

# Content Management for Inter-organizational Projects using E-mail Metaphor

Kosuke Nakatsuka and Toru Ishida

*Department of Social Informatics, Kyoto University  
Yoshida-honmachi Sakyo-ku, Kyoto, 606-8501 Japan  
nakatuka@kuis.kyoto-u.ac.jp, ishida@i.kyoto-u.ac.jp*

## Abstract

*Inter-organizational projects involve the creation, modification and management of content. Unless carefully handled, these overheads can cause the loss of mutual understanding. In this paper, we propose a content management approach for inter-organizational projects that uses the e-mail metaphor; the functions of creating, modifying, and managing content are represented as e-mail messages that are sent to project members automatically. The e-mail metaphor allows us to communicate the creation, modification and management of content explicitly across organizations. It promotes mutual understanding in inter-organizational projects.*

*We have developed a content management system that uses the e-mail metaphor. When one project member adds content to the project, the system informs this event to the other project members. When the project manager manages the content by grouping, commenting or semantic annotation, the system informs to project members of the operation by e-mail metaphor such as creating a mailbox for a new group.*

## 1. Introduction

The success of inter-organizational projects demands mutual understanding between organizations. In spite of the importance of mutual understanding, communication between organizations is decreased by misunderstanding and failure to maintain regular contact. This degrades mutual understanding between organizations. Especially, in multi-lingual projects increasing now, the lack of awareness becomes barrier of smooth progress. For example, in the software development project in Asian universities, though machine translation systems were provided to assist the collaborations, the project managers need to make large efforts to collect information and inform of it to the project members for mutual understanding [6].

The reason for this loss in mutual understanding is that

the creation, modification and management of content are not made explicit, and they are not passed around the organizations. E-mail is commonly used in order to communicate between organizations, and its use has been extended to content management [3, 9]. Though we can communicate in inter-organizational projects by e-mail, work reports about the creation and management of content are composed manually. This causes several problems since project members often fail to make reports or the reports are unclear. It is difficult for project members to communicate correctly in inter-organizational projects.

In this paper, we propose the content management using e-mail metaphor in order to solve the following problems that lead to a decrease in mutual understanding.

1. The creation, modification and management of content is not made explicit, and changes are not passed between the organizations.
2. Though project members can use free text to communicate, they often make errors in describing the creation, modification and creation of content.

In content management based on the e-mail metaphor, the creation, modification and management of content are sent to the project members like e-mail automatically. The management operations are distinguished clearly by predefined tags. Using tags instead of free text makes the meaning of the operation clear. The differences between e-mail and e-mail metaphor lie in their handling of content and semantic tagging. E-mail does not separate message and content, though files can be attached to a message. The e-mail metaphor can handle any message and content to provide comprehensive content management; it can tag content through the use of semantic annotation. Therefore, it can clearly notify updated and management information of content across organizations.

We have developed the content management system named Project Organizer. Project Organizer is based on the e-mail metaphor. Project Organizer allows the creation, modification and management of content to see as explicit

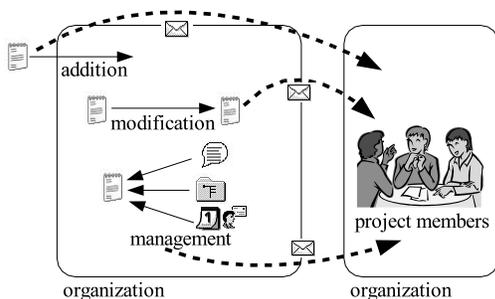


Figure 1. E-mail metaphor

communication between organizations. Therefore, in inter-organizational projects, we can enhance information flows and improve mutual understanding among organizations.

## 2. E-mail Metaphor

In inter-organizational projects, the existing communication channel is narrow, and update information of content is not explicitly established among organizations. Awareness between organizations is absent and the level of mutual understanding decreases. To promote mutual understanding, it is necessary to make clear the activities conducted such as the creation, modification and management of content and to communicate them explicitly between organizations.

The e-mail metaphor, illustrated in Figure 1, allows us to create, modify, and manage content as shown below.

