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Contributors
OUNL, INSEAD

Authors (Partner)
Francis Brouns, Peter van Rosmalen, Adriana J. Berlanga, Sibren Fetter, Danish Nadeem, Marlies E. Bitter-Rijpkema, Peter B. Sloep, Liesbeth Kester (Open Universiteit Nederland), Katrina Maxwell, Albert Angehrn (INSEAD)

Contact Person
Katrina Maxwell (INSEAD)

WP/Task responsible
Albert Angehrn (INSEAD)

EC Project Officer
Mr. M. Májek

Abstract
This deliverable provides overall results during the last period including the theoretical validation of the network management model, policies and guidelines, complimented with outcomes of simulation, consultation of experts, surveys and experiments with students.

Keywords List
learning network, community, policies, ad hoc transient communities, sociability, validation, guidelines
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1. Overview

The emergence of self-organizing communities within which members are self-directed and actively share, negotiate and create knowledge in a lifelong learning context remains a major challenge. The focus of WP8 is mainly on the social network dimension of competence development and management systems and in particular seeks to provide personalised support in all stages, from the identification of relevant competences to the choice of the appropriate competence development approach, to the sharing of community-resources and experiences within the learning network. The main objective of WP8 during the period from June 2009 to November 2009 was to:

1. Validate the results of policies to stimulate self-organisation and the feeling of autonomy in a network (ID8.17).

This objective builds upon work presented in Chapter 1 of D8.3 – Policies to stimulate self-organisation and the feeling of autonomy in a network.

As the Social Help Portlet was not available in time, the policy model was validated on a prototype that has been extensively tested and used by students. In fact, both the Social Help Portlet and the Goal Orientation Portlet experienced considerable delays in development and were not completed until December 2009. Thus a great deal of WP8 effort during the last 6 months of the project was used to complete the two portlets. These portlets are described in D8.3.

Finally, a version of TENCompetence Tube called GMPTube was piloted in the General Management Programme (GMP) at CEDEP - the European Centre for Executive Development. Participants were executives with 8 to 10 years of management experience and with international and general management responsibilities. This experience has allowed us to identify three main barriers to Web2.0 inter-organizational learning and collaboration in executive education: technological barriers, motivational barriers and the inter-organizational aspect itself. Interestingly, although the short exposure to GMPTube did not trigger the desired learning-orientated motivation, executives from three large companies in the biopharma, media and industrial sectors have expressed interest in applying it internally in their companies as a way to connect marketing people, creative people and IT professionals respectively, rather than using it to exchange knowledge with classmates. More details about this pilot can be found in D4.6.
2. Validation of Policies to Stimulate Self-Organisation and the Feeling of Autonomy in Learning Networks

2.1 Policies and guidelines

Shaping Learning Networks as a community of people who share a common interest to learn something about a certain domain will reinforce learning. Or put differently, when we can reinforce the social ties between people in a Learning Network, we can promote active participation and provide a more effective and efficient learning process (Bitter-Rijpkema, Martens, and Jochems, 2002; Sloep, 2008; Koper and Sloep, 2003). So, through active participation in the community the learning goals people have set for themselves will be attained more effectively, more efficiently, more attractively; or, put differently, reshaping a learning network as a community enhances the quality of the members’ learning experience. In order words, a learning network should self-organise such that a community emerges. To achieve this, several conditions must be created to allow emergence of community and self-organisation to arise. These conditions could be summarized into policies to stimulate self-organisation. Based on existing theories and looking at communities, we distilled the main factors and developed the model of ad-hoc transient communities.

At the same time, community characteristics are set by proximate and ultimate goals of the learners. The ultimate goal or learning goal is becoming more proficient in a certain domain. The proximate goals deliver the means to this end, and can be seen as the immediate actions learners engage in. This involves the member to take on different roles. So, although we assume that every Learning Network member has approximately the same ultimate goal, they all obtain this goal via different proximate goals.

The main characteristics of effective communities evolve around social space and social interactions (Kester et al., 2006; Kreijns, 2004; Nichani, 2001; Rovai, 2002), next to a clear boundary (Kester et al., 2006; Weber, 2004), common goals, rules and sanctioning mechanisms (Kollock & Smith, 1996; Koper & Sloep, 2003). Another characteristic is the heterogeneity of the community population and the different roles each of the members can take.

