

ID8.17 - Validation results of policies to stimulate self-organisation and the feeling of autonomy in a network

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Building The European Network for Lifelong Competence Development

Building the European Network
For Lifelong Competence Development

TENCompetence IST-2005-027087

Project Deliverable Report

Internal Deliverable nr 8.17 – Validation results of policies to stimulate self-organisation and the feeling of autonomy in a network

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Abstract (for dissemination)	This deliverable provides a 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		

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Learning Networks

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. Effectively this means that a Learning Network should self-organise into a community or set of overlapping 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 characteristic 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-Rijkema, 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 about 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-Rijkema (Rutjens, Bitter-Rijkema, & Crutzen) and Rusman (Rusman, van Bruggen, & Koper) emphasize the relevance of background information on personal identity and expertise to provide a foundation for effective knowledge communication and (swift) trust. Bitter-Rijkema (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-Rijkema, & 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 the sense of belonging participants experience and can be influenced by the support learners receive as well support they provide. (Fetter, Berlanga, & Sloep, 2008; Fetter, Berlanga, & Sloep, 2009).

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's 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 tend 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 improving 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 assist 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 has 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 as the social capital functions of the ad-hoc transient communities confirm the results obtained with students and provides insight in how to improve the matching criteria.

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 own profile, contacts, communities, networks, resources, and tags, etc.
- Self-organisation permits user 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 expects 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).

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

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 Social Support System (aka Social Help System) in Learning Network. The results provided an expert view of the features for such system. Concept mapping provides a structured approach

that supports the participants to identify the topic and get their interpretation of 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 concept mapping process involved three phases (a) Developing a trigger statement to generate ideas about the use of Social Support System in a Learning Network, (b) a total of 153 statements were generated from 11 different experts across 7 different countries, the ideas were then sorted into meaningful clusters, and (c) statistical techniques like multivariate analysis (Kruskal & Wish, 1978) is used to generate concept maps.

We used a software tool (Concept Systems Inc, Ithaca, NY) for the statistical analysis and generation of cluster maps. First, a similarity matrix was constructed that represented the relative similarity of participants' sorting statements. Second, the total similarity matrix was analyzed using non-metric multidimensional scaling analysis with a two-dimensional solution, which generated x and y coordinates in 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.

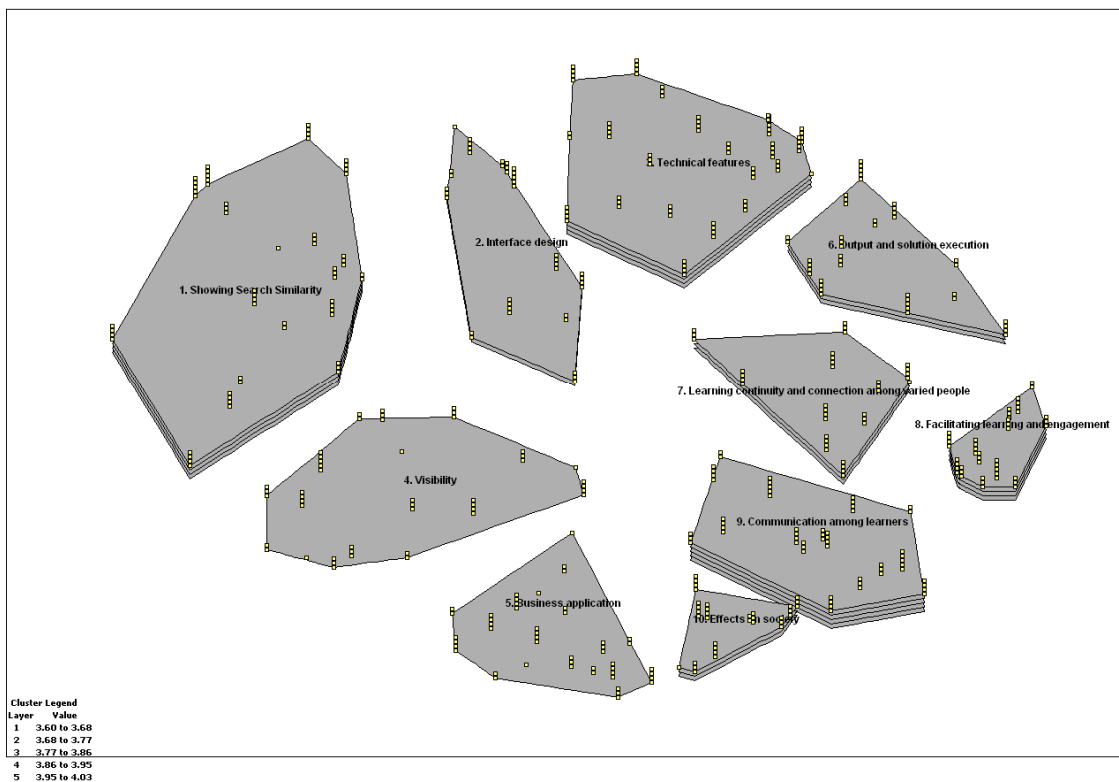


Figure 1. Cluster Map eliciting the focus on different required features of a social help system

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 community and enhance 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.

