USER PROFILES IN ORGANIZATIONAL ENVIRONMENTS

Cláudio Teixeira, Joaquim Sousa Pinto and Joaquim Arnaldo Martins
IEETA – Instituto de Engenharia Electrónica e Telemática de Aveiro
Universidade de Aveiro, Portugal

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Abstract: In an organizational/corporative environment, each user can perform different roles throughout the time. Dynamic user profiles can be used to accomplish this variation specification. A user profile is a set of information about a given user in a given context and on a specific period of time. The concept of dynamic profiling simply means that the relevant information about the user can vary in time. User profiling is usually related to web advertisement of goods and services for a user in a web site, by means of gathering information of the user's interests and then harvesting the web over these interests. The profile discussed in this paper is service related, directly depending from the user's condition in an organization.

1 INTRODUCTION

Corporative web portals provide an insight of the organization, often ignoring the user's own perspective of it. When a user accesses the portal, he's expecting to get a personalized view of the company's information. It's not just let him access information to which he has been authorized, but rearranging the web layout to fulfil this task in a user centric perspective.

Traditional user modelling systems rely on stereotypes (Alfred, 2001; Elaine, 1998; Kobsa, 1995) to build the user profile.

When working in corporative environments, partial user information is already in the system at first log in. If the software application can access this information, it may provide an adaptable interface since the user's first visit. This is known as "quick adaptation" (Alfred, 2001).

Stereotypes as defined in the state of the art may not be the best approach for personalization of corporative users. Following the work in (Teixeira, Pinto, & Martins, 2006), we propose a different approach to user modelling, based in "basic profiles".

In this paper we will review the user model according to the state of the art, followed by our approach to basic profiles. We will explain that even though different from the overall approaches, the basic profile and the Profile Management System are solid alternatives when addressing personalization of organization users.

2 RELATED WORK

"Personalization allows users to obtain information that is adapted to their needs, goals, knowledge, interests or other characteristics" (Andreas, Marcus, & Andreas, 2005). This is achieved by the use of user models.

A quick way of getting an individual user model is using the user's available information (personal and professional information, interests, socio-demographic, behaviour …) and determining in which pre-existing set of characteristics he best fits. This set of characteristics is defined as a stereotype. The conditions that take part in defining if and how a stereotype is attributed to a user are referred to as trigger conditions. The stereotype describes the expected behaviour of a particular class of users and can be used as an initial user profile.

A user profile is an individual user model, a collection of information that describes the user's needs, preferences and interests. It's a collection of information that describes an individual (G. Adomavicius, 1999) with data adequate to the system. The data gathering process is called user profiling which "is typically either knowledge-based or behaviour-based" (Elaine, 1998; Middleton, Shadbolt, & Roure, 2004). In our research, the knowledge-based information concerns who the user *is* and what he *can access* in the organization. The behaviour-based information will not be considered even though it may be interesting in some automated

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personalization scenarios like frequent viewed areas in the application or usage of advanced features.

Profile information can be divided into two categories (G. Adomavicius, 1999): demographic and transactional. The first describes who the user is, and the second what the user does. In recommender systems, the transactional data refers to the history of purchases.

Most stereotype definitions are unstructured, in the sense that there cannot be an inheritance of stereotypes to build a user profile. The notion of a given stereotype being a specialization of other doesn't seem to exist. The main exception seems to be (Brajnik & Tasso, 1994), that considers a hierarchically ordered set of basic user modelling purposes.

User modelling is not just about using the obtained profiles. In order to be efficient while in production, the storage mechanism must be considered. Therefore, how are the canonical user models and the user profiles stored?

The majority of user model systems are shell systems, even though there are increasingly more exceptions, as pointed by (Alfred, 2001; Alfred & Josef, 2006; Judy, Bob, & Piers, 2002). In (Alfred & Josef, 2006) authors present UMS, a user modelling server that is based on the Lightweight Directory Access Protocol. UMS extends traditional LDAP container schema to store the required information.

3 USER PROFILES

We proposed a structured profile approach, in which each user profile is the aggregation of several basic profiles. These basic profile definitions can be seen as transactional templates, since they define what a user can do in the system. For a detailed description of basic profile and user profile according to the model here described, please refer to (Teixeira, Pinto, & Martins, 2006).

3.1 Basic Profile

Bearing in mind the application scope, each basic profile holds information on what can be done with this basic profile and how it should be presented to a user.

This approach differs from the current state of the art on user modelling: we are not defining adaptable interfaces for content or products; we are using user modelling to customize access to services within a corporate environment, based on dynamic roles. Still, some parallelisms can be made with profile and prediction stereotypes (Liliana & Anna, 2000): the profile part resembles the formal process within the organization that attributes the basic profile and the prediction part is the actual basic profile, since it describes user features - service usage permissions in this case.

