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An Organizational Memory Approach to the Knowledge Dissemination of Post-Project Reviews: Combining Knowledge Management and Organizational Learning

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ABSTRACT

Current research on and practices of post-project reviews (PPR) are ad hoc in nature. This paper introduces an organizational memory (OM) approach to evaluating the knowledge dissemination function of post-project reviews in a systematic and quantitative way. The approach is based on a network topology of organizational memory and its structural changes during PPRs (i.e., network dynamics). We try to associate PPRs and OM in the sense that both facilitate organizational learning (OL) through knowledge management (KM). At the end of the paper, some suggestions on improving the practice and research of PPRs are given.

Keywords

Post-project review, organizational memory, knowledge management, organizational learning.

INTRODUCTION

Learning in project-based environment and post-project reviews

A project-based environment can facilitate individual learning by creating a context for employees to examine and then better understand the assumptions and consequences of their actions. Such reflection is fundamental to individual experiential learning and provides a basis for future action improvement (Raelin, 2001). Nevertheless, more desirable organizational-level learning does not automatically happen in project-based organizations due to the difficulty of knowledge dissemination (including formal transfer and informal sharing). Daft and Weick (1984) considered information sharing as the distinctive feature and preliminary requirement of organizational-level learning. However, projects have some inherent properties, such as knowledge discontinuity, time constraints, and team autonomy, which may inhibit effective knowledge transfer and knowledge sharing, even if the arrangements for transfer of knowledge and experiences from specific projects to the main organization are clearly established by management (Ayas and Zeniuk, 2001; Brady et al., 2002; DeFillippi, 2001; Disterer, 2002; Eskerod and Skriver, 2007; Reich, 2007; Sahlin-Andersson, 2002; Senge et al., 1999; Weiser and Morrison, 1998). As a result, the gap between individual and organizational learning is prominent in project-based organizations. To solve this problem, Argote (2005) suggests establishing an observable organizational learning (OL) mechanism through which organization members can interact to learn.

In project-based organizations, post-project reviews (PPRs), a formal project management process, could be such a mechanism. Unlike other types of project reviews (e.g., phase-review), a PPR is conducted after the completion of a project, aiming at capturing lessons learned for improving future projects. It provides a context where project participants articulate and make sense of their project experience with fellow project participants and other interested parties, usually through collective discussions, debriefing sessions, and performance evaluations. Explicit knowledge generated will be simultaneously recorded and preserved for future reference. In other words, PPR is a good opportunity for transferring and sharing individual/group knowledge as well as transforming it into organizational knowledge. Although PPRs are perceived by both academics and practitioners as an appropriate and useful tool, they are not widely adopted, and often fail to be effectively conducted even when used (Busby, 1999). One possible reason for this is the paucity of universal guidelines for PPR operations (Williams, 2008).

This paper proposes a systematic approach to the theoretical analysis and practical execution of PPRs. Based on a network topology of organizational memory, we show (1) how a typical PPR could be treated as a collection of knowledge processes, centering on the capturing, interpretation, dissemination, and storage of organizational knowledge that can support organizational learning and the retention of knowledge in organizational memory (Huber, 1991); and (2) how PPRs can enable double-loop learning (Argyris and Schon, 1978) by detecting and correcting mismatches between new project

experiences and previous reference systems (von Zedtwitz, 2002). We believe this approach provides a new insight into both the research and practice of PPRs.

In the following sections we will first discuss the link between organizational memory and organizational learning, and then present the organizational memory approach that supports post project review practices. Finally we discuss implications for both the study and the practice of post-project reviews.

