

# Enhancing Social Interaction in Competence Development Networks: A Conceptual Framework

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## Enhancing Social Interaction in Competence Development Networks: A Conceptual Framework

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**Abstract:** This paper addresses the challenge of enhancing social interaction through value-added connections among online community members engaged in knowledge exchange. We report on our exploration of three types of connection dynamics: (1) features enabling network members to visualize and browse through relationship networks, (2) intelligent agents and (3) innovative game dynamics aimed at stimulating the identification and establishment of value-adding connections between users and knowledge assets, individuals, groups, and communities. We describe here how such dynamics could be embedded in lifelong competence development networks.

**Keywords:** connection dynamics, intelligent social agents, connection games, network visualization, lifelong competence development, knowledge management, virtual communities.

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## **1 Introduction**

Stimulating knowledge exchange in on-line communities is a challenging task. Even if the system's repository contains many knowledge assets and has a large user community, it is still difficult to connect individuals to relevant knowledge assets and people. Better search capabilities were the most frequently cited improvement requested by IT professionals in a recent survey about their on-line community experience (King Research, 2007). Other areas for improvement included full-time moderators, whose role includes connecting people to content or people to people, and resident subject matter experts. Furthermore, in one consulting firm which strongly encouraged the use of its computerized knowledge repository, managers asked to describe information sources important to the successful completion of their projects immediately and spontaneously named specific people and almost never mentioned the repository (Levin and Cross, 2004). These findings strongly suggest that people prefer to obtain information from other people rather than documents. In addition, social learning processes based on human interaction are necessary to transform information into knowledge (Sawhney and Prandelli, 2000). Nonetheless, the vast majority of knowledge management systems fail to thrive because they do not take sufficiently into account the emotional, psychological and social needs of individuals. Thus one of the main trends today is to extend traditional knowledge management functionalities with new features which build on 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).

Knowledge exchange is particularly valuable in situations where feedback and advice from others is key, such as competence development, where people need access to knowledge and unbiased people to help them reflect on their current competences, learn which functions or jobs are within their reach, and explore the possibility of learning new skills or working in a new field. The application context considered in this paper is linked with the TENCompetence Integrated Project funded by the European Commission's 6th Framework Programme (Koper and Specht, 2006), where the focus is on interactive on-line systems supporting competence development networks and providing individuals interested in extending their competences with an overview of competence development opportunities (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 main challenge in this type of system is to (i) provide sustainable value to users, and at the same time (ii) stimulate users to contribute their knowledge, insights and experiences on a continuous

*Title*

basis. In order to address (i) and (ii), 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 about here]

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 and familiar with 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 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.

One way to increase user value is to help them connect with relevant people. New social ties can help one discover opportunities, sharpen one's own thinking, and provide links to new communities. Connecting people increases the number of their social ties which increases their social capital. At the organizational level, communities of practice improve organizational performance by developing and maintaining social capital among community members (Lesser and Storck, 2001). Connecting people also allows them to fulfil their needs for being, knowing, building and ensuring. Contact with other people is a basic human need (Maslow, 1987). In addition to accessing knowledge, people need other people to build personal and professional projects. Increased "connectedness" helps generate ideas, especially from connections with creative people and people in other disciplines (Sawhney and Prandelli, 2000; Fliaster and Spiess, 2008). People also now wish to increase their connectedness in order to ensure their future. As we often hear that most new jobs come through new contacts, we seek to increase our number of professional contacts as a sort of unemployment insurance. Thus the desire to acquire a large number of connections might now have even more to do with our basic need for safety than our need to belong. In order to support users in competence development networks, we have identified four distinct domains in which users' 'connectedness' can be gradually enhanced in a significant way via the establishment of new connections or the strengthening of existing ones. These four distinct domains determine a structured context for injecting different connection dynamics in the system.

[Figure 2 about here]

## *Title*

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, as well as on their personal profiles), (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 this paper, we report on our exploration of three specific connection-enhancing features and dynamics: network visualization and navigation tools, agents and games, and describe how they could be embedded in lifelong competence development networks. 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, innovative game dynamics contribute to the development of rich exchanges within and across community members via learning-by-doing experiences. These connection dynamics are aimed at helping users move efficiently through the four phases of the competence development lifecycle, providing them with 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 and at the same time contribute to the community by pro-actively sharing their experience and the expertise they have developed over time.

