# WEB 2.0 TECHNOLOGIES FOR KNOWLEDGE MANAGEMENT AT PROJECT LEVEL IN ORGANIZATIONS: AN EXPLORATORY STUDY

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**Abstract**

*Realizing Web2.0's potential for effective KM, a few leading IT organizations have adopted Web2.0 for project level. 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. 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 project level.*

**KEYWORDS: Web 2.0, Project, Knowledge Management, Exploratory case Study**

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**Introduction**

Project, a common unit of work in organizations, generally integrates diverse and specialized intellectual resources and experts (Desouza and Evaristo, 2004). Given that an organization's intellectual assets are generally dispersed, appropriate knowledge management (KM) is critical for a project's success and effectiveness (Fedor et al, 2005). However, KM at project level still remains a challenge for organizations (Wagner, 2000; Kang et al., 2008). It is mostly due to technology limitations and the nature of KM paradigm itself (Lee and Lan, 2007). Conceptually, Web 2.0 --with its ability to combine traditional KM with social computing where knowledge is evolved through social interactions (Parameswaran, 2007)-- has the potential for effective KM (Mindel and Verma, 2006; Wagner, 2006; Fitch, 2007; Minocha and Thomas, 2007). However, in the existing literature, there is no clear understanding of how to use Web 2.0 for projects' KM effectively (MISQE call for paper, 2009).

Realizing Web2.0's potential for effective KM, a few leading IT organizations have adopted Web2.0 for project level KM. Other organizations considering Web 2.0 technologies for KM are actively seeking information and detail about the innovation to make their decision about the adoption (Jones, 2008). Per Innovation Diffusion Theory (Rogers, 1964), the first group of organizations are "early adopters" and the organization in the second group are "early majorities" who are in the "persuasion" stage of the adoption. Such "early majority" organizations need information to adopt and implement new technology effectively (Beatty et al., 2001). Hence, organizations those are "early majority" adopters of Web 2.0 for KM need information for effective adoption and implementation. Relying on Innovation Diffusion theory (Rogers, 1964), we believe that the "early majority" organizations can learn from the "early

adopters" ways to adopt and use Web 2.0 technologies for effective project level KM. Hence, our study aims to understand the lessons learned by the "early adopter" organizations from using Web 2.0 based KM at project level to inform the "early majority" organization on how to effectively adopt Web 2.0 for project level KM. Based on this goal we derive our research questions. Our research is guided by the following research question (RQ):

*RQ: How do organizations use Web 2.0 technologies for Knowledge Management at the Project level?*

There is a dearth of existing research theory on the use of Web 2.0 technology in the KM literature at project level. Ideally, case study research designs are appropriate for "how" and "why" questions. Hence, we adopt an interpretive exploratory case study strategy in the first phase of our research to identify and understand "how" organizations are using Web2.0 technologies for KM at the project level. We follow Eisenhardt's (1989) guideline for interpretive study in phase1- the exploratory stage. In accordance with the guideline, we will 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 project level.

The selection of companies for the study is based on two major aspects. First, that the organization has been using Web 2.0 technologies for KM for more than two years at the project level so that we can study their effects on different outcomes. Second, for practical reasons, the organization will allow us and provide us with the required resources for conducting our intended case study. Based on these two criteria, we include multiple projects in three leading

firms in the IT industry for our study. The principal data collection method included semi structured interviews with individuals at managerial level in these organizations.

Using multiple case research design, our research will address the gap in KM literature in two ways: First, we will be able to provide examples of how organizations use of Web 2.0 based KM at the project level. Second, we will be able to establish the relationship between the uses of Web 2.0 for KM and its effects on the projects with empirical data. Such relationships have not been examined in the extant research.

With these findings from the companies that have implemented Web2.0 technologies for KM at project level for longer period of time to realize its effects, we develop and provide recommendations to IS managers. We believe these recommendations with examples of the best practices of adopting and using Web 2.0 technology at the project level will help the managers to deploy Web 2.0 technologies for KM in their work domain more effectively and we will be we be able to address a critical gap in the extant KM literature,

**Literature Review**

Our research goal is to examine the use and effects of Web 2.0 technologies for KM at the project level. As per suggestion by Eisenhardt (1989), we need to have a firm theoretical foundation to guide our exploratory research. The following three aspects help us achieve 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 at the project level.

2. We want to identify different outcome variables that have been studied in the extant literature as effects of KM at the project level. In our exploratory case study we will specifically look for effect of Web 2.0 based KM on those outcome variables together with any yet unstudied and new ones which we might find in our exploratory case study.

