Supporting Social Interaction in Intelligent Competence Development Systems

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Abstract: This paper addresses the challenge of enhancing lifelong Competence Development and Management Systems with advanced features enhancing social interaction. Such features include network visualizations and browsing, intelligent agents and game dynamics aimed at supporting users seeking advice throughout their competence development process. In particular, we are exploring the design and impact of software agents providing personalized and contextualized stimulus and support based on user objectives and social network information. We describe how we envision embedding such agents in Competence Development Systems to help users “connect” to other users as well as to relevant competence development opportunities and relevant knowledge assets. Our ultimate objective is to increase system usage towards a sustainable level of knowledge exchange and creation.

Keywords: “intelligent” agents, lifelong competence development and management system, knowledge management in virtual communities.

1 Introduction

Designing sustainable competence development networks and systems for distributed communities of users is a challenging task. One of the main trends today is to extend the traditional knowledge management functionalities embedded in such systems with new features which take into consideration the social nature of knowledge exchange networks and communities (Cheak et al, 2006; Brown and Duguid, 2000; Cross et al, 2001; Wenger et al, 2002). The ultimate objective of such advanced features is to support the social exchanges that occur between community members; in particular, the ability to generate and sustain ‘connections’ between users, and to stimulate them to actively participate in sharing and building on each others’ knowledge and experience (McAfee, 2006; O’Reilly, 2005). Our objective is to present our vision of the users’ lifecycle in a competence development context, and discuss the approaches and technologies that we are designing to (i) facilitate social networking (i.e., users-to-users and users-to-community connections (Wasserman and Faust, 1994; Watts, 2003; Cross and Parker, 2004), (ii) help users identify relevant learning opportunities and make informed decisions (i.e., users-to-competences connections), and (iii) foster active contributions to the collective knowledge space (i.e., competences-to-competences connections). We also show how network navigation functionalities, embedded intelligent agents and connection games can support the lifecycle of competence development.

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2 Competence Development Lifecycle

This work is framed within the Integrated Project TenCompetence (Koper and Specht, 2006), where the focus is on the design of an interactive system to provide users interested in extending their competences with an overview of possible competence development opportunities (or CDOs). In such a system, users are able to access information related to a variety of CDOs, including not only traditional courses, workshops, and reference material, but also ‘live’ resources, such as communities of practice developed around a given competence, or experts and peer groups. Such systems can be considered as interactive knowledge repositories which inform and guide competence development decisions in organizations, educational institutions, and individuals. The challenge is now to make sure that such systems (i) provide sustainable value to users, and at the same time (ii) stimulate users to contribute their knowledge, insights and experiences on a continuous basis. In order to address (i), we hypothesize that users seeking competence development support go through several phases (cf. figure 1) corresponding to Rogers’ change and adoption stages (Rogers, 2003).

Figure 1 Competence Development Lifecycle within a CD Network (User perspective)

At first, users might act very much as ‘free-riders’ and passive ‘lurkers’. In this first phase, the main objective is to help users become increasingly aware of what is going on in the network by encouraging them to explore the system to see how it could effectively support them in identifying relevant competence development experiences and opportunities. In a second phase, users might develop increased interest in the system and the users’ community and become gradually more actively engaged and motivated to spend their time with the system. It is in this critical phase that users can move beyond passively “watching” the content of the system and the behaviour of other users. They will start realizing the value of expressing their own insights related to specific CDOs, or the value of extending their user profiles with more information about themselves and their competence development expectations and objectives. Once their interest is high enough, users are expected to enter the third phase, and start becoming actively involved by contributing their own experiences, engaging in exchanges and gradually establishing relationships with other users. If they see that these exchanges are valuable and recognize the system and the network as a significant support for their competence development process, this phase will lead to a final “adoption” phase in which users will develop the necessary motivation and competence to become active members of the network, engaging in a mutually productive and sustainable knowledge exchange with the system and the users’ community.
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The ultimate goal of the features described in this paper is to help users move efficiently through the phases of the lifecycle, providing them the motivation, the competence and the confidence necessary to gradually become well-connected, aware, involved, engaged users, who can extract value from their system usage (through their connection to other users, to relevant knowledge informing their decisions, and to competence development opportunities) and at the same time contribute to the community by pro-actively sharing their experience and the expertise they have developed over time.

