Supporting the Interconnection of Communities of Practice: The example of TE-Cap 2

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Abstract

In this paper, a general model for the Interconnection of Communities of Practice (ICP) is proposed. This model creates links between local Communities of Practice (CoPs) and global Communities of Practice on the Web. To hit the target platform specifications to support an ICP are first of all proposed, soon after the TE-Cap 2 (Tutoring Experience Capitalisation) platform for an ICP of tutors is made up to support people working on it. This platform allows the capitalisation of tutors' contextualised knowledge, by making it easily retrievable from all the tutors in their daily practice. At last a descriptive investigation over a four-month period and forty-two users registered on the platform is conducted. Results presented in this paper concern the usability of the platform and the relevance of the model with regard to tutors' needs.

Keywords: Collaborative Computing, Social Learning Techniques, Online Communities, Knowledge Modelling and Sharing, Tutors, Web-based User Interfaces.

Introduction

With the use of Information and Communication Technologies (ICT) in education, new roles and professional figures have appeared, particularly the tutor. Tutors usually monitor learners' activities and assess them. They need training and advice to become a tutor and to be helped in all the roles that are assigned to them. However, there is a lack of training and assistance tools. Tutors compensate for this lack by participating in Communities of Practice (CoPs) within their institutions. At this local level, they have many contextual exchanges to, for example, solve problems or help each other. These exchanges are computer mediated at a very minimal degree, and any knowledge generated in the process is not, or is very rarely, capitalised upon. On another hand web technologies (e.g. forums, blogs, wikis) have enabled the emergence of online CoPs of tutors. At this general level, tutors discuss more general subjects which do not necessarily help them solve the problems encountered in their daily practice. Furthermore, knowledge does amass but in a relatively unstructured and uncontextualised manner. It is with this background that our research work aims to develop a platform that: (1) makes a link between these two types of CoP by putting tutors, working in the same areas, in touch with each other; and (2) capitalises on the value of all produced knowledge by contextualising it, so as to make it accessible and reusable by tutors in their working contexts.

In Section 2, we first recall the concept of a Community of Practice (CoP) and, more precisely, of an online CoP. To situate our work, we examine existing tools that have been proposed to support CoPs of tutors at a local level within their own educational institutions, or at a global level in the form of widely distributed online CoPs. In Section 3, we propose a model of Interconnection of CoPs (ICP) which considers tutors to be the links between existing local and global CoPs of tutors. We have deduced specifications for a platform to support such an ICP. The TE-Cap 2 platform, based on these specifications, is described in Section 4. TE-Cap 2 has been offered to tutors from different disciplines and different countries over a four-month period and in Section 5 we present the results and an analysis of the use of the platform.

Literature Review

Many skills are required to be a tutor, generally classifiable into four categories: pedagogical, communicational, disciplinary expertise and technological (Thorpe, 2002; Denis *et al.*, 2004; Banks *et al.*, 2004). However, tutors are

asked, 'to run before they can walk' (Bennett & Marsh, 2002) because most of them do not have these skills on which to lean, and there is no training which attempts to help tutors develop the required competence (McPherson & Nunes, 2004). Training methods remain specific to each campus (Denis, 2003; Class & Schneider, 2004) and therefore can be quite isolated and rather ad hoc. Furthermore, few tools have been developed to answer these particular training needs and those that exist do so in a very limited way. Indeed, there are currently few assistance systems for tutors (Dufresne *et al.*, 2003) or only specific prototypes (Garrot *et al.*, 2006). Research work based on data mining techniques predicts students' results (Romero & Ventura, 2007) and locates relevant information for tutors. However, results rest on elementary rules of association which do not reflect the reality of educational practice and are applicable only to simple exercises. They do not help tutors who do not really know what they have to do and the best ways to go about it (Casey *et al.*, 2005).

Tutors compensate for this lack of training and formal help by participating in Communities of Practice (CoPs) which emerge inside institutions and more generally on the Web. CoPs gather tutors together in an informal way (Lave & Wenger, 1991) because of the fact that they have common practices, interests and purposes (i.e. to share ideas and experiences, build common tools, and develop relations between peers) (Wenger, 1998; Koh & Kim, 2004). Members exchange information, help each other develop their skills and expertise and solve problems in an innovative way (Pan & Leidner, 2003; Snyder *et al.*, 2004). They develop a community identity around shared knowledge, common approaches and established practices and create a shared directory of common resources.

CoPs appear at various levels: at the local level of educational institutions and at a global level on the Web, in the form of widely distributed communities of tutors from various institutions. In educational institutions, tutors have many face-to-face exchanges to solve very contextual problems. For example, tutors discuss specific lessons, students or scenarios; they give feedback on courses to make them evolve and ask for advice and explanations on the relevant means of intervening with learners. But all these discussions pass unmediated by computer; they are mainly verbal and take place, for example, during coffee breaks. Thus the knowledge created is not, or is rarely, capitalised upon. Furthermore, tutors usually prepare their own educational material for their students (Casey *et al.*, 2005). This fact implies that there is no tracking of their work (decisions taken, events that occurred, configuration or customisation of scenarios, quality of the knowledge building process, etc.). Some CoPs are supported by learning environments offered by universities (Lefoe *et al.*, 2002; Sherer *et al.*, 2003). These environments provide resource directories and communication tools so as to create relations between tutors of the institution and to make the CoP grow. These CoPs have already emerged independently of the technology supporting them since members already know or convene during meetings. These environments are thus not designed to create relations between tutors from different institutions and to capitalise on their knowledge in a contextualised way. They are not necessary for the emergence and the life of the CoP, they offer only supplementary tools.

Web technologies (e.g. forums, blogs, wikis) have enabled the emergence of online CoPs (Daele, 2005; Cuthell, 2008; Pashnyak & Dennen, 2007) of tutors and teachers from different institutions. In these CoPs, tutors discuss general subjects such as answers to give to students, the best ways to monitor and assess them, how to adapt and design learning courses, when to intervene at the right time and in an adapted way and how to react effectively if a student is in trouble. At this global level, the use of technology does allow the accumulation of exchanges, but they are relatively unstructured and not contextualised. In fact, these CoPs are usually not supported by specific environments; i.e. mailing lists are mainly used to receive information without having to produce it (Caviale, 2008). Blogs are mainly used to share stories, experiences and opinions and rarely to get in touch with other persons (Pashnyak & Dennen, 2007). Web tools such as blogs, mailing lists, chat and email, only allow for discussion without building concrete knowledge. Only forums bring a slightly higher degree of explicit emergence, thanks to the spatial representation as discussion threads which highlights relations between messages, however, knowledge thus created is not reusable since no contextual information is assigned to it.

