

An XML based Meta model of virtual workspace for knowledge management
using knowledge context

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Abstract:

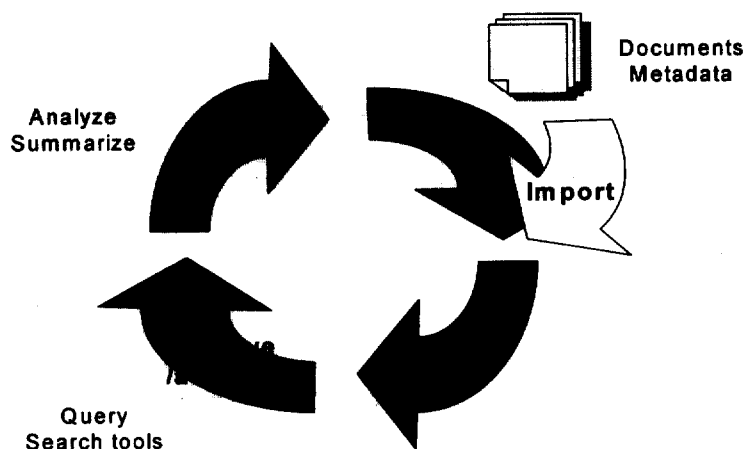
In a knowledge process, preserving a knowledge context is essential. To preserve a knowledge context, we need to transform relevant data or context of knowledge item in a standardized way. This paper suggests a meta model to preserve knowledge context in a virtual workspace. With this XML based meta model, we can annotate a document or knowledge that describe the knowledge item abstractly and synthetically according to predefined schema. This meta data can be applied to knowledge searching, help users to understand retrieved knowledge more clearly, provide more relevant documents by specific situations and suggest further navigation path of knowledge.

Keyword: knowledge management, virtual workspace, meta model, XML

1. Introduction

Main knowledge management facilities of virtual workspace or teamware, which supports collaborative work among distributed team members, are storing documents and some relevant data, searching those documents by full text search engine or other search functions. Knowledge processes usually have four steps such as creation or import, capture, retrieval and use (see Figure 1.1) [Staab, 2001]. In creation phase, knowledge management systems import much knowledge from internal or external applications. Many knowledge management systems import documents or knowledge metadata for increasing semantics of knowledge and organizing knowledge in a structured way. In this step or whole knowledge process, preserving the data's context is essential [Cook, 2001]. To preserve data or knowledge context, many researches use XML based metadata. HINTS project, that assist intelligence analysts in efficient discovery and assimilation of large volumes of information derived from a range of

sources, use XML based metadata for searching and storing data [Lang, 2000]. In Osirix project, XML offers major advantages for corporate-memory management [Rabarijaona, 2000]. They generate XML documents from knowledge models and exploit XML documents for knowledge searching and retrieval.



[Figure 1.1] Knowledge Process

In this article, we propose XML based workspace meta model for preserving knowledge context in a virtual workspace environment and apply this metadata for knowledge searching. In section 2, we describe knowledge context and its definition. We briefly introduce Virtual Workgroup Support System (VWSS) and workspace meta model in section 3. We show applying method of workspace meta model for knowledge searching in section 4 and some conclusions and further research directions will be given in section 5.

2. Knowledge Context

During import phase, knowledge management systems usually import documents and their bibliographical information. Useful information or knowledge, however, such

as why, for what, and how this knowledge or document was created is not imported and not used for knowledge search and other knowledge management activities. In this article, we define that background knowledge or information as a knowledge context and though there are many definitions of knowledge context, we use [Cho, 1999]'s definition as follows:

“Knowledge context is the set of environmental entities that provide background information regarding when, how, why, where, and by whom the knowledge created.”

In many cases, the context information is lost when managing knowledge. For example, it is usually observed that only final version of development documentation is preserved, and the information behind the document, or other candidates for alternative design is often lost. But not only preserving the knowledge context but also utilizing it actively is very helpful in many aspects. Knowledge context 1) gives us more clear understanding of a given knowledge, 2) enables us to find other knowledge with similar context as a given knowledge, 3) provides us rich navigation path for knowledge exploration, and 4) helps us accumulate knowledge evolutionarily by playing a role of base knowledge structure [Cho, 1999].

3. Workspace Meta Model

We provide knowledge context to knowledge item through workspace meta model in a virtual workspace environment. We briefly introduce VWSS's features and present workspace meta model.