3 Connecting Users

To support users throughout the lifecycle, we have identified four distinct domains in which the users’ ‘connectedness’ can be gradually enhanced in a significant way (that is, via the establishment of new connections or the strengthening of existing ones). These four distinct domains determine a structured context for injecting different dynamics (network visualizations and browsing, intelligent agents and game dynamics) in the system.

Figure 2 Four Domains for “connection”-enhancing Embedded Dynamics

As illustrated in Figure 2, the four domains include: (i) Helping users to better “connect” to themselves (in which case value can be created by letting users reflect on their own competence development experiences and objectives), (ii) Helping users to better “connect” to the user community (identification of relevant users and groups, notification of and involvement in community roles and events), (iii) Helping users to better “connect” to CDOs documented in the system (recommendation of relevant CDOs and CDO categories) and (iv) Helping users to better “connect” to the system itself (to enhance the users’ competence to generate, extract value from, and contribute to the system).

In concrete terms, agents can stimulate users on a regular basis to review their own personal profiles and competence development objectives (Angehren, 1993; Roda et al, 2003) in the light of recent experiences, contributing to (i). Agents can also make sure that users explicitly describe their relationship networks, and are stimulated to extend them through exchanges with appropriate peers, contributing to (ii). Game-like dynamics, beyond supporting individual and collaborative learning (Wideman et al, 2007; Manzoni and Angehren, 1997) can also contribute significantly to (ii), providing an opportunity for users to meet and know each other in informal contexts. Furthermore, agents can reduce the search costs for relevant CDOs and proactively invite users to explore them,
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contribute to (iii). Finally, agents or game dynamics can help users learn to use the specific features of the Competence Development system more efficiently, contributing to (iv) e.g. by "connecting" novice and expert users so that they can share best practices in using the system in an effective way.

Ultimately, these embedded dynamics are all focused towards promoting and stimulating action, via dynamically-generated suggestions, maintaining existing relationships (connections) and promoting a high level of willingness to exchange within a community. Such actions aim specifically at helping users discover and connect to network resources (other users, or different types of knowledge assets (Boisot, 1998) which will support their own social and competence development, learn about and from other users through game-like dynamics developed to encourage them to share their competences and work together towards a common objective, identify and engage in suitable CDOs (formal learning) or more informal knowledge exchanges with relevant peers and experts, and finally increase their motivation to share their own experience and insights which will contribute to an increase in the overall value of the system both for themselves and the user community.

4 Network Navigation Functionalities

Networks must provide users with facilities to generate and strengthen valuable connections to ensure the social dimension of the competence development process is supported. The power of these social and knowledge networks comes from the connections one can access. Not only can we benefit from our own connections, but we can also find out who –amongst the people we know- knows someone who may know something about a given subject (Wasserman and Faust, 1994). Enabling people to think in terms of networks (networks of relationships among people, or between people and knowledge assets, as well as networks of relationships among competence-related knowledge assets) requires therefore the possibility for users to visualize and browse through a graphical representation of the network, rather than traditional linear representations. This is why we are investigating a set of enhanced features that could be embedded in traditional competence development systems in order to better support users and their competence development lifecycle.

Providing users with the possibility to produce, visualize and browse through relationship networks between people and people (e.g., user ‘A’ knows user ‘B’), between people and CDOs (e.g., user ‘A’ has contributed to the development of CDO ‘C1’), and between CDOs and CDOs (e.g., CDO ‘C1’ addresses the same competences as CDO ‘C2’) has a potentially high value but is also associated with a higher degree of complexity. To reduce this complexity we are currently investigating which network-specific functionality needs to be provided. Such functionality includes a variety of selective display options - through which large/dense networks can be “centered/focused” around a given node (a person or a knowledge asset) – as well as network filtering options enabling users to remove unwanted information from the network representation. Expression-based, CDO type and subtype-based, connection-based and rating-based filters, to name but a few, will offer powerful ways to reduce the complexity of the network and support effective network visualization and navigation.

5 Connection Agents and Game-like Dynamics

In order to bring life to the system and stimulate users to gradually move though the different phases of the lifecycle model, we are developing connection agents which
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provide embedded dynamics. Agents can be perceived by users as virtual characters inhabiting the network and responsible for enhancing the users’ experience, for instance by regularly suggesting new or relevant CDOs, by pointing to interesting trends and events, or by initiating connections between users who have followed similar CDOs and happen to have related objectives. Agents aim to bring value to the users by helping them establishing “connections” in the four domains identified in Figure 2.

