

Enhancing the Social Network Dimension of Lifelong Competence Development and Management Systems: A Proposal of Methods and Tools

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Alicia M. Cheak
Center for Advanced Learning
Technologies, INSEAD
Boulevard de Constance
77305 Fontainebleau, France
Alicia.Cheak@insead.edu

Albert A. Angehrn
Center for Advanced Learning
Technologies, INSEAD
Boulevard de Constance
77305 Fontainebleau, France
Albert.Angehrn@insead.edu

Peter Sloep
Open University of the
Netherlands
Valkenburgerweg 177, 6401 DL
Heerlen, The Netherlands
Peter.Sloep@ou.nl

Abstract:

Competence Development and Management Systems (CDMS) belong to the category of knowledge management systems, which are structured online repositories of knowledge assets that a community of users accesses and maintains on a continuous basis for learning and knowledge sharing purposes. This concept paper addresses the challenge of enhancing the social dimension of CDMS with social network-based concepts and tools. Our premise is that knowing about and having access to the social network can help with decision-making and inform targeted efforts to promote knowledge exchange among learners. A series of tools will be presented, such as social network visualization, simulations, stimulus agents and network management policies with the aim of increasing the visibility and value of social resources within CDMS and opening up knowledge sharing opportunities among a community of CDMS users.

Keywords: Knowledge and Competence Management, Social Network Analysis, Network Visualization, Simulation, Stimulus Agents

1. Introduction

Competence development and management systems (CDMS) are computer-based, typically web-based systems centered on the organization and distribution of lifelong competence development programs. Although these systems have, as their objective, the provision of seamless and ubiquitous access to a variety of learning opportunities, they also rely on an active, participatory community of users.

This community consists of diverse learners who want to upgrade their knowledge, skills and proficiency in a discipline or profession, and may also include instructors who need assistance in designing learning activities, organizations and learning institutions in the process of implementing a competence development course, content and course providers who want to introduce new learning programs, and practitioners and other stakeholders who are interested in engaging in discourse within a field.

The heterogeneity within such a system opens up opportunities for members to draw upon the expertise of others and to contribute to the collective body of knowledge.

Over the past years, the community approach [1], and in particular, knowledge communities and communities of practice [2], have emerged as an important paradigm for supporting the transfer of both tacit and explicit knowledge as well as the creation of knowledge within distributed groups [3][4].

According to Wenger et al, the success of a community depends on its social space, the characteristics of its members and the characteristics of the community as a whole [5]. Additionally, individual success or failure in a learning community has been associated to the extent to which learners perceive themselves as members and participants of that community [6]. Those who are not socially embedded into the community are less likely to flourish in it.

Part of the challenge within the design of successful communities is the difficulty in engaging community members in knowledge exchange and creation, establishing a sustainable level of engagement, and empowering these communities to become self-organizing, self-directed entities [7][8].

This concept paper addresses the following two questions: (1) how to better connect CDMS users to one another to create a sense of community for knowledge sharing purposes, and (2) how to engage ongoing active participation of individuals toward increased self-direction and self-organization.

We begin with a description of some of the questions learners might have related to their search for competence development opportunities. We then propose a social network-based approach to facilitate connections among users and hence, open up opportunities for knowledge exchange among them. This will be followed by an exploration of how current CDMS design may be extended with interactive social network visualizations, simulations, stimulus agents and management policies toward the creation of a self-organizing, self-directed community of CDMS users.

2. The social nature of knowledge work

Learners in search of competence development opportunities have a variety of strategies towards accomplishing their objectives. They may do a general or specific search to discover various possibilities; then focus their attention on the more relevant and attractive option. To this effect, online repositories can help structure and make more efficient a learner's knowledge search.