Organizational memory and organizational learning

Following Huber (1991), we define the term *organizational memory* (OM) as the means by which an organization's knowledge is stored for future use, and we assume that organizational learning takes place if an organizational unit acquires knowledge that it recognizes as potentially useful to the organization. However, we add that it is not enough simply to recognize the knowledge as potentially useful: the learning will only be deemed to have taken place if the potentially useful knowledge is both recognized and applied. OM facilitates OL by providing storage and retrieval opportunities. In addition, subsequent information acquisition, interpretation, distribution, and other learning activities are influenced by previous knowledge and experiences retained in OM. Both the demonstrability and usability of learning depend on the effectiveness of OM.

Organizational memory can reside in both human and non-human repositories. Walsh and Ungson (1991) developed a synthetic concept of OM, arguing that it is not centrally stored but distributed across five "retention facilities" within the organization - individuals, culture (shared frameworks, stories, etc.), transformations (procedures and practices), structures (roles within the organization), ecology (physical setting of workplace) - and one outside the organization, external archives. Stein and Zwass (1995) added a new retention facility - information systems - to this structure, expanding the components of OM from mental, social, and cultural artifacts to include technical artifacts such as databases. A key measure of the effectiveness of an organization's memory is the ease with which new and existing information is distributed to organizational members.

Just as organizational memory is stored in different facilities, so it can be updated in a number of ways, both formal and informal. Formal updating of organizational memory occurs through the explicit documentation of knowledge as organizational operating procedures or routines, as reports on organizational reviews of performance, or by storage of data in organizational databases. Informal updating of organizational memory occurs in more subtle changes to organizational culture and as individuals within the organization learn from and share their experiences with others. PPRs, with their explicit purpose of knowledge capture and dissemination are key formal attempts to update organizational memory. In particular, they are an attempt to bridge the gap between individual learning from project experience and the subsequent organizational benefit of sharing that learning with other individuals and project teams. Fundamental to the success of PPRs is the assumption that knowledge can be transferred from individuals or groups into organizational memory repositories that continue to exist after the completion of projects, even when project teams have disbanded or individuals have left the team. Therefore, we argue that many of the theoretical and practical issues of PPRs could be usefully investigated through the lens of OM. Specifically, we will try to examine the role of PPRs in capturing project-specific individual or group knowledge and converting this knowledge into organizational knowledge. For this purpose, we will first propose a network topology of OM wherein various repositories are connected via human-human, human-artifact, and artifact-artifact interactions. The OM updating procedures described above will result in changes to the network topology (for example, adding an expert to organizational knowledge directory), thus leaving some "tracks." As a result, we may be able to evaluate the knowledge dissemination function of PPRs by examining these visible "tracks" in individual, group, and organizational knowledge as a whole.

AN ORGANIZATIONAL MEMORY APPROACH TO POST-PROJECT REVIEW

First of all, we need to unify two heterogeneous but equally important PPR perspectives. Both try to motivate knowledge sharing, yet with different epistemological assumptions. The first perspective views knowledge as a substance and learning as the transfer and addition of substance to mind, hence focusing on capturing and storing what participants articulate in repositories for individual retrieval in the future. The second perspective views knowledge as process and learning as participation in communities of practices and social interactions, hence focusing on motivating and maintaining the communication among participants. Both perspectives are incomplete in explaining organizational learning. While the knowledge-as-substance view neglects the interaction part of learning which involves issues like trust, proximity, and understandability, the knowledge-as-process view disregards the existence of non-experiential knowledge as another important facility of individual learning.

A corresponding divide in the role of technical artifacts is observable in OM management, illustrated by the polarization of knowledge management systems into knowledge repositories and knowledge networks (Alavi, 2000). While technical artifacts serve as central intermediaries of interpersonal knowledge sharing in the knowledge repository system, they are used only to assist in direct human interactions in the knowledge network system. From the managerial point of view, both systems support the augmentation of organizational knowledge assets. Technical artifacts such as knowledge repositories are able to deal with large-scale data at relatively low cost. Knowledge network systems based on organizational structure allow organizations to institutionalize and share individual knowledge, thus cushioning the impact of employee turnover (Rao and Arogate, 2006) However, human agents in a knowledge network system are irreplaceable in processing non-routine or tacit knowledge, which represents the majority of organizational knowledge. Thus, internal employee transfer and informal networks such as communities of practice are commonly used processes for the coupling of knowledge seekers and providers.