3.2 User Profile

This user profile approach is service related, directly dependent of the user's condition in the organization. The user cannot change these conditions; it's up to some formal process in the organization to issue and revoke user permissions.

At his first visit in the system, the user's profile will merely be a set of basic profiles applied to a particular user. However, the user has the possibility to customize the entire application, as well as a particular service to which he may access at the moment. More importantly, it's possible for each service in the application to access the user's current profile and adapt its information accordingly with personal tastes, or themes.

Each user profile is almost unique, since it is the aggregation of the privileges granted by the associated set of basic profiles, plus the user customization. A corporate user profile update will add, revoke or renew a given clearance, making the user profile more than just a simple permissions file; it also keeps a historical record of the privileges that a user had, along with personalization and characterization information.

3.3 User Profile Storage

Each user profile and each basic profile is stored in an XML file. As mentioned, the user can only alter part of his profile, being the organization responsible for altering the remaining information. Typically, there are two types of user profile updating: direct and indirect updating:

- Direct updating – occurs when an organization formal process updates a specific user profile (revoking permissions or issuing clearances); when the user makes changes to his profile; when the application or service update the user's profile;
- Indirect updating – occurs when an organization formal process updates a basic profile (changing security, adding or removing clearances). When this process occurs, it's necessary to access all the user profiles that have the basic profile active and act accordingly with the new basic profile definition.

The indirect updating may seem complicated, but it eases profile information retrieval, since we can guarantee that the profile is up to date with the organization specifications.

Our user profile approach relies heavily on the existing information model of the organization in which it's applied. We need a formal process to indicate from which basic profile (or profiles) the user profile will be generated. Even after creation, formal processes may update the user profile as needed. In our case study, project Contact@UA uses Universidade de Aveiro active directory and a set of additional services to provide the formal processes. However, this may not be the case in other organizations where this approach could be used (the information system may not be based on Active Directory; the formal processes may be entirely manual;…). Therefore, and following considerations in (Alfred & Josef, 2006; Judy, Bob, & Piers, 2002), the user profile system is completely autonomous from the organization information system and from its technology.

3.4 Profile Management System

The UMS server approach needs an Active Directory working underneath. Our approach was to minimize the amount of extra software requirements need to put the user modelling server to work.

The development of the Profile Management System permitted exactly that; the system is completely independent of any architecture or software already in place and is fairly easy to interoperate.

The profile server enables any kind of operation in a user profile or in a basic profile by means of web-services. Even query operations in the entire system are supported, facilitating tasks like user scrutiny and control (Judy, Bob, & Piers, 2002). Stereotype reasoning (Pohl, 2001), or in this case, profile updating is another important aspect, controlled by the Profile Management System and activated by a formal process within the organization.

Operations like creating and editing basic profiles are restricted to authorized users. It is up to them to devise what users can access and by which formal process.

4 USER MODELING SYSTEM COMPARISON

Table 1 enumerates the major differences between user modelling as defined in current state of the art and our organizational user model approach:

Unlike the individual user model (as defined in state of the art), the user profile can in some circumstances be similar to several users (discarding the customizations). Two employees in the same work area, or two students enrolled in the same course can be such an example. However, we believe this is not a weakness in the system, since the main purpose is to deliver the right organization information to the right users. Even with the exact basic profiles in their user profile, the information can be personal within the service, making it unique. Even so, the proposed model enables the creation of very specific basic profiles, maximizing granularity according to the needs of the organization business model.

Table 1: Major differences between the proposed approach and the current state of the art.

	State of the art user modeling	Organizational user model approach
Structure of characteristics set	Mostly unstructured	Inheritable
Main characteristics on each set	• Needs • Goals • knowledge and • interests	Transactional templates; security rules and layout templates, defined by profile components: • what the user can do • where information is seen
Profile creation and reasoning	Mostly trigger based	Based on a formal process
User features description	Prediction profile part	Basic profile
Profile update	Usually only user profile update is considered; Stereotype updates unnecessarily related with user profile updates	Direct updating: user profile update Indirect updating: basic profile update that reflects on user profile

5 CONCLUSIONS

This user model system was developed for use in project Contact@UA and is in production stage since December 2006. Currently we have about 10 basic profiles and 3500 user profiles which represent about 25% of the active university population (www.ua.pt, 2007). The number of basic profiles is low considering the number of active profiles, but 10% of the registered users visit the site daily, so we believe that the solution presented is valid from the user model point of view. Even so, 10% of visitors daily is a small number. We believe that this can be raised by increasing the system granularity (building more specific basic profiles, with even more accurate information for users).

The process of profile updating and retrieval has proven to be adequate to system needs. The Profile Management System is an application independent user model server that can be used to extract, insert and update user characteristics, on a user basis or on group basis, by the profile owner, the application using the profile or the organization to which the user belongs. Being an independent user modelling system built as a black box and having a single interface between the application and the user model server, it eases both application upgrades and user model upgrades without compromising the entire system.

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