However, as very often happens in practice, knowledge seeking also takes place socially, with people drawing from the knowledge, experiences know-how of others [9][10]. When faced with a knowledge need, learners often turn to who they know who might be able to provide the relevant information, as reflected in the following questions:

- *Who could I access who actually uses/applies the targeted competences on a regular basis?*
- *Who could I access who has gone recently through an experience similar to the one I am going to embark on?*

- *Who could I access who can provide me advice on how to best proceed in developing the targeted competencies?*
- *Who could I access who can provide me with the targeted competences in a "real-time" mode (i.e. learning in progress)?*
- *Who could I access who can advise me on which document/site/programme is the most efficient/most pleasant way of developing the targeted competencies?*
- *Who could I access who can provide me direct or indirect access to the people listed above?*
- *Which type of access to all these people can I actually get?*

In the next section, we borrow from knowledge management literature and business practice to emphasize the importance of the sets of relationships that people rely on to accomplish their knowledge work. We then propose a series of guidelines for the integration of a social networks perspective into the design of CDMS.

3. The evolution of knowledge and competence management towards more socially oriented systems

In a recent review of knowledge management research and practices, Hong and Stahle [11] noted the emergence of a new generation of knowledge management systems focused on the dynamic *self-organization* of knowledge and the *creation of new knowledge* and competences. This approach builds on previous generation systems which first emphasized locating, capturing and delivering knowledge, followed by the integration of concepts such as tacit knowledge, social learning and communities of practice toward knowledge sharing and transfer.

This shift toward a more socially-oriented perspective is mirrored within competence management literature. Recently, competence development is mainly seen not as the management of existing competences but as an *innovative learning process*, which requires the management of competences as they emerge from ongoing practices and activities.

We also borrow from current knowledge management practices within the business realm to illustrate the importance of supporting social networks. More and more, companies are focusing on the value of relationships and social

connections. The traditional aspect of the managerial role has taken a new dimension, as reflected in the so-called “post bureaucratic” or “network” organization [12]. Mapping the network of “who knows what” and “who knows who” in a group gives members insights and opportunities to tap into the expertise of their colleagues [13].

As such, traditional companies are now observed to be experimenting with network design. General Electric is turning into the ultimate network organization: the *boundaryless* organization composed of a seamless network of relationships. Within such a company, members of the group are dispersed across different geographic sites and hierarchical levels and bring together different kinds of expertise.

Within such organizational paradigms, success depends more and more on relationship skills: how well one builds good relationships with peers, superiors, subordinates, groups, teams, customers, suppliers and investors. Other companies such as Ericsson, IBM and others are practicing similar approaches [14] [15].

Based on the direction of knowledge management literature and business practice, we would like to apply a social networks dimension into the area of competence development. Our hypothesis is that knowing about and having access to the social network can help with decision-making and inform targeted efforts to promote knowledge exchange among learners.

4. Integrating social networks into the design of CDMS: Objectives and Guidelines

Networks, generally defined as specific types of relations linking defined sets of people, objects, or events [16], provide access to learning opportunities. Those with connections have a greater capacity to leverage resources, ideas and information from the community [17]. Furthermore those with connections outside their immediate peer group, i.e. with individuals in different social positions, power or expertise, are able to broker these relationships towards securing access to further opportunities, external information, and knowledge gathered by others in the community [18][19].

Our approach is that by focusing on the social network dynamics (SND) within CDMS, user experiences may be designed that have a significant impact on:

1. The *number* of connections between network members;
2. The *value* derived from user experiences in the network in terms of helping users meet their objectives efficiently;
3. The *attitude* and *behavior* of users, with respect to pro-active knowledge exchange and collaborative involvement.

We anticipate that making visible, explicit and meaningful to users the value of the network may affect user motivation and levels of engagement. Such a system would provide not only information and resources related to competence development, but also map the network of people who produced or use the information.

The design of such systems should include the following principles: greater efficiency, more usable information, increased cohesiveness, more productive user exchanges, and higher user involvement.

4.1 Greater Efficiency in the Navigation Process

As online curricula multiply, users are faced with many options and often find it difficult to gain an overview of what is relevant and what is not. The most common navigational tool is a search engine intended to help users identify quickly the most relevant information. Depending on how the information is organized and the sophistication of the search query, the process may be quick or it may involve a tedious sifting of valuable from less valuable information. Additionally, representations of relationship networks such as those among people (P2P) and between people and competence development programs (P2CDP) can provide enhanced navigation within the system, by having learners use other learners as pointers toward resources and learning opportunities. To date, a network or community is represented mainly in the form of a directory. More innovative and dynamic approaches may be used to link knowledge and knowledge resources to the people who possess and use them.

