A Sustainable Model based on the Social Network Service to Support the Research Cycle

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Abstract

In this paper, we analyze requirements for institutional repositories from the viewpoint of the research cycle, and find that it is critical any existing repository system has little functions managing social relations of researchers. This leads us to a general model in which an SNS platform is an interface for researchers and an institutional repository is a backyard system. The SNS platform enables researchers to work together with co-workers. In addition to the interface, the SNS platform provides authentication and authorization mechanism for other backyard systems. Due to the mechanism, we can use, for instance, a search engine with the access control. Therefore academic resources not available to the public, such as a manuscript of a paper, can be safely indexed. Managing the authentication and authorization mechanism is done in a sustainable manner, compared to other standard authentication or authorization systems, such as SSO or ACL (Access Control List).

1 Introduction

The institutional repository provides functions to preserve academic resources and open access to them, and thus researchers can put their works on their institutional repositories and find related works from institutional repositories. However, the institutional repository only supports a small part of researchers' activities because research activities are usually done in teams and so it is important to support cooperative works. The analysis of interviews in [3] supports this fact.

In this paper, we analyze requirements for the institutional repository from the viewpoint of supporting the research process. From the analysis, we find that there exist wide gaps between the requirements and existing repository systems. Especially, it is critical any existing repository system has little functions managing social relations of researchers.

Recently, new services based on social relations, such as PORTA[1] (National Diet Library Digital Archive Portal) which provides a social bookmark service and Connotea[2] which supports social reference management, have started. These services, however, are stand-alone and so researchers are forced to get used to new such services.

These findigs lead us to a new, general model which supports research activities of the whole research cycle. In this model, an SNS (Social Network Service) platform is an interface for users, and an institutional repository is included as a backyard system. Using mashup approach, we can put other backyard systems into the model.

The SNS platform enables researchers to create groups of people who share research interests, to hold discussions with them, and to share academic resources, such as URL for books or articles. This means the proposed model supports research activities from an early stage.

Fedora [5, 4], which is an popular software for the institutional repository, also provides similar mechanism for data access. But the main difference between Fedora and the proposed model is whether targets are materials or users. We can construct networks of co-workers with the proposed model, while Fedora provides functions to construct and manage data networks.

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[1]`http://porta.ndl.go.jp/portal/dt`
[2]`http://www.connotea.org/`

Access management is a key element of research infrastructure [1]. Especially, it is more important because an implementation system based on the proposed model must deal with unpublished works and materials. The SNS platform in the proposed model provides authentication and authorization mechanisms for other backyard systems.

Authentication methods could be a big problem when we try to federate multi services. SSO (Single Sign On) is an option to solve this problem, and some implementations of SSO, such as Shibboleth, are proposed. These technologies can integrate many repositories [1, 2]. However, all backyard services must implement SSO and hence it is too costly. On the other hand, the proposed model can be used without any modification to existing services[3].

In addition to the authentication method, the SNS platform provides an access control mechanism for other backyard systems, that is authorization for the services. Due to the mechanism, we can use, for instance, a search service with the access control, so academic resources not available to the public, such as a manuscript of a paper can be safely indexed. In general, it is costly to maintain ACLs (Access Control List). On the other hand, maintaining ACLs in the SNS platform is done in a sustainable manner, due to grouping function of the SNS platform.

2 Requirements Analysis

In this section, we analyze requirements for the institutional repository from the viewpoint of supporting the research process.

A typical research process consists of the following three stages (see Fig. 1): the 1st stage includes motivation, deciding themes, thinking of initial ideas, and survey on related researches; the 2nd stage is for problem solving and evaluation, including proofs and experiments; and the 3rd stage includes writing papers and presentation at a conference.

Providing access paths to related works, institutional repositories support a part of the 1st stage of the research process and preserving their works after publishing them, their institutional repositories also support a part

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[3]It is necessary to modify existing services if you want to use the authorization function described below.
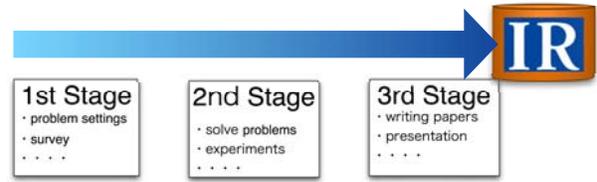

Figure 1: The relationship between the research process and the institutional repository, which only supports the final stage of the process

of the 3rd stage. In addition to the institutional repository, other services can support researchers. For instance, Connotea provides an online reference management service and Fedora provides a versioning function. However, these services including the institutional repository, support a small part of the research process.

Moreover many research activities are usually done with co-workers or in teams. Even if a paper is written by a single author, discussions with co-workers are useful. However, institutional repositories do not support such cooperative works although researchers demand to "Work with co-authors" [3].

To support cooperative works, an access control to materials, especially to unpublished materials, is important since leaks of unpublished materials lose the priority of the research. To control access to such material, the authorization is important as well as the authentication, because accessible resources depend on users.

