2.0 for KM, Satisfaction and Context Variables

We found support for the proposition that incentive for participating in KM activities positively affects the relationship between use of Web 2.0-based technology for KM in an organization and individuals' satisfaction with KM. Interviewees thought that incentive, especially informal incentive such as recognition, could play a positive role in individuals' satisfaction with Web 2.0-based KM.

We found that incentive for participating in Web 2.0 based KM activities increases an individual's overall satisfaction with KM. We did not find evidence that a formal reward, such as monetary gain for participation, positively affects individuals'

satisfaction with Web 2.0 based KM. However, we found that informal incentive, such as recognition for a contribution, positively affects an individual's satisfaction. For example, an interviewee from organization C who regularly shares his knowledge through blogs and Wikis stated,

> Whenever upper-management people, or anybody for that matter, are using the materials I have shared on the WikiC and recognizes my contribution obviously it feels good. It is nice to be appreciated.

This finding essentially highlights the importance of informal incentive such as recognition by management in the individuals' satisfaction with Web 2.0 based KM. This finding informs the management that they have to take a pro-active role in recognizing employee contributions using Web 2.0-based KM tools to augment employee satisfaction with Web 2.0-based KM.

We also found support for the proposition that supervisor and co-workers' support for participating in KM activities positively affects the relationship between use of Web 2.0 technology for KM in an organization and individuals' satisfaction with KM. Interviewees thought that support and encouragement from their colleagues for sharing knowledge provides them a sense of satisfaction.

We found that supervisor's and co-workers' support and encouragement for participation in Web 2.0-based KM increases an individual's overall satisfaction with KM. Interviewees thought that support from co-workers, such as appreciation for contribution of knowledge, gives a sense of accomplishment and sense of satisfaction

from that accomplishment. This is true in Web 2.0-based KM as well traditional KM. As described by an interviewee from organization C,

> … Web 2.0 or not, if your colleague says that he has been benefited from your post (on Wiki and/or blog), you feel good about yourself.

An individual's satisfaction with KM is attributed to the outcome of his participation in KM activities (Kulkarni et al., 2007). Our findings show that appreciation by co-workers for active participation in Web 2.0-based KM enhances an individual's overall satisfaction with Web 2.0-based KM. Therefore, to use Web 2.0 based KM at individual level, it important to have a KM culture in the organization where employees value and welcome the contributions of their co-workers through the Web 2.0 based platforms in their organization. Our finding essentially informs the management to promote a KM culture where employees recognize and appreciate each other's contribution through Web 2.0 based tools to increase individuals' satisfaction with Web 2.0 based KM. We present a summary of the individual-level proposition testing in table 16.

Table 16: Summary of The Individual Level Proposition Testing Results

Proposition	Result	Findings	Implications
P1: Tacit knowledge Sharing	Supported	Web 2.0 based KM can increase tacit knowledge sharing	Management should promote Web 2.0 based KM to increase tacit knowledge sharing between individuals. In the beginning , experts within the organization should take the initiative
P1a: Tacit knowledge sharing with incentive as	Moderately supported	Incentive plays a positive role in some cases of tacit knowledge sharing in Web 2.0 based KM	Management should rely more on informal incentive mechanism to increase tacit knowledge sharing in Web 2.0 based KM

Table 16: Summary of The Individual Level Proposition Testing Results			
Proposition	Result	Findings	Implications
context variable		Formal incentives might not be noteworthy motivating factor for all the individuals Informal incentives such as recognition are more effective than formal incentive such monetary	
P1b: Tacit knowledge sharing e with support as context variable	Supported	Supervisor and coworkers'' support plays a positive role in tacit knowledge sharing in Web 2.0 based KM	The supervisors have to take an active role in identifying and appreciating the individuals who actively participate and share knowledge in Web 2.0 based KM
P2: Perceived learning	Supported	Web 2.0 based KM can increase individuals' perceived learning	Management should gradually rely more on the Web 2.0 based KM for employee training to increase the perceived learning of individuals.
P2a: Perceived learning with incentives as context variable	Supported	Incentive plays a positive role in individuals' perceived learning in Web 2.0 based KM	Management should have an incentive mechanism in place to increase individuals' perceived learning
P2b: Perceived learning with support as context variable	Supported	Supervisor and coworkers'' support plays a positive role in individuals' perceived learning in Web 2.0 based KM	Supervisors should take initiative in encouraging employees to learn new things using Web 2.0-based KM
P3: Earning reputation	Supported	Web 2.0 based KM can facilitates individuals' reputation earning	Management should take a proactive role in identifying the "experts" based on their contributions on Web 2.0 based KM platforms and encourage such participations.
P3a: Earning reputation with	Supported	Recognition as an incentive plays a positive role	Management should work on creation of a culture that recognizes employees' contributions

Table 16: Summary of The Individual Level Proposition Testing Results			
Proposition	Result	Findings	Implications
incentives as context variable			
P3b: Earning reputation with support as context variable	Supported	Supervisor and coworkers'' support plays a positive role in individuals' reputation earning in Web 2.0 based KM	Management should promote a KM culture in their organization where co-workers motivate each other to share their knowledge with the whole organization
P4: Expert members' help	Supported	Web 2.0 based KM can facilitates individuals' acquiring knowledge from experts	Management should rely more on Web 2.0 based KM at individual level to effectively utilize the expertise available within their own organization.
P4a: Expert members' help with incentives as context variable	Moderately supported	Incentive plays a positive role in some cases of acquiring knowledge form experts in Web 2.0 based KM Incentive is not a significant factor for all the individuals, as many experts are self-motivated to help other people with their expertise.	Incentive is not a major motivating factor in many cases. More important is that management provides a proper Web 2.0-based KM environment at the individual level so their employees can interact with each other.
P4b: Expert members' help with support as context variable	Not supported	Supervisor's and co-workers' support does not have a significant role to play in the relationship between the use of Web 2.0-based technology for KM and acquiring knowledge from experts	The experts in an organization are in general self-motivated to help others and therefore management's responsibility to facilitate a favorable Web 2.0-based KM at the individual level, where individuals can locate and seek help from experts.
P5: Satisfaction	Supported	Web 2.0 based KM can increase individuals' satisfaction with KM There are concerns regarding the quality of Web 2.0 tool. Employees do not like the idea of making knowledge contributions mandatory for all individuals	Our results should encourage the management to implement Web 2.0 for individual level KM in their organization to increase individuals' satisfaction with KM Management should rely more on creating a culture where employees feel motivated to contribute instead of instituting rules to make the employees contribute

Table 16: Summary of The Individual Level Proposition Testing Results			
Proposition	Result	Findings	Implications
			Management needs to put in place Web 2.0-based KM tools that are on par with, if not superior to, the quality of the industry standard Web 2.0-based KM tools.
P5a: Satisfaction with incentives as context variable	Supported	Informal incentive such as recognition by management plays a positive role in individuals' satisfaction in Web 2.0 based KM	Management have to take a pro-active role in recognizing employee contributions using Web 2.0-based KM tools to augment employee satisfaction with Web 2.0-based KM
P5b: Satisfaction with support as context variable	Supported	Supervisor and coworkers'' support plays a positive role in individuals' satisfaction in Web 2.0 based KM	The management should promote a KM culture where employees recognize and appreciate each other's contribution through Web 2.0 based tools.

7.2.2 Project Level Propositions

7.2.2.1 Use of Web 2.0 for KM and Transfer of Knowledge between Projects

We found support for the proposition that use of Web 2.0 for KM can positively affect the transfer of knowledge between projects. The interviewers from studied organizations responded positively that the use of Web 2.0 increased the transfer of knowledge between projects.

We found that Web 2.0 tools, especially Wiki-like tool(s), facilitated the transfer of knowledge between projects in the studied organizations. Both organizations work on many similar projects. We found that use of Web 2.0 is effective in facilitating knowledge transfer between these similar projects. For example, the following incident was described by an interviewee from organization C who has worked in different projects as a project manager as well as a regular team member,

> Our organization was the first to setup WiMAX in Panama. It was a huge project and there were many challenges. I had to work very hard to make that project successful. Once the project got completed, I put the case report with all the details on WikiC. After that, in our organization other project teams used that information in similar large-scale projects

We found that organization B created a central repository of "Lessons learned" from previous projects which is a part of their Web 2.0 based KM at project level. Interviewees said that this WikiB based repository assisted in the transfer of knowledge between projects because it provided an organized interactive centralized mechanism to facilitate the knowledge transfer.

> When you are looking for something useful (from previous projects), you know where to start and how to find relevant information.

However, the interviewees shared that such a transfer of knowledge between projects through a Wiki-based repository is not as prevalent as it could be. Based on the responses, we identified two potential reasons for sub-optimal usage of the Web 2.0 based knowledge repositories. First, the initiative to create a Web 2.0 based central repository of "Lessons learned" from projects is relatively recent. Therefore, the repository does not offer sufficient content at the current time to attract project team members to be effective in the transfer of knowledge between projects. Consequently, people working in different projects are not relying on this Wiki-based repository for the transfer of knowledge between projects. Hence, the lack of sufficient content is one potential reason why Web 2.0 is not exceptionally successful in the transfer of knowledge

between projects. An interviewee from organization B who is project manager mentioned why Web 2.0 based central repository is not being used as much as it could be,

> Still lots of the documents are in the old technology (i.e. non Web 2.0 based decentralized project knowledge repository such as regular Webpage). We are trying to move everything to the WikiB(i.e. the WikiB based central repository)so that everybody can have access to that. But once we move everything to this new one, maybe within a year or so, I think we are going to see a change.

The second reason for sub-optimal usage of the Web 2.0 based knowledge repositories is the lack of an organized mechanism for the generation and collection of knowledge to be transferred. This reason was especially visible in organization C, where they did not have a structured mechanism in place to transfer knowledge between projects using Web 2.0. As described by an interviewee from organization C,

> I do my part. But, without any systematic approach, not necessarily everyone in the team is uploading and sharing their knowledge to make the knowledge transfer effective.

Every project faces challenges due to lack of knowledge (Yang, 2005) and transfer of knowledge from previous projects can help in facing the challenges posed by the current projects (Landaeta, 2008). Therefore, facilitating transfer of knowledge between different projects is an important aspect of project level KM. Our study found that co-created dynamic pages like Wikis are an effective way of transferring knowledge between projects as it allows the knowledge base to be co-created and evolve through contributions from different members of a project team, and makes the knowledge base more accessible to the people working in other projects.

Our results from the organization we studied indicate there is a positive effect impact of their Web 2.0 use on knowledge transfer. This suggests that Web 2.0 based KM's can increase knowledge transfer between projects. This has implications for management to recognize the potential of Web 2.0 for project level KM to encourage the effective transfer of knowledge between projects.

Our results also indicate that the effective transfer of knowledge can be enhanced through management intervention that engenders a systematic approach to the use of Web 2.0 for transfer of knowledge between projects. Due partly to both the emergent nature of the technology and the nature of our study, we are not able to provide details on the management interventions. However, our results indicate that institutionalization of the use of Web 2.0 within and across projects would facilitate the knowledge transfer between projects that is desirable, as evidenced from our study as well from extant research. Hence, our results should encourage project managers to take a pro-active role in ensuring team members' participation in Web 2.0 based KM.