4.2 More usable information

Knowledge work that focuses only on the retrieval of information from repositories will largely ignore a large part of knowledge that is not present in documents, i.e. *experiences, social knowledge, and know-how*. Within a network community, the experience of others serves as a filter for identifying the most appropriate and “tested” learning paths [20][21]. CDMS users may identify other users with similar learning objectives or users who have already achieved their targets, and seek advice and recommendations that are based on actual practice.

4.3 Increase the cohesiveness of group relationships

Social networking is a natural means for individuals to get to know others in their field and to seek out knowledge. Fostering networking processes and maintaining and strengthening ties within groups help reinforce the glue with which a community is bounded together [22]. Communities marked by higher levels of cohesiveness also exhibit higher levels of trust [23]. Research has shown that trust is a key factor to the development and maintenance of groups and communities [24][25]. Companies themselves recognize the importance of the “water-cooler” for facilitating interpersonal relationship building, the formation of both strong and weak ties, the development of trust, and the transfer of knowledge [26].

4.4 Stimulate productive exchange

Cooperation is powerful if it leads to the leveraging of resources, ideas and information towards fulfilling ones personal and professional goals. Peer interactions can lead to emergent knowledge [27], stimulate reflection, improve self-esteem, commitment to work, a sense of belonging and higher levels of participation [28]. Collaborative activities may also bring in a higher-level discourse which includes the exchange of ideas, explanations, justifications, speculations, inferences, hypotheses and conclusions that lead to more productive exchange and new learning [29]. As Woolcock notes, “*the latest equipment and most innovative ideas in the hands or mind of the brightest, fittest person, however, will amount to little unless that*

person also has access to others to inform, correct, improve and disseminate his or her work” [30].

4.5 Higher user involvement

Through social and collaborative experiences, individual learning may be extended to what one might accomplish alone [31]. Constructivist principles positions the learner in an active role, and responsible for not only in ones own learning but influencing the learning of others as well [32]. The challenge to community design remains with how to potentially transforming passive learners who receive of pre-packaged learning courses and activities into active contributors to the knowledge space.

5. TenCompetence- Building the European Network for Lifelong Competence Development

TenCompetence is a large, multi-year, research project-in-progress sponsored in part by the European Commission. The project aims to establish the most appropriate on-line and open-source technical and organizational infrastructure to support individuals, groups and organisations within Europe in lifelong competence development.

The project provides an ideal context for research and experimentation related to the enhancement of the social dimension within CDMS. As mentioned, the social dimension has been recognized as an essential component of knowledge management, with the understanding that in the absence of continued user participation, engagement and ownership, such systems will eventually become obsolete [9][10].

To avoid this, we are proposing the introduction of a number of features to enhance current CDMS. Such features range from *social network analysis and visualization tools* that facilitate communication and exchange, to more innovative approaches such as *advanced simulations* to scaffold networking and knowledge exchange behavior, and to the use of *stimulus agents* acting on user models to propose networking choices and to highlight cooperative opportunities. Additionally, *policies of self-organization* (terms of use, standards and quality, reward system, membership/ role) will be tested

to guide how users learn, share and create knowledge and support each other.

Figure 1 shows the connections between the proposed methods/tools and related design principles.