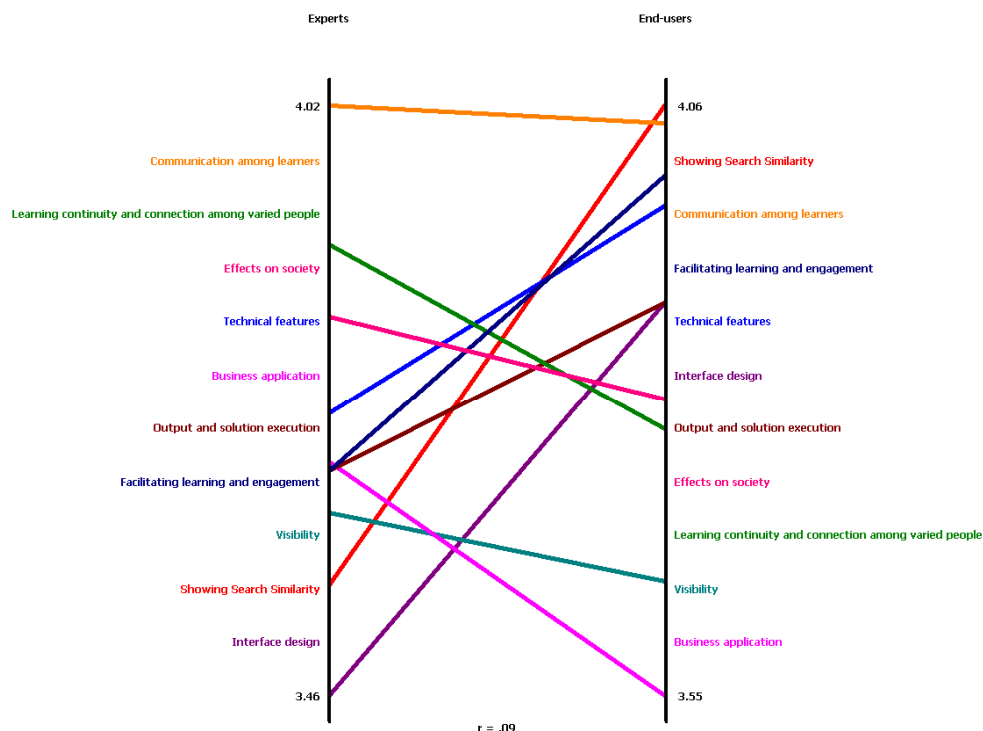


Figure 2. Pattern Match eliciting the expert versus non-expert opinion on the scale of importance corresponding to each cluster.

In the Figure 2, we can see the correspondence between average importance according to the view of views of experts (people having computer science background) and end-users (people using computers in daily use to perform different tasks). 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.

The concept map for social support system is also very useful in validation contexts. The map can act as a validation device to implementing the features and 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 experts 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 social help system and the individual statements within each cluster can suggest specific focus of feature development in the system.

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 community 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 in with 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 webapplication, 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 Liferay portlet (see Annex 1).

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Annex 1. Social help portlet

TENCompetence WP8 API

Task: Social Help API

Version: 0.1

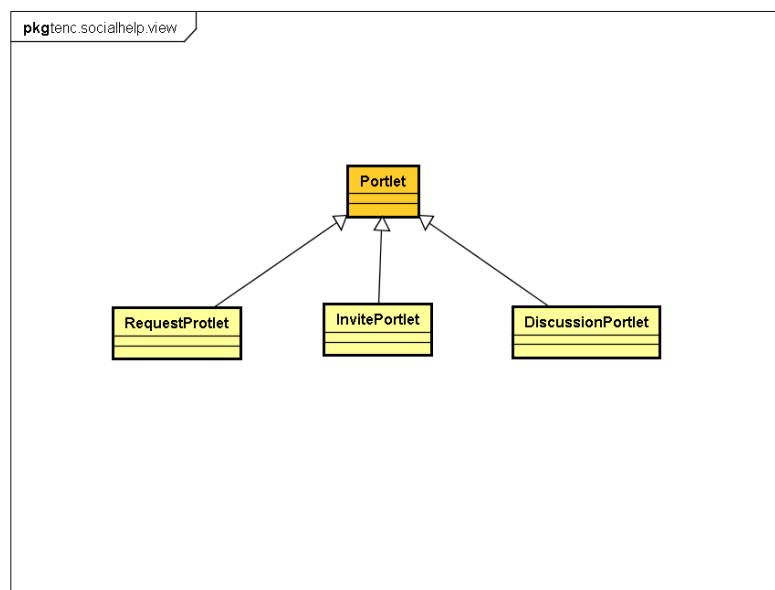
Contact: Adelina Aleksieva-Petrova, Milen Petrov - Sofia University

1. Introduction

This document describes the API provided by the TENCompetence WP8, which is responsible for management of social help portlet.

