The Appropriation Paradox: Benefits and Burdens of Appropriating Collaboration Technologies

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Abstract

We report on a preliminary study of information-sharing practices within software teams. We identified behavioral and technological misalignments in the sharing of information between individuals. Individuals appropriate different collaboration technologies to mitigate these misalignments. We also discovered that appropriation at the individual level makes it difficult to share information at the team level. We refer to this as the paradox of appropriation. Theoretical and design implications drawn from our findings will be discussed.

Author Keywords

Appropriation; collaboration technologies; information sharing

ACM Classification Keywords

H.5.3 Group and Organization Interfaces: Computer-supported cooperative work

Introduction

Appropriation of collaboration technologies is central to information sharing in organizations [1,12]. There are many definitions of appropriation (see [2,10]). However, we define it as the process in which individuals adjust their behaviors and/or their use of a

technology over time, which in turn leads to new norms or routines, or reinforcement of existing norms or routines. Research has shown that technology appropriation can lead to complex and unforeseen uses of technologies [4,7]. As Orlikowski noted [10], "users may deliberately or inadvertently use [a technology] in ways not anticipated by the developers" (p. 408).

Despite the importance of technology appropriation more research is needed to understand its consequences across multiple technologies and levels — individual, team and organizational. Prior research has been directed at understanding how appropriation allows a particular set of users to overcome the limitations of a specific technology [4]. However, appropriation routinely occurs across organizational levels and involves multiple technologies. Individual appropriation of one technology at one level can constrain the ability of teams and groups to effectively use technologies at other levels.

To address this issue, we explored information sharing in a small software development company to answer the following research questions: *1) What aspect of information sharing triggers the individual appropriation of technologies* and *2) What consequences does this individual appropriation have on information sharing within and between teams?*

Method

Participants

We conducted 1-hour semi-structured interviews with 12 (3 females) employees in a small software development company in the United States. Three interviews were conducted through videoconferencing for employees working remotely. The participants had

No.	Gender	Position	Degree
1	m	Prj. Manager (PM)	MS
2	m	PM	MS
3	m	Engineer	BS
4	f	Marketing	BS
5	f	PM, Engineer	BS
6	m	Sr. Engineer	PhD
7	m	Engineer	MS
8	m	Scientist	PhD
9	f	PM, Engineer	BS
10	m	Sr. Engineer	PhD
11	m	Sr. Engineer	PhD
12	m	Scientist	PhD

Table 1. Summary of Subjects' Background Information

diverse characteristics (Table 1). We chose a small company because it is common for one person to take multiple roles, and expertise is distributed based on tight collaborations across the small company.

Context of Collaboration
Teams generally consisted of a PI (principle investigator), a PM (project manager), engineers and scientists. Teams were project-based; 4 of the 12 subjects were involved in more than one project team and had different roles in each team. The composition of a team varied according to the phase of a project. For example, scientists had an active role in the idea-generation phase whereas engineers became central once the project was launched and under development.

Results

We identified two triggers of individual appropriation that occur during the information-sharing process: technology- and behavior-related misalignments. Individuals try to resolve these misalignments by appropriating different technologies individually. However, despite its benefit for individuals, such appropriation inhibits the sharing of information within and between teams. We refer to this as the "paradox of appropriation." The paradox occurs because individuals appropriate technologies to overcome misalignments at the individual level, which then restricts their ability to share information with others at the team or organizational level.

Technological Misalignments

Technological misalignments occur when individuals use different technologies for similar tasks. This combination of multiple users appropriating different

technologies for the same task can make it difficult for users to share information.

Constellation of Collaboration Technologies
Results show that the use of information technologies composes a *constellation of collaboration technologies* that has three levels: individual level, team level and organizational level (Table 2). Constellation represents a loosely tied use of different technologies without a common conception of how these technologies are interacting with one another to support uniformly information-sharing phases from the individual level to the organizational level.

Constellations varied by teams. Each team used different technologies for the same purpose, so individuals had to adapt to each of the technologies that were used in different project teams. Individuals such as P03, who were involved in two project teams, used Asana for one team and Teambox for another. Teams had their own software suites. This problem led to breakdowns in information sharing. For instance, individuals stored information in repositories using different technologies. As a result, the information could not be aggregated and searched across each user's input. This, in turn, reduced the ability of the repository to allow

users to store and retrieve information across the organization. P05 pointed out that this may be the fault of the organizational technology, such as poor search function, but also emphasized "the inability to clean up dead pages" stored in the repository.