Sociability and interactions do not arise spontaneously. However there are several short- and long-term motives for learners to collaborate and thus initiate interactions (Kester & Sloep, 2009; P. Sloep & Kester, 2009). There is sufficient proof that learning benefits from social interaction e.g. in collaboration and learners also feel less isolated, which is beneficial for the learning process. Because learners engage in social interactions with others, they get to know those others as well. This builds up trust between people, but also creates a knowledge network they can rely on in other situations (Bitter-Rijpkema, Martens, & Jochems, 2002; P. Sloep & Kester, 2009; P. B. Sloep, 2008). And by helping out others, people increase the chance of receiving help in return (P. Sloep & Kester, 2009).
In addition, it is important that learning network participants build up trust. Without trust, interactions are not sustainable. Trust between people is built in various phases and encounters. The first encounter can set the stage. Reputation, as indicated by indirect experiences or what other people tell about a person can influence this. Bitter-Rijpkema (Rutjens, Bitter-Rijpkema, & Crutzen, 2003) and Rusman et al. (2007) emphasize the relevance of background information on personal identity and expertise to provide a foundation for effective knowledge communication and (swift) trust. Bitter-Rijpkema (Rutjens et al., 2003) designed an easy-to-use template for community members to introduce themselves and their expertise; it also allowed them to give relevant context information and communication style preferences as a means to start further interaction. This so called pEXPi (abbreviation for personal expertise inventory or personal identity and expertise profile) was received well. It has been reused and adapted to various communities since its introduction, including various academic learning communities; the authentic virtual business learning environment OTO, a virtual software computer science company, is a case in point. Another example is the European Virtual Seminar, a community of international students in environmental sciences collaborating on European sustainability issues. More recent implementations involve the academic competence development environment (AIC) of the Master of Computer Science students at the Open Universiteit Nederland and a community of management professionals. Recently Rusman et al. (2007) investigated the value of pEXPi for trust building in a community (Meyerson, Weick, & Kramer). Students perceived the use of the pEXPi as a valuable instrument in initiating learning interaction and collaboration, contributed towards the emergence of community feeling and increased trust (Berlanga, Rusman, Bitter-Rijpkema, & Sloep, 2009; Ogg et al., 2004; Rusman et al., 2007).

Learning Networks are inherently dynamic because of the changing group composition (learners moving in and out). Only Learning Networks that are able to deal with this dynamic are able to sustain and become resilient. The social structure of a network determines resilience. A resilient network requires a large social capital and interaction between many learners. Social capital is determined by social network structure, but also by the sense of belonging participants’ experience and can be influenced by the support learners receive as well as support they provide. (Fetter, Berlanga, & Sloep, 2008; Fetter, Berlanga, & Sloep, 2009).

2.2 Ad-hoc transient communities

Ad-hoc transient communities can be seen as the mechanism to implement Learning Network policies. Ad hoc transient communities serve a specific goal, are limited in time (i.e. dissolve when the goal has been attained), and operate according to social exchange policies that enhance social embedding and knowledge exchange. They assist in the emergence of communities, but still allow individual autonomy.

The self-organisation, social exchange theory, systems, and expectation-state theories provide sufficient backing for the general principle behind the mechanism of ad-hoc transient communities. Additional support for our claims can also be found in behavioural and psychological literature on motivational mechanisms on why people
would participate and contribute in communities (Cheng & Vassileva, 2005; Erickson & Kellogg, 2000; Ling et al., 2005; Lui, Lang, & Kwok, 2002; Millen & Patterson, 2002).

To deal with the dynamics in a Learning Network, the network has to become resilient. A centralized network that evolves around a few key participants is unstable and tends to fall apart when those key players leave the network. The ad-hoc transient communities should enforce the weak ties in a Learning Network and thereby improve network structure, moving away from a centralized network. The social capital of a Learning Network is a major factor in this. As social capital is affected by social network structure, sense of belonging and learner support, it is important to have good selection criteria for matching peers in ad-hoc transient communities.