7.2.2.1.1 Use of Web 2.0 for KM, Transfer of Knowledge and Context Variables

We studied three project-level KM context variables. They are team members' familiarity with each other, stability of the project team, and the team leadership's ability to provide a team environment for open communication. While we found that a project manager's ability to provide a favorable KM environment for open communication has a positive role in transfer of knowledge between projects, we could not draw any definite

conclusions regarding the effects of project team members' familiarity with each other and of team stability on knowledge transfer.

The test result of the proposition that project team members' familiarity with each other positively affects the relationship between use of Web 2.0 technology for KM at project level and transfer of knowledge between projects is inconclusive. We did not find sufficient evidence in the responses of the interviewees to draw a conclusion for this proposition.

There are two major reasons why we could not draw any definite conclusion regarding the proposition. Firstly, such relationships are not clearly identifiable to the management and employees of the studied organization. For example, one of the interviewees from organization C who works as project manager as well regular member in different projects stated,

> They (i.e. familiarity of the project team members) might be important for using these tools (Web 2.0 tools e.g. WikiC) in projects. But, you know I cannot really exactly say how that has affected the things (i.e. transfer of knowledge between projects) you are trying to estimate.

Secondly, in the projects we studied, familiarity of the team members with each other is not an important criterion in the formation of project teams and in most cases the interviewees had to work in projects where they were not familiar with most team members. Hence, the interviewees did not have appropriate experience to identify the effect of team members' familiarity on the knowledge transfer between projects.

The members of a project team are involved in that project's KM and Gruenfeld et al. (1996) found empirically that team members who were familiar with each other

were significantly more successful at sharing than a team of strangers. Janz et al. (1999) also highlighted the importance of the team environment in effective KM in which team members are familiar with each other.

These findings in the existing literature essentially highlight the importance of project team members' familiarity with each other in knowledge sharing. Interviewees also indicated that knowledge sharing becomes easier and more effective when team members are aware of each other's strength. Therefore, we believe that a team member's familiarity with other team members should be used as a criterion in project team formation to promote effective sharing and transfer of knowledge between projects through Web 2.0 based KM.

Another project level context variable we studied is stability of the project team. We found moderate support for the proposition that project team stability positively affects the relationship between use of Web 2.0 technology for KM at the project level and transfer of knowledge between projects. While some interviewees mentioned that such a relationship is not clearly identifiable, few interviewees thought that project team stability in general could help in knowledge transfer – within as well as between projects. Some interviewees thought that in most cases the initiatives and the activities to transfer knowledge were mostly the responsibility of the project manager; the project managers did not change in the projects that had used Web 2.0 for KM. Hence, it is not clear to them how a change in the project team, especially at the management level, would affect knowledge transfer between projects. On the other hand, few interviewees thought that project team stability could play a role in knowledge sharing in general, as this would

mean that everyone in the project team is well aware of their responsibilities and roles as part of the project team. As described by an interviewee from organization C who is a project manager,

> When everyone understands their responsibility a sense of reciprocity also grows that helps sharing knowledge.

Project team members' relationship with each other plays an important role in knowledge sharing; Newell et al. (2008) found that when a project team works together for a long time, this positively affects the relationship between team members, which in turn increases knowledge sharing. In accordance with this finding, our results indicate that stability of the project team has a positive effect on transfer of knowledge between projects. However, we found that this effect might not be significant or even perceptible in the relationship between Web 2.0-based KM and its effect on knowledge transfer between projects. This finding informs the management team that having a stable project team can help the projects in their organization to have increased transfer of knowledge – both intra- and inter-project. However, there are other factors, such as the role of the project manager, that play a more important role in transferring knowledge between projects.

Another project-level context variable we studied is the project leader's ability to provide an open environment for communication. We found support for the proposition that the project leader's ability to provide an open environment for communication has a positive effect on the relationship between the use of Web 2.0 for KM and transfer of knowledge between projects. Interviewees thought that a project manager's perception

toward knowledge transfer between projects and consequent efforts to create an appropriate environment play a positive role in transfer of knowledge between projects.

In the projects of organization C, some managers have initiated a practice of sharing the "learning" of a project through a Wiki and/or a blog. However, such initiatives are not formal and depend largely on the project manager's view toward such sharing. As described by an interviewee from organization C,

> It is not required in our organization for the project teams to share their knowledge with others. So, it largely comes down to the project leader and whether he wants to set up something like a Wiki page to share the knowledge earned in a project with others. There are some project managers who think it is really important and who encourage all team members to contribute there.

Another interviewee from organization C, who is a project manager, states,

> I do not use Wiki for any such knowledge transfer in my projects, due to the nature of my projects. But, I know some project managers use them (i.e. WikiC) to facilitate knowledge transfer from their projects.

An interviewee from organization C's top management also highlighted the importance of the project manager's role in facilitating transfer of knowledge between projects and encouraging project team members:

> …it (i.e. contributing learning from a project on WikiC) is part of their responsibility.
>
> ….occasional reminder to the team members (from project manager) increases participation (in knowledge transferring activities).

Our results underline the importance of project leaders' role in creating an open environment for enabling knowledge acquisition and transfer. Hence, this finding should inform the top management of an organization to educate project managers about the importance of transfer of knowledge between projects and to encourage them to take the necessary steps to facilitate knowledge transfer.

7.2.2.2 Use of Web 2.0 for KM and Project Completion in Time

We did not find support for the proposition that the use of Web 2.0 for KM can positively affect project completion time. Interviewees thought that the use of Web 2.0 for project's KM does not significantly reduce a project's completion time.

In our case study, interviewees from the studied organizations emphasized that through the use of Web 2.0-based tools, some project-related activities requiring information sharing have become significantly easier and faster. However, interviewees did not think that faster information sharing through Web 2.0 alone can significantly affect the project completion time because there are many other factors, such as requirement change, are associated with any project and its completion time. For example, an interviewee from organization C stated,

> I do not think so (i.e. use of Web 2.0 for project's KM reduce project completion time). It makes many things easier and faster … convenient, sure. But, just because I am using these, I cannot say that project-completion time is going to reduce.

A project manager from organization B also had a similar response and thought that it positively affects project-completion time only in terms of information sharing. The interviewee states,

> Only considering file sharing. The large files needed to be shared during projects and we used to do it by email. It used to take lot of time to send those large documents and many times many users did not receive the files for different reasons. Now it is like instant msg. Upload the files on WikiB and inform the users to take a look at the files.

Another way the use of Web 2.0 is intended to help project completion on time by transferring knowledge from other projects. This transferred knowledge could be a template for managing a project or tool developed from previous projects. Theoretically such a transfer of knowledge should reduce project-completion time. As described by an interviewee from organization B who is part of upper management,

> The management thinks if they (i.e. the project teams) can reuse, that can reduce the cost of the projects. So if they can effectively transfer knowledge such as lessons learned, tools, other assets from the projects we have completed, then it can reduce the amount of work. The second is, what I think is more important, is that assets cannot be used as they are in another project, they need to be tweaked so that they fit the next project. What this repository does is it provides a starting point for the project managers and they can them modify the asset to use in their project. It becomes sort of a catalogue for the project managers, which they can potentially use in their project. It (i.e. the WikiB-based central repository of previous projects' lessons learned and relevant assets) is to help them (i.e. the project teams) to start with something instead of starting from zero so that they can save time and resources.

While we found that such Web 2.0 tools based transfer of knowledge happened quite effectively, we did not find any clear evidence that a project's completion time

reduced due to the transfer of knowledge. One reason is that the transferred knowledge must be adapted adequately for the current project and "tweaked" before it becomes useful in a new project. For example, an interviewee from organization B stated,

> ... such tools developed for a project could be useful in other projects. But, almost always these tools cannot be used as- is and therefore needs to be customized to meet the need of a project.

This adaption process actually takes a significant amount of time and therefore does not reduce the overall project-completion time. As pointed out by an interviewee from organization C,

> … creating those documents (e.g. training materials) is around 40% of the overall work of our project team. In each project, clients' requirement and setup are very different from others. When I have to create supporting documents (e.g. training materials) I go and search the repository for such materials from previous projects. In many cases, I find some existing materials. But, even then we have to work extensively to modify and prepare those documents for the current project's client.

Theoretically knowledge integration capability from external sources such as previous similar projects can play a positive role in the reduction of the project completion time (Mitchell, 2006) by permitting the reuse of knowledge, and the recombination of existing knowledge (Marjchrzak et al., 2004). We found that use of Web 2.0 for projects' KM, especially through Wiki based repositories, effectively facilitates knowledge reuse from external sources. However, per our case study such knowledge transfer and reuse did not significantly affect project completion time. We found that every project has certain unique characteristics and challenges, so the reuse of

transferred knowledge requires extensive adaptation related works which are time intensive in most cases. Moreover, factors (e.g. requirement change) other than knowledge sharing and reuse affect the project completion time. Therefore, we suggest that while management should consider using Web 2.0 for project level KM to effectively facilitate knowledge transfer and reuse, they should not necessarily expect a significant reduction in project completion time.

7.2.2.2.1 Use of Web 2.0 for KM, Project Completion Time and Context Variables

For this project completion time, we studied three project level KM context variables. They are team members' familiarity with each other, stability of the project team, and the team leadership's ability to provide a team environment for open communication. We found that a project team's stability do not affect project completion time. We could not draw any definite conclusions regarding the effects of project team members' familiarity with each other and project manager's ability to provide a team environment for open communication on project completion time.

The test result of the proposition that project team members' familiarity with each other positively affects the relationship between use of Web 2.0 technology for KM at project level and project completion time is inconclusive. We did not find adequate evidence in the responses of the interviewees to draw a definite conclusion for this proposition.

Interviewees thought that project team members' familiarity with each other could be helpful in implementing Web 2.0 based KM in a project. However, interviewees could

not identify the effect of this familiarity on project completion time. We found that in the projects we studied, familiarity of team members with each other is not an important criterion in the formation of project teams. We found that in most cases, interviewees had to work in projects with team members they were not very familiar with. Hence, the interviewees did not have proper experience to identify the effect of team members' familiarity with each other on knowledge transfer between projects. In addition, the interviewees mentioned many internal (e.g., availability of the required skill) and external factors (e.g., requirement change) that affect project completion time. Because of these factors, the effect of team members' familiarity with each other on project completion time in a Web 2.0-based KM environment was not clearly identifiable to the interviewees from the studied organization. For example, one of the interviewees from organization C stated, "...like I said, it is hard to say how it (i.e., project team members' familiarity) will play."

While our findings do not establish a positive effect from project team members' familiarity with each other on project completion time in a Web 2.0 based KM environment, in the extant literature, there is evidence that project team members' familiarity helps to establish effective KM at the project level (Janz et al., 1999). There are also indications in our study that team members' familiarity with each other can help in knowledge sharing within a team. Hence, we encourage management to use a team member's familiarity with other team members as a criterion in project team formation, to have an effective KM at project level.

Another project level context variable we studied is stability of the project team. We found no support for the proposition that project team stability positively affects the

relationship between use of Web 2.0 technology for KM at the project level and transfer of knowledge between projects. The interviewees thought that while project team stability helps to introduce and implement Web 2.0 based KM in a project team, such stability has no significant effect on project completion time, irrespective of the project-level KM type and practice.