- When one project member creates or modifies content, the updated content is sent to the other project members automatically. Because various collaboration tools are used in inter-organizational projects, the system should support any content.
- When one project member manages content such as adding comments to it and tagging it with metadata, the management results are sent to the other project members in the form of e-mail as a message replying to the original content.
- When one project member creates a group according to project features and related tasks and enters content into it, the new mailbox that corresponds to the group is created automatically on the servers of the other project members, and the new content is sent to the new mailbox.

## 3. Project Organizer

Figure 2 is a screenshot of Project Organizer. Project Organizer handles any content in local hard drives, network

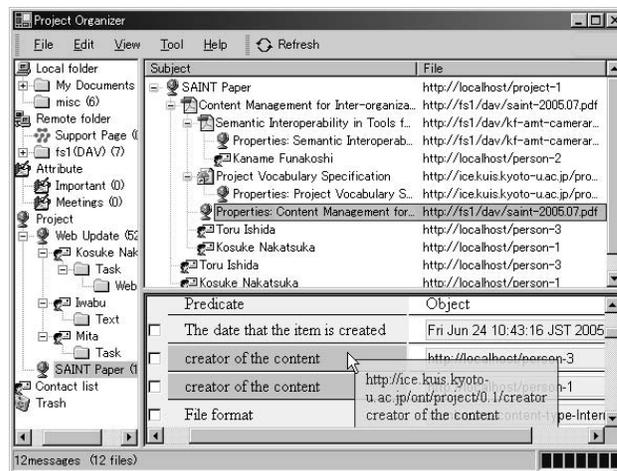


Figure 2. Project Organizer

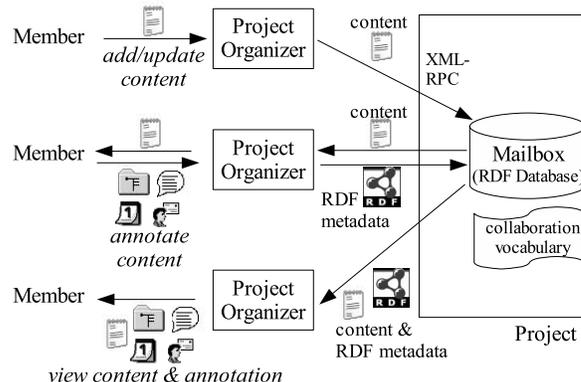


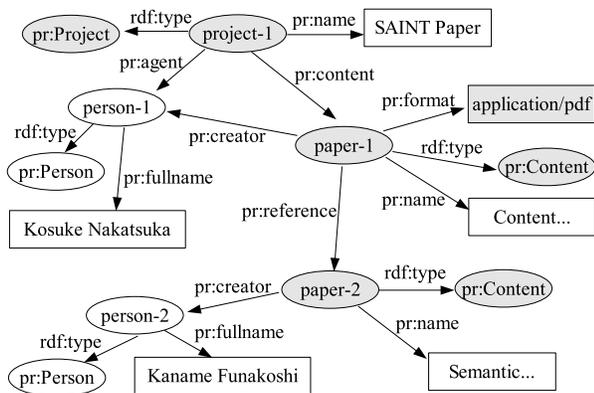
Figure 3. Behavior of Project Organizer

folders, and collaboration web sites such as WikiWikiWeb that are shown as folders in the left pane. The upper right pane shows a list of the project's content. Associated contents are displayed using a threaded tree layout.

Figure 3 shows the behavior of Project Organizer that implements e-mail metaphor shown in Figure 1. Project Organizer uses the RDF<sup>1</sup> database to store collaboration content, metadata, and associations. RDF makes it possible to bind content to metadata, as well as forming content association. The RDF database is constructed on the Jena Framework<sup>2</sup>. To communicate with the database, we use XML-RPC. To share content and metadata with several tools, we use a common vocabulary for collaboration. We use the modified collaboration vocabulary designed for promoting interoperability across collaboration tools[4].

