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Ad hoc transient communities: towards fostering knowledge sharing in learning networks

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Abstract: To enhance users' social embedding within learning networks, we propose to establish *ad hoc transient communities*. These communities serve a particular goal, exist for a limited period of time and operate according to specific social exchange policies that foster knowledge sharing. This paper explores the theoretical underpinnings of such communities. To this end, it identifies five theories that explain how group interaction affects community behaviour and argues that these can shed light on the expected behaviour of ad hoc transient communities. The paper also examines three conditions which community policies should adhere to in order to foster knowledge sharing and it suggests that ad hoc transient communities should be designed accordingly. Finally, it analyses how ad hoc transient communities can be implemented in an Information Technology (IT) platform which is currently under development, the TenCompetence Personal Competence Manager (PCM), and discusses the current practices in communities outside the learning arena. Finally, the paper explores the avenues for further work.

Keywords: ad hoc transient communities; learning networks; learner support; peer support; community building; policies for communities; knowledge sharing; community interaction; TENCompetence; learning technology.

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Professor Rob Koper, who is the Director General of the Educational Technology Expertise Centre, the OUNL, has published over 200 publications in scientific journals and books. He was responsible for the development of EML and edited its release as the open IMS LD specification. He leads or participates in a variety of EU-funded R&D projects, such as the TenCompetence integrated project. His research focus is on self-organised distributed learning networks for lifelong learning, including the use of interoperability specifications and standards.

1 Introduction

TenCompetence is a European integrated project which aims to enable and foster lifelong learning in an integrated open source infrastructure (Koper and Specht, 2008). The most visible part of the infrastructure is the TenCompetence Personal Competence Manager (PCM) (Vogten *et al.*, 2008). It provides the technology to integrate models, methods and tools for the creation, storage, use and exchange of learning resources, learning activities, units of learning, competence development programmes and learning networks (Koper

and Sloep, 2002). The PCM can operate at different educational levels and draws upon various resources. In broad terms, it aims to support lifelong learning through both formal and informal learning processes.

Lifelong learning can only flourish if lifelong learners can control their own learning activities. They should be helped, for example, in building their own learning plans, producing their own reports on assignments and collecting their own bookmarks and scholarly references. Because of this self-directedness, the learners are unlikely to be organised in cohorts or classes. We refer to such non-organised groups of learners, who really only share an interest in a particular domain of knowledge but otherwise differ from each other in many respects, as *learning networks*. It is in these networks that learners may perform all kinds of formal and informal learning activities, in different contexts and at the same time. It is the function of a PCM to enable them to do so.

An unfortunate side effect of their self-directedness and lack of organisational coherence is that the learners in a learning network may easily become isolated, particularly since there is no obvious way for them to interact with their peers. Even worse, because they do not feel engaged in or committed to the learning network as a community of learners, their desire to interact with others may be diminished even further. This may be problematic, since research shows that individual success in learning activities depends on the extent to which the learners perceive themselves as participants in a network (Wegerif *et al.*, 1998). It is important, therefore, to investigate how to foster knowledge exchange and sharing amongst learners – for this is what social interaction in a learning community amounts to – and what technologies will support this (Cheak *et al.*, 2006).

Our current research aims at identifying and implementing policies that foster knowledge sharing amongst the learners in peer support communities. We surmise that increasing the sociability within a learning network will enhance the knowledge sharing process. In this paper, we will concentrate on sharing procedural knowledge. We will argue that this may be achieved through the use of so-called ad hoc transient communities: communities which exist to fulfil a particular request (their *ad hoc*-ness) and for a limited period of time (their transience) (Kester *et al.*, 2006).

This paper presents, from the conceptual and theoretical points of view, the notion of ad hoc transient communities. It describes the characteristics, behaviours and policies that enable these communities to foster knowledge sharing in learning networks. It also outlines how the PCM provides the very functionalities that are needed to enhance the users' social embedding in the network.