We found evidence that stability of project teams is important to implementation of Web 2.0 at the project level. For example, an interviewee from organization B who is a project manager states,

> You know, someone joins a project in the middle then in the beginning there is a learning curve. People are trying to get to know others and how things are done and so on. So, people do not have time to explore new tools and so on. But if the teams are stable and the members are familiar with each other, then people already know that in that (i.e., Web 2.0-based KM environment) environment who and how has edited, made podcasting, and so on.

The interviewee also added that for that very reason it is easier to implement Web 2.0 for KM in a stable team.

> Because at that point, in a stable team people have fewer things to learn. But, in the beginning there are so many new things to learn that this sort of thing (i.e. Web 2.0 tools for KM) come at last. So, it becomes easy to adopt these new technologies when you are already stable in a project and you have fewer things to learn.

However, interviewees did not think that a project team's stability can positively affect the relationship between use of Web 2.0 for project KM and project completion in time. Interviewees thought that in most cases teams are not stable because of the changes

in the project requirements. When requirement changes, a project team often needs to add new member(s) to the team and/or replace an existing team member(s) with new member(s) to obtain required skill(s) and experience. This type of changes makes a project team instable. However, this type of instability in a project team is inevitable as a project team need to obtain the required skill(s) and/or experience that can help them to meet the new project requirements. Moreover, the presence of required skill and experience earned through project team reformation can actually help to meet the requirement in less time. As described by an interviewee from organization C,

> It has happened that from my group I had worked on the project team in the beginning of the project and then later a different person from my group joined the project in my place as he has more experience with that (i.e. the new project requirements). Even though I might not like it (i.e. leaving in the middle of a project), it helps the project team as he (the new project team member) brings required skill and experience… … … in turn, they might finish the project in less time.

Akgün and Lynn (2002) suggested that project team stability is not a desired project management technique when requirements change, as a team might need to include and/or exclude team members based on the new set of requirements. Essentially, our result reflects a similar finding for Web 2.0 based project level KM and indicates that project team stability does not always positively affect project completion time.

While we did not find support for this proposition, we found that it would be easier to introduce Web 2.0 based KM in a stable project team. This finding implies that management should recognize stability as one project team characteristic that should be present for introducing Web 2.0 based KM.

Another project level context variable we studied is a project leader's ability to provide an open environment for communication. We could draw no specific conclusions regarding the proposition that a project manager's ability to provide an open environment for communication affects the relationship between the use of Web 2.0 for KM and project completion time.

We could not draw definite conclusion regarding this proposition because interviewees responded that while project managers play a very important role in all project activities, including project level KM activities, the effect on project success in the Web 2.0-based KM environment of a project manager's ability to provide an open environment for communication is not clearly identifiable.

Interviewees were unanimous that project managers play a very important role in the implementation of Web 2.0 based KM at the project level. Project managers usually take the initiative and encourage project team members to participate in a project's Web 2.0 based KM. As described by an interviewee who is a project manager:, " I usually set up the Wiki pages and ask all the team members to contribute accordingly."

While we found that such initiatives by project managers positively affect transfer of knowledge within and across projects, we found no clear evidence that a project's completion time improves due to such transfer of knowledge. While the interviewees did not say that project managers' ability to provide an open environment for communication has no positive effect on project completion time, they also could not identify the actual effect on project completion time, as a project's completion time depends on many

internal and external factors. As stated by an interviewee from organization C," … if I try to draw conclusion, it will be a bit farfetched. "

Our results from the projects we studied indicate the importance of project managers' role in Web 2.0-based project level KM. However, we could draw no conclusion regarding project managers' role in the relationship between use of Web 2.0-based KM and project completion time. In this case study, while we could not confirm the proposition, our findings suggest that a project manager should provide an open environment for communication to make the project level KM functional, which is in accordance with the literature (e.g., Beer, 1999).

7.2.2.3 Use of Web 2.0 for KM and the Success of a Project's Product

We did not find support for the proposition that the use of Web 2.0 technology for KM at p`roject level positively affects the success of a project's product. While interviewees thought that the use of Web 2.0 for KM could help a project especially in terms of knowledge sharing, they did not think that it could significantly affect the success of a project's product measured in terms of acceptance by management and customers.

Interviewees, who had used Web 2.0 in their projects' KM, stated that in many cases the knowledge transferred from previous projects helped the project team significantly in ongoing projects. Web 2.0 tools also helped in knowledge sharing among team members. However, interviewees emphasized that the success of a project's product

is not significantly affected by advantages gained from the use of Web 2.0 for projects' KM. For example, an interviewee from organization B stated,

> No way. So many factors are associated with a project and each project is so much different from the others and poses different challenges that these tools alone cannot make a big difference.

Similarly, an interviewee from organization C stated,

> … they sure do help quite a bit in different ways. We have talked about those, right? But, I would not say that these tools affect the success of a product significantly. You know so many other factors are there.

Our results show that while use of Web 2.0 for a project's KM helps in transfer of knowledge between projects, it does not significantly affect the success of that project's product.

Managing project knowledge includes the creation of a system to organize project information and simplify access use of project data by the team (Linman, 2011). Though this management of project's knowledge is important (Linman, 2011), other factors associated with a project, such as requirement changes and team members' performance, significantly affect the success of that project (Belassi and Tukel, 1999). The interviewees expressed similar views. The interviewees thought while the use of Web 2.0 can positively affect a project's KM, it alone cannot significantly affect the success of a project because other factors have more significant impacts.

Our finding suggests that management should consider Web 2.0 for project level KM to more effectively facilitate knowledge transfer and reuse in projects. However,

management and project team members should not have higher expectation to produce a successful product due to the Web 2.0 based KM alone.

7.2.2.3.1 Use of Web 2.0 for KM, Success of a Project's Product and Context Variables

We studied three project-level KM context variables: team members' familiarity with each other, stability of the project team, and the team leadership's ability to provide a team environment for of open communication. While there are some indications that these context variables are important for the Web 2.0-based KM to be effective at the project level, we could not conclude that the context variables significantly affect the relationships between use of Web 2.0 for a project's KM and success of a project's product.

We could not draw any definite conclusion regarding the proposition that project members' familiarity with each other positively affects the relationship between the use of Web 2.0 for KM and a project's product's success. Our results was inconclusive as interviewees could not clearly identify the effect of the project team members' familiarity in the success of a project's product in the Web 2.0 based KM environment.

We found that interviewees did not think that use of Web 2.0 for KM at project level significantly affects the success of a project's product, but rather they pointed to other factors that significantly affect the success of a project's product. Consequently, the interviewees could not clearly identify how and to what extent project team members' familiarity would affect the use of Web 2.0 for KM at the project level and which in turn

would positively affect success of a project's product. As described by an interviewee from organization C,

> Hard to say as we are always more about worried things like sudden changes in the project requirement.

While we could not draw any definite conclusion regarding the effect of project team members' familiarity with each other on the relationship between the use of Web 2.0 for KM and a project's product's success, the existing literature emphasize the importance of project team members' familiarity in team's KM (Janz et al., 1999). Therefore, while we encourage management to consider project team members' familiarity with each other as an aspect in forming project teams, we do not assert that it would have a significant effect on the success of a project's product in Web 2.0 based project level KM environment.

Another project level context variable that we studied is stability of the project team. We could not find enough evidence in the interviewees' responses to draw a definite conclusion regarding the proposition that a project team's stability affects the relationship between the use of Web 2.0 for KM and a project's product's success. Our proposition testing result is inconclusive as interviewees responded that the effect of a project team's stability on the success of a project's product in the Web 2.0 based KM environment is not a clearly identifiable if there is any effect at all.

In the responses of the interviewees, it was evident that they were more concerned about other factors, such as abrupt changes in the requirements by the client, that affect the success of a project's product measured in terms of acceptance by

management and customers. Such responses led us to the conclusion that the stability of the project team does not have any significant effect on the success of a project's product in Web 2.0 based KM. However, when asked whether this is a valid conclusion, the interviewees did not concur. For example, an interviewee from organization C responded,

> I would not say so. Stability (i.e. the project team's stability) very well might have a positive effect on the use of Web 2.0 (i.e. Web 2.0 based KM). It is just that other factors are the ones we notice more and Web 2.0 things are sort of new.

While extant literature points out the importance of a project team's stability on the project level KM and subsequent outcome variables (Akgün et al., 2005), we could not draw any definite conclusion regarding the effect of project team's stability on success of a project's product in Web 2.0 based project level KM. Akgün and Lynn (2002) suggested that project team stability contributes to a positive outcome in the project if there are no exceptional circumstances such as unexpected change in the project requirements or scarcity of the required skills. In accordance with Akgün et al (2005) and Akgün and Lynn (2002) s' findings, we encourage management to form stable project teams, but we do not infer that stability would have a significant effect on the success of a project's product in Web 2.0 based project level KM environment.

We also studied project managers' ability to provide an open environment for communication as project level context variables. We could not draw a specific conclusion regarding the proposition that a project manager's ability to provide an open environment for communication affects the relationship between the use of Web 2.0 for KM and a project's product's success. Interviewees responded that the effect of a project

manager's ability to provide an open environment for communication in the success of a project's product in the Web 2.0 based KM environment was not clearly identifiable to them due to existence of many external and internal factors that affect a project's product success. Therefore, we could not draw any definite conclusion regarding the proposition.

All interviewees were unanimous that project managers play a very important role in the implementation of Web 2.0 based KM at the project level. As mentioned by an interviewee from organization C,

> His (i.e. the project manager) perception towards that (i.e. Web 2.0 based KM) is very critical. When I have to work with different mangers in different projects, it becomes very evident that how and to what extent a project team is using KM depends largely upon the project manager.

Another interviewee from organization B stated the following regarding his project manager's role to facilitate open communication among team members,

> Project managers do not usually interfere. Therefore, whenever needed we (the team members) just communicate with each other, set up a WikiB page and so on.

While interviewees thought that the ability of project manager to provide an open environment for communication is important for a project's KM, they could not draw any definite conclusion about how important it would be in the success of a project's product. Once again, interviewees mentioned the existence of many different factors that affect the success of a project's product as the reason why they could not comment specifically about the role of a project manager in the relationship between use of Web 2.0 for KM and success of a project's product.

A team's leader is responsible for facilitating the free flow of information and ideas in a team (Beer, 1999). Therefore, it is important that the project team leader facilities an open environment to encourage project team members to participate in Web 2.0 based KM activities to share their knowledge and make Web 2.0 based KM effective. While through our case study we could not confirm the proposition that a project manager's ability to provide an open environment for communication affects the relationship between the use of Web 2.0 for KM and a project's product's success, our findings of our study do suggest that a project manager should provide an open environment for communication to make the project level KM functional. We provide a summary of the project level proposition testing result in table 16.