2. Activities/Portlets

This section contains a list of activities that LNUs (learning network users) may perform. These activities are split up into three separate portlets:



1. **Request Portlet** – This portlet serves requests to the system to start the social help procedure. *Request* is sent by the *LNUs* and is not visible from *LNUs*.

This portlet launch the follow activities:

- Define *specific Request* to some problem.
- Set all *LNUs* as potential *peer tutor* participating in a *Social Help*
- Launch the jobSearchSchedule Portlet

2. **Invite Portlet** – this portlet executes the search algorithm for tutor suitability. It creates a ranked list of users and selects the first two of them. Then executes the job which invites the selected peer tutors by mail. This job and task has an exactly specified time (2 days). These are persistent jobs, for which the state is saved in a database and it can be sure that those jobs won't be lost. The invitation cycle has reached completion when some peer tutor accepts the invitation.

The tutor gets an invitation by e-mail. The message contains a description of the problem and corresponding activity. The tutor may either refuse or agree to join. If a

tutor were to either accept or reject after expiration of the invitation, he or she should receive a message to the effect that the invitation has expired.

3. **Discussion Portlet** - The *Discussion Portlet* is used for holding *Discussions*. Every *Request* initiates a new *Thread* of the *Discussion*. The *Thread* consists of a multitude of *Messages* containing information about the *Request* of the respective *Thread*. *Discussions* may be added by the *LNU* with make the *Request*. *Threads* are formed when a *LNU* sends a *Message*. The *LNU* may also reply to an existing *Message*. This way he continues the *Thread*. Then it (*The Thread*) becomes a hierarchy of *Messages* – sent and replied. *Messages* have a title and contain a short text. They must also keep information about their sender and the sending date.

3. Flow of events (design phase)

3.1. Flow of events for do Request Use Case

Precondition:

The user has logged to the system and is recognized as a system *LNU*.

Main flow:

1. The UI creates a Request Processor instance.
2. The Request Processor instance is initialised.
3. The UI provides the content of the *Request*.
4. A new instance of the Request Content database object is created.
5. The Request Processor saves into the database and launches the search algorithm and job schedule for sending invitation mail to peer tutors.

3.2. Flow of events for Refuse/Agree to Participate In Discussion Use Case

Precondition:

The user has logged to the system and is recognized as a system *LNU*.

Main flow:

1. The *LNU* follows a link to the *Views Requests* from his/her control page.
2. The system shows the main page of the *Active Requests*. It contains all current *Requests* for this *LNU*.
3. The *LNU* selects a *request* and view problem's details.
4. The *LNU* may Refuse or Agree the request invitation.

3.3. Flow of events for Participate In Discussion Use Case

Precondition:

The user has logged to the system and is recognized as a system *LNU*.

Main flow:

LNU may participate in any *Problem Discussion* that exists in the *Social Help Discussion Board*.

1. The *LNU* follows a link to the *Social Help Discussion Board* from his control page.
2. The system shows the main page of the *Social Help Discussion Board*. It contains all current *Problem Discussion*.
3. The *LNU* selects a *request* and launches it.
4. The system shows all requests (*Threads*) available.
5. The *LNU* may send (S1) either a new *Message*, or browse the tree of *Messages* and reply to any of them. After sending the *Message*, the system goes back to (4).