A network perspective on organizational learning is not novel. Skerlavaj and Dimovski (2007) conceptualized a social network to bridge the gap between learning-by-acquisition and learning-by-participation. They view organizations as social networks where the nodes represent people and groups, the primary sources and destinations of learning-by-acquisition. Learning-by-participation takes place primarily in social interactions between people, which are represented by links. We extend the network to describing organizational memory which contains both human and non-human knowledge repositories and the interaction between them. In addition, we try to build connections between the content/structure changes of network topology and the updates in OM caused by knowledge dissemination during PPRs.

A Network topology

The OM approach we propose is based on a network perspective of knowledge repositories and their connections. We view organizational memory as a single-layer network of nodes and links between the nodes. Each node represents a specific knowledge repository—either an employee or a technical artifact (e.g., database or project profile). Each link represents a potential channel of knowledge flows between two knowledge repositories. It can be a supervisor-subordinate relationship accompanied by query and report, a social relation facilitating interpersonal knowledge transfer (Borgatti and Cross, 2003), or a human-artifact interaction such as access to databases, creation of project profiles, or use of application systems. The links have different weights, indicating the frequency of interaction, or the closeness of interpersonal relations, etc. Since we are interested in the knowledge dissemination function of PPRs, the network only involves organizational structure (specifically, human and technical knowledge repositories, and the channels for information flows), which is just one of the organizational memory carriers (van der Bent et. al., 1999; Walsh and Ungson, 1991).

Figure 1 shows an example of this network structure. The smiling faces represent employees while other nodes represent various technical artifacts. There is a hierarchy structure on the upper right corner and a project team marked out by the dashed circle. In this network, various levels of learning co-locate with one another but are distinguishable through the network elements involved. Individual-level learning involves a pair of nodes and the link between them. For example, the nodes H1 and P are linked in Figure 1, from which we know that the employee H1 has access to the project profile P as well as the explicit knowledge stored there. Group-level learning involves a cluster of nodes and links. For example, four employees H2, H3, H4, and H5 form a well-connected cluster in Figure 1. It means they experienced group learning in a previous project and have established strong relations from which they can acquire knowledge in the future. Organizational-level learning involves the whole network. For example, the central position of the database D tells us that it is a heavily used knowledge repository which plays an important role in organizational-level learning.

Marking up changes on the network topology

The network topology is essentially dynamic. Updates are implemented during PPRs through a series of KM processes, represented as possible changes in the network topology, which may include:

- Alteration of nodes:
 - Adding nodes: indicate the addition of human agents or technical artifacts by virtue of the project (e.g., a new contractor, or a new application system). For example, the members of a marketing project team may build interpersonal relationships with some customers who were involved in the PPR.
 - Removing nodes: indicate member attrition due to turnover or layoff, or the departure of contractors or consultants, or the abandonment of a legacy information system. This implies a loss of organizational

memory since individuals act as a “retention facility” of organizational knowledge (Walsh and Ungson, 1991).

- Moving a node from one group to another: indicate the transition of individuals’ roles in different projects, or the transfer of technical reports from one project to another. This is usually done after the completion of a project along with resource reallocation.
- Alteration of links
 - Adding links: indicate the establishment of a new knowledge-based relationship. For example, a post-project review is uploaded to the internal database where each PM in the organization can check it at any time; two technicians get to know each other’s expertise through working on a project.
 - Removing links: indicate “organizational forgetting” (Rao and Argote, 2006) caused by time elapse or the removal of nodes. This operation can indicate either human-human or human-artifact connections. For example, “considerable time lapses can occur between the identification by team members of process improvements, the sanctioning of these by those in authority as significant sources of learning and the capturing of this learning for externalization and dissemination to other members of the organization.” (Keegan and Turner, 2001)
 - Changing the weight of links: variable weight can be placed on each link to express notions such as the communication frequency of two people, a team member’s access authority for a certain data set, the extent to which a person trusts a knowledge source (human or non-human).
- Shift of active areas: The network structure can be extremely large if the related organization has many members or a heavily equipped IT infrastructure. Thus an information application system based on this structure may have a potential problem in terms of computing power and running time. To solve this problem, we see the network as a combination of active, static, and dormant components. Each time only the active area (e.g., current project group) in the network will be examined and changed. This is inspired by Kim (1993)’s “shared mental model”, defined as an organization’s active memory that is relevant for organizational learning.