Table16 : Summary of the Project Level Proposition Testing Results

Proposition	Result	Findings	Implications
P6: Transfer of knowledge between projects	Supported	The transfer of knowledge between projects through Web 2.0-based KM has not reached its full potential due to lack of content and lack of systematic approach to collect knowledge.	Management should implement Web 2.0 for project level KM in order to increase transfer of knowledge between projects. Management has to take initiative to make sure the project team members are actively participating in knowledge sharing.
P6a: Transfer of knowledge with familiarity as context variables	Inconclusive	While the effect of familiarity on transfer of knowledge between projects is not clearly identifiable, familiarity of the project team members with each other has a positive effect in knowledge sharing in general.	Familiarity of the project team members with each other should be used a criterion in project team formation to facilitate knowledge sharing.
P6b: Transfer of knowledge with	Moderate support	While some interviewees mentioned that such relationship is not clearly identifiable, few interviewees thought that the	Management should try having a stable project team that can help the projects in their

Table16 : Summary of the Project Level Proposition Testing Results			
Proposition	**Result**	**Findings**	**Implications**
stability as context variables		project team stability in general can help in knowledge transfer- within as well as between projects.	organization to have increased transfer of knowledge- both intra and inter projects.
P6c: Transfer of knowledge with team leadership	Supported	A project manager's perception towards knowledge transfer between projects and consequent effort to create an environment plays a positive role in transfer of knowledge between projects.	The top management of an organization should educate the project managers about the importance of the transfer of knowledge between projects and to encourage them to take the necessary steps to facilitate the knowledge transfer.
P7: Project completion in time	Not supported	Use of Web 2.0 for project's KM does not significantly reduce a project's completion time.	Management should consider using Web 2.0 for project level KM to effectively facilitate knowledge transfer and reuse. However, management should not necessarily expect a significant reduction in project completion time because of Web 2.0 based KM.
P7a: Project completion in time with familiarity	Inconclusive	This relationship is not clearly identifiable to the interviewees as there are many other factors that affect the project completion time. .	Familiarity of the project team members with each other should be used a criterion in project team formation even though it might not have a significant effect on project completion time
P7b: Project completion in time with stability	Not Supported	Stability do not reduce project completion time in Web 2.0 based KM It is easier to introduce Web 2.0 based KM in a stable project team	Management should recognize stability as one the project team characteristics where Web 2.0 based KM should be introduced.
P7c: Project	Inconclusive	Project managers play a very important role in all the project	Project managers has to play an active role in all the

Table16 : Summary of the Project Level Proposition Testing Results			
Proposition	**Result**	**Findings**	**Implications**
completion in time with team leadership		level KM activities. The effect of a project manager's ability to provide an open environment for communication in the success of a project's product in the Web 2.0 based KM environment is not a clearly identifiable as there are many other factors that affect the project completion time.	project level KM activities Project manager should provide an open environment for communication to make the project level KM functional
P8: Project product's success	Not supported	Use of Web 2.0 for KM can help a project especially in terms of knowledge sharing. Use of Web 2.0 for project's KM cannot significantly affect the success of a project's product measured in terms of acceptance by management and customers.	Management ought to consider Web 2.0 for project level KM to effectively facilitate knowledge transfer and reuse in projects. The management and the project team members should not expect to produce a successful product due to the Web 2.0 based KM alone.
P8a: Project product's success with familiarity	Inconclusive	Interviewees could not clearly identify the effect of the project team members' familiarity in the success of a project's product in the Web 2.0 based KM environment.	Familiarity of the project team members with each other should be used a criterion in project team formation to facilitate knowledge sharing even though it might not have a significant effect the success of project's product.
P8b: Project product's success with stability	Inconclusive	Effect of a project team's stability in the success of a project's product in the Web 2.0 based KM environment is not a clearly identifiable as there are other factors are more prevalent in affecting the success of a project's product	Stability in a project team is desired only if there are no major changes in the project setup such as changes in project requirements.
P8c: Project product's	Inconclusive	Ability of project manager to provide an open environment for communication is important for	A project manager should provide an open environment for

Table16 : Summary of the Project Level Proposition Testing Results			
Proposition	**Result**	**Findings**	**Implications**
success with team leadership		project's KM, The effect of a project manager's ability to provide an open environment for communication in the success of a project's product in the Web 2.0 based KM environment is not clearly identifiable due to existence of many external and internal factors that affect a project's product success	communication to make the project level KM functional.

In our case study, proposition testing results were inconclusive for a significant number of project level propositions. Nevertheless, due to the rich nature of the qualitative data we collected and the interpretation of that data we were able to identify some interesting facts which we believe will help management to introduce and use Web 2.0 based KM at project level more effectively.

7.2.3 Group-Level Propositions

7.2.3.1 Use of Web 2.0 for KM and Group Performance and/or Effectiveness

We found strong support for this proposition that the use of Web 2.0 for KM positively affects group performance and/or effectiveness. The interviewees thought that the use of Web 2.0 for KM has positively affected their group's performance and/or effectiveness measured in terms of communication among group members, the group's ability to deal with a task, the flexibility of the process, and group decision quality. We found that the use of Web 2.0 tools has helped employees have effective communication between the group members. One major reason is the ease of sharing

information in different file formats and a simultaneous editing facility. For example, an interviewee from organization C, who works in a marketing group, described his experience of doing market analysis,

> … so each one of us does his own research and we keep on updating on that Wiki page (the Wiki page that has been created specifically for that market analysis task). We upload all the relevant documents we collected. All the group members can not only see them but can also add more to an existing one if they think that it is related. Through the built-in tracking mechanism in WikiC we can see what was contributed by whom and when.

Based on our analysis, we found that the use of Web 2.0 for KM has also increased participation of the group members in KM. For example, an interviewee from organization C stated,

> Before these technologies when I used to maintain my own webpage, I did it mainly for my own reference so that I could go back and find something I had worked on before. Sometimes my group members used to come to me asking whether I have some previous work that might help them. I used to refer them to those Web pages. But, I did not get the same favors as most of the people did not keep things in that way. But, now on WikiC more people are contributing. For example, after using my previous work they often also add something to that and make it richer. Just more people are getting into the habit of putting their work there (i.e. WikiC), unlike maintaining web pages.

The interviewees also thought use of Web 2.0 for KM has provided more flexibility in their group work. This flexibility was enabled by a Facebook-like social-communication platform and Wiki-like technology. The Facebook-like platform helped the group members to always be in touch and provide their current work status. Such features helped group members from different parts of the world and different time zones

work round the clock. An interviewee from organization B described one such phenomenon,

> The way agile development was designed that all the members are collocated so that every day they can have a meeting. But that is not possible in IBM. Team members are in different parts of the world. In order to overcome this problem, these teams are using social networking tool. There they share their current status, problems and so on which they have normally shared in daily meetings.

An interviewee from organization C described another phenomenon where flexibility in group work is achieved through the use of group Wiki for knowledge sharing.

> All of us provide the details of the projects we are working on at that point on that group Wiki. So, each group member is familiar or at least has an idea what his fellow group members are working on. It is not uncommon here (i.e. organization C) that another group member (because of a group member's particular expertise and/or experience) has to join a project I have been working on or even work on that project instead of me. We do not get much time to prepare to join those running projects. It used to be a big problem. But, now because of that group Wiki, it has become easier to catch up since it has the required information. Moreover, to begin with, group members are now more informed about each other's work and that helps.

While we did not find any clear evidence that the use of Web 2.0 for KM has improved group decision quality, interviewees said they were making more informed and more collaborative decisions because of using Web 2.0 tools. For example, an interviewee from organization C described the product-development decision scenario together with intra-group knowledge sharing: inter-group knowledge sharing is also required.

> In this sort of product-development decision now all the associated group members in this case do their own research and update on the assigned Wiki page. So, throughout this research phase everyone (i.e. the people who are part of the decision-making process) was well informed, which I think eventually helped us to have more comprehensive research.

Hence, based on the findings above, we draw the conclusion that the use of Web 2.0 for KM positively affects group performance and/or effectiveness. Our findings show that the use of Web 2.0 for KM in an organization can improve the performance and/or effectiveness of a group in an organization.

Availability of the required knowledge is an important factor for a group to perform. In different organizations, Group Support System (GSS) is used in group as a collaborative KM tool to provide the required knowledge (Hsia et al., 2006). An effective GSS can positively affect information exchange in a group, a group's ability to deal with a task, flexibility in group processes, and communication among group members. Our findings essentially establish the ability of Web 2.0-based KM tools to provide similar affect on group performance. This finding has implications for management to recognize the potential of Web 2.0 as an effective GSS to help different groups in their organizations to perform better.

7.2.3.1 Group-level Context Variables and Their Effect on Outcome Variables

We found support that a group's social capital has a positive effect on the outcomes of Web 2.0-based group-level KM activities. Interviewees thought that social capital measured in terms of group members' common understanding of goals and norms,

and ample interactions between group members with a minimum number of intermediaries can increase participation of the group members in Web 2.0 based group KM activities and positively affects group performance and/or effectiveness.

We found that it is important to have a common understanding among the group members regarding group activity and they share the same norm. Interviewees thought that when group members have a common understanding of their goals and share the same norm, it positively affects the use of Web 2.0 for KM and its effects at group level. As stated by an interviewee from organization C,

> If the group members understand each others' role and responsibility there (i.e. Web 2.0 based group KM platforms), it really helps.

We also found that interactions between group members with a minimum number of intermediaries can also positively affect the effectiveness of Web 2.0-based group-level KM. For example, one of the interviewees from organization C explained how it has helped their group to use Web 2.0 more effectively because of their group's ability to interact without an intermediary, and in them having a common understanding of their goals and task.

> One of the problems our group face is their group members work on different projects and sometimes one group member has to replace the one working now. But, it is challenging for the new members to catch up in a project that has been going on for a while. We realized this problem and decided to set up a Wiki page where the group members are going to share the information of their current project. So in the beginning we sat down for a face-to-face meeting and decided to set up that Wiki page where all of us can update the project status of our group members.

> When the interviewee was asked if the meeting was necessary, he answered, Yes. I think so. Through that we have made sure that all group members are on the same page and understand what the expectations are.

The interviewee further added,

> I think not only this one. Even for other group Wikis, it helps that we meet as group in face to face meeting. It reinforces that everyone has to contribute and meet the expectations.

When asked, the interviewee mentioned that this sort of decision to set up a Wiki page that can help a group does not necessarily have to come from or be approved by a group leader. However, the Wiki page becomes more effective if the role of the Wiki page is shared among group members in a face to face meeting. "… when you tell a group member in person (in a face to face meeting), he values it more. "

Furthermore, a group with higher social capital can also positively affect overall participation of the group members in the Web 2.0-based activities. For example, an interviewee from organization C described,

> Sometimes I actually told some group members to update the Wiki page with their contribution or mentioned to them that I have uploaded some useful documents on the Wiki page that they should check out. All these happened during some informal interactions or perhaps during some other meetings. So, I think it actually helps that we interact frequently and we have such understanding that we can discuss about the Wiki and its content without too much formality.

Hence, based on the above discussion, we conclude that a group's higher social capital positively affects the relationship between uses of Web 2.0 for KM and group

performance and/or effectiveness. This finding highlights the importance of a group's social capital in successful use of Web 2.0 based KM at group level. Our findings inform the management that Web 2.0 based KM will be more effective in a group where group members have a common understanding of their goals, share the same norm and have frequent informal and formal interactions. Hence, in the beginning management should consider implementing Web 2.0 based KM in groups with higher social capital.

Our findings also inform the importance of interactions between group members with a minimum number of intermediaries on the effectiveness of Web 2.0 based KM at group level. In addition to Web 2.0 based communications, occasional face to face meetings between the group members can enhance the effectiveness of Web 2.0 based group level KM. Such meetings are especially important in the beginning of using a Web 2.0 based tool for group level KM to establish a common understanding among the group members regarding the role of that tool in group activity. This finding informs the management about the importance of arranging occasional face to face meetings between the group members in a Web 2.0-based KM environment, and not to rely completely on web-based communications, especially at the start of the Web 2.0-based KM implementation in a group. We present the summary of the group level proposition testing result in table 17.