Numerous works aim to answer the specific needs of online CoPs by supplying tutors with tools to support specific activities. Some tools work through member participation and sociability, for example by offering a virtual 'home' like the Tapped In environment (Schlager & Fusco, 2004), others by supporting collaboration between members like CoPe_it! (Karacapilidis & Tzagarakis, 2007). Other tools favour the creation of contextualised resources and contextual search facilities such as the Inquiry Learning Forum (IFL) (Barab *et al.*, 2001) and the learning environment doceNet (Brito Mírian *et al.*, 2006). However, all these environments either favour sociability (engaging members to participate) to the detriment of the reification of the produced resources, or they favour the accumulation and indexation of contextualised resources, but to the detriment of sociability and member participation. There are some new approaches which try to adapt a more Web 2.0 type approach to sharing and networking, for example the Cloudworks system (Conole *et al.*, 2008). However, these environments are not designed to simultaneously support CoPs' activities both in the local context of members' practice (i.e. their own schools, educational departments or institutions) and at the global level of a widely distributed community in various

institutions.

As a result, tutors from different educational institutions can have similar practices without being necessarily aware of it, mainly due to the fact that they do not belong to the same institutions. If they do not belong to online CoPs, they will not interact and talk about their practices but will, nevertheless, develop their own practices, each one reinventing what has certainly already occurred somewhere else. If they do participate in online CoPs, they can have exchanges with others, although the knowledge generated loses its sense, being detached as it is from any context. Furthermore, in online CoPs tutors discuss general subjects and do not solve problems which occur in their daily practice, inside the local level of their institution. Our work aims to provide local CoPs of tutors from various institutions with a unique Web platform which will support their exchanges and which will also capitalise on these exchanges by placing them in the associated context (e.g. the concerned institution, the type of activity, the type of students). As a first stage in addressing this aim, we propose in the next part a model of ICP supporting links between CoPs centred on the same general activity, in our case working as a tutor in higher education.

Model of the Interconnection of Communities of Practice

Definition of an ICP

Brown and Duguid (1991) brought the notion of 'communities-of-communities' to develop innovation within organisations, considering that the productions of separate communities can be increased by exchanges among these communities. The concept of Constellation of Communities of Practice (CCP) (Wenger, 1998) resumes this idea by directing it on practices, explaining that some organisations are too wide to be considered as CoPs. The advantage of defining several communities around shared practices is to create more knowledge and to develop more interactions than in a global community (Pan & Leidner, 2003). This concept implies considering the boundaries of CoPs as places for knowledge creation. The relations between communities can be supported by 'boundary objects' (Star & Griesemer, 1989) and by 'brokering'. 'Boundary objects' are products of reification and they constitute the resource repertory shared by all the communities. 'Brokers' belong to multiple communities and have a role of knowledge import-export between these communities. The meetings on the boundaries of CoPs arouse interactions between members. According to Ziovas and Grigoriadou (2007), the combination of brokering as a product of participation and the boundary objects as a product of reification is an effective way to create relations between CoPs.

In the case of informal professions, such as tutoring, it is difficult to define exactly the field of practice of the actors. Actors' activities can be seen as a set of different practices which are similar in some points. For example, tutors' roles can be different as their interventions could be punctual or long-lasting; the learning session could be computer mediated or not and the learners' activity could be individual or collective. But some roles are shared by some of these contexts. We propose that this group of actors should be seen not as an endogenous entity defined by a field of practice, but rather as *a set of CoPs supported by a Web platform where individual members, acting as nodes of interconnected practices, are the connection points* (see Figure 1). We suggest developing this concept of ICP, as an extension of the model of CCP. This model aims to connect existing local CoPs of actors (e.g. within an educational institution), who are engaging in the same general activity (i.e. tutoring). This model also proposes active support for the dissemination of knowledge from CoP to CoP, detailed in Section 3.2.

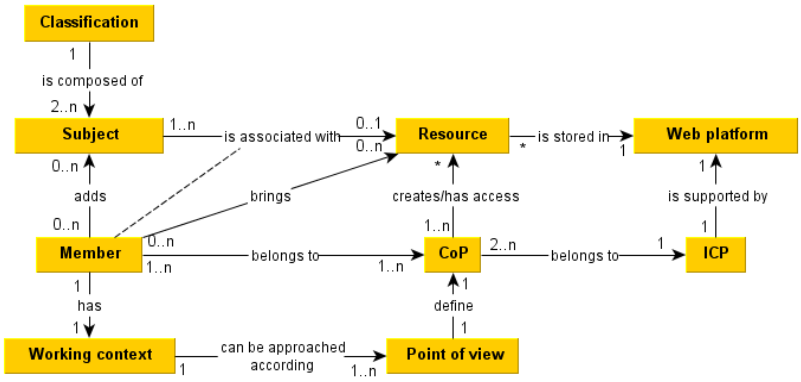

Figure 1. General model of ICP

Figure 1 shows the general model of ICP that we will now go on to explain. At an individual level, an activity can

be approached according to multiple points of view depending on the actor's working context. In the ICP model, a CoP is defined by a field of practice, corresponding to the elementary level of actors' practice. In this way, the CoPs to which the ICP members belong are defined by their working context. At a general level, an ICP is composed of all the CoPs defined by all the actors who participate in the Web platform. We could see it as a network of CoPs of actors practicing a same activity, brought together on the same platform; a group which can be approached from multiple points of view and accessed through multiple entry points. The ICP members bring resources that are stored in a database according to a hierarchical classification. As we explain in the next section, this classification is composed of subjects based on a model of actors' practices. In the case of tutoring, resources correspond to explicit knowledge (documents and Web links) and tacit knowledge shared among members (e.g. exchanges of experience, stories and discussions).

For example (see Figure 2), Tutor 1, working in the industrial engineering department of University A in France who is monitoring a collective project about maintenance can belong to five different CoPs: tutors who monitor collective activities, tutors who are interested in maintenance, tutors who monitor educational projects, tutors of the industrial engineering department and tutors of University A. Tutor 2 from another educational institution, for example University B in Canada, can belong to several CoPs, some of which Tutor 1 may also belong to. These two tutors, from different countries, will be put in touch since their working context can be approached according to several similar points of view, which imply that they belong to the same CoPs. Tutor 3 will be put in touch with both Tutor 1 and Tutor 2, because he belongs to the same educational institution and the same department as Tutor 1 and because he monitors the same type of activity as Tutor 2.