The rest of this paper is structured as follows: first, we further elucidate the problem we are tackling by presenting a use case. Then, we characterise the notion of an ad hoc transient community and explain the theoretical background behind its organisation and the actions of its members; this also includes an explanation of the conditions that enable knowledge sharing and the integration of ad hoc transient communities in the PCM. Additionally, we discuss how some of the characteristics of ad hoc transient communities are already present in non-learning communities and finally, we lay out the opportunities for future work.

2 The use case

TenCompetence makes a technology intervention which principally aims to solve the practical problems in lifelong learning – a complete description of the challenges and research issues this project is addressing can be found in Koper and Specht (2008). In this section, we elaborate on the nature and significance of the specific practical problems this project addresses.

One of the most critical issues in a learning network is how to foster the active contribution and participation of its members, both in formal and informal learning situations. To illustrate this issue, consider people who run a micro business – in 2003, micro businesses employed 30% of the European population (EU-25 members) (European Communities, 2006). Such people need to keep themselves updated on the latest developments in their field, even though they may be located in small cities and have few possibilities of exchanging knowledge with colleagues. Take, for instance, the case of Selma (Koper, 2005), a formal use case in the TenCompetence project. Selma was trained to be an optician in the ‘classical way’, which included such skills as measuring eyesight using a phoropter, measuring spectacles and fitting them, cutting glasses manually and drawing and cutting them using a machine. For years, she has run her own business in a small village. However, she recently started to lose clients to a new shop that was opened in her village. The owner, a recently graduated optician, offers lower prices and has at his disposition the most modern computer-directed measurement equipment. Within two years, Selma noticed that her net revenues are cut down by 40% and more of her customers are going to the new shop. At present, she lacks the competences to operate new eye measurement equipment or to handle new types of lenses. If she had continued active participation in the community of her colleagues, she might have been aware of the latest technical developments and, probably, have continued to train herself. But she has not done this.

At this juncture, the TenCompetence PCM comes into play. It will consider Selma’s background and identify the learning resources relevant to her competence development needs (*e.g.*, computerised eyesight measurement, contact lenses, *etc.*) while taking her present competences into account. It will also suggest the possible learning paths leading to the fulfilment of her competence needs. More pertinent to the topic of the present paper: while studying, Selma may also have questions regarding the topic she is studying or may want advice from her peers on which modules to take after the present one. The PCM will then look for peers who have mastered the same modules she is struggling with and create a community of people who are willing to help her.

In our opinion, these communities, which act as peer support mechanisms, are crucial in lifelong learning. In formal settings, task-related contacts between peers have proven to be useful (Griffin and Griffin, 1998) and peer support has helped to reduce the workload of the staff tutors, which otherwise may easily become too large (De Vries *et al.*, 2005; Fox and MacKeogh, 2003; Rumble, 2001). In addition, if learning takes place in informal learning settings, peer support will be the only means of guidance that learners have. Peer support in communities may use collaborative technologies such as wikis (Van Rosmalen *et al.*, 2006), but may also use ubiquitous discussion forums (Wei and Chen, 2006) or chats (Ribak *et al.*, 2002).

The observation that peer support communities are crucial in lifelong learning does not yet tell us much about the way in which such communities will function best. Thus, it is a challenging research topic to find out how they should be populated, what rules are needed to organise and manage them, how participants can be encouraged to share their knowledge actively and what technologies can be used to support all of this.

Our current research aims at identifying and implementing policies that foster knowledge sharing amongst learners in peer support communities. An important notion we have coined in the course of our research is that of an ad hoc transient community: a community which exists to fulfil a particular request (their *ad hoc*-ness) and for a limited period of time (their transience). Providing support upon request in a small group of fellow learners would be a case in point. Although this is valuable of and in itself (cf. Van Rosmalen *et al.*, in press), in our view, an important additional virtue of ad hoc transient communities lies in their ability to enhance the sociability of a learning network and, thus, increase learning effectiveness (Kester *et al.*, 2007; Sloep *et al.*, 2007). The next section discusses the insights reaped from the literature on how this may be achieved.