A concrete example of an agent we are currently investigating is the so-called “Personal Development Agent”, who acts as a personal coach (Roda et al, 2003; Cross and Parker, 2004). The goal of this agent is to help users better understand themselves and their needs by helping them formalise their objectives as well as their current and desired competences. It will suggest existing competences related to the ones users have indicated, and will provide them with initial tentative connections to both relevant users who have a similar user profile and to relevant CDOs that they may want to explore to address their desired competences. Other agents include “CDO Connection Agents”, responsible for maintaining a consistent network of relationships between the CDOs included in the system, and “Concierge Agents” responsible for updating users about relevant events, particularly when they log in after a while and need to be “re-connected” with the community.

Game dynamics can be defined as experiences that help participants gain awareness of a complex situation by letting them experiment with various solutions to a problem, and by showing them the consequences of their choices. They provide a situated context for learning and encourage participants to try and experiment, while ensuring that they learn something out of it via feedback on their decisions (Rogers, 2003). Teams seem to provide a very good setting for games, as they regroup different users with different experiences and approaches to a given problem. They are especially interesting because they trigger debate and discussion as to how to best solve the current situation, thus making everybody even more engaged in the game scenario.

Games and agents work together. Agents play two roles: (i) selecting the best candidates for a game and (ii) stimulating individual users to engage in the game. An example of one game dynamics that we are currently exploring and designing is the “Connection-finder Competence Development Game” which focuses on challenging users/players to find the “best” person to interact with to extend one’s competences in a given area. The purpose of this particular game is to help a user find someone that is not in her network yet and that is similar enough to her to guarantee a productive exchange, while being dissimilar enough to make sure that they will both learn from each other. Following ‘blind date’ dynamics, the game asks each user a set of multiple-choice questions and uses the answers to filter the network and reduce the space of possible connections. When a ‘match’ is found, the user profiles of both parties are revealed and a connection is proposed.

6 Inside a Usage Scenario

This section describes a user scenario illustrating some of the concepts and approaches we have developed in this article. It details the interaction of a user interested in locating Competence Development Opportunities (CDOs) related to a given subject, “Ajax”.

A first approach consists in using the network visualization features to display all the CDOs which address “Ajax” and then use the selective display and network filtering options mentioned in section 4 to narrow down the search to CDOs fitting the specific preferences of the user (e.g. books and online courses addressing “Ajax”). The same network visualization options could then be used to display not only relevant CDOs, but
also other users who are knowledgeable about them. In this way, using network visualizations, the user could easily identify people she knows who are in some way related to relevant CDOs (as they have read and commented a related book or attended an online course on the subject).

A second approach requires the user to indicate explicitly to the system that she is interested in developing her “Ajax” competences (by adding this information to her personal profile). Automatically, the agents embedded in the system will be activated and generate suggestions for relevant CDOs (as described in section 5), pointing also to discussion forums in which users exchange their opinions about “Ajax”, as well as to a list of relevant users to be contacted. In this case, agents would significantly reduce search costs for the user and also help her answering the question “Who do I know who knows about the subject I am currently interested in?” In case none of the people she knows are directly knowledgeable about “Ajax”-related CDOs, the user could use the network visualization features to display relationship networks and identify the “shortest path” to a relevant expert (“Who do I know, who knows somebody, who knows somebody … who is knowledgeable about “Ajax”).

7 Conclusions

This article has presented our vision of a more socially-aware competence development system and the dynamics we believe are necessary to gradually “connect” users - to themselves, to the user community, to relevant knowledge assets in the system, and to the system itself - as well as increase their motivation and capability to act as active members of a learning network. We also described a number of specific connection-enhancing features and dynamics we are currently exploring: Network visualization and navigation tools provide means to browse and filter the network, making the most use not only of one’s network, but also of the networks of each member of one’s network. Stimulus agents are responsible for suggesting connections between users and/or knowledge assets and competence development opportunities. Finally, game dynamics contribute to the development of rich exchanges within and across community members via learning-by-doing experiences. We are currently developing prototypes in the context of the TenCompetence project to validate these components and assess their suitability to extend current competence development systems and learning networks.

References


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