The remainder of the paper is structured as follows. In the first section we describe the network navigation features which we are adding to help users make sense of the social network, the CDOs and their connections. In the following section we describe how connection agents and game dynamics can enhance the connectedness of users. Next we describe in more detail the original connection games we are currently developing. We then provide two usage scenarios which illustrate how these connection-enhancing features and dynamics could be used in a competence development network. We conclude with a discussion of the specific research questions which we are exploring further.

## **2 Network Navigation Functionalities**

A competence development network can be expected to contain a huge amount of data about knowledge assets and people in addition to an abundance of links between them. To find relevant information in such a network, more sophisticated techniques are needed to aid the search process, as well as visualize the data. Network visualisation refers to a set of techniques commonly used to provide graphical and often interactive ways to tackle the complexity of a networked structure, i.e. a collection of nodes (representing ‘objects’ or ‘actors’) and edges (representing ‘relationships’ or ‘linkages’ between these objects). Networks can be used to represent individuals, teams, or organizations and their communication patterns (Wasserman, 1994), individuals and their attributes (Heer and Boyd, 2005), knowledge assets (as nodes) and the topics they share (as ‘qualified’ edges), as in many current Web 2.0 platforms, and combinations of some or all of the above, as in the recent Knosos platform (Coenen et al., 2006). We are following such a hybrid approach as our networks are composed of knowledge assets (CDOs, learners, competences, tags...), learners, and typical relationships such as ‘addresses’ (between a

### *Title*

competence node and a CDO node), ‘describes’ (between a tag and a CDO), ‘has undertaken’ (between a learner and a CDO), or ‘is my friend’ (between two learners).

We are also identifying which features, among the ones commonly developed in navigation modules, are particularly suited to a competence development context, and which ones need to be added to help learners make sense of the social network, the CDOs and the connections between them. Finding the most central nodes (the most commonly referred to by learners) in the network can be the first of these features. The centrality of a node can be seen as a measure of the quality of a CDO, which can therefore help newcomers focus on these highly-sanctioned items. This feature can be coupled with a possibility to specify a node as a central node, thus providing a starting point in a quest for a relevant CDO that can be displayed again at any time.

Filtering features can also help reducing the complexity of a network which may intimidate newcomers. Both qualitative and quantitative filters can be applied, in order to display only the nodes matching a given criterion, the relationships matching a given criterion, or a combination of them. Learners can thus decide to display only the CDOs containing a particular word in their description. They can also apply filters on the relationship, to find all the CDOs addressing a given competence. Later, they will be able to display, for instance, CDOs that address one particular competence and that have been undertaken by someone in the immediate network of the learner. Singling out relevant CDOs is of course only one of the ways to create value out of the networked representation. Learners can also make use of these features to extend their network and to get in touch with their peers, by identifying who is looking for the same competences in their network, or who, in the networks of each member of their networks, knows about a given competence.

The key contribution of network visualisation techniques is their ability to visualise and support interaction with complex and interrelated data. Different sources of qualitative and quantitative information can be included in a graph, such as the type of a node, the number of its connections, and the type of these connections. Various graphical representations can be used to convey these dimensions, including variations on the size of the node, a colour scheme, or a shape. In a competence development context, CDOs that are consistently rated above average by their users could be displayed in green, while the ones which do not seem to encounter success could be displayed in red. Similarly, green arrows could be used to point to CDOs addressing competences that are required to undertake the current CDO in proper conditions, while blue arrows could connect CDOs with related competences. We might also wish to visualise the historic evolution of the network over a long period. This could allow users to identify new competence development opportunities as opposed to competence development opportunities which may have been used extensively two years ago but that have not seen much use recently.