Table17: Summary of The Group Level Proposition Testing Results			
Proposition	Result	Findings	Implications
P9: Increases group performance and/or effectiveness	Supported	Web 2.0 tools help employees have effective communication between the group members. Web 2.0 for KM provides more flexibility in their group work Web 2.0 can facilitate more collaborative and informed group decision making	Management should consider implementing Web 2.0 based KM tools as Group Support System to help different groups in their organizations to perform better
P9a: Social Capital as context variable and its positive effect on group performance and/or effectiveness	Supported	A group's higher social capital positively affects the relationship between uses of Web 2.0 for KM and group performance and/or effectiveness A group's higher social capital can increase participation of the group members in Web 2.0 based KM activities	In the beginning management should consider implementing Web 2.0 based KM in groups with higher social capital It is important to arrange occasional face to face meetings between the group members in a Web 2.0-based KM environment, and not to rely completely on web-based communications, especially at the start of the Web 2.0-based KM implementation in a group

7.2.4 Organizational-level Propositions

7.2.4.1 Use of Web 2.0 for KM and organization level outcomes

The test result is inconclusive for the proposition that use of Web 2.0-based technology for KM will positively affect organization level outcomes. We did not find satisfactory evidence in the responses of the interviewees to draw a definite conclusion

for this proposition. However, the interviewees did mention incidents that essentially demonstrate positive effect of the Web 2.0 on organizations.

We could not obtain definite evidence from the responses of the interviewees to reach any specific conclusion regarding the organization-level proposition. We identified the principal reason for that was that many of the uses of Web 2.0 for KM were still discrete and specific to a project and/or group. These uses vary from one project and/or group to another project and/or group in terms of how and to what extent Web 2.0 tools are used. Sometimes a group and/or project team can have their own innovative way of using Web 2.0 tools for KM. In most cases, the effects of uses are prevalent at the respective project and/or group level. However, how these uses and effects are affecting the overall organization is hard to clearly identify and define. As described by an interviewee from organization C,

> C is such a large organization, it is almost impossible to point out the organization's wider effect. It is true that thweere is a push from the top management towards Web 2.0. But, the ways in whi ch Web 2.0 are in use are not consistent. Even considering the degree of use is not the same. I know our engineering teams use them religiously. But, that is not the case for all other groups. The groups who are using them are definitely having some benefits. We are enjoying using it in our groups and these tools are helping us in many ways. But, again for our whole organization……..

While we could not examine the propositions effectively, overall the interviewees were enthusiastic about using Web 2.0 and perceived that Web 2.0 for KM will positively affect their organization. For example, one of the interviewees from organization C

described how the use of Web 2.0 helped to achieve better coordination between different groups of the organization,

> One major thing we always have to do is market analysis and to assess the chances of our product in a market in which we are planning to launch. Being in marketing it used to be perceived as mostly our work. But, to do a really comprehensive analysis we also need to have input from the technical groups or at least keep them in the loop. It is not really feasible to always call a meeting with them for this purpose. But, now with WikiC, what we do is we create a Wiki page where we keep on updating our findings and all the people from the technical group can see them and put their feedback and comments, which helps us to make our report more comprehensive. For example, one major aspect is analysis of the competing product(s) in that market. As marketing people we might not sometimes understand all the technical details of those products. But, as we keep on updating the Wiki, if the technical-group people feel that they need more technical details on a certain aspect of a product, they can specify that to us through their comment. Or in some cases they might already know some technical details about the competitor's product(s) that we are missing and can add that to the analysis. In this way, by using WikiC, our group is keeping other people in our organization in the loop before creating the final report.

In a similar tone, an interviewee from organization B, who is in a high-level management position states that Web 2.0 tools helped organization B materialize the strategy of increasing global virtual teams in order to be more effective in terms of working 24/7 and providing a better service to their customers all around the world.

> ..this (Web 2.0) certainly has a role to play. About 10 years back organization B decided that they would have a global team to do complex solutions for clients. To do that a consistency needed to be developed: language, process, project-management method, and so on around the world. Now in organization B we have been able to run these global teams and these tools have a big role to play in that. Before pretty much all the team members were collocated. Now team members are from different parts of the world and they are doing projects successfully and I think that the tool means that we are talking.

As with any organizational resource, the development of effective KM capabilities contributes to organizational performance (Gold et al., 2001).However, several studies (Huber, 1991; Kelly& Amburgey, 1991; Kogut& Zander, 1993) have pointed out that it takes time for an organization to learn how to create value through KM capabilities, and that over time organizations improve their generation of value from KM capabilities. Since Web 2.0 based KM is a relatively new phenomenon, we believe that organizations have not yet realized its full potential. We believe that this is the reason that we could establish that the use of Web 2.0 for KM positively affected performance at the individual or project level, but could not draw definite conclusions that the use of Web 2.0 for KM positively affects performance at the organizational level. However, there were clear indications that the use of Web 2.0 for KM has a positive influence on groups, projects and individuals within the organization. This finding indicates that management should consider the potential of Web 2.0 to positively affect an organization's performance on many different levels. At the same time, management should not develop unrealistic expectations about the extent of the improvement in organizational performance due to Web 2.0 based KM, especially at the early stages of implementation.

7.2.4.2 Organizational-level Context Variables and Their Effect on organization level outcomes.

We studied two organization level context variables. They are technical KM resources and social KM resources. The test result was inconclusive for the propositions regarding these two context variables. However, there were clear indications that the

technical KM resource and social KM resource are important for implementing Web 2.0 for KM.

The test result is inconclusive for the proposition that technical KM resource positively affects the relationship between use of Web 2.0-based technology for KM and an organization's performance. In our case study, we did not find sufficient evidence in the responses of the interviewees to draw a definite conclusion regarding this proposition.

In our exploratory case study, it was quite apparent that having proper customized Web 2.0 tools was important, as off-the-shelf Web 2.0 tools do not often meet the requirements of the organizations. We found that having the proper technical KM resource was important for adoption of Web 2.0 for KM in an organization. For example, an interviewee who works in a higher level managerial position in organization C stated,

> C spent lot of time to develop these tools (i.e. the Web 2.0 based tools) to make sure that these have the required functionalities to meet the requirements of different people and groups. These tools have been beta tested by the people working in C to make sure it has all the functionalities and what needs to be improved or added. We have to convince ourselves first, right?

Similarly, an interviewee from organization B stated,

> Groups choose Web 2.0 tools based on their needs. One thing is clear that if a tool does not have anything useful and unique to offer, people are not going to use it. These are professional we are talking about. They have certain expectations from a tool. If those are not met then manager or any other person cannot force them to keep on using them.

However, we could not clearly identify and establish its impact on the relationship between the use of Web 2.0 for KM and organization level outcomes as interviewees

thought that most of the uses of Web 2.0 tools for KM are still specific to a project and/or group and not uniform throughout the organization.

Studies have shown that technical KM resources can help an organization to facilitate different KM activities ((Lee & Choi, 2003). These activities can positively affect an organization's performance (Gold et al., 2001). While we found that technical KM resource is important to successfully implement Web 2.0 for KM at different levels in the organization, we could not draw any definite conclusion regarding the effect of social KM resources on organization level outcomes in Web 2.0 based KM environment. Nevertheless, our finding informs the management about the importance of having proper technical KM resource to implement Web 2.0 tools successfully. Therefore, we suggest that a management should take initiative to develop proper technical KM resources to adopt Web 2.0 for KM at different levels. Our study further informs that off the shelf Web 2.0 based tools might not meet all the requirements in most cases. Hence, management needs to take initiative to develop and /or customize tools in-house or in collaboration with a third party to achieve the desired technical KM resource.

The test result is inconclusive for the proposition related to the other organizational level context variable we studied- social KM resource. In our case study, we did not find sufficient evidence in the responses of the interviewees to draw a definite conclusion regarding the proposition that social KM resource positively affects the relationship between use of Web 2.0-based technology for KM and an organization's performance.

We found that an organization's social KM resources such as reward and recognition for participating in KM activities are important for the individuals working in

the organization. We also found that social KM resources such as an environment for open communication and understanding among the group members are important for Web 2.0 to be effective in the projects and groups of the organization. However, since impact of Web 2.0 on the organizational performance was not clearly identifiable to the interviewees, .we could not clearly identify and establish the role of social KM resources in the relationship between the use of Web 2.0 for KM and organizational performance, The interviewees mentioned that since most Web 2.0 based KM efforts were relatively new and disconnected in the studied organizations, organization wide effects of Web 2.0 based KM and the role of context variables on these effects were not clearly observable. As stated by an interviewee from organization C who has worked on many projects that used Web 2.0 for KM and also works in a group that use Web 2.0 for group KM,

> … for organization wide performance, it is kind of hard to say, you know, C is so big that measure their effects overall.

To achieve effective KM, extant literature highlighted the requirement of an overall organizational culture and social KM setup in which the importance of KM is clear to all individuals and groups within an organization (Gold et al., 2001; Chuang et al., 2004). In other words, in attaining effective KM, an organization-wide climate of knowledge sharing is important (Kulkarni et al., 2007). In accordance with the existing literature, we found that social KM resource is important to successfully implement Web 2.0 for KM at different levels in the organization. However, since Web 2.0 based KM is a relatively new phenomenon and organization wide uses of Web 2.0 for KM are not consistent, we could not draw a definite conclusion regarding the effect of social KM

resources on organization level outcomes in Web 2.0 based KM environment. Nevertheless, our finding informs the management about the importance of social KM resource in implementing Web 2.0 tools for KM successfully. We summarize the proposition testing results at organization level in the table18.

Table18: Summary of The Organization Level Proposition Testing Results

Proposition	Result	Findings	Implications
P10: Positively affects organization level outcomes.	Inconclusive	There are clear indications that Web 2.0 based KM helps improving performance of different units of the organization. The impact of Web 2.0 based KM on the overall performance of the organization is not clearly identifiable yet.	Management should consider implementing Web 2.0 based KM tools at different levels in the organization Management should not expect any immediate positive impact on the organizational performance
P10a: Technical KM resource as context variable and its positive effect on organization level outcomes.	Inconclusive	It is very important to use appropriate Web 2.0 based KM tools that have the required features to meet specific needs of individual, projects and groups in the organization While having proper technical KM resource is important for adoption of Web 2.0 for KM at different levels in an organization, the effect of technical KM resource on the organization level outcomes in Web 2.0 based KM is not clearly identifiable yet.	Management needs to develop proper technical KM resource to adopt Web 2.0 for KM at different levels Off the shelf Web 2.0 based tools might not meet all the requirements. Hence, management needs to take initiative to develop and /or customize tools in-house or in collaboration with a third party.
P10b: Social KM resource as context variable	Inconclusive	Social KM resources such as reward and recognition for participating in KM activities	Management should have incentive mechanism(formal and/or

Table18: Summary of The Organization Level Proposition Testing Results			
Proposition	Result	Findings	Implications
and its positive effect on organization level outcomes.		are important to promote active participation in Web 2.0 based KM Social KM resources such as an environment for open communication and understanding among the group members are important for Web 2.0 to be effective in the projects and groups of the organization. The effect of social KM resources on the relationship between the use of Web 2.0 for KM and organization level outcomes is not clearly identifiable yet.	informal) in place to promote participation in Web 2.0 based KM activities Management should promote an environment for open communications throughout the organization to make the KM activities more effective

Proposition testing results were inconclusive at the organization level due to the emerging nature of the technology we studied and the nature of our case study, Nonetheless, through our case study we were able to collect rich qualitative data. The analysis and interpretation of that data helped us to identify some interesting facts regarding the effects of Web 2.0 based KM at the organizational level along with the role that different organizational level KM context variables play. We believe these findings will help management to evaluate the potential of Web 2.0 based KM, and implement it at different levels in the organization effectively.

