A Social Approach to Knowledge Management in Projects

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ABSTRACT

In this paper, the concept of social knowledge management within projects is introduced to allow project team members to share knowledge in a dynamic way without having to embrace a new platform. This new approach is different than many of the previous knowledge management systems (KMS) in the past because it moves beyond the notion of centralized repositories as knowledge management systems, and recognizes that knowledge is created and shared in multiple locations and in dynamically changing contexts.

Keywords

Project Management, Knowledge Management, Text Mining, Social Network Analysis.

INTRODUCTION

The lack of proper knowledge management methodologies throughout the project management lifecycle, according to Disterer (Disterer 2002) is among the key causes for failure in projects (2002). Petter & Vaishnavi (Petter and Vaishnavi 2008) describe a similar issue in IT Software Projects whereby software project managers aren't able to reuse the experience of previous project managers and projects. Even failures causes often cited in literature such as lack of project management methods, lack of change management processes, project scope size and project duration (Reich 2007) and the lack of experienced project managers is often cited as a key factor in IT project failures (Karlsen and Gottschalk 2004; Petter and Vaishnavi 2008) can be to a certain extent addressed by efficient knowledge management within and across project lifecycles.

To address the issue of poor knowledge management in projects, we propose an approach that utilizes Web 2.0 / Enterprise 2.0 technology in a new way for knowledge management within project teams and organization. A key feature of this approach is its focus on the social aspects of knowledge management and its use of text-mining and social networking analysis to analyze and present knowledge in dynamically changing contexts.

In this paper, the concept of social knowledge management within projects is introduced to allow project team members to share knowledge in a dynamic way without having to embrace a new platform. This new approach is different than many of the previous knowledge management systems (KMS) in the past because it moves beyond the notion of centralized repositories as knowledge management systems, and recognizes that knowledge is created and shared in multiple locations and in dynamically changing contexts.

While the repository-centric knowledge management systems have been shown to work for some forms of knowledge that are more explicit, they do a poor job capturing the dynamic and ever-changing knowledge of project team members (Bhardwaj and Monin 2006; McCall, Arnold et al. 2008).

Rather than forcing users to embrace a KMS platform that doesn't capture all of the organizational knowledge, why not look at other methods that allow a more social approach to managing knowledge within organizations and project teams?

To address this question, the remainder of this paper outlines an approach to capturing and sharing knowledge within project teams by utilizing Web 2.0 platforms that have already been embraced and used by project team members and organizations. This research is based on Reich's (Reich 2007) project knowledge framework as well as other research into the world of knowledge management / sharing within projects including Petter & Vaishnavi's (Petter and Vaishnavi 2008) Experience Exchange model for knowledge sharing within project teams.

The purpose of this research is to determine if there are methods or tools that can be used create a social aware knowledge repository that can be used to index and aggregate relevant knowledge about projects, project team members and project technologies without adding additional workload to the individual project team member.

RESEARCH PROBLEM

This paper attempts to provide an overview of the issue of poor knowledge management within the project management world and describe methods to improve knowledge sharing capabilities within project teams.

As a method to improve knowledge sharing and management within projects, the following question is considered:

> *Can a project team use Web 2.0 / Enterprise 2.0 platforms to communicate and share knowledge during a project and have this communication indexed and mined to capture relevant knowledge about the project, project team members and project technologies without adding additional burden to the project team members?*

The remainder of this paper attempts to describe an approach that might assist with sharing knowledge within project teams by allowing team member to more easily take advantage of knowledge contained within unstructured and semi-structured documents (blogs, documents, emails, instant messages, wikis, etc) by having this knowledge automatically categorized and centralized for quick search & retrieval.

To assist with the knowledge management approach in projects, the social aspects of transferring and sharing knowledge is also considered. Project team members' knowledge and strengths can be generated using social network analysis methods.

LITERATURE REVIEW

Knowledge Management in Projects

While much research has been completed in the area of knowledge management in projects and many organizations (like the Project Management Institute) have begun to highlight the need for more focus on the subject, there is still a need for a more comprehensives set of guidelines for collecting and managing knowledge within projects and project teams.

Disterer (2002) argues that traditional project management is overly concerned with efficiency and effectiveness of project team members, which makes the act of capturing knowledge a lower priority during a project (Disterer 2002). This is compounded by the fact that the knowledge needs of future projects isn't within the context of the current project requirements; therefore project managers and leaders do not focus on these efforts (Disterer 2002).