3 Ad hoc transient communities

Ad hoc transient communities support voluntary, emergent and informal knowledge sharing. This follows from their being a part of a learning network, which emphasises self-organisation and emergence (Koper *et al.*, 2005; Koper and Sloep, 2002). A variety of knowledge sharing processes may be discerned, depending on what the members of the ad hoc transient community jointly seek to achieve. Some examples are peer tutoring (on content questions, cf. Van Rosmalen *et al.*, 2006), peer review (of resources, research, learning process), peer advice (on how to continue one's studies), peer assessment (360 degrees) and peer collaboration (gathering resources such as bookmarks, references, learning activities, lessons and so on when writing a paper). In this section, we will discuss the characteristics of ad hoc transient communities, some theories that underpin their functioning and some conditions that have to be met in order to manage them.

3.1 *The characteristics of ad hoc transient communities*

Ad hoc transient communities have several characteristics.

- The period of time in which they exist is limited when compared to the time a typical learner spends in the learning network for the completion of his or her competence development programme. If the latter amounts to several months, the former is in the order of days, or a few weeks, at most.
- It is not assumed that the knowledge sharing process is organised by an institution. The contrary would often be the case, for instance, in computer-supported collaborative learning (Kirschner, 2002), where students are selected by a teacher to work collaboratively on a particular problem in order to achieve a learning goal. In ad hoc transient communities, knowledge sharing is not imposed; rather, it arises spontaneously, even though technology may be used to guide and speed up the emergence of the community.

- The exchanged knowledge is of different kinds. It may be declarative (answers to ‘who’, ‘when’ and ‘where’ questions), procedural (‘how’ questions) or conditional (‘why’ questions). Obviously, the potential value of a community discussion increases from the declarative to the conditional. While declarative questions can be looked up in handbooks or even Wikipedia,¹ procedural and conditional knowledge is best acquired in discussions with others.
- The members of the community will exchange knowledge by communicating with each other. The kind of communication process – synchronous or asynchronous – and the kind of technology used – e.g., text messaging, phone conference, forum, wiki – should be adapted to the kind of knowledge sharing process the community is engaged in. Particular technologies will suit particular goals better than others. Answering questions about declarative knowledge items may profit from the rapidity that synchronous text messaging can offer; perhaps peer collaboration has better performance in the relative tranquillity of a wiki, *etc.*

3.2 The behaviour of ad hoc transient communities

The overall performance of a particular ad hoc transient community results from the behaviour of its members and the way they interact. We have identified five theories, which detail how group interactions affect community behaviour. These theories shed light on the behaviour one may expect of ad hoc transient communities.

The self-organisation theory (Varela *et al.*, 1991) states that the behaviour of a system is a complex aggregation of the interactions of all the parts (*i.e.*, individual users). As no part controls the whole, such systems are ‘self-organising’ and the behaviour of the aggregates of the components is said to be ‘emergent’. According to the self-organisation theory, therefore, we may expect that ad hoc transient communities will not need a central organising force to arise and function. This fulfils the minimum condition for their ability to function in a learning network which, after all, has no central, overarching body behind it.

As much as self-organisation theory, the *systems theory* (McClure, 1998) regards groups as systems of interacting individuals. However, according to the systems theory, it is the task of the group to analyse the inputs, provide feedback to the members and generate decisions regarding group actions. The analysis focuses on information inputs, such as the characteristics of the individual members (skill, experience, training, motivation) and the group level factors (group structure and cohesiveness), the processes during group work (*i.e.*, communication, planning, conflict and leadership) and the products that are generated as output. The organisation is an emergent, unimposed property of the system itself and may undergo gradual or rapid change. The systems theory supports the idea that the device of ad hoc transient communities in the context of a learning network is a viable one. One may, at least to some extent, rely on the system to ensure that the characteristics of the individuals are taken into account, that feedback is provided and decisions are taken.

According to the *social exchange theory* (Thibault and Kelley, 1952), which applies Skinner’s behaviourism to groups, group members negotiate through their mutual interactions and, thus, secure personal rewards while minimising costs. Individuals no longer fully control their outcomes and interdependences are created: individual actions potentially influence the outcomes and the actions of every other individual.

The social exchange theory thus adds a twist to the self-organisation theory: although people will voluntarily interact in (ad hoc transient) communities, their actions are those of the rational consumer in economic theory. This means that, for instance, game-theoretic notions could be used to model the behaviour of the members of ad hoc transient communities.