CHAPTER VIII

DISCUSSION AND CONCLUSION

This dissertation has eight chapters. The first chapter presents the motivation for the proposed research and briefly lays out the theoretical foundation for the research development, presents the research questions, and outlines the research approach addressing the research questions. The second chapter provides an extensive review of the extant research on KM, drawing from the literature on Information Systems, Education, Marketing, and Management. The third chapter provides an in-depth description of different Web 2.0 technologies and their features, followed by a review of the current literature on Web 2.0 in KM. The fourth chapter presents our research approach. In the fifth chapter, we describe the research methodology for the exploratory part of our research and the findings of that study. The sixth chapter provides details of the relationship between the uses of Web 2.0 for KM and its effects. The seventh chapter describes the Qualitative phase of our research and the results of the proposition testing. In this, the last chapter of the dissertation, we present the discussion of our findings, the implications and contributions of those findings, the study's limitations, and our plans for future research.

Web 2.0 has gained widespread popularity at the consumer level. However, it is still not well-understood how Web 2.0 can be effectively used for KM by enterprises. In our research, we address this critical gap in the literature by using a multiple-case

research design. As there is currently a dearth of existing research on the use of Web 2.0 technology in the KM literature at the organizational, project, group, and individual levels, and ideally case study research designs are appropriate for "how" and "why" questions, we adopted an interpretive, exploratory case study strategy to identify and understand how organizations are using Web 2.0 technology for KM at different levels, together with the contexts, mechanisms, and effects associated with those uses. Then we adopt a Qualitative case study to confirm the relationship between the use of Web 2.0 technology and KM, and its effectiveness. In the following section, we describe the contributions of our research.

8.1 Contributions of the Research

The four major contributions of our research are outlined below:

(1) Through an exploratory case study in leading IT organizations, we identified and presented how these organizations are using Web 2.0 for KM at the individual, project, and group levels. While some desultory efforts to conduct a similar study can be found in the practitioners' literature, to the best of our knowledge this is the first study that is theoretically grounded to meet the expectations of academics as well as practitioners. Our research is guided by a theoretically grounded framework and the research method, which includes data collection and analysis, is also guided by theory. This essentially ensures the rigorousness of our research. Such theoretically grounded research on Web 2.0 in organizational setups is missing in the existing literature. Thus, our research essentially addresses this gap in the literature.

(2) Through our exploratory case study, we identified and reported the lessons learned by organizations that have adopted and utilized Web 2.0 for KM. These organizations are among the early adopters of Web 2.0 for KM. Therefore, they have had to go through many trials and errors in the adoption process in order to understand what works and what does not. For example, these organizations have had to spend a significant amount of time and money just to identify a Web 2.0 tool and the features required in that Web 2.0 tool for it to be used effectively in organizational setups. Through our research, we have identified such requirements and reported on them. We believe that this information would be very helpful for organizations that are planning to adopt Web 2.0 for their KM at different levels.

(3) Through our research, we examined the relationship between the uses of Web 2.0 for KM and different outcome variables at the individual, project, group, and organizational levels. The highlights of these findings are as follows:

(a) We found that the use of Web 2.0 for KM in an organization can increase tacit knowledge sharing between employees. While organizations realize the importance of tacit knowledge sharing, facilitating the sharing of this knowledge has always been a challenge for organizations. Therefore, the present study essentially establishes Web 2.0 as an effective way of addressing this challenge.

(b) We empirically found that the use of Web 2.0 for KM in an organization can augment the perceived learning of employees in the organizations by facilitating a

convenient, multimedia based interactive learning environment and providing access to sources of knowledge that were not easily accessible in a non-Web 2.0 KM environment. In fact, it has been so effective that in the organizations studied, the need for traditional trainings has been reduced significantly. Therefore, organizations that are planning to adopt Web 2.0 for KM can consider including Web 2.0 in their employee training strategy.

(c) We empirically established that the use of Web 2.0 for KM in an organization paves the way for the employees to earn the reputation of being an expert in the use of a tool and/or technology within the organizations. Such an opportunity can essentially increase active participation of the employees in the KM activities and can help management to identify relatively untapped knowledge sources within the organization.

(d) We empirically established that the use of Web 2.0 for KM in an organization creates an opportunity for the employees to acquire knowledge and gain help from the expert and/or knowledgeable people within the organization through Wikis, blogs, and Face book-like social networking platforms facilitated by the organization. In a large organization, especially a multinational one, it is virtually impossible to know about all the knowledgeable persons in the organization and their expertise, let alone seek help from them. Hence, this finding confirms that Web 2.0 based KM is a suitable and effective way for organizations to facilitate

knowledge and information exchange between their employees in different parts of the world. Overall, we found that employees were more satisfied with KM when Web 2.0 for KM was used at the individual level.

(e) At the project level, we empirically established that the use of Web 2.0 for KM can increase the transfer of knowledge between projects and the degree of learning achieved by a project's team. While we did not find any conclusive evidence that use of Web 2.0 can positively affect a project's completion and the success of a project's product, we did find that the use of Web 2.0 for KM can make information sharing between team members both faster and more convenient.

We empirically established that the use of Web 2.0 for group level KM can increase a group's performance and/or its effectiveness in terms of better communication among group members, the group's ability to deal with a task, flexibility of the process, and the quality of decisions made by the group. This finding essentially establishes the potential of Web 2.0 as an effective group support system.

4. All KM activities reside in a duality with the context; that is, KM activities influence the context and are influenced by the context (Grover and Davenport, 2001). Thus, it is important to understand the context of KM as it allows identification of the KM context where certain uses of Web 2.0 KM are effective. However, there is no such study in the existing literature. Our research addresses this gap in the literature by empirically examining the effects of KM context variables on the effectiveness of Web

2.0 for KM at different levels. These findings will help organizations to identify and put in place an appropriate KM context to ensure that Web 2.0 based KM is effective. The highlights of these findings are outlined below:

(a) For KM at the individual level in organizations, we empirically established the positive effect of providing incentives for participation in Web 2.0 based KM activities on the KM based outcomes. We found that incentives can positively affect tacit knowledge sharing, the perceived learning of the employees, acquisition of knowledge from the experts, and the overall satisfaction of individuals with KM. Furthermore, our research revealed that informal incentives, such as recognition by top management for participation, are more effective then formal incentive such as cash bonuses for an individual's contribution.

(b) For KM at the individual level in organizations, we also empirically established the importance of supervisor and co-workers' support for participating in Web 2.0 based KM activities on KM based outcomes. We found that such support can positively affect tacit knowledge sharing, the perceived learning of the employees, an individual's earning reputation of being an expert, and overall satisfaction of the individuals with KM.

(c) For KM at the project level in organizations, we empirically established the importance of project managers' leadership in the transfer of knowledge between

projects. While we could not empirically establish any direct relationship between a project team's stability, familiarity, and a project manager's leadership with project level outcome variables such as project completion in time or the success of a project's product, through our rich qualitative data we showed that these context variables play an important role in adopting Web 2.0 for project level KM.

(d) For KM at the group level in organizations, we empirically established that a group's social capital, such as sharing the same norms, plays an important positive role in the relationship between the use of Web 2.0 for group KM and a group's performance and/or effectiveness measured in terms of better communication among group members, the group's ability to deal with a task, the flexibility of the process, and a group's decision-making quality. In other words, if a group has a higher social capital, then use of Web 2.0 for KM will be more effective.

(e) For the organizational level, we were unable to draw any definite conclusions regarding the effects of KM context variables on the relationship between the use of Web 2.0 for KM and outcomes at the organizational level. However, we were able to point out that organizational level KM context variables, such as technical KM resources and social KM resources are important for adoption of Web 2.0 for KM at different levels within the organization.

Since there is dearth of theory based and rigorous research on Web 2.0 based KM, especially in organizational setups, we believe that our findings will address the gap in the academic literature as well as help different organizations to adopt Web 2.0 for KM effectively at different levels.

8.2 Limitations

Even though our research is strongly grounded and guided by theory, we identify a few limitations in our study, as described below:

(a) Proposition testing results were mostly inconclusive at the organization level due to the emerging nature of the technology we studied and the nature of our case study, Nonetheless, through our case study we were able to collect rich qualitative data. Through the interpretive analysis of the collected data , we were able to identify some interesting facts regarding the effects of Web 2.0 based KM at the organizational level along with the role that different organizational level KM context variables play. We believe these findings will help management to evaluate the potential of Web 2.0 based KM, and implement it at different levels in the organization effectively.

(b) Despite the many positive aspects of qualitative research, studies continue to be criticized for their lack of generalizability. The word 'generalizability' is defined as the degree to which the findings can be generalized from the study sample to the entire population (Polit & Hungler, 1991). While we followed the suggestion by Yin (1994) , and Sarker and Lee (2003) to increase the external validity of our research, in accordance

with Myers (2000) we suggest that while qualitative studies are not generalizable in the traditional sense of the word, they have other positive features which makes them highly valuable. While partial generalizations may be possible to similar populations, that should not be a primary concern of qualitative research (Myers, 2000). According to Adelman, et al (1980), the knowledge generated by qualitative research is significant in its own right and in many situations, such as while studying a contemporary phenomenon, a small sample size might be more useful in examining a situation from various perspective and can help gain a more personal understanding of the phenomenon. Such results can potentially contribute valuable knowledge to the community (Myers, 2000).

Therefore, we believe that while one might question the generalizability of our findings, it does not diminish the significance of our findings in understanding a relatively new phenomenon.

(c) To increase the rigor of qualitative study, presence of multiple investigators during data collection is recommended. However, during our data collection, due to schedule conflicts there was only one investigator in some occasions. However, the transcripts of the interviews were shared with the interviewees as well as with the other researchers associated with this research to make sure that the responses were captured properly.

8.3 Future research

Based on our current research, we propose three future research studies and/or research directions.

First, in our exploratory study we included only IT intense organizations. In future, we would like to include non-IT organizations to identify the uses and effects of Web 2.0 based KM in those organizations.

Second, we would like to investigate the necessary conditions, which are the KM context variables, for the effective implementation of Web 2.0 for KM in organizations. These finding could help the organizations to evaluate the potential of Web 2.0 in the context of their organizations.

Third, while we studied the effects of Web 2.0 for KM at the individual level through qualitative data, we would also like to evaluate these effects using quantitative data. To do this, we will develop a survey instrument and conduct a survey among the employees of the organizations that we studied. Case studies are especially effective when a research area is relatively unexplored. Therefore, now that we have conducted a case study and explored the research area, we can do the same for the project and group level findings.

REFERENCES

Ackerman, M., Pipek, V,& Wulf, V *Sharing Expertise: Beyond Knowledge Management*, MIT Press, Cambridge, Mass,2003.