To combat the lack of KM within projects, better methods are needed to ensure that knowledge is captured and shared with other members of the organization. Owen, Burstein & Mitchell (2004) published research results that report on this very topic. In this research, the authors state: "knowledge gained in a project needs to be transferred to an organization's memory for reuse in other projects" (Owen, Burstein et al. 2004).

Leseure & Brookes (2004) provide further argument for this notion by stating that knowledge transfer is one of the most overlooked issues in projects today when they write, "Knowledge is generated within one project and then lost. Failure to transfer this knowledge…leads to wasted activity and impaired project performance" (Leseure and Brookes 2004). Leseure & Brookes benchmarked KM practices within projects to provide broader and more qualitative evidence of KM methods in projects. The results of this research pointed to two main areas that could improve KM in projects: collecting knowledge in projects; and managing tacit knowledge (Leseure and Brookes 2004). By focusing on these two areas, organizations can help to improve project knowledge management.

Kasvi, Vartiainen, & Hailikari (2003) performed research on how knowledge is managed in projects and what knowledge management capabilities are required for proper knowledge management in projects . The researchers used interviews to gather data on knowledge management capabilities and practices in various organizations. The results provided interesting feedback on organizational knowledge practices in projects and led the authors to observe that "knowledge management practices were weak and unsystematic" (Kasvi, Vartiainen et al. 2003) and that paper documents and interactions with colleagues were the most important sources of knowledge.

Research by Karlsen & Gottschalk (2004) addresses the topic of factors that affect knowledge transfer in projects (Karlsen and Gottschalk 2004). The authors used surveys to gather information from project managers and organizations on knowledge transfer in projects. The survey results showed that organizational culture plays a key

role in knowledge transfer within projects and should be the main area that organizations focus when looking at knowledge transfer methodologies capabilities.

Slaughter & Kirsch (2006) extends the concept of the importance of organizational design and culture on knowledge management with the introduction of Knowledge Transfer Portfolios. This research, which was conducted as a field study in the area of software process improvements, provides some very interesting ideas on organizational design and knowledge transfer and outlines the following three items as being key for knowledge transfer within organizations: Proximity, Frequency of Interactions and Relationships (Slaughter and Kirsch 2006).

Reich (2007) has developed a framework for knowledge management within IT Projects, which seems promising. In this research, Reich proposes a three level framework that addresses what knowledge management in IT projects is, a typology of critical IT project knowledge and identifies the top ten knowledge-based risks found in IT projects (Reich 2007). In addition, key principles for knowledge management in IT projects are provided for use in helping build strong knowledge management capabilities within IT projects.

Reich's framework is a good place to start as it provides a framework that is built upon sound principles and research in the IT project space. Reich defines IT project knowledge management as:

Knowledge management in the context of a project is the application of principles and processes designed to make relevant knowledge available to the project team. Effective knowledge management facilitates the creation and integration of knowledge losses and fills knowledge gaps throughout the duration of the project (Reich 2007).

Reich's framework describes the types of IT Project knowledge. This typology contains four distinct types of knowledge: process, domain, institutional and cultural. A brief definition of these types of knowledge follows:

- **Process Knowledge:** knowledge that project team members have regarding the project (tasks, methodologies, timelines, structure, etc) (Chan and Rosemann 2001; Meehan and Richardson 2002; Reich 2007).

- **Domain Knowledge:** knowledge that a project team or member has about the industry, technology, processes, current situation, business and products (Chan and Rosemann 2001; Reich 2007).

- **Institutional Knowledge:** knowledge that a project team or member has about the organization (Reich 2007).

- **Cultural Knowledge:** knowledge about the organizational culture as well as cultural backgrounds of the project team members (Reich 2007).

The extent of knowledge management in most project management methodologies begins and ends with the 'lessons learned' document that is created after the completion of a project. This document is a good exercise, but doesn't do much to manage knowledge during the project or ensure that knowledge is transferred between project members because project members must know to read the document to receive any value from it.