Whereas previous OM research focused on the content, technological, or cognitive aspect of OM (Schwartz, D. G. et al., 2000; Stein and Zwass, 1995; Walsh and Ungson, 1991; Watson, 1998; Wegner, 1986), we depict OM as a hybrid network to emphasize its conjunctive role in knowledge management and organizational learning. We hope this approach can guide the practice and evaluate the outcomes of PPRs in terms of knowledge accumulation and dissemination, and improve current mainly qualitative PPR studies by introducing some positive and quantitative elements.

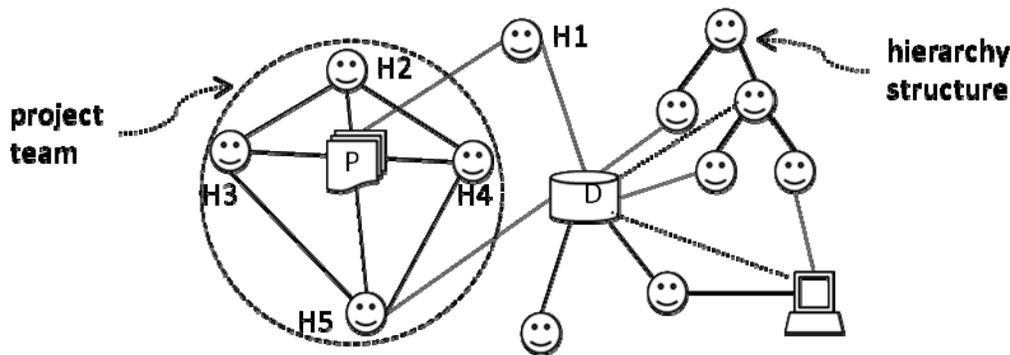


Figure 1. An exemplary network topology of organizational memory

APPLICATIONS OF THE OM APPROACH IN THE PRACTICE OF PPR

The proposed OM approach will facilitate PPR in two ways. On one hand, it guides the practice of a specific PPR by showing people potentially useful connections. On the other hand, it makes explicit the outcomes of a specific PPR as changes in network topology.

Two major factors that affect the effectiveness of PPRs are time pressure and discontinuity among projects. Due to the delay of PPRs, knowledge acquired during the project will be temporarily scattered in various OM carriers (such as individual

minds and project files), and runs the risk of being forgotten due to the turnover or transmission of team members. The network topology of OM is essentially a mental map, which keeps track of not only the organizational memory as a whole, but also the memories of different projects. Therefore, it helps to “recall” the project knowledge as much as possible whenever the PPR is carried out. This point is somewhat supported by an empirical study (Rao and Argote, 2006) which demonstrates that turnover has less effect on the performance of organizations that are high in structure. A primary purpose of PPRs is to encourage good practices or avoid pitfalls in future projects by applying the lessons learned in previous projects. So team leaders or project managers are often required to search for relevant lessons learned before the start of every new project (Carrillo, 2005). Nevertheless, project managers need to overcome the discontinuity among projects as well as the tacit nature of most project lessons learned before they can effectively use them. Our OM network, as a mental map, can facilitate this procedure by showing project managers the connections (people or documentation) between previous projects and their own projects.