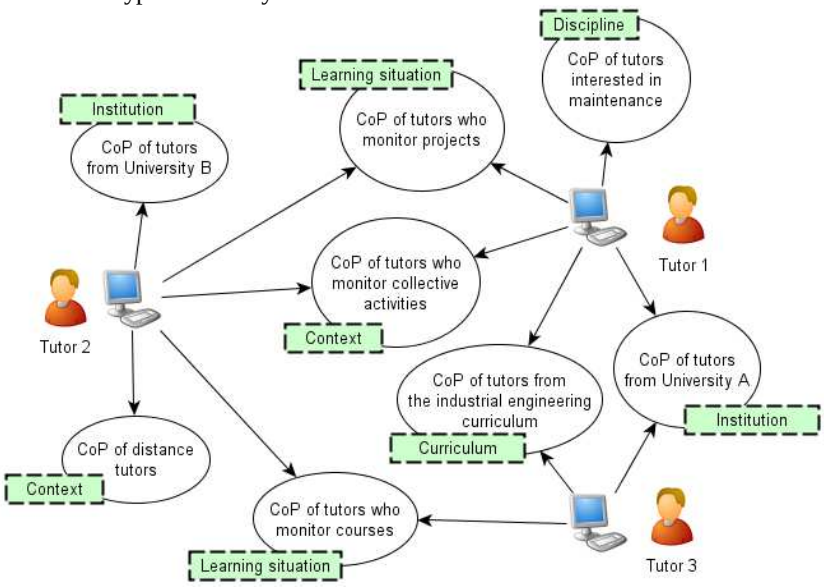

Figure 2. Tutors as nodes of ICP

Therefore, this example illustrates the fact that tutors are the nodes of ICP. In this example, tutors' activity can be approached from several points of view: the context of the activity (collective, distance), the learning situation (project based learning, courses), the discipline (maintenance), the curriculum (industrial engineering) and the educational institution (Universities A and B). These points of view are categories of CoPs.

The model of ICP does not correspond to the model of CCP defined by Wenger (1998). It could be seen as an extension of this model in the sense that the conditions for its existence are less restricting:

- Contrary to a CCP, the CoPs of an ICP do not share historic roots on which the mutual engagement of the members could base itself. The ICP members do not know apart the platform on which they join. This difference is fundamental because it raises the difficulty of bringing persons who do not know each other to interact, what requires supporting a high level of sociability on the platform.
- In a CCP, the CoPs have interconnected projects which connect them whereas an ICP consists of actors practicing the same general activity who want to exchange their practices with others, the community emerging by 'propagation'. It is important to make the actors aware that they have close practices which they can share so that members are interested in the practices of the others.

- Contrary to a CCP, the ICP members do not necessarily belong to the same institution. Since we aim to support exchanges in members' local working contexts as well as at the general level of the activity, it is necessary to have actors from various institutions.
- The CoPs of a CCP are in close proximity to each other, in particular geographically, whereas an ICP is constituted of persons who meet on a Web platform and can thus be from all over the world. Therefore, this model does not include geographical proximity.

Knowledge Creation and Dissemination

As we briefly explained previously, the ICP resources are stored in a database according to a hierarchical classification composed of subjects based on a model of actors' practices. As a result of a previous study on tutors' practices and needs (Garrot, 2008), we built a model that defines four levels of tutors' practices. The first level corresponds to the main factors that differentiate actors' practices and which define the main categories of CoP. Each category is divided into subcategories and so on. The terminal nodes correspond to modifications or additions made by the ICP members themselves. The resources are classified according to these categories of CoPs. Tutors only have access to the resources of the CoPs to which they belong.

Figure 3 illustrates a part of the hierarchical classification used to store tutors' resources which is divided into three levels. The first level is composed of four categories of CoPs named 'Institution', 'Curriculum', 'Discipline' and 'Activity'. Each one is then divided into subcategories ('Type of institution', 'Type of curriculum', 'Context', 'Learning situation') or CoPs ('University A', 'Industrial Engineering', 'Maintenance', 'Collective', 'Project'). These categories of CoPs and CoPs are those identified in the previous example (see Figure 2). If we use this example, Tutor 1 has access to the resources of all the CoPs; Tutor 2 only has access to the resources of the CoP of tutors who monitor collective activities and the resources of the CoP of tutors who monitor educational projects.

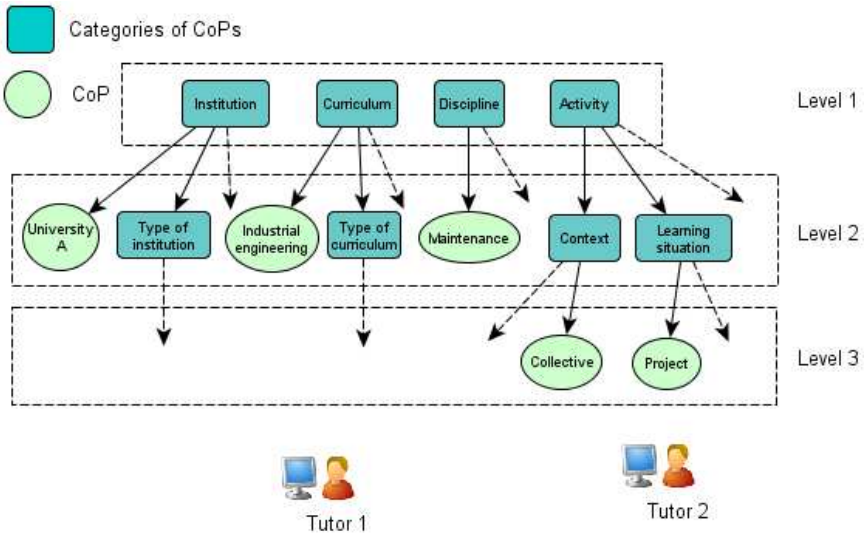

Figure 3. Categories of CoPs and CoPs of tutors distributed in three levels

ICP members decide that a particular resource belongs to a CoP by associating the name of the CoP (subject in the lowest level of the classification) with the resource. Child CoPs (a hierarchically lower level CoPs) inherit all the resources of a category of CoPs, meaning that all the resources bound to a category of CoPs are accessible to the child CoPs of this category. Therefore, members can associate names of categories of CoPs (subjects at higher levels in the classification) so as to generalise this resource to several CoPs. When they find a resource (result of a search), members can also associate new subjects with this resource so as to spread it to new CoPs. They can either associate the name of a CoP to spread the resource to only a single CoP, or associate it with the name of a category of CoPs to spread the resource to all child CoPs. So, ICP members' participation not only consists of creating new resources but also of creating links between these resources according to their relevance to the CoPs. This relevance is estimated by members themselves who consider a resource to be useful or interesting for a CoP.

If we use the previous example of tutoring in an industrial engineering department (see Figure 4), Tutor 1 can consider that the resource R1 of the CoP centred on the industrial engineering department will be interesting for the

CoP centred on the institution INSA Lyon. He thus spreads the resource R1 of the first CoP to the second one by associating the subject 'INSA Lyon' (name of the CoP of the tutors of the INSA Lyon) with it. As another example, Tutor 2 can decide to generalise the resource R2 of the CoP centred on projects in all the types of learning situations, by associating the subject 'Learning Situation' (name of a category of CoPs) with it. All the CoPs centred on a type of learning situation then inherit from it.