Ad-hoc transient communities have shown to improve the learner support structure. Students appreciated a question answer service build on the basis of ad-hoc transient communities: their questions were successfully answered by their peers. This however was affected by peer matching criteria: a random selection of peers was less effective (Brouns, Fetter, & Van Rosmalen, 2009; Peter van Rosmalen et al., 2006; P. van Rosmalen, Sloep, Kester et al., 2008; P. van Rosmalen, Sloep, Brouns et al., 2008). By expanding on this principle and elaborating the matching criteria this always works towards increasing the social capital of the Learning Network. It assists in connecting learners; it can increase sense of belonging and willingness to provide support because the learner experiences the benefits. Together this improves the effectiveness of the Learning Network as a whole (Fetter et al., 2009; Fetter, Berlanga, & Sloep, submitted). The matching criteria that originally have been provided by the work of Van Rosmalen have been expanded to take into account the quality of the social network structure, sense of belonging and support received and provided.

Netlogo simulations of both the learner support and the social capital functions of the ad-hoc transient communities confirm the results obtained with students and provide insight in how to improve the matching criteria.

### 2.3 Design guidelines

Following an analysis of popular existing online communities, we distinguish the following required functionality that allows users to manage, organize, and regulate resources and communities (Berlanga et al., 2009; Berlanga et al., 2008).

- **Self-management.** This is related to administration and sharing; permitting users to create their own profile, contacts, communities, networks, resources, and tags, etc.

- **Self-organisation permits users to interact and react to member’s resources:** commenting, recommending, copying, subscribing, rating, bookmarking, seeing related resources.

- **Self-categorisation allows users to classify and evaluate their own contributions as well as those of others.**
- Self-regulation allows users to control existing resources and communities: create private and public resources/communities/groups, mark communities/resources/groups as offensive.

Many of the online social network sites provide these functionalities. This was confirmed by a survey we conducted among university staff. The survey was designed to explore the use and perception of social network sites among staff, whether these could be related to requirements for Learning Networks for professional development. The survey highlighted foremost the social aspects of Learning Networks: staff expect to be able to interact with others. Learning occurs via knowledge sharing. In addition, they require facilities to organise resources, both people as learning material. Next, survey results indicated that reputation and quality of resources are important (Brouns, Berlanga et al., 2009; Brouns et al., submitted).

### 2.4 Using Concept Mapping to develop a validation model for a Social Help System in a Learning Network

One way to validate a model is by implementing a system based on it. Concept Mapping is a structured conceptualization process that provides a visual representation of relationships among ideas (Trochim, 1989). We used Concept Mapping to perform requirements analysis for the design of a Social Support System (aka Social Help System) in the Learning Network. The results provided an expert view of the features for such a system. Concept mapping provides a structured approach that supports the participants to identify the topic and get their interpretation from a group point of view. The method was selected because it can provide ideas from large and diverse groups about a given topic in a short span of time. The method in a concept mapping process involved three phases: (a) developing a trigger statement to generate ideas about the use of a Social Support System in a Learning Network; a total of 153 statements were generated from 11 different experts across 7 different countries, then (b) sorting the ideas into meaningful clusters, and finally (c) using statistical techniques like multivariate analysis (Kruskal & Wish, 1978) to generate concept maps.

We used a software tool (Concept Systems Inc, Ithaca, NY) for the statistical analysis and generation of cluster maps. After each participant has completed the task of sorting, the results of all the participants are combined. First, a similarity matrix was constructed that represented the relative similarity of participants’ sorting statements, i.e. the results of the sort for each person are put into a square matrix which has as many rows and columns as there are statements. The values of this matrix are either ‘1’ or ‘0’. The value ‘1’ indicates that the statements for that row and column were placed by that person together in a pile while a ‘0’ indicates that they were not. Second, the individual sort matrices were added together to obtain a combined group similarity matrix which is considered as the relational structure of the conceptual domain because it provides information about how the participants grouped the statements. A high value in group matrix indicates that many of the participants put that pair of statements together and implies that the statements are conceptually similar in some way. This group similarity matrix was analyzed using non-metric multidimensional scaling analysis with a two-dimensional solution, which
generated x and y coordinates in a two-dimensional space for each statement based on its mathematical similarity to other statements. Third, statements were combined into clusters using a hierarchical cluster analysis. The results of the hierarchical cluster analysis were superimposed on the multidimensional scaling results to create a map displaying the points graphically within each group, with polygonal boundaries surrounding the points in each cluster group. A hierarchical cluster analysis yields all possible cluster solutions, from each statement in its own cluster to all statements in one cluster.