Visualization adds value to users by helping them find patterns and unexpected relations in data. For example, visualizing social networks helps people make sense of the mass of potential relations they observe (Krackhardt and Kilduff, 1999). Network visualization can also be used to link people with their contribution to knowledge assets. People can evaluate the “willingness to help” and subject matter expertise of individuals by seeing if they make contributions to knowledge assets and by judging the quality of their contributions. In addition, social network visualization also effects how others perceive your social network and thus impacts their impression of your power and reputation.

We are currently developing a prototype in order to validate our hypothesis that facilities to visualize and browse through a graphical representation of a network of people and CDOs are better than the flat, linear representations found in previous

### *Title*

environments as they will enable users to single out potentially valuable connections, rekindle existing ones, and ultimately create value out of the ‘ocean of possible connections.’

[Figure 3 about here]

Figure 3 shows the six executive education programmes (CDOs) at INSEAD that address the competence “Finance and Banking” (FB) including the people who have attended them. This was displayed after filling in the top query panel. We can see in the above visualization that José Pietri has attended two programmes about Finance and Banking, one of which is called Finance for Executives (FFE) and the other GIW (Global Investors Workshop). Placing the mouse over the node causes the full title to be shown. Clicking on the node opens a window which provides a short description of the programme and a link to its full description on the INSEAD website. Clicking on a person opens a window which shows their job title, company and nationality and a link to their full profile. Since José has also attended the same programme as Katrina Maxwell and Takis, either one might now feel more comfortable contacting José to ask what he thought of the Finance for Executive programme. We can also see that the programme CFSGM (Corporate Financial Strategy in Global Markets) has been attended by the most people. If we are looking for people who are interested or have competences in corporate financial strategy, we could look at the profiles of all of these people. We also notice that the MAI (Mastering Alternative Investments) programme has been attended by no-one so perhaps it is a new programme that we should take a look at it. In addition, we can also double click on any node to see its neighbours while either retaining past information or starting fresh, reduce or increase the spacing between nodes, make the nodes smaller, show arrows, and zoom in on a node.

One of the major challenges associated with network representations is their inability to display a large number of nodes. While displaying a few dozen nodes on a rather large display is both feasible and cognitively understandable by humans, trouble arises when one needs to display hundreds of nodes. In such situations, new graphical paradigms must be developed to move away from the complexity and subtlety of the network (Freeman, 2000). Kartoo for instance investigates how ‘zones’ (rectangular areas of a given colour and surface) can be used when there are too many nodes to display (Kartoo, 2007). These zones cluster the space of nodes into areas satisfying certain conditions. Mechanisms to zoom in these areas and to reveal the full complexity of the network can be devised to move from a macro-level to a micro-level and vice-versa (Tufte, 1990). Currently, we are still experiencing difficulties when the number of nodes exceeds 40. One of our solutions to this challenge is to randomly show the best 40 matches.

### **3 Connection Agents and Game Dynamics**

In order to bring life to the system and stimulate users to gradually move through the different phases of the lifecycle model, we are developing connection agents and game dynamics. Agents and game dynamics aim to bring value to the users by helping them establish “connections” in the four domains identified in Figure 2. In concrete terms, agents can stimulate users on a regular basis to review their own personal profiles and competence development objectives (Angehrn, 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

## *Title*

supporting individual and collaborative learning (Wideman et al, 2007; Manzoni and Angehrn, 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, contributing 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.

Agents can be perceived by users as virtual characters inhabiting the network and responsible for enhancing the users’ experience. 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. 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. 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 Connection Games**

We are currently designing four different types of innovative “Connection Games”:  
**Profile-related** Connection Games, **CDO-related** Connection Games, **Collaboration**



*Title*

**and Knowledge** Connection Games, and **Organizational** Connection Games to be deployed in online communities and competence development networks..