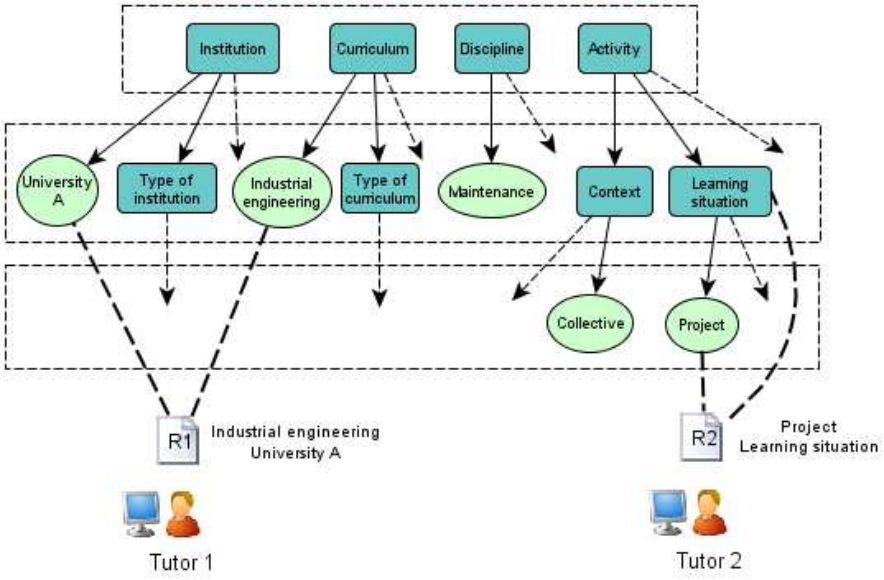

Figure 4. Spreading a resource from one CoP to another and from one level to another

The model of ICP thus relies on the Web 2.0 approach, with an informal building of knowledge and links between this knowledge by users themselves. The Web platform which supports the ICP is based on the participation of members who have several roles, as illustrated by Figure 1 showing the general model of ICP:

- They develop the resource classification by proposing new subjects.
- They feed the ICP shared directory by proposing new resources: messages, documents and Web links.
- They associate subjects with resources to give a context and to disseminate it to CoPs.

To sum up the ICP principle: a resource can be born at any level, and then spread to other levels. A resource can also concern only a precise point of view concerning a precise context of practice and thus not spread to another CoP. The supply of a resource to a CoP can lead to a debate on this resource and possibly to the creation of new resources for this CoP. Events reported in a precise context can lead to experience sharing (solutions, cases, scenarios), being used as a base to generate rules or recommendations which become global knowledge within the ICP.

Specifications and TE-Cap 2 Platform

The specifications detailed below were applied to develop the TE-Cap 2 (Tutoring Experience Capitalisation) platform. This platform aims to support tutors in sharing experience and practice and using and building on this shared knowledge in a working context. According to a co-adaptive design approach (Lavoué *et al.*, in press), the development of the TE-Cap 2 platform was based on a first prototype named TE-Cap developed in a previous development cycle. This first prototype offered few functionalities: perception and sharing among the community, personal space within the community portal, knowledge capitalisation. We conducted a pilot study that involved the participation of 12 tutors from six countries during a two-month period. The interpretation of the results, detailed in (Lavoué *et al.*, in press), gave more information to determine the functionalities for the final platform TE-Cap 2.

The conception of the platform TE-Cap 2 relies on the Content Management System (CMS) open source Joomla!.

We opted for this CMS from among a comprehensive list of existing CMS[1] and because on the one hand, Joomla! proposes basic functionalities such as the management of articles, documents and users and, on the other hand, its functionalities are based on independent components so the evolution capacities and the modularity of TE-Cap are largely facilitated. We modified some components and developed others so as to answer the needs, identified previously.

Specifications

The model of ICP requires support within a specific Web platform (see Figure 5, each number corresponding to each point enumerated below):

(1) To manage and to take into account the user profile (working context and interests).

(2) To support the addition and the creation of contextualised resources by users who associate subjects with resources.

(3) To facilitate access to useful resources for users by favouring searches which link with their working context and by sending information directly 'at' the users.

(4) To facilitate interaction between users so as to bring them into communication and to highlight their contributions and their areas of expertise.

(5) To operate the dissemination of resources from one CoP to another and from one level of practice to another, by facilitating the association of subjects with resources by users.

(6) To enable the evolution of the resource classification by facilitating the addition of new subjects by users.

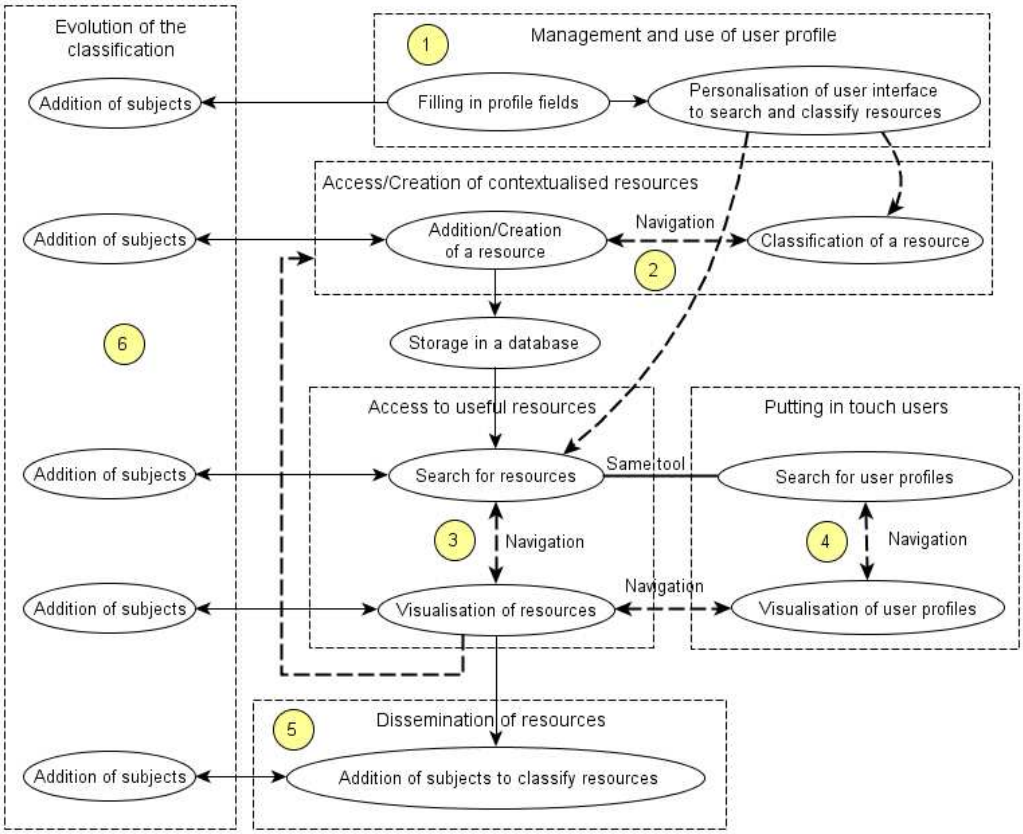

Figure 5. Specifications of a platform for supporting an ICP

One of the most important specifications is that users can actively trigger the evolution of the resource classification by their participation in the platform, which will lead to a shared classification system using a common vocabulary moving gradually closer to the tutors' practices. For that purpose, the interface must give, at any time