There exist many systems for the authorization. An administrator of such a system in general has to maintain a matrix of the materials and the users, where each cell of the matrix shows "who can access to what". The number of the materials would be very huge and would be increasing quickly. Therefore, in existing authorization systems, it is costly to maintain the matrix. Thus, it is very important to maintain an ACL in a sustainable manner.

It is also important to be flexible for new functions or services because individual functions or features may newly appear in the future. For example, calendaring, instant messaging, versioning and so on might be desirable by researchers. If functions are sticky to some specific system, new services can not be implemented in the system.
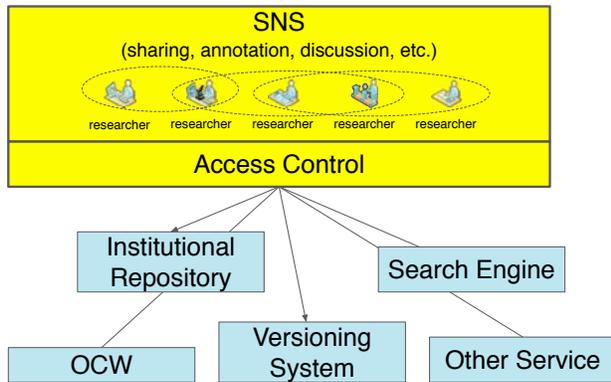
Figure 2: The architecture of the proposed model, where an SNS platform is the interface for users and many services are mashuped under the SNS platform

Figure 3: With the proposed model, the research process become a cycle

3 Proposed Model

From the requirement analysis above, we proposed a new model to support research activities. Fig. 2 illustrates the architecture of the proposed model. An SNS platform plays an important role of the proposed model. It is a unique interface for researchers and many backyard services are hidden behind the platform. An institutional repository software is one of the backyard services.

We explain merits of the proposed model by a use case approach, where a search engine, an institutional repository and a versioninig system are backyard systems. We assume that the institutional repository and the versioning system require the authentication process while the search engine does not.

A user first logins to the SNS platform. The user has some groups which correspond to cooperative works with co-workers, and the user holds discussions or shares interesting articles from the repository system in some groups. The user can create a new group if necessary. When the user writes a paper, it first checks out a manuscript from the versioning system. The authentication and authorization process are automatically done between the SNS and the versioning system. If this manuscript will be completed and published, then the user can upload it to the repository system seamlessly.

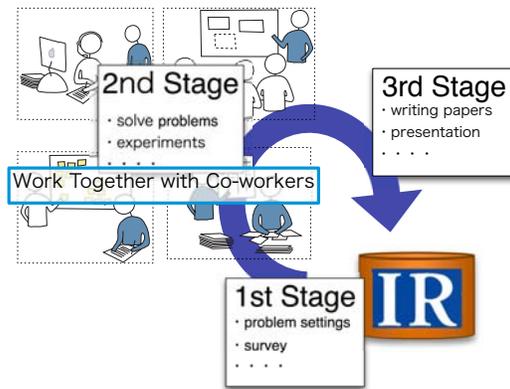From the above use case, we find that the proposed model covers the whole research process. Moreover, the proposed model naturally supports moves from one stage to the posterior stage (see Fig. 3). For example, during a survey on related works at the first stage, a user can write down his/her memos about related works on the SNS platform and can discuss about them. These memos and discussions lead to motivations for new research problems or ideas.

The proposed model uses the mashup approach to connect many backyard systems and so the proposed model are flexible for new functions or services. Because users can use new services through the unified, popular interface of the SNS, the familiar interface may break a psychological barrier to use new services.

For some backyard system, a user needs to pass through an authentication process for this system. If this system is not compatible with SSO, the proposed model provides an ID management function using "User Profile" of the SNS platform. A user puts its ID and password for the system into the profile page, and then the SNS platform safely sends the pair to the system.

The proposed model also provides the authorization mechanism using grouping function of the SNS platform. Consider a research project which has several members. In this case, a member of the project creates a group of the SNS, and all cooperative works will be done in this group. Any users not in the project can not enter the group. If a member wants to put some materials of this project into the versioning system, then the member uses the version-

ing system through this groups. So the versioning system can judge whether the member can access resources of the process without predefined ACL. Creating and maintaining groups is done autonomously. Therefore, the proposed model is sustainable.

The authorization mechanism is powerful enough to provide authenticated or authorized search functions. If a user give a search query from the SNS platform, then the query with IDs of the groups to which the user belongs is sent to the search function. Group IDs tell the search function which materials can be accessed by this user.

4   Conclusion

We have proposed new, sustainable model to support research activities, and showed its merits. An institutional repository is contained in this model as a backyard system and an SNS is the front-end system. Many backyard systems, such as a versioning system or a search engine, can be connected to the SNS using mashups. The SNS supports not only cooperative works but authentication/authorization mechanism for backyard systems. Especially maintaining ACL is done in a sustainable manner.

Now we are implementing our model using open source systems. It is an important future work to verify described merits of the proposed system with actual use of researchers.

References

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