The expectation states theory (Berger *et al.*, 1992) has a slightly different take on how individuals determine their behaviour in a group. It focuses on the cognitive processes that occur within each individual in the group. Newcomers form an impression of the group and search for information about the other group members. The group members search their memories for stored information about the group and the tasks it must face; they take note of the actions of others and try to understand what caused the other members to act in this way. The group members allocate two kinds of status characteristics:

- 1 specific status characteristics, *i.e.*, the qualities attested to each individual's level of ability to perform a specific task
- 2 diffuse status characteristics, *i.e.*, the general qualities that the members think are relevant.

The members with the most status-earning characteristics will rise to the top. The expectation states theory – as does the social exchange theory, for that matter – points to the importance of keeping a record of the various attributes of the members of ad hoc transient communities, indeed, learning network users in general. The value one attributes to the answer to a particular question one has asked will, for example, depend on the relevant expertise of the person providing the answer (specific status). The decision to accept an invitation to participate in a particular ad hoc transient community may, for instance, depend on the past performance of the other members: have they been loyal contributors, or were they bent on profiting only from the efforts of the other members (diffuse status)?

Yet another way to look at the behaviour of the individuals in groups is through the lens of trust. If a community is to function at all, its participants should show a modicum of trust towards each other. But how can trust be built up if an ad hoc transient community exists only for such a short period of time? It seems that a specific form of trust, *swift trust*, may emerge in temporary teams which are formed around a clear purpose and common task (Coppola *et al.*, 2004; Meyerson *et al.*, 1996). These are precisely the conditions that apply to ad hoc transient communities. According to the *swift trust theory*, swift trust fosters a willingness to suspend doubt on whether others, who are 'strangers', can be counted on in order to get to work on the group's task. The swift trust theory points to an effect any ad hoc transient community has over and above helping to attain the goal for which it came into being: by building trust, it helps in establishing engagement and commitment. According to the swift trust theory, therefore, ad hoc transient communities will enhance relatively quickly the social embedding of learning network users.

3.3 Policies that enable knowledge sharing in ad hoc transient communities

The literature names three conditions that community policies should fulfil if knowledge sharing is to occur. These conditions are the boundary condition, the heterogeneity condition and the accountability condition (Kester *et al.*, 2006). A community should have clear boundaries to protect collective goods, should be populated with a heterogeneous group of members to assure its liveliness and should be equipped with guidelines to encourage ongoing interactions amongst its members. We will discuss their implications for ad hoc transient communities and learning networks, in turn.

The *boundary condition* requires that a community has a clear goal, such as a particular, well-defined way of sharing knowledge. Moreover, it needs to have a set of rules that govern the use of common resources and point out who is responsible for producing and maintaining the collective goods. The community members should be responsible for setting and modifying these rules. By monitoring each other's actions in a community, the community members see whether their fellow members comply with the rules; if so, this will make them more willing to comply themselves. A transparent community with clear boundaries and rules allows its group members to sanction the behaviour of the other group members. In ad hoc transient communities, boundaries are set by engaging in a particular peer support activity. This happens, for instance, when a learning network user asks a particular content question and, as a consequence, is linked up with other users who try to help in finding an answer to this question (cf. Van Rosmalen *et al.*, 2006). Rules refer to the division of labour in the group, where everyone is supposed to contribute to the best of his or her ability to reach a satisfactory answer. Monitoring adherence to the rules is only possible if the individual contributions are identifiable (see also accountability).

According to Amichai-Hamburger and Furnham (2007), Bandura's *social learning theory* helps in understanding why community members adhere to a particular set of rules (social norms). Bandura claimed that the behavioural patterns of the existing community members who are respected or loved are likely to be mimicked by newcomers. It is, therefore, important that the existing members conduct themselves in ways that are beneficial to the community as a whole and, thus, become respected role models. As ad hoc transient communities have only a fleeting existence, the benefits that Amichai-Hamburger and Furnham promised can only be reaped if someone's behaviour in an ad hoc transient community is recorded and made visible outside the community to the learning network as a whole, for instance, through a user's digital dossier. Indeed, this is one of the ways in which ad hoc transient communities should contribute to sociability in the larger learning network.