[1] http://cmsmatrix.org/

and for any user activity in the platform, the possibility of adding a new subject to the classification, whether it is when completing their profile or when classifying, searching or consulting a resource. The used subjects are recorded which allows, for example, the deletion of those considered useless; unused subjects, likewise, will be deleted. The fact that they were unused will be taken to mean that they were not adapted to the actors' field of practice or not located at the appropriate level of the classification. Deletions can be made by the administrator or be automatic (deletion if the subject is not used during a given time). This evolution of subjects is necessary so that the classification made a priori will become closer to the reality of tutors' practices and also so that it will follow the evolution of tutors' uses and practices. It also provides an important focus to ensure coherence among all the CoPs forming the ICP, offering a common identity to all the members and facilitating a feeling of membership.

The TE-Cap 2 Platform

The specifications outlined above were used to develop the TE-Cap 2 platform for an ICP of tutors. In this section, we present the main functionalities and interfaces of this platform.

Management of user profile

Figure 6 illustrates the user profile edition through the example of filling the tab 'Activities' corresponding to the user's 'Working context'. Tutors define their profile by completing several fields. These fields correspond to the last categories of CoPs of the hierarchical classification. Values given to fields define CoPs and imply tutors' membership of these CoPs. Users can also propose new values so as to define new CoPs and cause the classification to evolve. If users do not complete a field, we suppose that they belong to none of the CoPs of this category, meaning that this category of CoPs does not interest them or that they have not seen its interest yet.

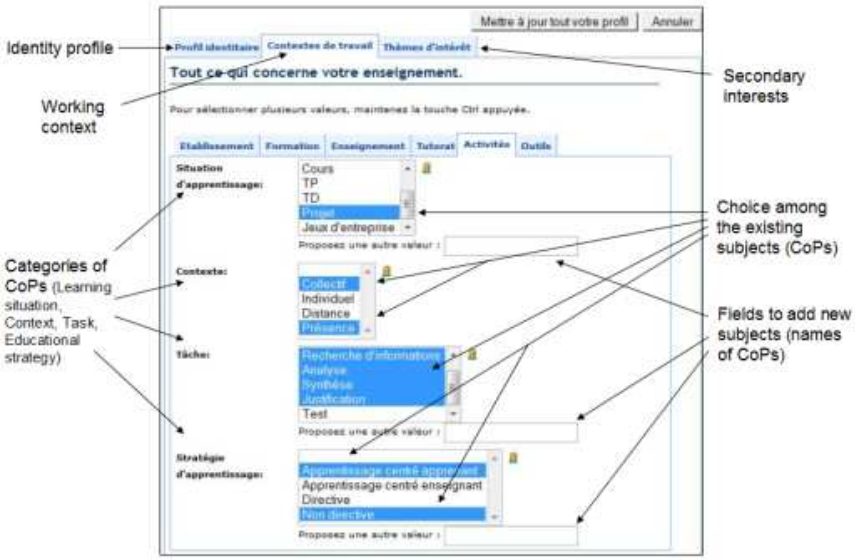

Figure 6. User profile editing: example of the tab named 'Activities' in tab named 'Working context'

The profile is composed of three main tabs:

- Identity profile: address, postal code, city, country, phone number, fax number, website.
- Working context: all the CoPs in which tutors have a central role (directly bound to their working context). This tab is composed of six sub-tabs, each proposing multi-select fields: Institution (name, country, and type), Course (name, type, level, and certification), Teaching (discipline and learners' profile), Tutoring (roles and degrees of freedom), Activities (learning situation, context, task and approach) and Tools (educational material, communication tools, collaboration tools, tracing tools, work management tools and use of tools). These categories of CoPs have been identified in a model of tutors' practices (Garrot 2008) and are the subjects of the penultimate level of the hierarchical classification. Figure 6 illustrates the link between the model of ICP (see Figures 2 and 3) and the TE-Cap 2 platform: Tutor 1 indicates his membership to the CoPs centred on collective activities and on project based learning situations by completing the fields 'Context' ('Contexte' on Figure 6) and 'Learning Situation' ('Situation d'apprentissage' on Figure 6). Furthermore, Tutor 1 indicates the types of learning tasks he monitors and

the educational strategies he applies. In this way, he can participate in the CoPs centred on these practices and have access to their resources.

- Secondary interests: all the CoPs in which tutors have a peripheral role or interest (not directly bound to their working context). This tab is composed of the same six sub-tabs as the previous tab, with some supplementary sub-tabs which do not directly concern tutors' working contexts. We think that this is an essential point so that resources spread from CoP to CoP. If tutors only join the CoPs which correspond to their precise working context, then they have no access to other resources able to interest them. These sub-tabs, we believe, play the valuable role of allowing tutors to realise that other people share similar practices or experiences. From an individual point of view, this 'discovery' of experiences can be useful to tutors in their work trajectory or for moving into another activity.

The platform offers a list of ICP member profiles. Each profile can be called up in more detail. Creating relations between tutors and bringing them into contact with each other is a crucial point of the platform because most of the ICP members do not know each other apart from the platform. It is therefore advisable to convey to every user that others share similar practices or practices which can interest them. Filling in the profile in a relevant way is then important for tutors who wish to be contacted by other tutors.

The user profile is also used to personalise the classification and search interfaces with regard to tutors' working contexts and their other interests. We present these interfaces in the following sections.

A contextual search for relevant resources

The interface to search for messages and tutor profiles, illustrated in Figure 7, rests on the resources classification built for the ICP. The platform proposes the same interface to search for resources as for member profiles. In this way users can, at every search, consult the profiles of found members and 'discover' people who have similar interests or who offer relevant expertise. The distinction of both tabs 'Found Messages' and 'Found Members' allows the exposition of all the types of results found for a same search by separating them.

