Mobile Communities in the Learning Context: a Possible Approach

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Abstract—This paper describes the development of the mobile extensions of a virtual system communities, result of the cooperation between the Laboratory of Maieutics of the University of Trento and the Institute of Advanced Management System Research (IAMSR), Åbo Akademi, Turku (Finland). The objective of the cooperation was to create mobile modules for the virtual communities platform, equipped with e-learning services, specific tools for online collaboration as well as services typical of web 2.0. The resulting platform, called MobiC (Mobile Community), was released at the beginning of 2009 and is now being tested and extended to various settings, among which lifelong learning projects in which our group is involved. Our research group has for many years now been involved in the management of a virtual communities platform used as experimental and research example applied to e-learning topics but, above all, to communication and collaboration through ICT. The aim of the collaboration was to expand into the mobile universe the functionalities of Online Communities, the platform developed by our team. At present, this platform is used in the academic environment both as a platform for lifelong learning projects and in the Public Administration’s field. The interest is particularly devoted to understand the possible implications on collaboration among users of geo-referenced services, like mobile blogging with geo-tagging, online presence with geo-position of the user, connection to a collaboration platform done using mobile phones where the physical position of the participant can be recorded. These services have been developed and integrated in the platform: we will describe their structure and the implications in learning context.

Index Terms—Learning communities, m-learning, e-learning, lifelong learning

I. INTRODUCTION

This paper presents the mobile extensions recently added to a Virtual Communities (VCs) platform used as experimental and research example applied to e-learning topics. VCs (Preece, 2001) and, in particular, Learning VCs, have for some time now been the center of attention of the media, thanks also to the wide diffusion of web 2.0 and, more recently, to the great echo that social networks are having in the world of research and their impact on the social habits of netizens. In this context, for the past few years our research group has established a strong collaboration with the Institute of Advanced Management System Research (IAMSR), Åbo Akademi of Turku (FIN); IAMSR is an outstanding institution in the field of mobile services (research and development). Our collaboration is a result of a long experience of both teams in developing mobile services [1;2]; one of the last project has been the extension into the mobile universe of the functionality of Comunità Online – Online Communities – COMOL [3]. COMOL is a platform that supports collaboration / cooperation mainly (but not only) in the e-learning settings and has been entirely designed, developed and managed by the Laboratory of Maieutics.

Initially applied to academic environments (University of Trento and Åbo Akademi), COMOL now is used as a platform for lifelong learning projects and in some Public Administrations of our Region (Trentino, Italy). The idea to equip COMOL with services directed at the mobile world is not new; in the past we have designed and experimented some prototypes suited to the state of art as they were at the time [4;5;6]. The first experiments on the usage of mobile technologies inside Virtual communities showed interesting convergences, and we developed some useful extensions for mobile settings, like tools for time management, SMS, Chat, forum, Sticky notes. The usage, however, has been very limited, due to the limitations of the devices and the costs that we all know.

The perspectives of mobile applications, especially those closely related with the information system of the organization, have greatly improved respect to the past, due to many reasons. On one side, we have more powerful devices with few (if any) of the previous limitations (keyboard, size and resolution of video, batteries). Secondly, mobile devices are now equipped with geo-reference equipment that allow an incredible expansion of possible usage of the device in different scenarios, considering not just traditional geo-reference services (like navigators), but the fact that in this way the user is geo-positioned, allowing interesting situated services (situated-learning). Finally, the availability of mobile Internet connections at reasonable costs and the explosion of web 2.0 and social networks phenomena are two factors that on one side converge, on the other stimulate each other towards a pervasive use of the mobile device. This being connected “anytime-anywhere” could be seen like a nightmare, but also as a great opportunity especially for specific learning settings.
In the results we are presenting in this paper, we exactly experimented a series of mobile extensions to our VC platform that go in these two directions, i.e., geo-referencing and social networks. The objective set by the our two groups has been to develop an application compatible with the recent mobile devices, capable of including a series of services within an e-learning context and collaborating also in a non-formal way. We could have undertaken a much simpler approach, i.e., replicate and simply resize the screen and applications of desktop version of COMOL, but the simple transfer of these functionalities onto a mobile device would be clearly a mistake due to the differences that still exist between a PC and a mobile device. We then decided to develop a lighter version built from scratch, more flexible to be used also through different appliances, like a mobile phone or a PDA. The whole version was to be set in an applicative context that partly adapts itself to the needs of training in a more narrow sense, and partly extends the use of the metaphor od VC's to more collaborative areas where the border between learning, collaboration, cooperation is always very hazy. After a first round of tests, we found some issues in the interface, and we applied some improvements thanks to some usability tests applied using a User-Centered Design (UCD) approach.

The paper is composed as follows: in the second section we will describe the main characteristics of Online Communities. The third section illustrates the motivations we had to create the MobiC platform, while last section is devoted to the description of the main functions activated in MobiC.