Profiles are central for each community of users engaged in exchanging formal and informal knowledge related to competence development. It is for instance there that individuals can map explicitly their experiences as well as their ambitions, providing a basis for matching as well as information and inspiration for other users. **Profile-related Connection Games** use profiles as a basis for stimulating the creation of new connections or the reinforcement of existing ones in all four domains shown in Figure 2. In particular, such Connection Games can help individuals better understand how to gradually improve their own profiles, as well as to critically re-assess and redefine their competence development objectives and plans. At the same time, through exposure to other user profiles, individuals can identify relevant users to connect with for knowledge exchange, as well as discover new CDOs. Finally, exploring profiles of other users can inspire individuals to improve their own profile, making them more attractive to other users and hence increasing the probability of value-adding connections. However, as some users may not wish to share their personal profiles, only users who choose to make their profiles available to other users will be selected to play these games.

**MutAnT** (Mutual Anonymous Tagging Game) is one example of a Profile-based Connection Game. The game is played by an agent-selected large group of users (synchronously or asynchronously) and the profiles used in the game are actually the anonymized profiles of the players themselves. When starting the MutAnT Game, the players are introduced to a realistic scenario and competence development-related challenge. This scenario is represented by the simulated department of an organization featuring a team of employees in a given professional area (from which the players will have been selected based on their experience or competence development objectives). What the players do not know is that the profiles of the employees of the simulated department correspond to those of the actual players. In this context, players (operating in small distributed teams) are challenged by the mission of selecting the three most “promising/interesting” profiles to be promoted to create a new department after the existing one is dissolved (the typical problem of “who to keep” in an acquisition and restructuring situation). In the first phase of the game players are asked to select individually the 3 employees to “save”, indicating (1) the reasons for their choice and (2) suggestions on how each one of the selected employees should be supported through a competence development plan. In the second phase of the game the results from the individual selections are aggregated. At this point all the players will be able to access the information produced by other players (particularly the one related to the individuals they selected, as well as to the profile of the employee “representing” them). Winners in the game can be then determined as the players whose profiles have been selected in the aggregated assessment, as well as the players whose individual selection best matches the aggregated group selection. Beyond achieving the same “connection” objectives as other Profile-based Connection Games we are designing, the MutAnT Game provides direct feedback related to the users profiles, and the opportunity to critically review them on the basis of the information gathered by peers to whom users have been “connected” through the game and who are therefore available for further personalized feedback.

A second type of game we are developing is a **CDO-related Connection Game** in which pairs of anonymous users simultaneously watch and annotate mutually interesting videos, winning points when they use the same words to describe a video. After the game players can decide to let the other player see their profile. This connects users to relevant CDOs and community members.

## *Title*

Developing the fundamental competences of collaborating effectively is key to the development and sustainability of the user communities of knowledge exchange networks. **Collaboration and Knowledge Connection Games** addressing the development of these competences can hence contribute not only in generating value-adding connections among players but also in increasing the overall competence of the network members to engage in value-creating knowledge sharing exchanges.

Understanding that competence development has not only an individual but also an organizational dimension is also key to helping people reflect and fine-tune their competence development objectives as well as to better understand how competences need to be continuously renewed within companies and how the process of diffusing new competences often meets resistance from people, including ourselves. **Organizational Connection Games** addressing the development of these competences are therefore a fourth type of Connection Games we are exploring to generate value-adding connections among players but also to increase the overall competence of the network members to understand the organizational dimension of competence development and the associated diffusion (and resistance) dynamics.

An overview of Connection Games currently under development at INSEAD is provided in Table 1 in the Appendix.

## **5 Inside two Usage Scenarios**

This section describes two user scenarios illustrating some of the concepts and approaches we have developed in this article.

### **5.1 Connecting People to and via CDOs**

In our first scenario we show 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 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). This is similar to the example shown in Figure 3.

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, 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”).

*Title*

## **5.2 Connecting People to People**

In our second scenario we take the viewpoint of a user who wants to explore alternative careers. Many individuals who visit the TENCompetence website in order to reflect on their current competences, to learn which functions or jobs are within their reach, or to explore the possibility of learning new skills or working in a new field will be doing so in the context of managing their own career development.

We may need to explore alternative careers at many different stages of our lives. When we are young and need to choose our first career, when we have experienced a career crisis beyond our control like losing our job due to down-sizing or de-localization, when we want to re-enter the work-force after raising children, or simply because we start to question, at any age, if we are really doing what we want with our life.