<sup>1</sup><http://www.w3.org/TR/rdf-concepts/>

<sup>2</sup><http://jena.sourceforge.net/>



**Figure 4. RDF metadata provided by Project Organizer**

### 3.1. Content Operation

In Project Organizer, project members can manage content in four ways: addition of content, content grouping, text comment, and metadata based on the project ontology. These management actions are sent to the project members in the form of e-mail.

**Addition of Content:** Project Organizer allows any content can be added to a project. Each project is shown as a folder in the “Project” folder in the left pane. When an user drags and drops content into the project folder, Project Organizer sends it to the appropriate mailboxes of the other project members.

**Grouping Content:** Project members group content based on their viewpoint. Project Organizer regards each group as a folder, for example, as shown in “Web Update” folder in Figure 2. When one member makes a new folder, Project Organizer creates the equivalent folder in each mailbox of the other members. In Figure 2, 3 members create folders such as “Task” or “Text”.

When project members group content, Project Organizer transforms the categories into the equivalent RDF metadata, and sends it to the RDF database. Reference [5] pointed out that grouping via a semantic network can be difficult. Project Organizer has a folder style interface for grouping and converts categorizes into RDF metadata. As a consequence, all users can discover the content categories easily.

**Text comment:** In Project Organizer, project members can add any comment to any content. Comments are displayed as embedded in the content. When one member adds a comment to a content, Project Organizer sends it to the mailboxes. The comments are linked to the content in the thread tree in the list of content.

**Metadata Using Project Ontology:** Project members can add metadata to content. This metadata is also treated

like e-mail and is informed to the other project members.

Figure 2 shows the operation of adding RDF metadata in Project Organizer. The metadata given to a content is shown in the lower right pane. Metadata is displayed in the table where each row represents an RDF statement. The user can add, edit and remove RDF statements in the pane. When the user passes the metadata to Project Organizer, Project Organizer displays the relationship of content, related persons and agents, and so on in threaded tree layout.

Figure 4 shows an example of the RDF metadata provided by Project Organizer. RDF metadata in Figure 4 corresponds to the metadata in Figure 2 in Project Organizer. Ovals in the figure represent resources and squares represent literals. Labeled arrows represent RDF predicates. “pr” is the namespace of project ontology[4]. “rdf” is the namespace of RDF. Gray ovals and squares are generated automatically by Project Organizer. White ones are set by users.

As an example, we assume that the project manager creates a new project “SAINT paper.” Project Organizer creates a resource `project-1`, and it assigns the property `pr:name` to the resource automatically. The created project looks like a folder. When a project member drags and drops content into the project folder, Project Organizer creates the corresponding RDF metadata automatically, and the metadata are sent to project members based on e-mail metaphor. In the example, the PDF file “Content...” is dropped into the project folder. Project Organizer then creates the resource `paper-1`, and it sends the created `paper-1` to the other members. When the member adds the person “Kosuke Nakatsuka” and creates the property `pr:creator` that links to `paper-1`, Project Organizer informs project members of the metadata. The person is then linked to the content in the threaded tree.

A side effect of the e-mail metaphor is that the semantic network is hidden, we can operate the resources without awareness of RDF. Note that programs appended to Project Organizer can search RDF metadata such as shown in Figure 4 via RDQL.

### 4. Related Work

In this section, we describe studies on project management by e-mail and semantic portals, and we relate them to the e-mail metaphor.

Though e-mail were originally designed for asynchronous communication, its use extends to information management such as task management and personal information management[9]. And it is a medium for document exchange and for organizing meetings[3]. E-mail metaphor is an extension of e-mail for task and content management of projects as shown below.

- handling any content in a project: E-mail does not separate message and content, and it is not aware of the

creation and management of content. Project Organizer can handle not only simple text but also any content. And it adds semantic annotation such as reply, and correlates any content.

- automatic notification of creation and management of content: Content and metadata are sent to appropriate mailbox automatically. It is not necessary for users to notify these operations manually, though notification is required on using e-mail.
- representation of context of activities by semantic annotation: Semantic annotation by Project Organizer also shows the context of content creation. Project Organizer can handle context explicitly by expressing semantics of content.