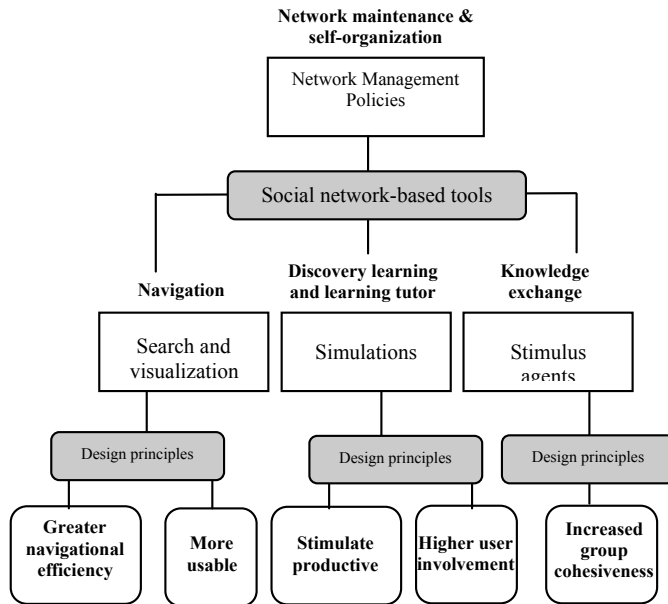


Figure 1. Social network-based models and tools and design principles

6. Proposed methods and tools

6.1 High-level visualization of social networks and competence development programs

Most existing search engines for information work off a query to present users with a list of documents. However, our objective is to test the impact of information delivered in a more interactive and dynamic form such that it reflects the structure of underlying social networks. Additionally, searching for individuals is equally important as these represent the source of ‘tacit’ knowledge oftentimes missing from a list of documents.

To this effect, interactive visualizations of the people and processes (who is interacting with who and on what) will assist in making the CDMS space more tangible and easier to navigate [33]. These visualizations will present knowledge as a web of connections which users may explore and discover. They will also include a very synthetic and rich view of useful and usable

information, be adapted to user profiles and current learning objectives, and open up opportunities for collaboration and community building. Technologies similar to Kartoo [34], a metasearch engine with visual displays and other open source software (Touchgraph [35], Inflow [36], etc) may serve as exemplars.

We anticipate the visualization of networks to enable greater efficiency in navigation (see section 4.1), to include not only navigation toward relevant knowledge resources, but also towards knowledge bearers (see section 4.2).

6.2 Games for promoting discovery, socialization and collaborative behavior

Simulations, in the form of games, provide a learning-by-doing approach [37] that may guide users toward discovering the social network structure and networking opportunities within the CDMS. Serious games have been in the market for a number of years, and have played a significant role in training activities in certain sectors, notably those in defense and aviation. Driven by falling technology costs, rising technological capabilities and changing attitudes of users, serious games are quickly moving into other sectors as serious tools with business relevance [38].

Within the educational contexts, games have been successfully and extensively used to develop the competencies of managers, engineers and decision-makers in top business schools (such as MIT, Stanford, etc.) in managing change and innovation in different types of organizational contexts [37][39].

A concrete example of a learning experience which can be classified as a *SmallWorld Simulation* is the ‘EIS Simulation’ [40][41] which has been widely adopted over the last few years to substitute or complement traditional ways of teaching change management competencies to engineering and management students, as well as to experienced executives.

The objectives (see Figure 2) of such simulations are to:

- Gradually increase the level of **familiarity** of each user with a specific space or feature of the overall system:
- Increase the **value perceived** by each user from using the system by locating and

suggesting the ‘exploration’ of valuable spaces, knowledge assets and members: and

- Gradually increase the level of **participation/involvement** of each user.

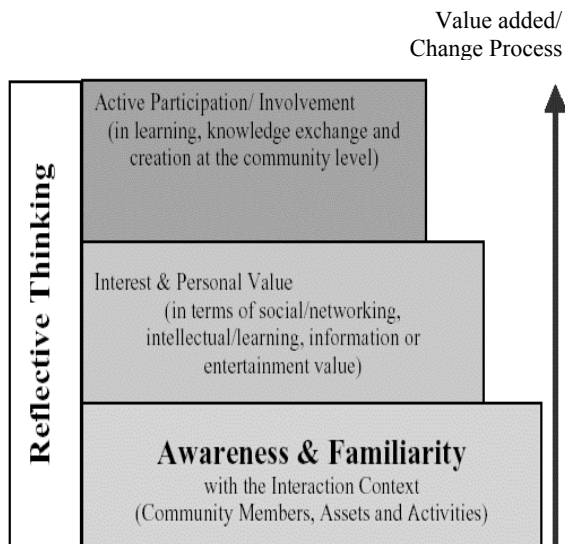


Figure 2. Change Process within Simulated Games

Based on the EIS simulation, we propose developing a similar simulation-based learning experience for CDMS users. This simulation will consist of a network of professionals within a field, with simulated characters, each with a competence profile as well as connections to competence development opportunities. Users playing the simulation will be given a mission that will launch them into an exploration and experimentation with social network space and its features.