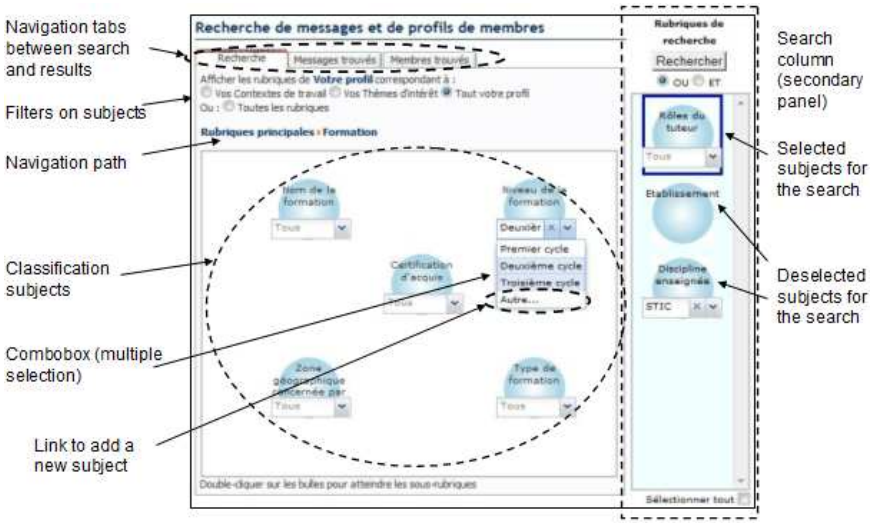

Figure 7. Interface for searching for resources and member profiles

A main panel (at the centre of the screenshot) composed of three tabs allows easy and fast navigation between the results of the search and the classification and for the dynamic modification of the search subjects. The tab 'Search' allows the user to navigate within the classification and to select search subjects. These subjects are represented in the form of bubbles, to bring conviviality and attractiveness to the interface. Users can navigate within the classification by double-clicking on a bubble which explodes into bubbles representing the sub-subjects. When reaching the last level (corresponding to the CoPs), subjects are represented in the form of a combo box allowing for multiple selection. Users can return to a superior level thanks to the navigation path.

A secondary panel (on the right of the screenshot), named 'search column', allows users to store subjects chosen for the search. The subjects in this panel are always visible when users navigate in the tabs of the main panel and

from one request to another one. To make a search, it is necessary to 'move' bubbles from the main panel to the secondary panel by a drag and drop. Once in the search column, users can deselect or select a subject (so as to refine or to widen the search), delete a subject by sliding the bubble outside the column and move bubbles inside the column to choose a preferred order. This principle of category selection can be compared to carts on commercial sites. This original human computer interaction has been chosen to favour navigation within the classification and to simplify the selection of items.

One of the crucial points of the platform is to bring users to quickly see its usefulness in their daily practice. For that purpose, it is important that they can have access as quickly as possible to the relevant resources for them. For that purpose, two means are used (see Figure 7):

- A link between the search interface and the profile allows users to only see the subjects from the classification which concerns them and which interests them according to their profile. So users only have access to the resources of the CoPs to which they declare they belong, and can create resources only for these CoPs. The more fields users complete in their profile, the more subjects they see and the more access they have to resources. But this principle has limits: too many subjects reduce the relevance of the information obtained. This principle thus entices members to auto-regulate their profiles.
- Users have the possibility, according to their aim when connecting to the platform, of applying a filter to display only those subjects bound to their working context or to their secondary interests on the classification interface. We distinguish several use cases:
    - In their daily practice, users need to have fast access to the resources of the CoPs in which they have a central role. For that purpose, it is advisable to offer them at first only the subjects which concern their direct working context, this being the most efficient.
    - If users do not find the information they are looking for in their direct working context, they must be able to extend the search to the other subjects of interest bound to their activity. They can thus find interesting 'unexpected' resources, which they can bring to CoPs in which they have a central role.

Creation of contextualised resources

A message is written according to the following principle: users classify the message according to its context (bound subjects) at the same time as they write it. This principle aims to lead them to reflect upon the experience as they relate. To facilitate this action, an interface in the form of tabs (see Figure 8) ensures an easy and simultaneous navigation between the writing of the message and the classification of this message. Messages are written in a tab named 'Writing' containing a title, the indication of a call for help or not, the scope of the message (public or private), the body of the message and a possible link to a downloadable document. The other tab named 'Classification' displays the same interface as for the search (see Figure 7). The selected subjects in the classification column are then associated with the message, meaning that this resource belongs to the CoPs or categories of CoPs.

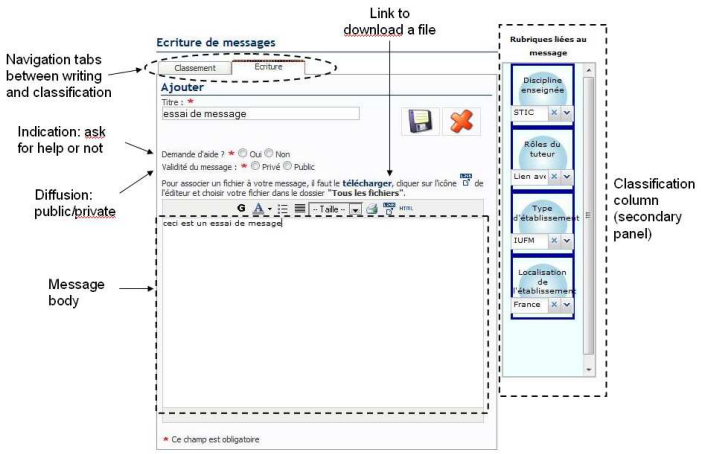

Figure 8. Interface for writing and classifying messages

This interface provides tutors with the means to modify the associated subjects during the editing of their message. Tutors can navigate between the writing and classification interfaces to find relevant subjects and so to clarify the message context at the same time as the thought which they are expressing becomes clearer. By formulating their experiences, even without the intention of diffusing them to others, CoP members are brought to reflect on these experiences, to learn from this process and so to improve their practice (Barak 2006). As for the search, they also have the opportunity to add new values to subjects if the existing ones are unsuitable for them.

Spread of discussion threads

When visualising a discussion thread, tutors can:

- See general information: title, author and date. In particular, this information allows users to identify the messages contributors and to detect tutors' expertise and competencies in a field.
- Add the discussion to their favourites, subscribe to a RSS (Really Simple Syndication) feed (shows last comments) or subscribe to the discussion to receive answers by email. These functionalities aim to facilitate tutor participation, by sending the information directly to their workstation. They can quickly negotiate the sorting to keep only discussions which interest them, and to consult them on the platform. They are not then obliged to connect to the platform to see if there are new messages or comments.
- See the subjects associated with the discussion thread, be they by the thread's author or by other tutors. These subjects represent the discussion context and indicate the CoPs and the categories of CoP to which they belong. Tutors can monitor and regulate the association of subjects to a discussion, the author of the initiating message having the right to remove subjects which they consider irrelevant for this discussion.
- Associate the discussion with new subjects so as to spread the resource from one CoP to another and from one level to another. The movement from one CoP to another can provoke reactions in the new CoP and thus new messages. By clicking the link 'Add a subject', a pop-up window displays the classification interface (see Figure 7) but only regarding those subjects selected in the user profile.