To apply e-mail to task management, Taskmaster[1] proposes the “thrask” model to collect interdependent messages and content. Content management using e-mail metaphor not only aggregates content related to tasks but also informs of addition, modification and management of content to project members.

Thanks to Semantic Web technology, many semantic portals such as ODESeW[2], SemanticOrganizer[5] and OntoWeb[7] have been developed. Semantic portals provide the functions of management, search, and reuse of content. To inform these management actions explicitly among organizations, they need some medium. E-mail metaphor is applicable because it handles management of content as well as content itself as e-mail. It can be used to support these portals.

## 5. Conclusion

In this paper, we propose a content management approach that uses the e-mail metaphor for inter-organizational projects. Our proposal prevents the loss of mutual understanding among the members as follows.

1. When a project member creates or modifies content, the content is sent automatically to the other project members. When the project manager manages content, the management action is sent to the project members automatically. Therefore, the creation, modification and management of content in inter-organizational projects is notified explicitly.
2. The management activities performed by the project manager such as grouping, comment and tagging are informed to project members in the form of e-mails. Related content, metadata and comment are treated as reply messages shown in threaded trees. The management of content can be informed explicitly by clear semantic annotation rather than ambiguous free text.

We used the e-mail metaphor to develop the content management system called Project Organizer.

We need further investigation to fully understand the proposal's effectiveness. The current version of Project Organizer demands a lot of manual work by the project manager and some form of automation such as automatic metadata extraction from semi-structured tables[8] is needed to ease this burden.

## Acknowledgement

This work was supported by a Grant-in-Aid for Scientific Research (A)(15200012, 2003-2005) from Japan Society for the Promotion of Science (JSPS).

## References

- [1] V. Bellotti, N. Ducheneaut, M. Howard, and I. Smith. Taking email to task: The design and evaluation of a task management centered email tool. In *CHI 2003*, volume 5, pages 345–352, 2003.
- [2] O. Corcho, A. Gómez-Pérez, A. López-Cima, V. López-García, and M. del Carmen Suárez-Figueroa. Odesew. automatic generation of knowledge portals for intranets and extranets. In *Second International Semantic Web Conference (ISWC 2003) LNCS 2870*, pages 802–817, 2003.
- [3] N. Ducheneaut and V. Bellotti. E-mail as habitat: an exploration of embedded personal information management. In *Interactions*, volume 8, pages 30–38, 2001.
- [4] K. Funakoshi, K. Sugiyama, T. Ishida, T. Yoshino, J. Munemori, H. Zhang, and Z. Shi. Semantic interoperability in tools for intercultural collaboration. In *Third International Conference on Active Media Technology (AMT-05)*, 2005.
- [5] R. M. Keller, D. C. Berrios, R. E. Carvalho, D. R. Hall, S. J. Rich, I. B. Sturken, K. J. Swanson, and S. R. Wolfe. Semanticorganizer: A customizable semantic repository for distributed nasa project teams. In *3rd International Semantic Web Conference (ISWC2004) LNCS 3298*, pages 767–781, 2004.
- [6] S. Nomura, T. Ishida, M. Yasuoka, N. Yamashita, and K. Funakoshi. Open source software development with your mother language: Intercultural collaboration experiment 2002. In *10th International Conference on Human - Computer Interaction (HCI2003)*, volume 4, pages 1163–1167, 2003.
- [7] P. Spyns, D. Oberle, R. Volz, J. Zheng, M. Jarrar, Y. Sure, R. Studer, and R. Meersman. Ontoweb - a semantic web community portal. In *Practical Aspects of Knowledge Management, 4th International Conference, PAKM 2002, Springer LNAI*, number 2569, pages 189–200, 2002.
- [8] M. Tanaka and T. Ishida. Ontology extraction from tables on the web. In *IEEE/IPSJ Symposium on Applications and the Internet (SAINT-2006)*, 2006.
- [9] S. Whittaker and C. Sidner. Email overload: exploring personal information management of email. In *Proceedings of the SIGCHI conference on Human factors in computing systems*, pages 276–283, 1996.