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Building a knowledge portal for communities based on personalized functionalities



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ABSTRACT

Over the last decade portals have become an important facet of the Web and of structured communities like companies. This paper presents a knowledge portal that has been developed to provide an improved support to the users during their navigation and access to information. The idea of this work is to create a smooth and richer connection between the users and the relevant data. These tasks have been done by considering personalization aspects (i.e., user preferences and user activities), based on ontological user profiles aimed at managing information effectively. The portal has been tested within the Knowledge-Based Management System 2.0 Project.

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1. Introduction

In the last few decades, the growth rate of users who have accessed digital information on the Web through search engines has increased. This success has been mainly based on the simplicity of the Web technologies: users can easily access to search engines with the intent of discovering valuable information to satisfy their information needs. Many researchers have centered their attention on the management of information on the Web by focusing on users who have to search and interact with this information [18,19]. However, the same simplicity that made the impressive expansion of the Web possible has brought some important limitations [21]. A classical drawback is that users spend a lot of time in retrieving relevant information from a large set of search results or, worse, a substantial amount of useful information is not found.

To overcome the limitations of search engines, portals have become an important facet of the Web as they integrate an increasing amount of information, functionalities, and services [22]. “A portal is a Web-based application that acts as a gateway between users and a range of different high-level services” [23]. Portals are gaining more popularity thanks to their simplicity in development, richness in functionalities, customization of interfaces, and pluggable architecture for the integration of services (i.e., the common concept of SOA: “Service-Oriented

Architectures”). With the use of SOA, portals have achieved popularity and more diffusion in companies because they maintain order and service reputation with stakeholders [24].

Portals are aimed at providing an effective communication for members belonging to communities, each focusing on a particular topic or activity. These portals collect and integrate relevant community data, so that members can better discover, search, query, and track interesting community activities with the objective of providing an open and effective communication forum. In addition, portals should provide personalized retrieval of relevant information according to user preferences, interests, etc. In some cases, users with common interests can implicitly define their sub-community by sharing information about a given topic/interest [21].

This paper presents a portal for companies with an improved knowledge management. For instance, knowledge portals interconnect individuals and provide logical links between user's roles and documents in the repository to unify networking [25]. The portal described in this paper makes a further step with respect to the standard knowledge portals as it considers both features of personalization and semantics to interconnect users and knowledge. Personalization is aimed at modeling the user context by analyzing the user's knowledge (i.e., preferences, activities), and by defining processes that exploit such knowledge in order to tailor the search outcome to his/her information needs [26–29]. Semantics are aimed at representing users in ad-hoc profiles to better exploit knowledge in the portal [21]. The definition of personalized methodologies has become easier, thanks to user profiles that store user's knowledge, i.e. preferences, interests, activities, and personal data. Ontologies have been more recently

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considered powerful and expressive means for representing knowledge of user profiles [30,31]. This paper presents how to define user profiles represented as an ontology in an innovative way by considering the Ontology Design Patterns (ODP) [32]. ODP are defined as a “reusable successful solution to a recurrent modeling problem”, and they are aimed at reducing mistakes in ontologies, detecting uncovered requirements, improving qualities of produced ontologies, etc. [33,34]. In the literature, semantic portals adopt ontologies to define a logical structure of contents [35,36,25]; in our portal, we consider another approach since the ontology is used to define user’s knowledge that can be applied to better connect users with documents.

Furthermore, this knowledge-based portal can manage all the multiple roles that people have in a company in order to have different access to information thanks to the adoption of a ODP-user profile. For instance, the individuals who work in a company are logically organized in a hierarchical structure, and for each level in the organization a specific role is assigned; consequently, not all of the knowledge has to be accessible or viewed in the same way for each role. Managing information in a company is not a simple task; it requires the use of personalized methodologies to properly satisfy user information needs. It is also plausible to assume that users, having the same role information do not have the same interests and preferences. For instance, by using a search engine, for a query, the retrieved documents have to be ranked considering several user’s information such as market, roles, interests, etc. This means to define approaches that model the search outcome according to the user’s needs.