Regarding the *heterogeneity condition*, this requires that communities be populated with participants who differ with respect to at least three characteristics: experience with communities ('newbies' versus veterans), being prepared to set a trend (connectors, mavens, salesmen) (Nichani, 2001) and the inclination to participate (posters, lurkers). To what extent the composition of an ad hoc transient community needs to be heterogeneous depends on the goal of that community. It may well be that certain types of knowledge sharing or certain occasions or objectives maximally benefit from heterogeneity, while others definitely do not.

The *accountability condition* targets the community members' identification and performance. First, communities should ensure the recognisability of the learners by forbidding the use of multiple aliases (one alias is allowable, if it persists). Also, a

historical record of user activities should be maintained by logging all user activities. The most significant ones for knowledge sharing – activities that reflect content competency and the willingness to share – become part of the user's dossier. To enhance individual accountability (Slavin, 1995), both the content and sharing competency of a user should be visible to the members of a community. For the same reason, the rating of peers should not be anonymous: the rater should always be identifiable. Additionally, communities should acknowledge the actions and behaviour of their members by showing, for example, their posts, replies, the number of votes received, ranking and so on.

Finally, according to the accountability condition, communities should guarantee that its members are committed to stay in touch by requiring that all community members remain accessible; if they use aliases, they should use only one and use it persistently. But continuity of contact only makes sense if there is extra value, compared to just having access to others (knowing others versus knowing of others). Therefore, the users should be allowed and stimulated to maintain a rich online identity. This should be done through the aforementioned dossier and this should, therefore, also contain information on a user's background and community performance. Needless to say, it should be updated regularly and automatically.

3.4 Ad hoc transient communities and the personal competence manager

As mentioned above, in the context of the TenCompetence project, learning networks are supported by a technology platform that manifests itself to the network members in the form of the PCM (Vogten *et al.*, 2008).² In short, the PCM aims to help learners develop their competences in formal and informal contexts. To this end, the acquisition of competences is conceptualised as a process in which the participants perform actions to attain their goals. These goals include, for instance, studying for a new function or job, keeping up to date with a job or profession or improving a competence level.

In the PCM, goals are referred to as competence profiles (*e.g.*, measuring eyesight). They contain descriptions of the competences needed (*e.g.*, eye examination, operating laser eye diagnostics equipment, *etc.*) to perform a particular function, job or role (*e.g.*, optician). These competences could be achieved by following one or more competence development programmes, which are structured collections of actions that can come from different sources. They include, for instance, following an online course, completing certain activities or attending a traditional course provided by an association.

Through this platform, actors can find, create, edit and share competence profiles, competence development programmes and actions. They are, thus, stimulated to be self-directed learners and are encouraged to provide support to each other; the PCM is, therefore, a natural niche for the incorporation of ad hoc transient communities. Furthermore, if ad hoc transient communities are the powerful device this paper argues them to be, the PCM should facilitate their emergence through the appropriate communication and collaboration facilities. The first version of the PCM already includes functionalities that attempt to (Vogten *et al.*, 2008):

- promote the creation and sharing of personal contributions to the community. The PCM uses a principle of automatic sharing that, by default, makes available to the community the actions created by each member. This principle, at the same time, fosters the reuse of actions within the community

- encourage participants to control their own learning networks, competence profiles, competence development programmes, activities and so on. The participants control authorisation levels: for example, a learning network can be private, open or restricted, or a user can modify an existing competence profile only if s/he has the required access permissions
- support community communication and collaboration by providing rating mechanisms, discussion forums and the members' availability. In future releases of the PCM, the Friend of a Friend (FOAF) protocol (FOAF, 2000) will be used to keep track of the relationships between the members of the learning network.

As explained above, ad hoc transient communities could be used for peer tutoring, peer review, peer advice, peer assessment or peer collaboration. These applications can latch onto the functionalities already implemented in the PCM in a number of different ways. For instance, a peer review process could be used to evaluate and rate actions, a peer collaboration task could help create new resources based on existing ones, peer advice and peer tutoring mechanisms could be invoked to answer questions, give advice and so on.