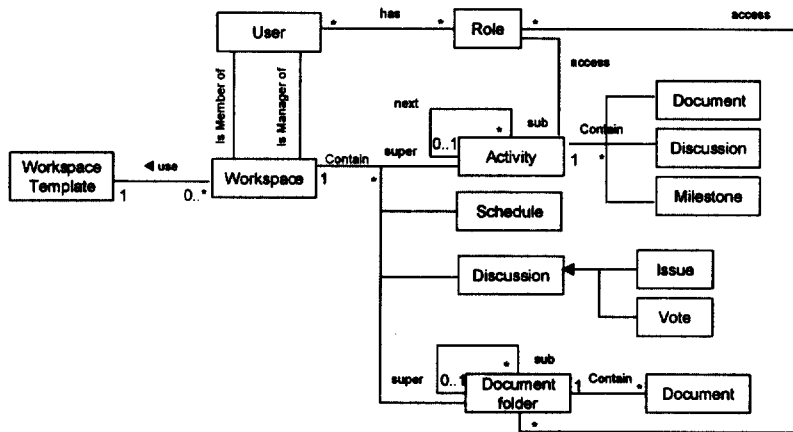
3.1 Virtual Workgroup Support Systems (VWSS)

VWSS project at KAIST is building virtual workspace for sharing, exchanging, and monitoring activity information focused on research and educational domain. Conceptual architecture of VWSS is presented in Figure 3.1.1.

Virtual workspace has five functional components. Workspace management is for structured organization of project or work. Workspace has activity folders, sub activity folders, members and messages. Activity management organizes activities in a workspace by sub activity creation, activity progress updating, activity authorization and activity arrangement. Activity folder has activity properties, sub activity folders, discussion articles, document folder, documents and voting. Document management shares and collects documents. Document management provides document version control, document locking and annotation for reviewing documents. Discussion management supports threaded discussion, and discussion results can be exported to voting. Message management is a speech/act based structured conversation system. Message can be used for coordination and cooperation of groupwork. Message system provides activity execution request, due-date changing, activity reporting and meeting/resource scheduling.

Templates are predefined types of VWSS structure for supporting diverse using goals such as laboratory project workspace, thesis workspace, term project and SIG study.

[Cho, 1999]



[Figure 3.1.1] Workspace model of VWSS

3.2 Modeling knowledge context of VWSS

The meta model identifies the basic set of entities used and the top-level entities are as follows: workspace, activity, participant, document, schedule and discussion (see Figure 3.2.1).

Workspace	Activity	User	Document	Discussion	Schedule
ID	ID	ID	ID	ID	ID
Name	Name	Name	Title	Title	Title
Description	Description	Description	Creator	Creator	Creator
Start Date	Start Date	e-mail	Creation Date	Creation Date	Type
End Date	End Date	Organization	Description	Activity	Activity
Workspace Template	Workspace	Department	FileType	Workspace	Workspace
Participants	Participants	role	Activity		
Domain	Super Activity		Workspace		
Deliverable	Milestone		Versions		

[Figure 3.2.1] Workspace Meta Model

Workspace entity contains generic workspace information such as workspace name, duration, target domain, and deliverables. Workspace consists of one or more activities, each comprising a self-contained unit of work within the project process. Activity entity has basic information of activity, activity relationship, participants' information, milestone information and so on. Specific description of activity entity is shown on Figure 3.2.2. Document entity defines document information such as document id, document creator, title, version history, creation time, and related activity. Participants entity provides each member's information such as name, organization, department, organizational role, participating activity, and so on. Discussion entity and schedule entity have context information about activity and workspace and have basic information of identity, name and specific type.

	Description
ID	Used to identify the activity
WorkspaceID	Used to identify the workspace which this activity are subordinated
Name	Text used to identify the activity
Description	Short Textual description of the activity
StartDate	Starting date of activity
EndDate	Ending date of activity
Participants	Activity participants (Manager and Researchers)
SuperActivity	Used to identify super activity of this activity
CreationDate	Creation date of activity
Milestone	Deliverables of activity

[Figure 3.2.2] Specification of activity entity

We can build meta model XML DTD based on these basic entities. XML DTD and XML document of activity entity can be built as Figure 3.2.3.

```

<!ELEMENT Activities (Activity*) >
<!ELEMENT Activity (WorkspaceID, ActivityType, Name, Description, StartDate, EndDate, Participants,
SuperActivity) >
<!ATTLIST Activity ID CDATA #REQUIRED >
<!ELEMENT WorkspaceID (#PCDATA) >
<!ELEMENT ActivityType (ActivityTypeID, ActivityTypeName) >
<!ELEMENT ActivityID (#PCDATA) >
<!ELEMENT ActivityTypeName (#PCDATA) >
<!ELEMENT Name (#PCDATA) >
<!ELEMENT Description (#PCDATA) >
<!ELEMENT StartDate (StartDateYear, StartDateMonth, StartDateDay) >
<!ELEMENT StartDateYear (#PCDATA) >
<!ELEMENT StartDateMonth (#PCDATA) >
<!ELEMENT StartDateDay (#PCDATA) >
<!ELEMENT EndDate (EndDateYear, EndDateMonth, EndDateDay) >
<!ELEMENT EndDateYear (#PCDATA) >
<!ELEMENT EndDateMonth (#PCDATA) >
<!ELEMENT EndDateDay (#PCDATA) >
<!ELEMENT Participants (Manager?, Researchers) >
<!ELEMENT Manager (UserID, UserName) >
<!ELEMENT UserID (#PCDATA) >
<!ELEMENT UserName (#PCDATA) >
<!ELEMENT Researchers (Researcher*) >
<!ELEMENT Researcher (UserID, UserName) >
<!ELEMENT SuperActivity (SuperActivityID, SuperActivityWorkspaceID) >
<!ELEMENT SuperActivityID (#PCDATA) >
<!ELEMENT SuperActivityWorkspaceID (#PCDATA) >
<!ELEMENT Milestone (DueDate, MilestoneType, DocumentID) >
<!ELEMENT DueDate (#PCDATA) >
<!ELEMENT MilestoneType (#PCDATA) >
<!ELEMENT DocumentID (#PCDATA) >