The support from top management is critical to the execution of PPRs and the utilization of their outcomes. However, in an environment such as a project-based organization where effectiveness and efficiency is critical, senior managers often do not want to spend a significant amount of time and resources on what only has uncertain long-term benefits. Therefore, it would be helpful to measure the outcome of PPRs in some quantitative way such as a cost-benefit analysis, which, however, is currently impossible. The proposed OM approach may provide a solution to this problem. On one hand, the extent of organizational learning as opposed to individual learning will be reflected in the variation of OM carriers, some of which can be monitored and measured by audit techniques (van der Bent, 1999). On the other hand, the hybrid network makes it possible to utilize some quantitative measures from social network analysis (Skerlavaj and Dimovski, 2007), such as centrality (how central a node is) and structural equivalence (how structurally similar two nodes are), to evaluate the role of different knowledge repositories (both human agents and technical artifacts) in the interaction process accompanying organizational learning.

Another well recognized barrier to PPRs is the reluctance to share knowledge. People may hoard information in order to preserve perceived personal competitive advantage, especially in knowledge-intensive organizations such as consulting companies. Even if keeping on top is not an issue, people may only share knowledge with those they know well and trust. As a result, just a small portion of those who need the knowledge can actually get it. Many researchers have argued that we should treat this as an incentive problem, and design a reward mechanism to motivate more efficient knowledge sharing. However, it is hard to measure the extent of people’s contribution to a shared knowledge pool. Moreover, since the project outcomes result from collective efforts, it is hard to separate individual contributions fairly—some team members may free-ride on others’ contributions (Alchian and Demsetz, 1972). An organizational economics perspective suggests that management provide incentives for the project team as a whole and let the group members distribute team rewards among themselves based on subjective performance evaluation (Foss and Mahnke, 2003). The idea is that team members have first-hand information about each other’s contributions (Gibbons, 1998). We suggest expanding this subjective evaluation idea to the entire organization by use of an internal “reputation system” using the network topology of organizational memory as a basis. A reputation system attempts to determine ratings for a collection of entities, given a collection of opinions that those entities hold about each other. It is similar to a recommendation system, but with the purpose of entities recommending each other, rather than some external set of entities (such as books, movies, or music). Reputation systems are often used in large online communities where interaction with a total stranger frequently happens and others’ evaluation about this person is therefore needed.

IMPLICATIONS OF THE OM APPROACH ON THE STUDY OF PPR

There have been a few PPR frameworks proposed by both researchers and practitioners, mainly as process models on how to conduct PPRs (Collier et al. 1996; Roth and Kleiner, 1998; Jacobs, 1999; Collison and Parcell, 2001; Birk et al., 2002). Another typical kind of PPR framework defines the process of improving rather than conducting PPR. For example, Barker and Neailey (1999) proposed a model showing the evolution of project knowledge in an organizational environment starting from PPR. Similarly, von Zedtwitz (2002) proposed a capability maturity model comprised of five levels, each of which contains some key practices that contribute to the maturity degree of the review process under assessment. Generally, traditional PPR frameworks have been developed from “best practices” reports and are essentially descriptive. Thus it is difficult to measure the effects of PPRs in terms of KM and OL using these frameworks.

Our approach provides a new lens to view the previously intangible OL via PPRs. Since it is a product of historical forces and contemporaneous interactions between organizational members or between human agents and technical artifacts, changes in the network structure will allow us to see the sustainable growth of organizational knowledge and the role post-project reviews play. Possible examples include,