Comparison between TE-Cap 2 and other classification tools

The tool presented above is based on a structured and evolutionary method of knowledge classification. So as to validate this work, we have made a comparison with other existing knowledge classification methods, such as taxonomy, ontology and folksonomy (Garrot, 2008). On the one hand, taxonomies and ontologies are structured conceptual representations on which many knowledge organisation systems rely. However, these models require a consensus which can be expensive and long to reach and are not easily useful and comprehensible by those who did not build them, especially for novices in the domain. Furthermore, these knowledge representations are not able to evolve in time. On the other hand, folksonomies rely on the community activity: users can associate tags with a resource to enrich its description although this system of 'tagging' lacks structuring. TE-Cap 2 offers a combination of the structuring of taxonomies and the community effect of folksonomies and the conviviality, attractiveness and simplicity of use necessary for a community environment such as defined by the Web 2.0 principle (O'Reilly, 2005). Furthermore, it allows a personalisation with a presentation of the fields completed in the profile only and with a filtering of the subjects by working context or secondary subjects of interest.

Descriptive Investigation: Results and Analysis

Context and Aims

We carried out a descriptive investigation, which attempted to gather evidence to support the usability of the TE-Cap 2 platform. A previous study of the prototype TE-Cap (Garrot *et al.,* 2009) involved the participation of 12 tutors who belong to an existing CoP of tutors (named t@d). They used the prototype TE-Cap during a two-month period and tried to integrate it into their practice. We observed a rather low participation (Lavoué *et al.*, in press) and we think that there were not enough members in the community to generate high levels of interactions between tutors. It implies that there is a minimal size required for the community to engender the emergence of rich interactions. That is why in the study of TE-Cap 2 we invited as many tutors as possible, from different institutions and communities, to register on the platform. Furthermore, during the first investigation, all the tutors were from different institutions so they could not exchange about concrete problems which they encounter in their day-to-day practice. We think that it is from the sharing of these very contextual concerns that wider and more global exchanges in a CoP of tutors can arise. In the study of TE-Cap 2 we invited tutors from the same institutions to participate so that there is this first level of exchanges.

In concrete terms, this investigation began on 25 February 2008 and finished on 5 July 2008. Our role consisted

of encouraging registered tutors to participate by sending out regular newsletters (six newsletters were sent during this period). The Web address of TE-Cap 2 was disseminated among several communities of tutors (ATIEF, t@d, PALETTE) and to virtual campuses (VCiel, FORSE, E-Miage, Téluq, Master UTICEF, did@cTIC, FLE). Registration was free and we spread the address widely to recruit a maximal number of users. We also sent an email to the users of the first prototype TE-Cap. We wanted to develop the community around this existing core, hoping that they would feel involved in this study and that they would encourage new users to participate. Discussion threads created during the first study were kept to be used as a base for new discussions. To help in the understanding of how the platform works, we posted online demonstration videos: one general and three specific (to do a search, to write a message and to complete the profile).

This study aimed to validate the TE-Cap 2 platform as a support for the ICP of tutors. We wanted to determine the response to the identified specifications. We defined the following criteria from the works of Preece (2001) and Koh & Kim (2004), adapting them to our aims:

- Sociability: people (number of participants among members, member profiles, emergence of roles and feeling of identity or membership), purpose (peoples' level of engagement and exchange intensity, quality and depth). The period of study was too short and participation too low to be able to evaluate the building of policies by the community.
- Knowledge sharing and creation: resource creation and visualisation (number of messages written and visualised, members searched), way of classifying and searching for resources (used, proposed, missing subjects and classification coherence and evolution), content of shared and visualised resources (nature of messages), level of resource sharing (level and content of the exchanges between tutors from the same institution, various institutions, evolution of the subjects associated with a message).
- Usability and utility: the ability to respond to the communication needs of tutors (adequacy and relevance of the communication tools, relevance of the information in the profile), the ease of use (global satisfaction and general quality of the interface, ease, difficulties and quality of the interface for every functionality), the efficiency (efficiency of the classification and search tools, quality of found information, quality and relevance of the structural organisation and the regulation of subjects).

Results come from three types of data:

- Use tracks: a specific tool was used to collect the use tracks according to the evaluation criteria (e.g. connections, posted messages, used and proposed subjects).
- Questionnaire: this was posted online on the platform to collect users' opinions and explanations regarding the used or unused functionalities. Among the 42 registered users of TE-Cap 2, 13 filled in the questionnaire (30 questions), so bringing significant results. The questionnaire is detailed in Garrot (2008).
- Usability test: we asked three tutors to use the platform by following a scenario (Garrot, 2008). The observation brought us an extra means to explain the results concerning the platform usability and, more specifically, its interface. For this test, the tutors had no help and did not watch the demonstration videos.

Results

Regarding **sociability**, 42 people, from different francophone countries (31 from France; the others from Senegal, Algeria, Tunisia, Italy, Canada, Brazil, Togo and Belgium), registered on TE-Cap 2, which demonstrates the interest in this kind of platform. Among the 42 registered members, only seven wrote messages on the platform (with a total of 15 messages) but 27 users read discussion threads. This low activity can be explained by the fact that no tutor took on a leader role in the community life, inciting members to participate. We did not want to play this role since we aimed to observe the emergence of natural roles. But it would be necessary to define one or several coordinators who would encourage participation among the registered members. We also notice that some users do not practice tutoring themselves, but are interested in this activity, and have therefore registered on the platform (three users filled in their interests in their profile entirely, but not their working contexts). We think that these people were interested in reading the messages but were unable to relate themselves to tutoring experiences and practices. According to questionnaires, people registered on TE-Cap 2 both to share experiences and practices and also to discover a new tool. The first reason corresponds with what the platform intends to offer but we would have hoped that these persons would participate more. The second reason implies a rather passive attitude and is certainly the cause of the lack of engagement in the community. Nevertheless, lurkers can also be considered as participants in a CoP platform. This group of people can become resource producers after a period of time. Also, the activity of reading is in itself also an important part in a CoP development.

In spite of the low activity, we notice that the quality and the relevance of discussion threads were good with

regard to the tutoring activity. We observed that when a discussion was started, answers (two at least) were written in every case. A discussion was composed on average of four to eight messages, which testifies to a rather important depth in the exchanges. Concerning message quality, we notice that they are all concerned with tutoring and that the answers are relevant with regard to the discussion. Every discussion forms a coherent thread with, for several messages, the contribution of Web links pointing at interesting outside resources with regard to the discussion. Another positive point is that the subjects of the classification, bound to the tutoring activity, tend to bring a feeling of identity and membership to the community. Indeed, six tutors answered positively on this point (against one negatively). However, the six non-responses led us to suppose that the study period was too short to significantly estimate this point. The last point concerns newsletters: by studying user connection tracks, we observed four important connection peaks corresponding with the sending of newsletters. We conclude that this functionality is important to provoke activity among the registered members.