Additionally, the FOAF mechanism, which keeps track of the ties between the members of the community, might provide a first stab at identifying the possible members of an ad hoc transient community. When a learning network member asks for support (*i.e.*, peer tutoring, peer advice, *etc.*) or wants to perform a task collaboratively (*i.e.*, peer assessment, peer collaboration, *etc.*), a goal has been established and an ad hoc transient community can be triggered. Then, in accordance with the heterogeneity condition, one needs to find the appropriate and available peers to populate the community. Finally, to meet the accountability condition, the PCM needs to be able to identify and track the members' actions and show them in a personal profile. Some initial work in this regard already points out the importance of such a profile to foster interpersonal trust within communities (Rusman *et al.*, 2007).

4 Discussion

In this paper, we have introduced and discussed the concept of an ad hoc transient community, a notion we developed to understand better how to enhance its participants' sociability within a learning network.

We have characterised the behaviour of ad hoc transient communities by:

- the self-organising powers of the community and the absence of hierarchies
- the negotiation processes that the members engage in
- the expectations the members have of the actions and behaviour of their fellow members
- the work of the members towards a set of goals through united actions
- the emergence of relations of swift trust between the members.

In order to enhance knowledge sharing, we claimed that ad hoc transient communities should have policies regarding the allowable goals and behaviours (boundary condition), about the characteristics of the participants (heterogeneity condition) and their identification and actions (accountability condition).

Note that collaboration in ad hoc transient communities differs in significant ways from collaboration in computer-assisted collaborative learning environments (Kirschner, 2002; Kreijns *et al.*, 2003) or virtual companies (Westera and Sloep, 1998). In contrast to the latter environments, in ad hoc transient communities, there are no collective activities aimed at the achievement of shared learning objectives, there is no assignment of roles depending on the participants' competences and needs, nor is there tutor guidance during the process, task assignment, instruction, feedback or assessment. The participants of ad hoc transient communities do not share a learning goal; they help out a peer achieving his or her particular goal. Moreover, the decision to do so is entirely theirs. The 'system' (PCM) suggests doing so but does not enforce it; it thus complies with the self-organising character of the learning network. One may even argue that the term 'community' is a misnomer, as communities are characterised by shared goals and lasting relationships. However, as we have argued in this paper at great length, the term 'ad hoc transient community' is appropriate, as through them, the social fabric of the learning network as a whole becomes strengthened. This is also born out of experience with several communities outside the educational arena proper. As it turns out, they harbour many of the characteristics discussed above.

Social networking systems, considered as an essential part of Web 2.0 (O'Reilly, 2005), such as Orkut,³ LinkedIn[®],⁴ Flickr,⁵ YouTube⁶ and Friendster[®],⁷ use policies to enforce what we call the accountability condition. In these communities, the participants have a profile to share with others, which contains their interests, background, motivations, friends and so on. They also enforce the continuity of commitment by letting members create links to others and comment on each other's profile. Moreover, these communities fulfil the boundary condition by having mechanisms for reporting and sanctioning the members' undesirable behaviour or inappropriate posts.

Perhaps more appropriate examples are communities whose members can seek peer support or peer advice. They include Q&A websites such as Yahoo![®] Answers,⁸ Yedda,⁹ Live QnA,¹⁰ Wondir,¹¹ Answerbag,¹² Scholieren (questions about homework),¹³ and Cisco NetPro (questions about technical issues).¹⁴ These communities, which exhibit very similar functionalities, are self-organised communities without hierarchies, whose participants share the common goal of knowledge sharing, much like in a learning network. Furthermore, within their confines, the groups that resemble ad hoc transient communities of answer seekers and providers arise as their members negotiate answers and monitor each other's qualities and behaviour.

Regarding the conditions that enable knowledge sharing, these communities fulfil the accountability condition by identifying the users, keeping a historical record of their actions and making their activity visible (*e.g.*, showing how many questions they have answered or their ranking). Likewise, these communities meet the boundary condition by providing the participants with community guidelines and mechanisms to rate and sanction the contributions of the members. For instance, in Answerbag, the members post questions, answer and comment on questions posted by others and determine (by giving points) if the questions and answers provided were helpful; they can also flag posts as nonsense or offensive.