### ***User Description***

Caroline, a 46 year old professional woman, recently lost her job when her company decided to merge two business units. She knows it is not going to be easy to find another position in her field. She lives in France, a country with a very high unemployment rate. Fast approaching 50 and with two school aged children, she doubts that she will ever be able to find work in the youthful world of marketing again. Her self esteem has also taken a severe blow - was she chosen to go because she was bad at marketing? Or was it the office politics? Maybe she should also try finding a new job in another field – but what? What else could she do? What are her competencies? What jobs correspond to these competencies? And which of these alternatives would she actually like?

Unfortunately, there aren't many people with whom she can discuss her dilemma. She has to be careful, if word gets out that she was fired, she may never work again. No one wants to hire a failure, and that's what she feels like these days. In fact, she thinks it's probably best to avoid people when she feels like this – she is tired of the sympathy offered by her close friends, and she doesn't want to make use of her business contacts until she has a positive attitude, and a good story.

The kids are at school, the rest of the world is busy, and she has time on her hands. She makes a cup of coffee, turns on her computer and googles “lifelong competence development”.

### ***First visit – Building Awareness***

One of the websites she comes across is the TENCompetence website – where she is greeted by a “Personal Development Agent” that we'll call Wendy. Wendy asks Caroline if it is her first visit to the site. On learning that it is, Wendy gives Caroline a very quick overview of the site. She then asks Caroline to click on the option below which interests her most.

- A. Keep up-to-date with developments in field of expertise.
- B. Reflect on current competences in order to know which functions or jobs are within reach.
- C. Improve proficiency level in a specific competence
- D. Explore the possibility of learning new skills or working in a new field

Caroline chooses option B. Wendy explains to Caroline that in the “reflection” phase she will create her “Professional Identity Profile” (Maxwell et al, 2007). This profile will initially be made up of four parts.

- A personality test which measures basic but implicit assumptions about what is desirable and possible in our lives and in the world.

### *Title*

- A “career anchor” survey to determine the competencies, preferences and work-related values that we would be unwilling to give up.
- A “life experience” survey to provide details about the jobs (and other related activities ) we have already tried, and what we liked and disliked about each of them.
- Other basic information such as education, age, sex, nationality, and language(s).

By completing her profile, Caroline will not only learn more about herself, she will also be able to learn what jobs people similar to her (i.e. with her basic and work-related values) have or have not found satisfying and why. This should give her some good ideas about alternative careers.

Caroline can then contact the people behind the jobs (and comments) that sound interesting to her in order to learn more about their experiences. She can also use further narrow down the career list, using network visualization and navigation tools, to show only the careers, for example, of “all women in France, between 45 to 55, who share her values”. Since they share the same values, live in the same country, and are at the same point in their lives, it is very likely that these women can provide some useful advice. Caroline may even find a good role model in this group. Of course, Caroline is not limited to contacting people with her values – this is just to help narrow down initial job ideas. In addition, if Caroline desires to discuss her test results face-to-face with a real person, she can also use the TENCompetence site to find a career counselor.

Wendy asks Caroline if she would like to start creating her Professional Identity Profile. She tells her that her true identity will never be revealed to anyone without her permission. Wendy helps Caroline log-in to the system in order to create her private space.

### ***Moving from Awareness to Interest***

Every time Caroline visits the TENCompetence site she is greeted by Wendy. Wendy encourages Caroline to complete each part of her Professional Identity Profile. As Wendy learns more about Caroline she will be able to help her connect to different information resources and people.

### ***Moving from Interest to Trying/Engaging***

Caroline has now completed her profile, learned a lot about herself, and has some good ideas about alternative careers that she would like to explore. She also feels less depressed and socially isolated. Wendy told her about a “Fired and over Forty” forum. Via this forum she has made a couple of new friends in her situation and they keep each other up-to-date on their progress and mutually encourage each other. It is nice being in contact with others in her situation.

Wendy also told her about a young person who wanted to work in marketing who was looking for someone to give him a mock interview. Caroline has experience in this area, likes to help others, and does have some extra time, so she agreed to do this. Plus she might like to have some mock interviews herself later! She interviewed the young man via Skype’s video-conferencing facility, and gave him some feedback that she hopes will help him improve his story. Wendy has added him to Caroline’s “helped” list.