Behavioral Misalignments
Behavioral misalignments occur when information sharing takes place over time, and individuals who create information cannot predict exactly when and how the information is used.

Creator–Seeker Misalignment
We identified a behavioral misalignment between when individuals generated documents as *an information creator* and when they searched the information as *an information seeker*. That is, although participants were aware of the value of using archived information in the repository, they rarely took into account the future use of the information when they created new information. P04 mentioned that information "is just in the minds of a few individuals, or rather it's in the minds of people who have been here a long time." Most participants, especially people who had relatively short experience in the company, were frustrated when they, as information seekers, attempted to find and use information created in the past by other workers.

Information was rarely located in the place where the seeker thought it should be, because "it's often written by someone with a very different outlook on what some of these documents are useful for" (P06). Rather, as P06 mentioned, the information was "under some sub-page that you have to get through some hidden method" by going directly to the person who created the document at that time. Although the information

Level	Technology	Purpose	Primary Users
Individual	MS Word, PowerPoint, Google Drive	Document Creation	Engineers, PMs, Scientists
Team	Asana, Teambox	Dividing tasks, Coordination, Accountability	All team members, led by PMs
Organizational	FTP Server, Wikis, Repositories	Information repository, Information distribution	Engineers, PMs

Table 2. Collaboration technologies in different levels. *PM* project manager

repository was adopted to freely share archived information across the organization by allowing easy access, several participants reported that they had to "find the exact person who was in charge of the information back then" (P12).

Protocol Misalignment Between Teams
The behavioral misalignment occurred between teams as well. As P01 pointed out, every team had its "unique protocols, way of working and describing particular projects." However, the set protocols worked only within teams and didn't correspond with those of other teams, because these protocols were usually adopted by a project manager or principal investigator of the particular team. Thus, information stayed only within the team that created it and couldn't easily be circulated across teams.

Overall, the misalignments in the information-sharing behavior limited the functionality of the shared repository and the value of the archived information in the system. Individuals were not able to find desired information that was created by another person at different time points and in different formats.

Paradox of Appropriation
To deal with behavioral and technological misalignments, participants appropriated the different technologies for streamlining the collaboration. However, appropriation for resolving misalignments caused another unseen misalignment. That is, individuals and teams appropriated adopted technologies in different levels to meet unique needs in varying situations. The appropriation of the same technology varied by individual and situation, and confusion and inefficiency occurred at the team and

organizational levels. We refer to this as the *Paradox of Appropriation*. P02 put it this way: "There are three different documentation systems and they all have slightly different purposes but it's not 100% clear if you were writing a document, 'does it go in there, in here, or in there?'"

Apparently participants had different methods to manage documents in different systems. P01 said he used the file server organizational system as "a dumping ground" and generated new versions while leaving the old versions, whereas P02 and P07 said they considered the file server to be a resource.

Different ways of storing information in the same repository seemed to suppress the searchability of the system. P10 pointed out the limited-access problem. Each individual had personal workspace and the level of access wasn't transparent across the system. Documents in the personal workspaces were not indexed and thus not searchable. This produced an additional process of "asking explicitly granted permission to what they call workspaces" (P10). Instead, P10 acknowledged, "Everybody should be given access to all the wiki pages."

Technology at one level was not harmonized with technologies at other levels; this, in turn, restricted information sharing. P08 said that none of the participants knew a way to directly combine the technologies in different levels. These incompatibilities led to version conflicts, duplication of data, and loss of context and data. P04 illustrated the version conflict problem: "If you send it to three people, they each make changes, you come back and you've got three different new files with changes."

Moreover, participants acknowledged that the unintended hassle by individual appropriations would become harder to handle as the company grows. That is, cluttered use of organizational systems will hamper the scalability of the system as an information repository. P09 anticipated that the potential confusion would become deeper as the company grows. She pointed out the problem of inconsistency, saying "This project uses this wiki and this project uses another wiki …; it gets really hard as your organization grows…"

Implications for Research

The analysis revealed two triggers of technology appropriation for the purpose of information sharing: technological and behavioral misalignments. To solve these misalignments, individuals devised their own ways of appropriating technologies, but this appropriation at the individual level caused barriers to sharing information at the team and organizational levels. Overall, our results suggest that appropriation at the individual level can be beneficial for individuals but at the same time be detrimental for others.