The features described up to now bring our knowledge portal to be viewed as one of a kind, and then it becomes difficult to be able to provide close comparisons with other knowledge portals. In order to provide an assessment of the portal we resorted at creating a prototype version called KBMS 2.0 in collaboration with Enel S.p.A. The knowledge portal developed in the KBMS 2.0 Project has been integrated in the Liferay Portal Enterprise [37]. Liferay is considered as a 2nd generation portal as it consists of different portlets that can process consumer requests to services with the goal of generating dynamic content from the responses. For the KBMS 2.0 Project several portlets have been developed to accomplish the different requests of stakeholders. This paper provides examples of the most important portlets that consider the personalization issue in order to provide a specific exchange of information between the user and the portal, according to user interests and preferences. The most important modules/portlets developed for the KBMS 2.0 portal presented here are: a *personalized search engine* to retrieve relevant documents for users, a *grid of navigation* to allow users immediate access to documents classified according to the support of specific categories.

The paper is organized as follows. Section 2 presents the related works, while Section 3 introduces personalization and contextualization issues in companies. These issues are then analyzed according to several aspects: the modeling of a novel architecture of a portal framework (see Section 4), the definition of the ODP schema of a user profile based on ontology (see Section 5), and two of services (i.e., grid of navigation and the search engine) developed to customize information and results according to the user’s needs (see Section 6). In Section 7 we report an overview of the utilization of the KBMS 2.0 prototype. Section 8 presents the future trends of research related to framework portals for companies. Finally, in Section 9 conclusions are given.

2. Related works

Portals are classified into three basic classes that are: (1) *Horizontal Portals* (or *consumer Portals*), (2) *Vertical Portals* (or

*Vortal*s), and (3) *business to business – B2B* (or *Industry Portals*), respectively [22]. The first is related to the use of portals on the Web [38]; they give a broad array of resources and services such as search capabilities, e-commerce, Web catalogs, news, free home pages, messaging services, etc. The second offers content and services for specific domains or communities; they are focused on consumers with specific tasks or interests according to the geographical locations of individuals. The third provides a virtual marketplace where specific industries can benefit from information related to software for business transactions. This last type of portal refers to corporations, rather than to consumers.

In this work we focus on the second type of portal classification as it refers to the definition of portal for communities, where a community can be considered like a company with members who work on specific common interests by sharing and by exchanging information. In detail, *Vertical Portals* are also identified either as *Enterprise Information Portals*, that are a common entry point for customers and employees [39], or as *Intranet Portals*, that are business applications exclusively for members of a company [40]. The former provides Web applications that integrate all the typologies of data and services related to a company, whereas the latter provides personalized information for employee’s needs and supports cooperation, as well as workflows. The portal defined in the KBMS 2.0 Project is really an *Intranet Portal*, having both features of personalization to exchange and share information according to specific interests among the members of the Enel S.p. A. energy company, and a semantic representation of users in ad-hoc profiles to better exploit knowledge in the portal.

One of the main points for defining the new generation of community portals is related to the aspects of personalization where users can customize the portal’s functionalities to their personal interests or activities. The use of personal information improves the effectiveness of the portal with the logical consequence of increasing user satisfaction. An accurate definition of a user profile is important, since it heavily influences the results of the interaction with the portal and as a result the satisfaction of the user.

2.1. Semantic Web portals

We have taken inspiration from the Semantic Web portals that use ontologies to manage the knowledge in the portals in order to define an innovative model for a user profile. In [21] it is provided a survey of Semantic Web portals. In detail, the following semantic portals are presented: Esperanto Portal, OntoWeb Portal, Empolis K42 Portal, Mondeca ITM Portal, SWWS Portal, Mindswap Portal, and OntoWebEdu. In these cases, domain ontologies are used to model the knowledge of the portals by mainly considering information about project partners, project members, organization/company, documents, and meetings. The ontologies are connected through several relationships. The common features of these portals are given by the use of ontologies as a browsing search engine, where an ontological taxonomy (or a hyperbolic tree) is used by users/members to retrieve search results linked to concepts and/or instances of the considered taxonomy (or hyperbolic tree). None of these portals can be considered as a complete Semantic Web portal for several reasons: different document types are not explicitly modeled within the ontologies, multi-language capabilities are not supported, there is a lack of collaboration features, a limited use of common Web technologies, an insufficient helpline and documentation, or a poor level of usability. In the present work, at variance with respect of the aforementioned projects we change the point of view by focusing on user ontologies in order to enhance the connection between the users and the documents. With the advent of the Web 2.0, social aspects have assumed a key role in the Semantic Web technologies

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