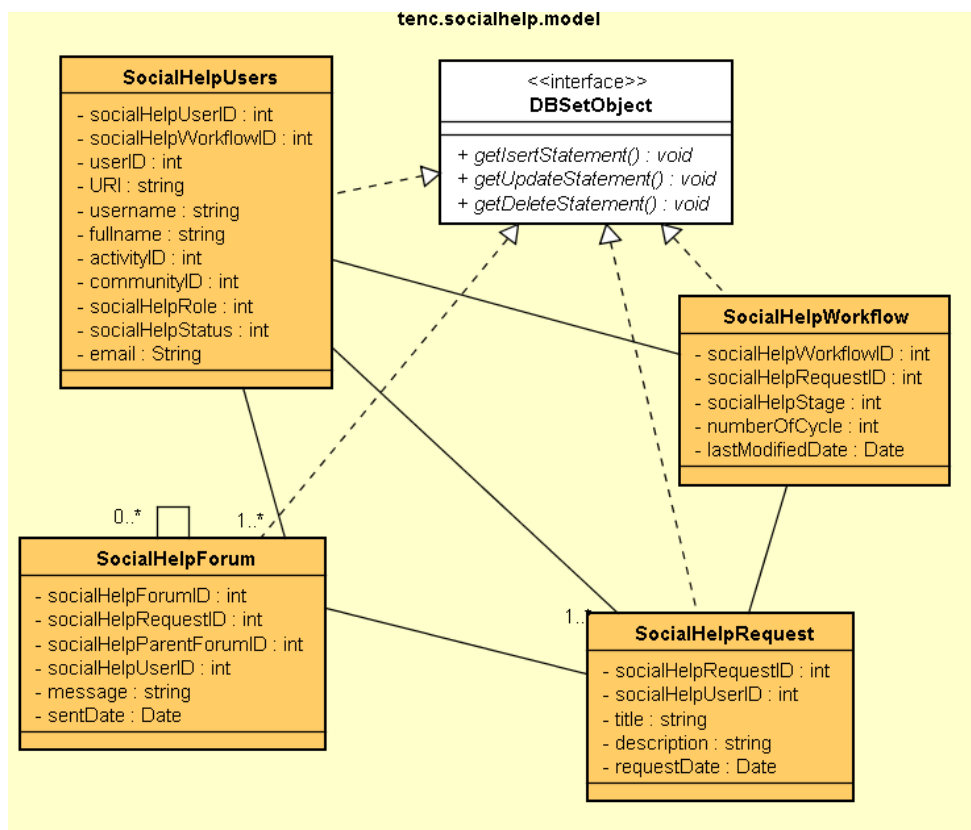
Subflows:

S1. The system shows a new page – a *Message* composer. There the *LNU* types the text of the message. Finally the *LNU* sends the *Message*.

4. Objects

In this section the objects needed for the Social Help are described. It should be noted that the lists of object fields listed below may not be exhaustive and it include only specific fields. Social Help API should provide getters and/or setter for all fields listed in this section.

The main Social Help API objects are showed in follow class diagram:



4.1 SocialHelpUser

This section contains an extension of the definition of the *user* object in invitation cycle.

Field Name	Values	Default Value	M/A ¹	Reason/Meaning/Usage
Email	String	""	M	E-mail address of the user
socialHelpRole	Integer	0	A	Indicates what is the user role: (1) learner and (2) peer tutor.
socialHelpStatus	Integer	0	A	The status has follow value: (1) – receive invitation; (2) – accept invitation; (3) – decline invitation.

The list of methods of this class follows:

Method Name	Static	Return	Parameters		Notes
			Name	Type	
receiveInvitation	N	Boolean	question	Integer	This method should be used to invite a user to

¹ This column describe whether the associated field is either filled in 'Manually, by the user, or 'Automatically, by the system.

					<p>participate as a tutor in a peer community.</p> <p>If the user accepts the invitation, the method returns true and false, otherwise.</p>
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4.2 SocialHelpRequest

This object represents the user request for social help.

Field Name	Values	Default Value	M/A	Reason/Meaning/Usage
socialHelpRequestID	Integer	Last ID + 1	A	A unique identifier for each agenda
socialHelpUserID	Integer	UserID	A	Uniquely identifies, the LNU, associated with the Request.
discription	String	""	M	The description of the problem.
title	String	""	M	The title of problem request.

4.3 SocialHelpWorkflow

This object represent the invitation cycle.

Field Name	Values	Default Value	M/A	Reason/Meaning/Usage
SocialHelpWorkflow ID	Integer	Last ID + 1	A	A unique identifier for the tutor competence object.
socialHelpRequestID	Integer	0	A	Provides identifier from Request
numberOfCycle	Integer	0	A	The number of invitation cycle.

4.4 SocialHelpForum

This object is used to represent a problem discussion forum.

Field Name	Values	Default Value	M/A	Motivation/Reason/Usage
socialHelpForumID	Integer	Last ID + 1	A	Provides a unique identifier for forum
socialHelpRequestID	Integer	0	A	Provides identifier from Request
socialHelpUserID	Integer	0	A	Provides identifier from user
socialHelpParentForumID	Integer	0	A	Provides identifier from parent forum. It is

				hierarchical structure of data.
sendDate	Long	Now()	A	Indicates the date and time of sent the message.
message	String	""	M	Defines the subject of the message.

5. Invitation Scheduler Service

The Invitation Scheduler service would ensure that jobs (send invitation email) are scheduled to run at specific times in the future. These jobs could be run multiple times based on the user's preference.

The Invitation Scheduler Service that we are going to develop will have the following features:

- The ability to schedule jobs at fixed and varying times
- The ability to schedule jobs that can run at fixed intervals indefinitely
- The ability to cancel jobs
- The ability to list all the currently scheduled jobs

The figure below shows the sequence of events of the Invitation Scheduler Service.

