Virtual Learning Communities - Theory and Practice: the Case of VirRAD[1]

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Abstract: In this paper we discuss the development of virtual communities and especially virtual learning communities, taking into account basic community requirements as well as social factors of e-learning. This paper has been inspired by the VirRAD European project and presents the intermediate results that have raised form the definition of a virtual community for the vocational training of radiopharmacists. We therefore present the user requirements that form the functional specification of such an environment along with the role model that provides a mindful but solid distribution of the access level in the system.

Introduction

Nowadays the use of Internet facilitates the creation of on-line communities in order to assist the interaction among individuals that share common interests and goals. These communities are described by the term "virtual communities" in order to define their "on-line" substance. According to (Preece 2000) the main characteristics of a virtual community are: (a) people, who want to interact socially, to satisfy needs, perform roles etc.; (b) a shared purpose, that provides a reason for the community; (c) policies, that guide people's interaction; (d) computer systems, to support and mediate social interaction.

From the above, it is clear that a key factor for the success and the subsistence of a virtual community is the strong interest among the concerned people. Those people have a common goal (Sharda & Romano & Lucca) and they are captive of spatial, time and economical limitations that could prevent their interaction in real place. Such a case could form a group of people that want to share knowledge, learn together and, therefore, constitute a learning community. The shared purpose of a virtual learning community is learning. The establishment of such a community could be an effective solution, especially for groups of people in highly specialized fields, such as radiopharmacy, because their main problem is their poor communication. Main issues that should be examined in such a learning community are the policies that guide individuals' interactions and the computer system that supports the virtual community. These issues are referred to both usability and sociability along with their interrelations. Successful learning

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communities not only should support these basic needs of users but should also meet additional needs like resources, guidance, feedback and enjoyment (Preece 2000, Laister & Koubek 2001).

This paper presents the functional characteristic of such a community within the scope of the VirRAD European project and proposes technological solutions for the development of a system able to support such a community. In particular, this paper provides a brief description of the VirRAD project and presents the main user requirements. Moreover, it describes the system's functionality and a first approach of the VirRAD system architecture. Finally, some concluding remarks along with the envisaged next steps are presented.

The VirRAD project

VirRAD (Virtual Radiopharmacy) project is concerned with section III.2 of the IST 2001 work programme - Education and Training. It started on February 2002, and it will run for almost 3 years.

VirRAD aims to be a learning environment, which will combine a solid theoretical and instructional background with the concepts of a community and the support of technology for the realization of the virtual space. In particular, VirRAD is envisioned to be an environment, which will provide knowledge and training for individuals in the field of Radio pharmacy. The learning process will be inspired and conducted under the concepts and principles of the Mindful Learning theory (Langer 1997) as well as other contemporary learning or instructional design theories. The innovation of the VirRAD system is that it will try to translate the philosophy and concepts of these theories into an instructional framework. Regarding the environment where this process will take place, it will be a virtual space, which will allow the communication and collaboration among the individuals.

System Design

The main goal during the system design phase is the translation of the users requirements (Mather 2002) into functional specifications of the system. Till now, the two main characteristics (people and shared purpose), of the VirRAD community, have been defined: the people are members of the radiopharmasists' community and their shared purpose is to share knowledge on the radiopharmacy as well as to communicate and learn together. During the definition of the functional specifications both the policies and the computer system are defined. In addition the mapping of the system functionality to available or new technological solutions is a step that facilitates the definition of efficient system architecture.

Functional Specifications

This paragraph is focused on the functional content, purpose and interactions of the different components of the VirRAD system. This environment should be inclusive, participative, open and user-centered. In order to create the above environment, the VirRAD system has been divided into four main areas (sites): (a) the Public Website, (b) the Community, (c) the Instructional Component, and (d) the Project Internal Site.

Public web site: this site, which is accessible by all users, aims to present the VirRAD project and constitutes the introductory component for the invitation of the potential VirRAD users' to the system. It also, provides a general description of the radiopharmacy and a mean for the users to contact the VirRAD team.

Community: The Community site provides a series of tools for the communication, collaboration and information exchange among the radio-pharmacist's community members. These provide functionalities such as: Personal Card, Links, Events, Glossary of terms, Adverse reactions reporting system, Library, Text chat, Virtual conference, Forum, News, Frequently asked questions and Search. Users can exploit the above functionality after becoming members of the community through a registration process. Furthermore, they can moderate the use of the above functionality by undertaking upgraded roles in the community (editors and moderators).

Instructional Component: The main goal of the instructional component is to facilitate the interaction among learners, authors and mentors, as well as to support the access on the learning material

by the learners through an intelligent learner modeling system. The instructional component is being composed of the courseware, the virtual laboratory and the learning management element (Bouras & Nani & Tsiatsos 2003). The courseware comprises the learning content of the VirRAD system. Various content types will be supported by the VirRAD system, such as exercises, slides, 3D simulations, etc. The courses are composed of learning objects. The learning objects will be accessible and re-usable and they could be linked to more than one course. The Virtual Reality (VR) laboratory provides a 3D simulation environment where the learners can meet mentors, or carry out radiopharmacy scenarios. The user is represented in the VR laboratory by an avatar. Users can access the VR laboratory in two ways: a multi-user way (VR teaching laboratory)or a standalone way (VR Laboratory). The learning management element provides the available tools for creating and integrating courses and learning objects to the VirRAD environment. This element facilitates the learners' access to the courseware, monitors the learner's interactions with the content and offers them pedagogic advice by means of a multi-layer, meta-cognitive learner modeling system.