Wendy has also prompted Caroline to add a list of possible careers that she is interested in exploring to her Professional Identity Profile. When Wendy found out that Caroline was interested in jobs in public relations, she directed Caroline to CDOs that could help her learn more about this area. In addition to pursuing this idea with her real-

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life contacts, Caroline is also using the filtering options on the site to find people who have recently worked in this area, for example “Anyone over 40 who has worked in public relations in the last two years”. For now, she is curious to see what type of background they have, what type of public relations they do, what books they recommend, and what groups they belong to... maybe later she’ll even contact one of them and ask for advice. For the moment she just adds links to interesting profiles to her “potential contacts” list. On another occasion Wendy will ask Caroline if she would like her to contact some of these people on her behalf.

### ***Moving from Trying/Engaging to becoming Actively Involved and Connected***

One day when Caroline logs into the site, Wendy asks her if she would like to participate in the “Convince Me” game. In the anonymous version of the game, people who want to work in a field try out their stories – a short explanation that links what you have been doing with what you want to become – on people who work or have recently worked in that field. Each judge reads the story and votes yes or no. They are also asked to give a few reasons for their decision. In the non-anonymous video version, people make a video of themselves selling their story. In the video version participants not only receive feedback about their story, but also about how they have presented themselves. People “win” when they have a story that convinces all the judges.

As a contestant, Caroline decides to try out her “marketing to public relations” story in order to receive feedback about how it can be improved. For the moment, she does not want to appear in video herself; however, she decides to judge some video version contestants who want to work in marketing. Later Caroline decides to contact one of the contestants to see how they are getting on.

## **6 Conclusions and Further Research**

In this article we have motivated and presented three specific connection-enhancing features and dynamics: network visualization and navigation tools, connection agents and games, that 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 knowledge exchange network.

Network visualization and navigation tools which enable users to switch from “linear” to “network”-based models, through the deployment of visualizations of dense social and knowledge networks representing relationships between people and different types of knowledge assets (competences, learning objects, competence development programmes, CDOs, etc.) have a very high potential value. Nevertheless further research is needed to resolve a number of representation and complexity-related challenges.

Connection agents operating dynamically and proactively with the user community suggesting and creating value-adding connections among users and between users and relevant knowledge assets and community activities are a second high impact domain we have identified. However, the mechanisms regulating the intervention dynamics of such agents throughout the Competence Development Lifecycle, and how such agents can gradually develop a trust-based relationship with users (agent acceptance challenge) needs to be explored further.

Finally, the design of engaging game-based dynamics as a way of strengthening and extending social networks is the third promising research area we have identified. Next

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steps include evaluating and fine-tuning our games and tools using an action research methodology and data triangulation (electronic surveys, interviews and system log files) in order to guarantee (a) their acceptance by users, and (b) the effective value created through the involvement of games at the individual, group and user community levels. In addition, further research is required to explore in detail the inter-play between games and agents intervening before (players selection), during (involvement stimulus), and after (reflection/game experience debriefing stimulus) the competence-related connection games.

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.