Profiling members is a common feature amongst Q&A websites. As has been claimed for the accountability condition, identifying the characteristics and performance of the members might help to develop trust between the members. In Yahoo![®] Answers, for instance, each member has a profile that displays his/her actions, attributes and contacts.

It shows the answers and questions a user has posted, his/her starred questions, an evaluation of his/her activity (*e.g.*, the percentage of best answers provided or open questions versus solved questions) and the contacts and 'fans' he/she has. The members can also link their profile to the webpage they might have in the social network service of Yahoo![®],¹⁵ where more personal information, friends, photos, blogs, *etc.*, can be found. There is, moreover, the status of the 'top contributor', someone who is knowledgeable in a particular topic and has provided a high percentage of good answers. This status might help not only to encourage the work and relations of swift trust between the members, but also to enforce the heterogeneity condition by highlighting someone who, at the same time, can be considered as a connector and a poster.

The ranking and recognition of top contributors is certainly a common characteristic amongst Q&A websites. They normally use systems of points and rewards. Answerbag, for example, uses points and badges to reward participation. The members get points if their questions or answers have been rated high, but also if they rate the questions and answers of others. The more points a member has, the higher his/her ranking in the leader board is. The board can be sorted by points, the number of questions, the number of answers and the number of popular questions. In Cisco NetPro, points and badges are also used for rewarding 'top NetPros'. Logically, as it is a topic-centred community, only the helpfulness of the answers can be rated. Top NetPros are those who have the highest point totals.

In these Q&A websites, anyone can become a member; the heterogeneity condition, thus, hardly needs enforcing. Nevertheless, taking into account the number of registered users – Yahoo![®] Answers reported 12.3 million users (Hamner, 2006), Wondir reported 200 000 users (Caumont, 2005) and Answerbag, 175 000¹² users – we may safely assume that they are populated with participants who differ with respect to the three characteristics mentioned earlier: experience in communities, trendsetter inclination and the predisposition to contribute to the community.

5 Future work

Certainly, further research needs to be done to substantiate our claims and evaluate if, in practice, ad hoc transient communities actually foster knowledge sharing amongst the participants in learning networks. This evaluation should include, at least, a framework that considers both quantitative and qualitative measures, as well as feedback from the participants. Currently, we are analysing the different options to design and set up this evaluation. Also, additional research needs to be done to develop the technologies, such as that harboured by the PCM, that support ad hoc transient communities. We discuss a few items currently under investigation.

As argued, a determinant factor for the success of any ad hoc transient community is that the members have few reservations about participation. On this topic, some preliminary work (Koné *et al.*, 2007) has been carried out. It aimed to investigate how one can stimulate collaboration in ad hoc transient communities by influencing member behaviour. The results of the simulations done, along with the policies described in this paper, will be taken into account to develop what may be called a social search engine: a collection of algorithms that will locate the peers suitable for and available to populate ad hoc transient communities. The work of Van Rosmalen *et al.* (2006; 2008; in press) may be seen as a first step towards the definition of such algorithms. In the same vein,

further research is needed to analyse the feasibility of developing mechanisms, such as software agents, that automatically create and trigger ad hoc transient communities, populate them and update the personal profiles of the members.

Finally, we will investigate the functionalities needed to foster interaction in ad hoc transient communities. We plan to explore further the current practices in applications not intended for education, such as Flickr, del.icio.us and YouTube, that are vivid examples of emergent, online communities and perceived as fundamental for the next generation of e-learning communities (Downes, 2006; Keats and Schmidt, 2007; Owen *et al.*, 2006; Wilson *et al.*, 2006).

Currently, we are exploring these with the objective of analysing whether the policies we want to define for ad hoc transient communities are already present in these communities and if new ones can be found. We are also identifying the features (*i.e.* personal profile information, rating mechanisms, definition of groups, *etc.*) these communities use to encourage and facilitate the interaction of the participants.

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Notes

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