**Figure 1. Cluster Map eliciting the focus on different required features of a social help system**

In the figure above, there are 10 different clusters shown, which depicts how they were grouped together by hierarchical cluster analysis. The main point of interpretation of the cluster map is that all participants come to figure out well the interrelationships among the clustered statements. It is aimed that everyone in the group has a clear picture of the project through the concept map. Furthermore, it is essential that everybody shares the sense that the concept map is their own product as a result of their collaboration-- it is an achievement based on statements that they generated in their own words and that they grouped, and the labels on the map were named by them all.
We briefly list and explain the meaning of each of the 10 clusters as depicted in Figure 1.

1. **Technical features**: Focusing the state-of-art technologies for development like web 2.0 applications and Social apps.
2. **Showing search similarity**: The feature focuses on the search options where people would like to know the search results similar to what they are looking for.
3. **Visibility**: The feature focuses on the how social help system provides visibility of learners in the Learning Network.
4. **Business application**: The social help system as a tool for collaboration for further interests and commercial interests among people.
5. **Communication among learners**: The tool supports effective sharing of knowledge among learners facilitating communication via email, instant messengers or phones.
6. **Learning community and connection among varied people**: The tool supports forming learning communities and enhancing communication among the participants.
7. **Facilitating learning and engagement**: The tool provides support for bringing people to engage on a learning task and enhance learning by social engagement.
8. **Interface design**: Easy to use features and user-interface to search for suitable people in a network of learners.
9. **Effects on society**: The overall effects on society as a useful feature for supporting learning by socialization.
10. **Output and Solution execution**: The feature focusing on additional support like finding not only people but also relevant learning resources, supporting external collaboration, other embedded support.
Figure 2. Pattern Match eliciting the expert versus non-expert opinion on the scale of importance corresponding to each cluster.

In Figure 2, we can see the correspondence between average importance (on the average scale of 1 to 5) according to the views of experts (people having at least 5 years computer science, IT as their educational background) and end-users (people using computers in daily use to perform different tasks without subject knowledge). In other words the ‘pattern match’ based on the cluster map shows the relationship between the expert view and non-expert view on similar features required for the system. It shows the estimates of the average relative importance of the ideas averaged across clusters on the map. Horizontal lines suggest relative agreement while overlapping lines suggest relative differences in expert view and end-users view. Such differences in view of experts and end-users suggest the significance of such system in their requirements.

The concept map for a social support system is also very useful in validation contexts. The map can act as a validation device to implementing the features and to evaluation of the system. For instance, while developing the social help system, the focus can be based on addressing each cluster. The rating of each cluster shows the significance of expert’s opinion on that particular feature of the expected system. In Figure 1, each cluster can also be viewed as a measurement construct for required features of the social help system.
and the individual statements within each cluster can suggest specific focus of feature development in the system. The ideas generated using Concept Mapping method (different clusters) are the upper level view of the generic system for social help. This method can be iterated over each cluster to investigate in details the specific requirements about the features of the social help system.

2.6 Software implementations

The model described above has been validated by implementing three prototypes. The first prototype consists of three main components: the LSA (latent semantic analysis) component to create the document space; set LSA parameters and query the document space; the ATL (a tutor locator) component to set the tutor selection parameters, identify suitable tutors and set-up the ad-hoc transient communities (creating communities and inviting peers); and the integration of both components into a learning network, where users find course content, a form to ask questions and where the ad-hoc transient communities are instantiated. The design and implementation of the system has been described in more detail by (L. Kester et al., 2007; Liesbeth Kester et al., 2007; Peter van Rosmalen et al., 2006; P. van Rosmalen, Sloep, Kester et al., 2008). This prototype has been extensively tested and has been used by students. Results showed that peers can successfully answer questions of others, and that the peer selection criteria to find suitable peers resulted in better results than random selections. The next prototype was implemented as PHP web application, based on the PCM services. Because the datamodel and API of PCM services did not fully support the social help application, this prototype never reached full maturity. With the decision to move to Liferay, a third prototype has been implemented as a Liferay portlet (see D8.3 for more details).

2.7 References


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