3. KM context, i.e. the surrounding environment of KM activities, plays a very important role in the effects and outcomes of the KM (Coakes, 2004, Grover and Davenport, 2001). Hence, we identify the context variables that have been studied in extant literature to examine and understand their role in the relationships between the Web2.0 based KM and its effects at project level.

***KM Activities***

KM activities have been conceptualized in different ways based on the domain and scope of research (Chen and Chen, 2005). While these conceptualizations are not clearly delineated in the literature, their definitions share convergent elements (See Table1). In accordance with Grover and Davenport's (2001) conceptualization, our synthesis of KM activities consist of four major activities- Generation (knowledge acquisition and development), Codification(knowledge conversion in accessible and applicable formats), Transfer(moving knowledge from the point of generation or codification to the point of use), and Realization (making use of the available knowledge to generate value).

***Outcome Variables***

Researchers assessed the effects of KM on projects in two major ways: project output's success (Fedor et al., 2003) and project team performance (Janz and Prasarnphanich, 2003). One

criterion that has been used to determine the success of project is goal achievement by the project (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. Success of the new product had been measured using financial indicators such as ROI and non-functional indicators such as satisfaction of management and customers with the new product. This study found a positive influence of KM on product success. Effects of KM on a project have also been measured in terms of project completion time (Mitchell, 2006). Mitchell (2006) found that proper KM can reduce delays and help finish a project as per schedule.

**Table1: Overview of the conceptualizations of KM activities in the extant literature**

| ***KM Activity*** | | | | | | | | ***Source*** |
|---|---|---|---|---|---|---|---|---|
| **Generation** | | **Codification** | | **Transfer** | **Realization** | | | *Grover &Davenport,2001* |
| Creation | | Conversion | | Circulation | Completion | | | *Chen and 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* |

Performance of a project team is another major effect of KM on projects and has been 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 and Prasarnphanich, 2003). Effects of KM on a project team's performance have also been measured focusing on a team's learning measured by the extent to which KM has helped a team gain knowledge to perform better (Janz and Prasarnphanich,2003) and transfer of knowledge between projects (Akgu¨n et al., 2005). Both studies found a positive influence of KM on their respective dependent variables.

Gold et al (2001) argues that these objective measures are significantly confounded by many uncontrollable business, economic, and environmental factors. Hence, using measures that are less confounded to uncontrollable factors will provide a clearer insight into the value-added aspect of KM capability. Hence, in our research, unlike some other studies in existing KM literature, we do not intend to look specifically for objective financial measures like ROI as effect of KM at the project level. We are more interested in learning how Web 2.0 facilitated KM effects a project's outcome in terms of efficiency, timeliness and team learning.

***Context Variables***

Project Team characteristics, such as team size, proximity of team members, familiarity and interpersonal trust are frequently studied as context variable while examining the effectiveness of a KM initiative (Hoegl et al., 2003; Akgu¨n et al., 2005). Project type- inventing vs. upgrading (Hoegl et al., 2003), organizational support for KM at project level (Fedor et al., 2003) are among other project level KM context variables. As these variables are not specific to any

particular project level KM activity or technology, we believe these context variables will play a role in any project level KM initiative including the Web 2.0 based ones. Hence, we study and understand the role of these variables in the relationships between the Web2.0 based KM and their effects on projects.

**Research Method**

Given that Web 2.0 is a relatively new phenomenon, there is a dearth of existing research theory on the use of Web 2.0 technology in the KM literature at organizational as well as project level, ideally case study research designs are appropriate for "how" and "why" questions. Hence, we adopt an interpretive exploratory case study strategy in the first phase of our research to understand contexts, mechanisms and effects associated with the use of Web 2.0 technology for KM at the project level.

**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. 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.

An 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.

**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 the project level.

**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.

**Table 2: 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<br>•Third party provided enhanced Wiki-*WikiA* with additional functions:<br>(a) Organized uploading of large number of documents<br>(b) Task and associated deadline allocation for a project<br>(c) Calendar planning<br>(d) Meeting scheduling | •Sophisticated Wiki like tool-*WikiB* for KM developed in collaboration with a third party, with:<br>(a) Advanced search mechanism<br>(b) File sharing support in different formats<br>(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:<br>(a) Advanced search mechanism<br>(b) Extensive multimedia file sharing support<br>(c) HD audio/video format support<br>(d) Fine tuned access rights to authorize each user for specific read/write rights on a Wiki page |
| • Blogs<br>• Internal platform to host blogs and Wikis initiated by management or employees | • Blogs<br>• Internal platform to host blogs and Wikis initiated by management or employees | • Blogs<br>• 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 |

## Conclusion

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. 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 project level. 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 firmly grounded on 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.

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