- Research on both individual and organizational learning indicates that items that are perceived to be important by the persons concerned will be paid more attention to, and retained better in OM, than items perceived as tangential to these persons (van der Bent, 1999). So, which components or parts in the network are frequently changed? On the contrary, which components or parts are seldom changed? Why? Does it have something to do with the purpose of projects, the type of markets and industries, or the cultural contexts? By answering these questions, the organization may be able to identify its critical knowledge sources and information channels.
- As Cook and Brown (1999) note, organizational knowledge differs from individual knowledge in its “acceptance” element. In other words, sometimes the conversion (from individual knowledge to organizational knowledge) needs to go through a procedure of sanction, which is conducted and negotiated collectively among a specific group or community. By analyzing the network topology of organizational memory, which embraces the social network of organizational members, the organization may find dominant formal or informal groups, as well as deviant memories¹ maintained by subcultures, subgroups, and subunits (Martin et al, 1985).
- Cross-case analysis can also be carried out by observing PPRs in different organizations and asking questions such as: (1) which kind of OM updates (in terms of changes in the network topology discussed in Section 2.2 appears most frequently? (2) Which kinds of changes are the most effective? (3) Are heavily used operations more effective? (4) Are there any potentially useful operations being ignored? Why? (5) What are the relationships between the type of changes and the purpose of projects, the type of markets and industries, or the cultural contexts?

In addition, contrary to the traditional PPR approach of trying to externalize individual knowledge in order to transform it to common collective knowledge, the proposed OM approach suggests that it would be better to remain some variation and heterogeneity in organizations, allowing organizational members to have exclusive knowledge rather than “forcing” them to contribute all. Specifically:

- It is inefficient for people to learn everything related to their work. That would be too burdensome and somewhat unnecessary concerning the huge amount of information and advanced ICT in this age. They only need to know who takes charge of the problem or who might have the answer to the question. This is compatible with the propositions of transactive memory theory (Wegner, 1986).
- Delegating decision rights to front-line workers, as a way for modern organizations to achieve responsiveness, will make them more and more independent and isolated, hence increasing the risk of failing to integrate their respective work. Small decision groups rather than individual decision points should become the units of decentralization.
- While the difficulty in articulating tacit knowledge and the reluctance to share knowledge inhibit smooth knowledge flows within organizations, they will not stop the flows of meta-knowledge, which we think of as the major type of information flows in organizations. They tell knowledge seekers the knowledge of who knows what.

The project-based environment has a special advantage in organizational learning. The premise of effective OL, knowledge sharing, is highly dependent on social and affective relations in which trust, social confidence, credibility and interest play a pivotal role. Such relations are easier to build in cooperative working settings like project teams. Therefore, in project-based organizations where people have more opportunities to build trustworthy relations with each other, the performance of OL should be better.

CONCLUSION

In this paper, we have sought to augment existing research on learning in project-based organizations by proposing an organizational memory approach to improving the knowledge dissemination function of post-project reviews. For this purpose, we (1) conceptualize a network topology of organizational memory, and (2) map KM and OL activities during PPR to structural changes in the network topology. We hope our approach could provide a basis for stimulating future studies on PPRs and help remove some well-known barriers to the application of PPRs, as well as guiding project-based organizations through their development and evolution of organizational learning capabilities.

The basis of our approach is a network-structured organizational memory. It elucidates potential opportunities of and constraints on transferring individual/group knowledge to organizational knowledge, thus making the conduct of PPRs more

¹ inconsistencies or contradictions in the organizational memory reflecting the differences in experience, the confusion of history, and conflicting interpretations of that history (Levitt & March, 1988)

purposeful, systematic, and effective. Taking a network perspective, PPR executors may find new knowledge sources or recipients (as nodes in the network). For example, knowledge acquired in a within-unit project could be useful for another unit, since members of that unit have been searching for the information in organizational databases for a while. Knowledge management can be done by adjusting relevant network elements. For example, PPR executors may constrain the leakage of certain knowledge by storing it in a database which requests access authority.

The OM approach is also a start for defining, modeling, and measuring (in both qualitative and quantitative ways) the role of PPR in motivating organizational learning of project-based organizations through knowledge dissemination. We anticipate further development of our OM approach, such as the application of network analysis methods, measurable criteria, and optimization strategies

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