It is widely reported that project failure rates are still very high (Owen, Burstein et al. 2004; Pawlowski and Robey 2004; Scarbrough, Bresnen et al. 2004; Ahn, Joo et al. 2005; Reich 2007; Petter and Vaishnavi 2008). Industry research shows fifty to sixty percent of all projects are considered failures (IT-Cortex 2007). While most research blames these failures on poor project management and/or lack of executive sponsorship (Reich 2007), the fact that there is very little knowledge transfer and sharing between project teams has to play a key role in allowing these failures to occur.

Petter & Vaishnavi (Petter and Vaishnavi 2008) describe the use of a concept they've called Experience Exchange to facilitate knowledge sharing within software projects. This Experience Exchange uses the concept of a Library to store documents and knowledge about the project for use by other project team members and project managers. The authors point out that careful thought and planning must be undertaken to ensure that this Library is organized for performance and ease of use.

The Experience Exchange Library model combined with the Project Knowledge Framework, along with the idea of automating knowledge capture and identification and social network analysis, forms the basis for the provides the basis for the Social Project Knowledge Platform described in later sections.

Moving from Capturing Knowledge to Managing Knowledge

What would it mean for an organization's knowledge managements capabilities if a system could be implemented that could find and index the many disparate repositories of structured and unstructured data sources and provide that information in a socially aware platform that could wrap context around the indexed knowledge as well as provide a mechanism for users to capture and share both tacit and explicit knowledge?

While the interest in making applications and platforms more socially aware is interesting and a worthwhile exercise, there's been little thought put into utilizing these new platforms for knowledge management; but the underlying aspects of these newly socially aware tools are just waiting to be utilized as knowledge management tools.

An organization that creates an environment that is socially aware provides mechanisms for the social networks that have existed in the 'real world' for years to move into the digital space. By digitizing these social ties, an organization is setting the stage for the digitization of the dialogue that occurs within these social networks. By digitizing dialogue, there's a chance that knowledge is being transferred between people within the organization, which would then allow for that knowledge to be indexed and shared with others around the company.

For these social aware platforms to be embraced and extensively used, users must trust the platform, the other users and the organization to manage the shared information in a responsible manner. Trust is the key to ensuring that these socially aware platforms are used and embraced (Cross, Borgatti et al. 2001; White and Korrapati 2007).

Combining Knowledge Management and Social Networks

Social Network research has grown exponentially over the last 20 years or since it was first found in literature the 1970's and research in the field has been increasing ever since (Borgatti and Foster 2003). The interest in this field has been driven by the interwoven nature of business in today's digital economy where relationships between businesses and people are drawing considerable attention (Oinas, nbsp et al. 2010).

Considerable work has been done in the KM space to describe the act of knowledge sharing as a very social transaction, especially for tacit knowledge (Parise, nbsp et al. 2009). Research topics like that of the Communities of Practice field of research popularized by Brown & Duguid (Brown and Duguid 1991) clearly define knowledge sharing as being more active and successful when like-minded people are able to interact with each other to share information and knowledge on that topic (Brown and Duguid 1991; Parise, nbsp et al. 2009). Additional KM research highlights the social nature of knowledge management and sharing with the many research studies into areas such as Transactive Memory, Boundary Spanning and Social Capital as key areas of KM research that intersect with social network research (Nahapiet and Ghoshal 1998; Hansen 2000; Cross and Cummings 2004; Wasko and Faraj 2005; Pearsall and Ellis 2006; Parise, nbsp et al. 2009).

Social networks can make it much easier for organizations to share knowledge across the entire organization as well as with people and entities outside the organization. They also provide a means for individuals to reach out for assistance, knowledge, validation, solutions and legitimacy (Cross, Borgatti et al. 2001).

By providing a socially aware platform for project teams to collaborate and share knowledge, an organization can create a place for social interaction, knowledge sharing and organizational learning.

One of the main design principles in Petter & Vaishnavi's (Petter and Vaishnavi 2008) research has to do with creating 'meta-knowledge' for project managers and project team members so that they are aware that there is project knowledge available. By creating a socially aware platform for project knowledge, this meta-knowledge is created and project team members are able to become more aware that project knowledge exists and aware of where they can go to find that knowledge.

PROPOSED SOLUTION

To address the research problem, a solution is being proposed that will create a "Social Project Knowledge Platform" to capture and share project and organizational knowledge for project teams.