```

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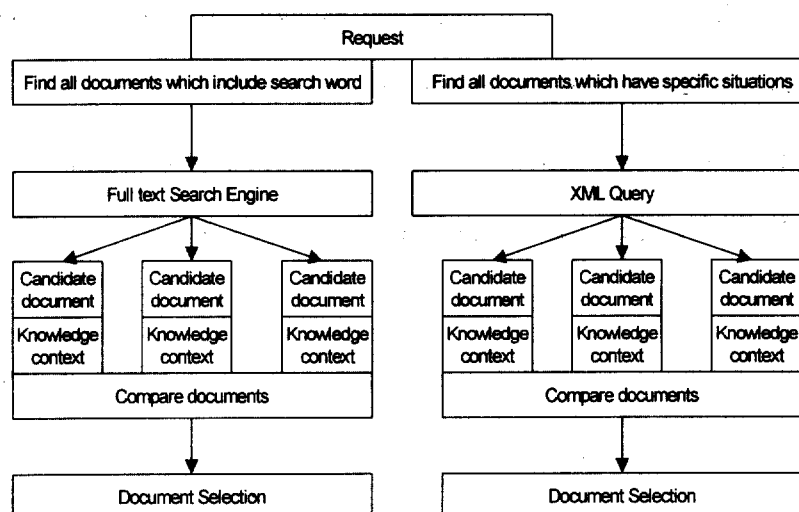
<Activities>
  <Activity ID=24>
    <WorkspaceID>1</WorkspaceID>
    <ActivityType>
      <ActivityTypeID>1</ActivityTypeID>
      <ActivityTypeName>Work Activity</ActivityTypeName>
    </ActivityType>
    <Name>System Analysis</Name>
    <Description>System analysis by use case analysis</Description>
    <StartDate>
      <StartDateYear>2001</StartDateYear>
      <StartDateMonth>6</StartDateMonth>
      <StartDateDay>1</StartDateDay>
    </StartDate>
    <EndDate>
      <EndDateYear>2002</EndDateYear>
      <EndDateMonth>5</EndDateMonth>
      <EndDateDay>30</EndDateDay>
    </EndDate>
    <Participants>
      <Manager>
        <UserID>134</UserID>
        <UserName>Hongjoo Lee</UserName>
      </Manager>
      <Researchers>
        <Researcher>
          <UserID>135</UserID>
          <UserName>Hyungjoon Ahn</UserName>
        </Researcher>
      </Researchers>
    </Participants>
    <SuperActivity>
      <SuperActivityID>13</SuperActivityID>
      <SuperActivityWorkspaceID>1</SuperActivityWorkspaceID>
    </SuperActivity>
    <Milestone>
      <MilestoneType>Report</MilestoneType>
      <DocumentID>37</DocumentID>
    </Milestone>
  </Activity>
</Activities>

```

[Figure 3.2.3] XML DTD and XML document of activity

4. Application of workspace meta model

When workspace is finished, users store workspace documents and workspace information. At this phase, we can make workspace metadata through workspace meta model. Using stored meta data, users can search meta data by XML query language for finding similar knowledge context. Knowledge context can help users to understand retrieved knowledge more clearly and provide navigation path for further knowledge exploration. In a document search case, user can find relevant documents in two ways as described in Figure 4.1. One way is finding all documents that meet specific situations in knowledge context. User's knowledge search criteria can be workspace domain, activity type or milestones of specific activity. The other way is finding all documents that include search word and then user can review knowledge context of document that is transformed from XML data by XSLT to decide relevance of knowledge. Knowledge context gives us more clear understanding of a given knowledge, enables us to find other knowledge with similar context as a given knowledge, and provides us rich navigation path for knowledge exploration.



[Figure 4.1] Application of Workspace meta model

5. Conclusion & Further Research

Using knowledge context, workspace help users to understand retrieved knowledge more clearly, provide more relevant documents by specific situations and suggest further navigation path of knowledge. Also, workspace can exchange knowledge with other applications via XML.

Knowledge context of knowledge item can be extracted from other applications such as workflow, groupware, and document management system. So we need to research about enterprise level knowledge context model and we also need to construct enterprise knowledge ontology to organize enterprise knowledge more properly.

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