Project Internal site: this site is used mainly for the internal communication among the project members and provides functionality similar to the Community site.
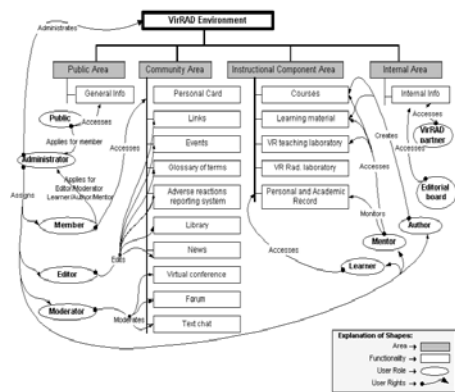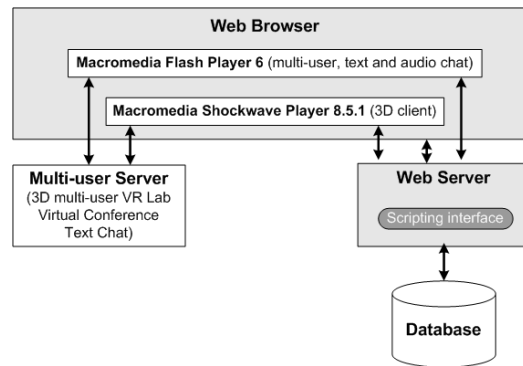

Figure 1: Role model in the VirRAD system

Figure 2: VirRAD Architecture

Role model

An important factor to be taken into account is the definition of the users' roles in the system, as well as the levels of access that each role involves. This paragraph is therefore engaged with the description of the policies that guide people's interaction in the VirRAD environment. Each of the above-described areas of the VirRAD system is characterized of distinct roles (actors). The role model of the VirRAD environment is depicted in Fig. 1. The actors encountered in the VirRAD system are the following: (a) the "public" that can access parts of the information on the VirRAD community. (b) The "member" that represents users that have registered to the system, have their own personal card and have access to all the functionality provided within the community. (c) The "editor" that represents members with the additional privilege to monitor a content area of the VirRAD Community. (d) The "moderator", that represents member with the additional responsibility to monitor a communication channel in the VirRAD community (i.e., chat). (e) The "learner", that is a role in the Instructional component. A learner has its own learning profile; can access e-learning material; can use the 3D radiopharmacy laboratory; can be supported by a mentor and an intelligent learner modeling system. (f) The "mentor" has as main task to provide support to the learners in the Instructional component. (g) The "author" is a member that has as main task to provide instructional material to the learners. (h) The "VirRAD Partner" can access all the internal information of the VirRAD project internal site. (i) The "Editorial Board" is a role of the project Internal Site and the courseware element. The main tasks of this role are the quality control of any new instructional material, and the expelling of a user of the VirRAD system. (j)The "administrator" represents a group of users with technical role, having as main task the activation of new services and the manipulation of the users of the VirRAD system. The innovation in the role model adopted by the VirRAD system is that each member can upgrade its role in the system, by becoming an editor, a moderator, or to withdraw from a particular role.

Implementation issues

VirRAD will be a network-based environment, which will be mainly comprised of the following: (a) a web based learning community of both learners and practitioners, (b) a virtual-reality simulated environment, both multi-user and stand-alone, where active experimentation may take place. (c) Multimedia courseware. VirRAD will be based on a n-tier architecture in order to support the above components. The main modules of this architecture are the web server, the database and the multi-user server. The technological solutions that have been selected for the above modules are depicted in Fig 2. In addition, VirRAD will exploit these technologies in order to develop: (a) a web-based authoring tool for uploading content and attaching SCORM metadata to it; (b) a web-based authoring tool for creating learning objects and courses attached with SCORM metadata elements. The learning objects can be tracked, in terms of the learners' learning activities, whereas they can be aggregated to form larger instructional units (courses). These tools will also be used in order to support the manipulation and access of the e-learning content. This solution allows seamless integration with the VirRAD learner modeling and needs. According to the above discussion the proposed system architecture is depicted in Fig. 2.

Conclusions and Future Work

In this paper we presented the development of an educational virtual community in the bounds of the VirRAD European project, which is targeted to support the radiopharmacists' community. Currently existing learning opportunities for such disciplines suffer from a number of shortcomings. Conventional "classroom" learning is expensive, poorly available and inflexible in the extent to which it meets individual students needs. Current "distant" learning suffers from an "unreal" artificial interface and a lack of personal interaction with the system. The objective of the VirRAD project is, therefore, to empower individuals to manage their own professional learning in a self determined manner, permitting them to learn when and where they want, and though widely dispersed throughout Europe and North America, easily establish contact with other learners and surmount the problems of isolation.

At this time, the first prototype of this system is being developed in close co-operation with the end-users in order to achieve a usable environment. After the creation of the prototype a thorough evaluation will be conducted in order to assess the educational value of the VirRAD system. Modifications and enhancements will take place in order the final prototype to meet the primer objectives.

Acknowledgements

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