Figure 1 provides an overview of this platform. The remainder of this paper describes this platform and its use within an organization. This platform is broken down into four layers: Data, Analysis, Knowledge and Presentation/Collaboration. Each layer is described in detail in the following sections.
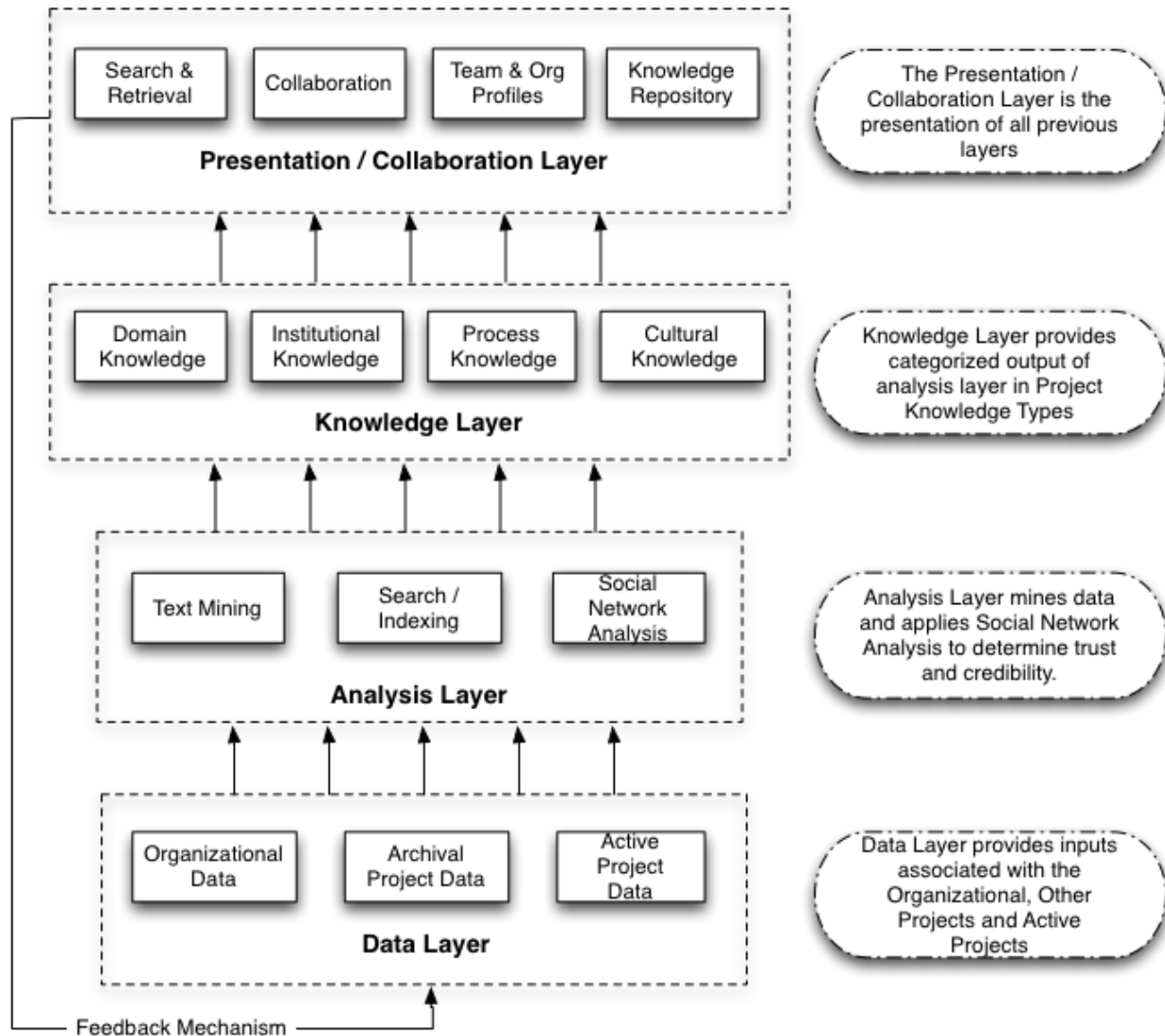

Figure 1 - Social Project Knowledge Platform

Data Layer

The Data Layer is made up of data from three distinct areas: The Organization, Project Archives and Active Projects. The data layer contains all forms of data and content including structured and unstructured data.

Organizational Data covers topics such as organizational hierarchy, history, strategy, mission and various other types of data relevant to projects. The type of data included here be different for every organization but there are basic requirements such as hierarchy, organizational goals and team alignments.