Findings from the study extend the literature on technology appropriation. Research of technology appropriation should consider multiple technologies across levels in an organization at the same time. Our results showed that misalignments occurred among individuals in using multiple technologies in different ways. This informs the prior research of technology appropriation that typically views poor task–technology fit as the main trigger of appropriation [4]. Rather, our findings suggest that the main reason for appropriation was inherent in the information-sharing practice involving multiple technologies, rather than individual tasks. Thus, more work is needed focusing on the

linkages between individual and group tasks that involve multiple technologies.

Implications for Design and Practice

First, lower-level collaboration technologies should be designed to support technologies at the higher levels. Results show that in order for information created individually to be shared across the organization, documents need to be crafted in forms that correspond with the information repository for teams and the organization as a whole. For instance, contextual information and keywords of the documents should be inserted so that they can be easily retrieved from the repository in the same manner with team technologies. Such features could allow organizations to effectively implement information-sharing technologies and maximize the reuse of information created across levels. To address this, future work should examine the use of wikis (e.g., [5]).

Second, teams should have a consensus on appropriation in the use of multiple technologies. Individual task performance can be enhanced by group consensus on technology appropriation [6]. This supports that appropriation is fundamentally a social and collaborative activity [3]. In line with this, the findings of our study show that it is important for individuals to reach explicit consensus about information sharing using technologies. Although individuals expect a complementary relationship between technologies at different levels, use of multiple technologies at different levels is more likely to result in a redundant or competing relationship.

Conclusion

As the use of collaboration technologies increases so does the importance of understanding the implications of their use [8,9,11]. This study proposes that technology appropriation involves multiple technologies across organizational levels, rather than a particular set of users using one technology. Our preliminary study showed that individuals appropriated technologies to solve some misalignments in the lower levels, thereby inhibiting effective information sharing in the higher levels. Our preliminary findings offer new insights into areas of further study in technology appropriation.

References

[1] Alnuaimi, O., Robert, L., and Maruping, L. Social loafing in brainstorming CMC teams: The role of moral disengagement. *System Sciences, 2009. HICSS'09. 42nd Hawaii International Conference on*, IEEE (2009), 1–9.

[2] DeSanctis, G. and Poole, M.S. Capturing the complexity in advanced technology use: Adaptive structuration theory. *Organization science 5*, 2 (1994), 121–147.

[3] Draxler, S., Stevens, G., Stein, M., Boden, A., and Randall, D. Supporting the social context of technology appropriation: on a synthesis of sharing tools and tool knowledge. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM (2012), 2835–2844.

[4] Fuller, R.M. and Dennis, A.R. Does fit matter? The impact of task-technology fit and appropriation on team performance in repeated tasks. *Information Systems Research 20*, 1 (2009), 2–17.

[5] Grudin, J. and Poole, E.S. Wikis at work: success factors and challenges for sustainability of enterprise Wikis. *Proceedings of the 6th international symposium on Wikis and open collaboration*, ACM (2010), 5.

[6] Kang, S., Lim, K.H., Kim, M.S., and Yang, H.-D. Research Note-A Multilevel Analysis of the Effect of Group Appropriation on Collaborative Technologies Use and Performance. *Information Systems Research 23*, 1 (2012), 214–230.

[7] Leonardi, P.M. and Barley, S.R. What's under construction here? Social action, materiality, and power in constructivist studies of technology and organizing. *The Academy of Management Annals 4*, 1 (2010), 1–51.

[8] Munson, S.A., Kervin, K., and Robert Jr, L.P. Monitoring email to indicate project team performance and mutual attraction. *Proceedings of the 17th ACM conference on Computer supported cooperative work & social computing*, ACM (2014), 542–549.

[9] Newell, J., Maruping, L., Riemenschneider, C., and Robert, L. Leveraging E-Identities: The Impact of Percieved Diversity on Team Social Integration and Performance. (2008). ICIS 2008 Proceedings, 46.

[10] Orlikowski, W.J. Learning from notes: Organizational issues in groupware implementation. *Proceedings of the 1992 ACM conference on Computer-supported cooperative work*, ACM (1992), 362–369.

[11] Srinivasan, S.-S., Maruping, L.M., and Robert, L.P. Mechanisms Underlying Social Loafing in Technology Teams: An Empirical Analysis. (2010).

[12] Srinivasan, S.-S., Maruping, L.M., and Robert, L.P. Idea Generation in Technology-Supported Teams: A Multilevel Motivational Perspective. *System Science (HICSS), 2012 45th Hawaii International Conference on*, IEEE (2012), 247–256.