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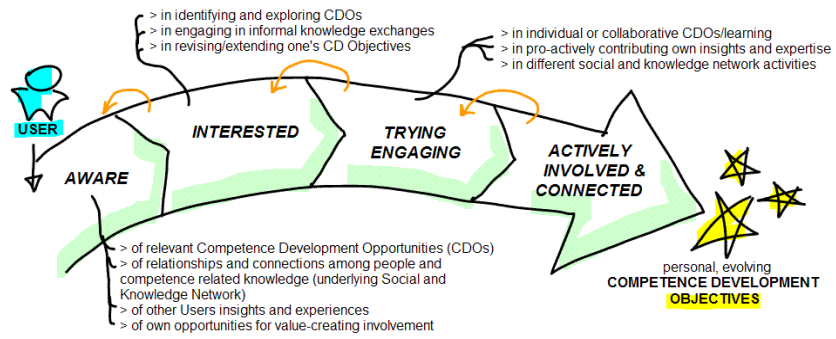
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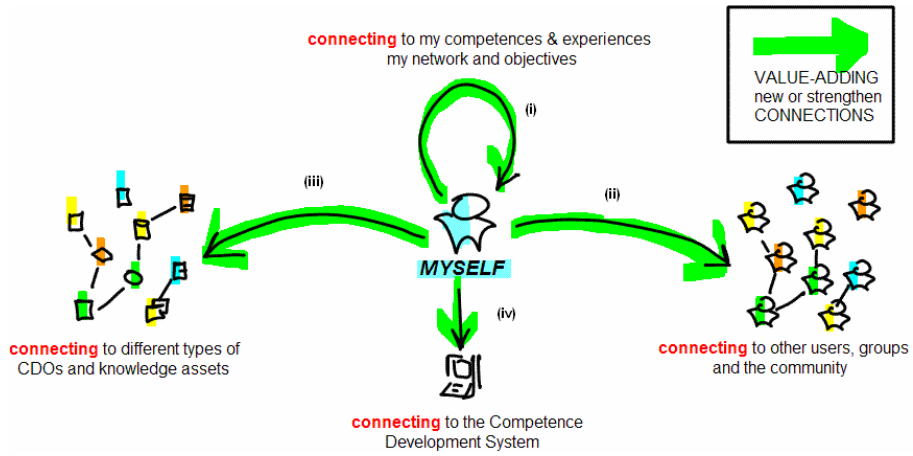


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**Figure 1** Competence Development Network Lifecycle (User perspective)

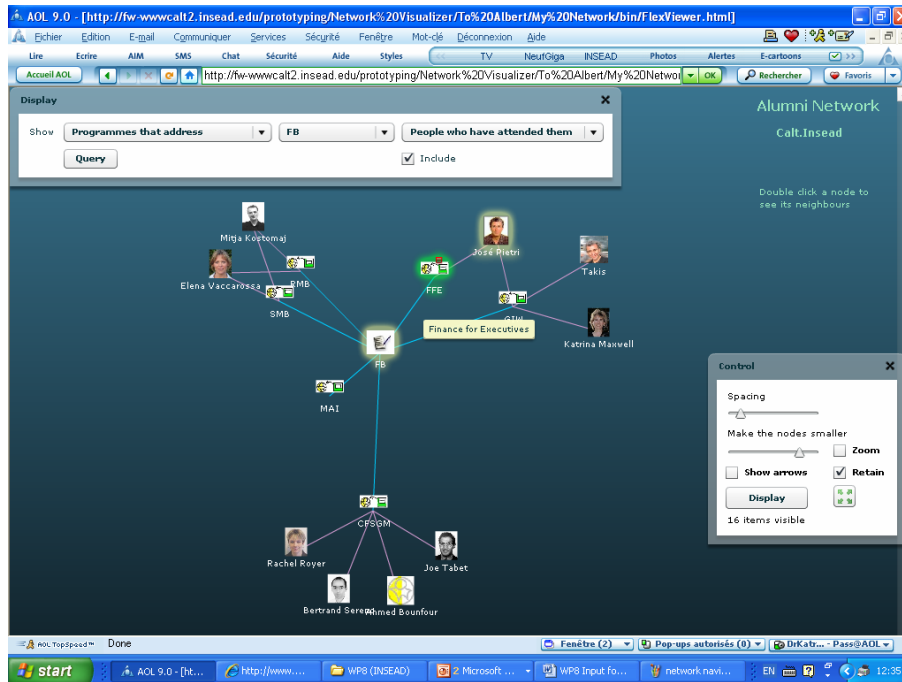


**Figure 2** Four Domains for Connection-Enhancing Embedded Dynamics



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**Figure 3** Network Visualization and Navigation Prototype developed at INSEAD



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**Appendix: Table1 Connection Games under development at INSEAD**