We anticipate the impact of the simulations to be three-fold:

- Users will become familiar and adapt to the virtual environment. They will do so by gaining an understanding of social networks, developing navigation skills, and discovering system spaces and their communicative and collaborative features.
- Users will undergo socialization on a continual basis as the simulation assists them in forming connections among people.
- The gradual adoption of ‘desired’ behavior, i.e. transforming users from lurkers to active contributors.

These games will be designed with the intent of stimulating more productive exchange (see

section 4.4) and higher user involvement (see section 4.5) by scaffolding users’ social and knowledge seeking experiences within the network.

6.3 Stimulus agents based on Social Network Analysis tools

According to Cohen and Prusak, “*knowledge flows along existing pathways in organizations. If we want to understand how to improve the flow of knowledge, we need to understand those pathways*” [42].

Social network analysis (SNA) is a method for collecting, analyzing and presenting data about patterns of relationships among people and knowledge flows within a network [43][44]. As a knowledge management practice [45], SNA has been used to study knowledge flows [46], the emergence of groups and the quality of their social relationships [47], as well as collaboration, innovation and knowledge diffusion [48][49].

Data from SNA may be leveraged to accelerate the flow of knowledge and information across functional and organizational boundaries; to identify the thought leaders, key information brokers and bottlenecks; and to identify opportunities for increasing impact by increasing flow.

Stimulus agents will act on SNA data as well on information from user profiles to generate interventions to stimulate the participation of users [50][51]. Agent interventions may include suggesting connections among users, setting up groups, closing the gaps in people’s knowledge of other members’ expertise and experience, and strengthening the cohesiveness within existing teams [52].

These agents will serve as knowledge exchange facilitators, working towards increasing the cohesiveness of group relationships (see section 4.3).

6.4 Policies for managing the network

The practical measures discussed thus far all support users in deriving more value from the network by fine-tuning their attitudes and behavior. But what if users do not comply? By serving one’s own personal goals, the network as a whole may suffer.

Crucially, all users are expected to contribute without necessarily receiving an immediate

payback, although in the long run, they should expect to be compensated. This expectation is only born out if it is rational for an individual user to contribute without immediate payback. The user's decision will therefore be influenced by the following considerations:

- What is the expected value of the payback?
- What is the time-lag between the investment and the payback?
- What is the expectation to be paid back at all?

The ability to gauge these expectations depends on the *transparency* of the network. As an investor of time and effort, a user should be able to quickly estimate the *quality of the network*, the *speed with which queries are resolved*, and the *likelihood of being helped at all by peers*. Visualization tools, games, and user agents all help users to better make these assessments.

However, it is the *values* of all three that ultimately determine someone's decision. These depend on the collective behaviors of all users [53]. Powerful drivers to stimulating high quality contributions include community norms and gains in reputation [54][55].

Accordingly, a variety of management policies will be explored [29]:

- Adopting some means of rewarding (or punishing) users whose behavior is conducive (or detrimental) to network survival
- Forbidding anonymity to reveal free-loaders, i.e. those who take without ever contributing
- Adopting some, not necessarily monetary currency to measure and compare users' contributions with respect to their value for the network

These and similar policies, the details of which depend on the network's precise configuration, are the ultimate drivers behind a network's capacity for self-organization.

7. Conclusions

A community thrives not only on its resources, but also on the relationships among its members. However, the emergence of a community of knowledge workers within which members actively exchange and create knowledge remains a major challenge within online competence

development and management systems. We address this challenge through a social-networks based approach, focusing on the connections between people and supporting knowledge exchange activities once these connections are set up.

At the current stage of the TenCompetence project, no empirical studies exist for the set of tools illustrated. Next steps will include developing a complete framework to describe the effects and interactions of these tools toward the adoption of pro-active networking and knowledge sharing behavior. We envision that such a framework will be modeled as a *change process* in which users become increasingly more invested, self-organized and self-directed in their knowledge-related activities.

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