Akgu¨n A.E., Byrne, J., Keskin, H., Lynn, G.S. ,Imamoglu, S.Z. Knowledge networks in new product development projects: a Transactive memory perspective, *Information and Management*, (42), 2005 pp1105–1120

Alavi, M. and Leidner, D. E. "Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues," *MIS Quarterly*, 2001, (25: 1), pp. 107-136;

Alavi, M. and Tiwana, A. "Knowledge integration in virtual teams: the potential role of KMS," *Journal of the American Society for Information Science and Technology* (53), 2002, pp. 1029–1037

Alavi, M., Kayworth, T. R., & Leidner, E. L., "An empirical examination of the influence of organizational culture on knowledge management practices," 2006,(22:3) Journal of Management Information Systems, pp.191-224

Alavi, M., and Leidner, D. . " Knowledge Management Systems: Emerging Views and Practices from the Field," *Communications of the AIS*(1:5), 1999

Al-Hawamdeh, S., "Knowledge management: re-thinking information management and facing the challenge of managing tacit knowledge," .*Information Research* (8:1), 2002

Argote, L., B. McEvily, and R. Reagans. Managing Knowledge In Organizations: An Integrative Framework And Review Of Emerging Themes, *Management Science*. (49:4),2003,pp. 571-582

Argyris C. , Schon, D. *Organizational Learning: A Theory of Action Perspective*, Addison-Wesley Publishers. Reading UK.,1978.

Ausubel, D. P. *Educational psychology: A cognitive view*. New York: Holt,

Balaji, S. and Ahuja, M.K. ,Critical Team-Level Success Factors of Offshore Outsourced Projects: A Knowledge Integration Perspective*, Proceedings of the Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS'05)* - Track 1 - Volume 01

Barlow, C. A., Deliberate Insight In Team Creativity, ,*Journal of Creative Behavior*, (34:2), 2000,pp.101–117.

Beatty, R.C., Shim, J.P., & Jones, M.C.Factors Influencing Corporate Web Site Adoption: A Time-Based Assessment, *Information & Management*, (38), 2001, pp 337–354.

Bellaver, R.F., Lusa, J.M. ,*Knowledge Management Strategy and Technology*, Artech House, 2001

Bieber, M., Engelbart, D., Furtua, R., Hiltz, S.R., et al., Towards virtual community knowledge evolution., *Journal of Management Information Systems*, (18: 4),2002 11-36.

Bock, G.W.; Zmud, R.W.; Kim, Y.G.; and Lee, J.N. Behavioral intention formation in knowledge sharing: Examining the role of extrinsic motivators, social-psychological forces, and organizational climate., *MIS Quarterly,* (29, 1) ,March 2005, pp.87–111

Butler, T., Exploring the Reality of Knowledge Management Systems: A Case Study., *In Proceedings of The Third European Conference on Organizational Knowledge, Learning and Capabilities*, April 5-6, 2002, Athens, Greece

Carroll, J. M., Choo, C. W., Dunlap, D. R., Isenhour, P. L., Kerr, MacLean, S. T., A Knowledge Management Support For Teachers, *Educational Technology, Research and Development*,2003, (51: 4), pp.42-64

Caverly, D., Ward, A. ,Techtalk: Wikis and Collaborative Knowledge Construction. , *Journal of Developmental Education*(32:2), 2008,pp. 36-37. Retrieved May 6, 2009, from Academic Search Premier database

Chakravarthy, B., Zaheer , A.,Zaheer, S., Knowledge Sharing in Organizations: A Field Study, *Organization Science Research Workshop on Management*, 1999

Chen, M.Y. and Chen, A.P., Knowledge management performance evaluation: a decade review from 1995 to 2004, *Journal of Information Science,*(32), 2006

Chiu, C. M., Hsu, M. H., & Wang, E. T. G. Understanding Knowledge Sharing in Virtual Communities: An Integration of Social Capital and Social Cognitive Theories, *Decision Support Systems*, (42:3), 2006, pp.1872-1888

Choo, C. W,*The Knowing Organization: How Organizations Use Information to Construct Meaning, Create Knowledge, and Make Decisions,* Oxford University Press, New York, 1998

Chuang, S. A Resource-Based Perspective On Knowledge Management Capability And Competitive Advantage: An Empirical Investigation, *Expert Systems with Applications* (27), 2004, pp. 459-465

Coakes E., Knowledge management: a sociotechnical perspective in Knowledge Management in the Sociotechnical World: the Graffiti Continues,2002 London: Springer Verlag pp.4-14

Cole, R.E. , Special issue on Knowledge and the Firm - Introduction, *California Management Review* (40:3), 1998, pp 15-21

Conner, K.R. , A Historical Comparison Of Resource-Based Theory And Five Schools Of Thought Within Industrial Organization Economics: Do We Have A New Theory Of The Firm?, *Journal of Management*(17: 1), 1991,pp. 121-54

Conner and Prahalad, op. cit.; Grant, R. M., Prospering in Dynamically Competitive Environments: Organizational Capability as Knowledge Integration,

Cooper, R.G., Kleinschmidt, E.J., Success factors in product innovation, *Industrial Marketing Management* (16), 1987, pp. 215–223

Davenport, Thomas H., Lawrence Prusak., *Working Knowledge: How Organizations Manage What They Know*. Cambridge, MA: Harvard Business School Press. 1998.

Desouza,K.C. Facilitating tacit knowledge exchange, *Communication of ACM (*46:6), 2003, pp. 85-88

Desouza, K.C., and Evaristo, J.R. ,Managing Knowledge in Distributed Projects, *Communications of the ACM*,

(47:4), 2004, pp.87-91

Devaraj, S., Fan, M., and Kohli, R. ,Antecedents of B2C Channel Satisfaction and Preference: Validating e-Commerce Metrics, *Information Systems Research* (13:3) 2002, pp 316-333.

Doll, W., Torkzadeh, G. ,Developing a multidimensional measure of system-use in an organizational Context,, *Information and Management*(33) ,1998, pp. 171-185.

Drucker, P. F. *Post-Capital Society*, Harper and Collins, New York.1993

Drucker P.F. *Management Challenges for the 21st Century*, Butterworth-Heinemann, Oxford,1999

Dube, L. Pare, G., Rigor in Information Systems Positivist Case Research: Current Practices, Trends, and Recommendations, ,*MIS Quarterly*, 2003, (27: 4), pp597-636

Easley, R., Devaraj, S., & Crant, J., Relating Collaborative Technology Use to Teamwork Quality and Performance: An Empirical Analysis, *Journal of Management Information Systems* (19: 4), 2003, pp.247-268

Eccleston, D., & Griseri, L., How does web 2.0 stretch traditional influencing patterns?, *Paper presented at Market Research Society Annual Conference*, March 18, 2008

Edmondson, A. C., Winslow, A. B., Bohmer, R. M. J., Learning How and Learning What: Effects of Tacit and Codified Knowledge on Performance Improvement Following Technology Adoption, *Decision Science* (34: 2), 2003, pp. 197-220.

Eisenhardt, K. M. ,Building theories from case study research, *Academy of Management*

Review, (14: 4), 1989, pp.532-550.

Fedor, D. B., Ghosh, S., Caldwell, S. D., Maurer, T. J., & Singhal, V. R., The effects of Knowledge management on team members' rating of project success and impact, *Decision Sciences*(34: 3), 2003, pp. 513-539.

Fiol, M., Lyles, M. ,Organizational Learning, *Academy of Management Review(* 10), 1985,pp. 803-813.

Fitch, Dale., Wherefore Wikis? *Journal of Technology in Human Services*, 2007(25: 4), p79-85

Ganesh,J. and Padmanabhuni, Srinivas, Web 2.0: Conceptual Framework and Research Directions, 2007. *Proceedings of AMCIS*

Glaser, Barney G. and Anselm L. Strauss. *The Discovery of Grounded Theory: Strategies For Qualitative Research*. Chicago, IL: Aldine. 1967.

George, Alexander L. and Timothy J. McKeown., Case Studies and Theories of Organizational Decision Making.*Advances in Information Processing in Organizations*(2),1985, pp. 21-58

Gibson, C. B., Zellmer-Bruhn, M., & Schwab, D. S. ,Team effectiveness in multinational organizations:Development and evaluation across contexts, *Group and Organization Management (*28),2003,pp. 444–474.

Gold, A. H., Malhotra, A., Segars, A. H. Knowledge Management: An Organizational Capabilities Perspective, *Journal of Management Information Systems*(18: 1),2001, pp. 185-214.

Grant, R.M. , Prospering in dynamically-competitive environments: organizational Capability as knowledge integration, *Organization Science(* 7: 4) ,1996,pp. 375-387.

Grant. R.M. ,Toward a knowledge-based theory of the firm, *Strategic Management Journal.*(7), 1996,pp. 109-122

Grover, V., Davenport, T. H., General Perspectives on Knowledge Management: Fostering a Research Agenda, *Journal of Management Information Systems*, 18(1), 2003, pp. 5-21

Gruenfeld,D.H., Mannix,E.A., Williams, K.Y., Neale,M.A., Group composition and decision making: how member familiarityand information distribution affect process and performance, *Organizational Behavior and Human Decision Process,*(67) 1996, pp. 1–15

Hansen, M. T ., The search-transfer problem: The role of weak ties in sharing knowledge across organization subunits. Administrative Science Quarterly. 1999 44(1) 82-1 1

Harris, S.C. & Sutton, R.I., Functions of parting ceremonies in dying organizations, Academy of Management Journal (29), 1986,pp. 5-30.

Haseman, W.D., D.L. Nazareth, S. Paul., Implementation of a group decision support system utilizing collective memory, *Information & Management* (42), 2005, pp. 571–605

Hedlund, Gunnar. ,A model of knowledge management and the N-form corporation, *Strategic Management Journal* (15), 1994, p.73 – 90

Hoegl, M., Parboteeah, K.P., and Munson, C.L. ,Team-Level Antecedents of Individuals' Knowledge Networks, *Decision Science* (34: 4), 2003, 741-770.

Hollingshead, A.B. , Retrieval processes in Transactive memory systems, *Journal of Personality and Social Psychology* (74), 1998, pp. 659–671

Holsapple, C.W. ,Joshi, K.D., Knowledge selection: Concepts, issues, and technology,, *J. Liebowitz, Ed., Handbook of Knowledge Management. CRC Press, Boca Raton*, 1999, pp. 7-22

Hsu, C-L., & Lin, J. C-C. Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information and Management*, 2008, 45(1), 65-74.

Huber, G. P. ,Organizational learning: The contributing processes and the literatures, *Organization Science (*2),1991,pp. 88-115.

Hurley, Robert F. , G. Tomas M. Hult , Innovation, Market Orientation, and Organizational Learning: An Integration and Empirical Examination, *Journal of Marketing(* 62), 1998 ,pp. 42-54.

Iansiti, M., Real world R&D: Jumping the product generation gap, *Harvard Business Review,*1993, pp. 138–147.

Janz, B.D., and Prasarnphanich, P. ,Understanding the antecedents of effective knowledge management: The importance of a knowledge-centered culture, *Decision Sciences*(34: 2), 2003, pp. 351-384.

Johannessen, J.A., Olsen, B. Knowledge management and sustainable competitive advantages: the impact of dynamic contextual training, *International Journal of Information Management (*23), 2003, pp. 277-289

Jones. *Web 2.0 Heroes: Interviews with 20 Web 2.0 Influencers*. 2008

Kane, Gerald C. and Fichman, Robert G., The Shoemaker's Children: Using Wikis For Information Systems Teaching, Research, And Publication, *MIS Quarterly* (33:1), Mar2009, pp.1-17

Kankanhalli, A.; Tan, B.C.-Y.; and Wei, K.-K.. Contributing knowledge to electronic knowledge repositories: An empirical investigation., *MIS Quarterly,* (29: 1) ,March 2005, pp. 113–143.