Connection Game Name	Summary of Gameplay	Connection Targets Achieved
<p>“<b>ProfilAMat</b>”: Profiles Annotation and Matching Game</p> <p><b>Type:</b> Profile-related Connection Game</p>	<p>In this game, played in parallel by pairs of anonymous users over the Internet, users get exposed to different Profiles from other users (including their own) and have to provide annotations/ remarks about the profiles until they match, in a similar way as in the <i>ESP</i>, <i>Verbosity</i> and similar successful internet-based matching games (von Ahn and Dabbish, 2004; von Ahn et al, 2006).</p>	<ul style="list-style-type: none"> <li>- browse through and reflect about relevant profiles</li> <li>- gather annotations related to profiles and provide feedback to existing profiles</li> <li>- provide opportunity to identify relevant community members</li> </ul>
<p>“<b>Convince Me</b>”: Profile Judging Game</p> <p><b>Type:</b> Profile-related Connection Game</p>	<p>In this game, played individually over the Internet, users who want to work in a field have their stories, and/or video presentations, judged by other users who work or have recently worked in that field.</p>	<ul style="list-style-type: none"> <li>- browse through and reflect about relevant profiles</li> <li>- provide feedback to existing profiles and on judging capability</li> <li>- provide opportunity to identify relevant community members</li> </ul>
<p>“<b>MutAnT</b>”: Mutual Anonymous Tagging Game</p> <p><b>Type:</b> Profile-related Connection Game</p>	<p>This game is played by a group of users, whose personal Profiles are anonymized and then associated to virtual characters populating the department of an organization which has to be downsized (only 3 can be retained). Players have to first individually and then jointly decide which 3 to retain, explain their choices and try to guess which 3 will be retained by the group of players.</p>	<ul style="list-style-type: none"> <li>- connect to other users with relevant profiles</li> <li>- connect to how others “assess” and comment their own profile anonymously</li> <li>- connect their own competence development plans with the ones others would advise</li> </ul>
<p>“<b>TENTube Game</b>”: Video Annotation Game</p> <p><b>Type:</b>CDO-related Connection Game</p>	<p>The “TENTube” game makes extensive use of videos to better “connect” people to competence development opportunities. It integrates rich profiling, network visualizations, connection agents and game dynamics. Examples of CDO videos are used in the game are competence-developing videos (e.g. “how to” play blues guitar or complete a CV) as well as videos featuring courses, teachers or experts.</p>	<ul style="list-style-type: none"> <li>- connect to relevant CDOs</li> <li>- annotate CDOs</li> <li>- provide opportunity to identify relevant community members</li> </ul>
<p>“<b>L2C/CDC</b>”: Learning to Collaborate (in Competence Development Contexts) Game</p> <p><b>Type:</b> Collaboration and Knowledge Connection Game</p>	<p>In this online game groups of players are engaged into an entertaining and realistic role-playing scenario in which they need to take individual, small team and large group decisions collaboratively. The performance in the game depends on their capability to reach consensus and share/combine their knowledge online using different comm. technologies, as in the collaboration- related simulations developed in the L2C Project (Angehrn, 2006a)</p>	<ul style="list-style-type: none"> <li>- connect to relevant users in a realistic organizational decision making context</li> <li>- connect to CDOs related to the fundamental competence of “collaboration”</li> <li>- connect with one own’s competence (and lack of competence) to collaborate and reach consensus with others in small teams as well as groups/communities</li> </ul>
<p>“<b>CoRe</b>”: Competence Renewal Diffusion and Resistance Game</p> <p><b>Type:</b> Organizational Connection Game</p>	<p>In this game, players operating in small teams are challenged to spread a new set of competences in a simulated organizations populated by virtual characters displaying different forms of resistance to renew and acquire new relevant competences, in a similar way as in <i>EIS</i>, <i>EduChallenge</i> (Angehrn et al. 2005) and similar successful <i>SmallWorld Simulation</i> games (Angehrn, 2006b).</p>	<ul style="list-style-type: none"> <li>- connect players to people (and to their own) resistance to competence renewal</li> <li>- connect to the reality of diffusing new competences in organizational contexts</li> <li>- connect to relevant profiles and CDOs related to the professional area simulated in the game</li> </ul>