The Project Archives contain data from previous completed projects and provide historical project data, lessons learned, team structure, project documents and other project management activities for an organization's completed projects.

Active Project Data covers all aspects of current, active projects including project documents, team members, stakeholders, budgets and current schedules and status. This data is found within all project management activities for active projects within the organization.

Information found in the data layer is made available to the next layer, the Analysis Layer, to provide analysis and mining methods to find relevant knowledge that can be shared across the organization.

Analysis Layer

In the analysis layer, the information from the Data Layer is analyzed, indexed and mined to find knowledge. This analysis is performed using text-mining techniques to find relevant information, indexing to provide search capabilities and social network analysis to provide profiles, areas of expertise and experience and build trust profiles for knowledge for use in the presentation layer.

Text Mining can be performed on structured data (databases, etc) and unstructured data (document repositories, etc) to determine context, meaning and other semantic and contextual associations found within the data layer. Using text-mining methods similar to Nasukawa & Nagano (Nasukawa and Nagano 2001) and Trappey & Trappey (Trappey and Trappey 2008), among others, a semi-autonomous text-mining system can be built to find, retrieve and classifying knowledge into relevant project knowledge framework categories.

Search / Indexing will be used to index the data found in the Data Layer to provide search capabilities to users of the platform. This indexing will be applied to all content in the data layer.

Social Network Analysis can be applied to the information found in the data layer to provide team profile information, expertise and experience maps and build trust profiles. In addition, outputs from this analysis can be used to all four types of project knowledge found within the project knowledge framework.

Knowledge Layer

The Knowledge Layer is a descriptive layer to provide a means for categorizing the output of the Analysis Layer. Output from the text-mining and social network analysis methods in the Analysis layer are assigned to one of the four types of knowledge found in Reich's (Reich 2007) Project Knowledge Framework.

Examples of the types of knowledge found are:

- Process Knowledge: Project tasks, Project schedules & timelines, project scope and deliverables, project team members, etc.

- Domain Knowledge: Project status, project platform configuration (servers, etc), technology platforms, change management issues, etc.

- Institutional Knowledge: Project stakeholders, strategic roadmap, budget, etc.

- Cultural Knowledge: Social aspects of the project team & organization, areas of expertise of each person, background of each person, etc.

The categorization is actually performed within the Analysis Layer but then stored within the Knowledge Layer for presentation to users.

Presentation / Collaboration Layer

The Presentation / Collaboration Layer is where all three previous layers are combined to render knowledge to the project team members and other organizational users. This is the 'workspace' of the user and is where project

managers and team members would spend a good portion of their day capturing knowledge, interacting with other users and collaborating throughout the project.

In this layer, project managers, project team members and any other organizational user will be able to access previously captured / shared knowledge using search methods that will return categorized knowledge relevant to aspects of projects and the organization. In addition, this layer can provide all the digital tools for project management activities to keep schedules, assign tasks and manage all aspects of the project.

One of the main components of this layer is that all knowledge available to users has a level of trust assigned to it (via the Social Network Analysis outputs). This trust profile will allow a user to not only interact with the knowledge repository but also understand the experience and expertise level of the person(s) that initially created that knowledge artifact.

Feedback Mechanism

A feedback mechanism must be included in this model to allow for any input mechanism that a project team member / organizational user might have while using the Presentation / Collaboration layer. This feedback mechanism can take many forms (database, file system, etc) but it necessary to ensure that the dynamic nature of projects and project teams can be managed.

CONCLUSION AND FUTURE RESEARCH

This paper has provided an introduction to the idea of managing knowledge in projects using a social platform. This platform uses information gathered from various Web 2.0 / Enterprise 2.0 platforms using text mining techniques and social network analysis to mine knowledge and associate that knowledge with users.

This research is still in its early stages. Future work must include a more robust description of the Social Project Knowledge Platform and research into developing a text mining solution to mine repositories of information for project management knowledge. In addition, research into applying social network analysis methods to allow a sense of 'context' and trust to be formed around this mined data.

Further work must also be done to determine how best to categorize knowledge into the project knowledge framework using automated text-mining and pattern-mining techniques. Additionally, further work can be performed in the areas of project knowledge management techniques, guidelines and frameworks to prepare project managers and project team members for a social project knowledge platform as described in this paper.

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