Kang, S.-C., Morris, S. S., Snell, S. A., Relational archetypes, organizational learning, and value creation: extending the human resource architecture, *Academy of Management Review (*32), 2007,pp. 236-256

Kanawattanachai, P. and Yoo, Y. (2007). The impact of knowledge coordination on virtual team performance over time. MIS Quarterly, 31(4), 783-808

Kelly, Dawn , Amburgey, Terry L., Organizational Inertia and Momentum: A Dynamic Model of Strategic Change, *Academy of Management Journal*(34), 1991, pp. 591-612

Kerzner, H. *Advanced Project Management best Practices on Implementation,* 2nd edn, John Wiley & Sons, Hoboken, New Jersey, 2005,

Kessler, E.H. , Chakrabarti, A.K. ,Speeding up the phase of new product development, *Journal of Product Innovation Management* (16) 1999, pp. 231–247

Kogut, B. , Zander, U. Knowledge of the firm and the evolutionary theory of the multinational corporation,, *Journal of International Business Studies*(24), 1993,pp. 625-645

Kostova, T., & Roth, K.., Social capital in multinational corporations and a micro-macro model of it formulation. *Academy of Management Review*, 28(2), 2003, pp. 297–313.

Kulkarni, U.R., Ravindran, S., and Freeze, R., A knowledge management success model: Theoretical development and empirical validation, *Journal of Management Information Systems* (23: 3) 2006-7, pp 309-347

Lansiti, M. ,Real-world R & D: Jumping the product generation gap,, *Harvard Business Review (*71:3), 1993,pp. 138–147

Lee, A.S. A scientific methodology for MIS case studies, MIS Quarterly 13 (1), 1989, pp. 33–50.

Lee, H., Choi, B. Knowledge management enablers, processes, and organizational performances: an Integrative view and empirical examination,.*Journal of Management Information Systems* (20:1),2003, pp. 179 – 228

Lee, M. and Lan, Y., From Web 2.0 to conversational knowledge management: towards collaborative Intelligence, *Journal of Entrepreneurship Research* (2:2), 2007,pp.47-62.

Levinson, M. (2006). ABCs of knowledge management.

Louridas. P., Using wikis in software development, *IEEE Software*(23), 2006, pp.88-91

Lubit, R. Tacit knowledge and knowledge management: The keys to sustainable competitive advantage, *Organizational Dynamics*, 29 (3), 2001. pp.164-178.

Lynn, G.S., New product team learning: developing and profiting from your knowledge capital, *California Management Review* (40), 1998, pp. 74–93.

Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Cannon-Bowers, J. A., & Salas, E., Scaling the quality of teammates' mental models: Equifinality and normative comparisons, *Journal of Organizational Behavior*(26) .2005.,pp.37–56.

McDermott, R., Learning across teams: The role of communities of practice in team Organizations, *Knowledge Management Review (8),*1999,pp. *32-36*

McLure-Wasko, Molly & Faraj, Samer. Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice, *MIS Quarterly*, (29: 1). 2005

Mindel, J. L. and Verma, S." Wikis For Teaching And Learning ", *Communications of AIS*, 2006

Minocha, S. & Thomas P.G. Collaborative learning in a Wiki Environment: Experiences from a software engineering course, *New Review of Hypermedia and Multimedia*, (13: 2), 2007, pp. 187-209.

Mitchell, V. Knowledge Integration and Information Technology Project Performance, MIS Quarterly (30:4), 2006, pp. 919-939

Myers, M. D. Qualitative Research in Information Systems, *MIS Quarterly* (21: 2), June 1997, pp. 241-242.

Nahapiet, J., & Ghoshal, S., Social capital, intellectual capital, and the organizational advantage, *Academy of Management Review* (23), 1998, pp. 242-266

Nonaka, I. ,A dynamic theory of organizational knowledge creation, *Organization Science (*5), 1994, pp.14-37

Nonaka, I. and Takeuchi, H.*The Knowledge-Creating Company*. New York: Oxford Press,1995

Pan, S., Scarbrouth, H. A socio-technical view of knowledge sharing at Buckman laboratories, *Journal of Knowledge Management*(2:1), 1998,pp. 55–66

Orlikowski, W.J., Baroudi, J.J ., Studying Information Technology in Organizations: Research Approaches and Assumptions, *Information Systems Research* (2:1),1991, pp. 1-8

Effy Oz , Jane Fedorowicz , Tim Stapleton, Improving quality, speed and confidence in decision-making: measuring expert systems benefits, Information and Management, v.24 n.2, p.71-82, Feb. 1993

Parameswaran, M. "Social Computing: An Overview", *Communications of AIS*, (19), 2007,, pp.762-780

Pare, G. ,Elam, J. J., Using Case Study Research To Build Theories Of IT Implementation', in Information Systems And Qualitative Research, ,*Proceedings Of the IFIP TC8 WG 8.2 Conference On Information Systems And Qualitative Research, Philadelphia, Pennsylvania*, 1997, pp. 542-569

Poynter, Ray. , Facebook: the future of networking with customers. *International Journal of Market Research*, 2008, Vol. 50 Issue 1, p11-12, 2p

Patton, M. Q., *Qualitative evaluation and research methods* (2nd ed.). 1990,Newbury Park, CA: Sage Publications.

Preece, J. Supporting community and building social capital, *Communication ofthe ACM*, (45:4),2002,pp. 37-39.

Raven, A., & Prasser, S. G. , Information technology support for the creation and transfer of tacit knowledge in organizations. In R. Ramsower (Ed.), (1996). *Association for Information Systems 1996 Americas Conference. Phoenix: CAIS*,

Richards,B., A social software/Web 2.0 approach to collaborative knowledge engineering, ,*Information Sciences (*179), 2009,pp. 2515–2523

Rogers, E. M. *Diffusion of innovations*, (4th ed.). New York: The Free Press,1995.

Ruggles. S.,. The U.S. Public Use Microdata Files as a Source for the Study of Longterm Social Change., 1991 IASSIST Quarterly (15) pp. 20-27.

Rulke, D. L., & Galaskiewicz, J. Distribution of knowledge, group network structure, and group performance. *Management Science*, 46(5), 2000,.pp.612-625.

Santo, S. A. Knowledge management: An imperative for schools of education, *TechTrends*, (49: 6), 2006, pp. 42-49

Santosus, Megan, Surmacz, J. The ABCs of Knowledge Management, . *CIO.com,* 23 May 2001.
Available online at http://www.cio.com/research/knowledge/edit/kmabcs.html.

Sarker, S & Lee, A., Using a Positivist Case Research Methodology to Test Three Competing Theories-in-Use of Business Process Redesign, *Proceedings of the International Conference on Information Systems*, Brisbane, 2000

Sarker, S & Lee, A., Using a Positivist Case Research Methodology to Test Three Competing Theories-in-Use of Business Process Redesign, *Journal of the Association for Information Systems*, (2: 7), 2002.

Shanks, G.,"Guidelines For Conducting Positivist Case Study Research In Information Systems," *Australian Journal of Information Systems*, 2002, Special Issue

Simon HA , Bounded rationality and organizational learning, *Organization Science*(2:1), 1991,pp.125-134

Tanriverdi, Hüseyin. Information Technology Relatedness, Knowledge Management Capability, and Performance of Multibusiness Firms, *MIS Quarterly* (29: 2), 2005.

Teece D. J., Pisano G. Shuen A, Dynamic capabilities and strategic management, *Strategic Management Journal, (*18: 7), 1997,pp. 509-533

The Times of India, 2011, *Infosys: India leading IT services market,* (http://timesofindia.indiatimes.com/tech/news/software-services/Infosys-India-leading-IT-services-market/articleshow/7517217.cms)

Thomas-Hunt MC, Ogden TY and Neale MA, Who's really sharing? Effects of social and expert status on knowledge exchange within groups, *Management Science* (49: 4) 2003, pp. 464–477.

Trent, W.,2007, *Infosys: With Employee Retention Still An Issue, Expect a Slowdown, (*http://seekingalpha.com/article/32336-infosys-with-employee-retention-still-an-issue-expect-a-slowdown)

Van Maanen, John ,*Tales of the Field: On Writing Ethnography,* Chicago: University of Chicago Press, 1988

von Krogh , G., Knowledge Strategy*, Speech at Bak Gylden Leadership Forum, Konstanz, Germany*, December 7, 2000

Wagner, C., Breaking the knowledge acquisition bottleneck through conversational knowledge management, *Information Resources Management Journal*, (19: 1), 2006, P70-83.

Wagner, C., Majchrzak, A., Enabling Customer-Centricity Using Wikis and the Wiki Way, *Journal of Management Information Systems*, (23: 3),Winter 2007 pp. 17 – 43

Wegner, D.M., Guiliano, T., Hertel, P.T. Cognitive interdependence in close relationships, in: W.J. Ickes (Ed.), Compatible and incompatible relationships, Springer-Verlag, New York, 1985, pp. 253–276

Waterman, D.A., *A Guide to Expert Systems Reading*, Addison-Wesley Publishing Company, MA,.1986

Wu, Harris and Gordon, Michael D. From Social Tagging to Social Hierarchies: Sharing Deeper Structural Knowledge in Web 2.0, 2009, *Communications of the Association for Information Systems* (24), Article 45

Yeung, A. K., Ulrich, D. O., Nason, S. W. .von Glinow, M. A. *Organizational learning capability*, New York: Oxford University Press,1999.

Yin, R. K., *Case study research: Design and methods, (2nded.)*. , 1994, Thousand Oaks, CA: Sage.

Yin, R. K., *Case study research: Design and methods, (3rd ed.)*. , 2003, Thousand Oaks,CA: Sage.

Yoo, Y., Kanawattanachai, P., Developments of Transactive memory systems and collective mind in virtual teams, *The International Journal of Organizational Analysis*Vol9, 2001, pp. 187–208.

Zahra, Shaker, & George Gerard,. Absorptive capacity: A review, reconceptualization, and extension .,. *Academy of Management Review*, Vol. 27, No. 2, 185-203

Zhang, Yi , Hiltz, S.R. Factors that Influence Online Relationship Development in a Knowledge Sharing Community. *Proceedings of the Americas Conference on Information Systems*, Tampa, August.2003

APPENDIX A

IRB APPROVAL

From: UNCG IRB
RE: Determination that Research or Research-Like Activity does not require IRB Approval
Study #: 11-0018
Study Title: Web 2.0 Technologies for Effective Knowledge Management in Projects and Across Organizations

This submission was reviewed by the above-referenced IRB. The IRB has determined that this submission does not constitute human subjects research as defined under federal regulations [45 CFR 46.102 (d or f)] and does not require IRB approval.

Study Description:

The purpose of this study is to understand organizations use of Web 2.0 for Knowledge Managagement and its affects.

If your study protocol changes in such a way that this determination will no longer apply, you should contact the above IRB before making the changes.

CC:Rahul Singh, Information Systems And Oper Mgt, Anupam Nath, Chris Farrior, (ORED), Non-IRB Review Contact, (ORC), Non-IRB Review Contact