Regarding the **knowledge sharing and creation activity**, among the 42 registered members, only seven wrote messages on the platform (with a total of 15 messages) but 27 users read discussion threads (with a total of 225 readings). Only two discussions were started, but there were also reactions to discussions resulting from the first study. Concerning the search for resources, the community activity was more important (37 searches) but they were made by a minority of users (only six). There were 175 connections to the platform, which is rather low for a period of more than four months. There was an average of four or five visits per user, with an important heterogeneity (from only one visit to 22). We mainly interested ourselves in understanding the reasons for this low activity on TE-Cap 2. We suppose that there were not enough messages on the platform to provide tutors with an interest in searching something. Furthermore, the tutors were not interested enough in the others (almost half of the users never chose to view a profile). We think that the number of tutors in the community was too limited so tutors did not use it to look for persons they wanted to get in touch with. It would be necessary, on the one hand, to motivate more registered tutors to participate and, on the other hand, to encourage tutors from various institutions to register on TE-Cap 2 by increasing advertising of the platform.

Concerning the messages classification, three or four subjects were associated with them. For every message, a new subject was proposed, which allows us to suppose that this functionality is essential. We also notice that a rather large number of items (45) were added when completing the user profile, which involves a significant evolution of the classification and thus an appropriation by users. All the new subjects proposed are values given to user profile fields and therefore they all correspond to the lowest level of the classification. They are bound to 10 subjects (categories of CoPs) and especially to institutions and course names. The added values are coherent with the corresponding subject in the profile. However, we observed no evolution (addition or deletion) of the subjects associated with a discussion thread. It is not a surprising result since the duration of the study was too short and the number of messages too low to observe the spread of a discussion from one CoP to another, or from one level to another. However, the platform does answer existing tutor needs: tutors look for information or practice sharing as much at the local level of their course (eight answers to the questionnaire) as at a more general level such as tutors' roles (12 answers), technical and educational tools and resources (12 answers), learners (10 answers) or learning scenarios (eight answers).

Regarding the **usability and utility** of the platform, users were satisfied with the navigation in the platform, the overall ease of use and the general quality of the interface (answers to the questionnaire). According to the questionnaire responses, the platform utility is considered good. We think that this positive feedback springs from the fact that tutors wish for and need online spaces to exchange practices and experiences (expectations exposed in the questionnaire), and that any initiative in this sense will be welcome. Nevertheless, the answers to the questionnaire mainly demonstrate a lack of time among the registered tutors. Participation in the community will always be a lower priority than tutoring or teaching. But a surprising result is that the tutors did not take up useful functionalities such as RSS feeds (two respondents had used them against nine who had not) and subscriptions to discussions (six subscriptions by four distinct users). We make the hypothesis that they do not know or are not used to these functionalities or that they did not see them. It would thus be necessary to highlight these functionalities so that users save time when accessing interesting information.

Concerning the classification and search tool, usability tests highlighted that its interfaces are very easy to use and efficient. But the use of these interfaces requires a learning step, which is normal for an innovative interface which proposes new functionalities. Furthermore, users of the study did not see some innovative functionalities. One respondent's answer to the questionnaire confirms this point: "*According to your questions I perceive the potential of the platform*". So the help available from the videos is insufficient or not adapted (usability tests and use track analysis highlight the fact that when users connect to the platform, they do not watch the videos or just glance at

them). Furthermore, some users (23) did not complete or use their profile, which leads us to suppose that they did not see its purpose or did not take the time (it requires 5–10 minutes). The most important reason however, must be the fact that users did not understand the link between the profile and the proposed classification. Therefore, it would be necessary to explain this link better, so that they can see its relevance to their day-to-day practice (i.e. to filter subjects proposed for a search, according to their working context or interests). We observed during usability tests that some users had difficulties in understanding and/or in choosing some of the values in the profile. It is always difficult to have a consensus on the subjects of a classification, it is thus normal that some subjects are not understood by some users and this point highlights the importance of allowing users to make the classification evolve.

Discussion

In this paper, we have shown that the general model of ICP can be implemented in the form of the TE-Cap 2 platform. We have explained the way this platform responds to the demands of the general model. Furthermore, the results of the study show that this platform achieves what it has been designed to and answers some existing tutors' needs. Indeed, numerous tutors joined the platform; they declared their interest in this type of platform to discuss subjects bound to their institution as well as subjects bound to the activity of tutoring generally. Furthermore all discussions were relevant with regard to this activity. However, the utility of the platform has not been demonstrated in this research and the evaluation of the platform being used by tutors in their daily practice has not been carried out. We strongly believe that it is important to allow the classification of the resources to evolve, as has been observed in this study. However, essential functionalities have not been used, such as the addition of new subjects to discussion threads so as to spread them to new CoPs. This type of functionality is interesting only if the platform is used by a lot of people and over a long period of time. It would be interesting to conduct a new study with an already formed community, having some leaders to animate discussions. It would also be necessary to help users easily understand how the platform works so as to make them see all of its potential. An improvement could thus be the addition of contextual help or a software companion. From this starting point, we would be able to really estimate if this platform is useful.

Conclusion

In this paper, we proposed a model of ICP to support local CoPs of tutors who practice a same general activity to create relations and to share experiences. This model aims to bring together different local CoPs and global CoPs of tutors and to capitalise on all their knowledge in a contextualised way. We validated the implementation of this model by developing the TE-Cap 2 platform. This platform gives access as quickly as possible to the relevant resources (discussion threads and members' profile) to tutors with regards to their working context. In this way, tutors can, for example, discuss lessons and solve problems with the help of tutors from other institutions who have similar practices. We finally conducted a descriptive investigation of this platform over a period of approximately four months with tutors from various institutions, disciplines and countries. Results show that the platform is usable, although all the possibilities offered by the innovative interface were not used.

The aim of this study was not to observe the emergence of a CoP because it was unachievable in only four months. So to observe such emergence, we plan to conduct another type of study, across a long-term period and with the addition of a software companion to facilitate the understanding of the innovative interface. It would also be interesting to address another community than that of tutors or teachers who often tend towards rather individualistic professional behaviour and who are not always used to sharing and helping each other. Indeed it would certainly be necessary for their professional mentality to take an evolutionary leap before offering them this kind of platform again. Another perspective would be to use the TE-Cap 2 platform in another context; for example as a training tool for trainee teachers, asking them to use it to discuss teaching practices.

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