II. THE EXPERIENCE OF ONLINE COMMUNITIES

In this part we briefly describe the basic idea of the COMOL system. On Line Communities is a dynamic web application, based on the metaphor of virtual learning communities in a blended approach [7,8], that guarantees the work organization of cooperative users group named Community. A virtual community is defined as a communication space that is shared by a certain number of people, for whatever reason not only related to educational aspects. Communities and their services better help to manage situations like:

- The community of teachers’ thesis students
- The community of Faculty members
- The community of the Faculty’s secretary
- The community of labor union
- The community of the “HCI” course
- The community of the secretary of “University games”
- The community of people involved in the Project “XYZ”
- The community of people following the stage of student “ABC”

Each community has at least one coordinator, and the participants are not anonymous. It comes spontaneous, in fact, to imagine VC as aggregations of subjects created through ICT tools, as an extension in the virtual of a typically “didactic” environment, like the classroom and the course that is held in it. The system has been designed from scratch, and is able to support whatever user of the system (teacher, student, tutor, lecturer, secretary, external expert, porter, dean, chancellor, consultant etc.) in using real, virtual, face-to-face or distance communication. In this way the construction of virtual communities of different nature becomes possible; i.e. in a community of “Faculty Board” all members (teachers, student representatives, representatives of technical staff) are at the same level, that is to say, they have the same role of participants and only the principal of the faculty takes on a special role.

Membership in a community can be obtained automatically, as a right or as a free choice: for example, a student enrolled in the Faculty of Economics and taking the course “Database 2007/2008” is a member of this community by choice and for a limited period of time, while s/he is member of the Faculty community automatically. The participants are non-anonymous and they also have (multiple) roles, each role having specific rights and duties within the community. Thus, the actors of the system participate in several virtual communities at the same time, acting in different roles with different rights and duties. Communities are characterized by events, that is, temporary interventions that involve the community. A typical virtual community organized around a university course with professor experiences several events: one for every lesson or session, one for each test or exam, another for each meeting with an external lecturer, and other similar didactic activities.

On Line Communities was released on 2005, but was under the experimentation on a limited number of courses from the end of 2003. The Faculty of Economics started to use the system from September 2005, and now other faculties of our University are experimenting it in many types of courses. The system has about 10.000 registered users, a monthly average of 33.000 accesses, and 1.500.000 total real accesses with a login on the system: the impact on the whole information system of the University and on the daily life organization of members is not trivial. “On Line Communities” offers different kinds of communication services: whiteboards, forum, chat, calendar, lesson schedule, mail, learning objects download/upload, shared workbooks, sticky notes, agenda, syllabus, work areas, etc. These services are not strictly related to educational or training activities, but in general can be used to facilitate the interaction of community’s members for any scope the community itself has been created. What we define “services” are reactive components of the web application and users access them with their respective permissions in order to cooperate in organizational and educational processes in various ways. Some of these services are typical of an e-learning environment (like, for instance, the diary of the lessons) but the most part of the services are totally general and usable in processes of heterogeneous cooperation. It follows that, even though the system has a mainly applicative e-learning scenario, its uses in the context in which it has been installed (mostly training entities and public administration) are moving fast towards what originally had been foreseen in the founding metaphor of the system, that is, the community
where collaborative and cooperative processes take place that are not directly linked to didactic activity.

Indeed, on the one hand, COMOL is far from the traditional systems of e-learning, such as Moodle™, compared to which it offers different services better usable through the VC metaphors. On the other our system is not, and does not meant to be, one of the many platforms of social networking, even if it has (ante-litteram) many of its characteristics. Suffice to mention one fundamental difference among the many; the participants in COMOL are not anonymous, since for the system communities are not the result of a spontaneous aggregation of people “emerging phenomena on the net” in the sense given by [9] but, rather, a space that extends into the virtual processes of cooperation among people whose identity enriches the community.

III. MOBILE COMMUNITIES

The COMOL experience made us to experiment its use to different devices: in particular the convergence between mobile devices and community services could favors the improvement of various training contents, capable of interacting with geo-referential devices linked to the place of learning [10]. The “situated learning” is interesting in the traditional learning environment but is even more specifically relevant in the life-long learning contexts that we are examining, where the subject is no longer part of the standard training circuits (classroom, teacher, course, etc.) but finds itself in a working context in which it needs to learn (consult a manual, share opinions, interpret documents, etc.).

We have, therefore, decided not to limit ourselves to adapt the PC version to the mobile device via browser, but to develop a solution specific to the case. There are at list two reasons for this choice:

1) the use of a mobile device is, for obvious reasons, far different from the use of the PC (screen dimensions, usage times, connection speed, etc.).

2) the services to be used and appreciated within a mobile device are not the same as those available in a classical web application.

We have decided to start collaboration between our team and the IAMSR’s team to merge the skills of the two groups and establish a convergence between the concepts of community and mobility; indeed, the approach based on the metaphor of VCs makes it possible to transfer into a virtual environment the relations among users in real life. The idea of Mobile Communities stemmed from these and other considerations. The objective of the system is to offer to the mobile users of COMOL a subset of services available on the platform, suitably selected in order to be easily used through a device with a smaller screen compared to a PC. Following this approach it is also possible to foresee functionalities otherwise not repeatable in the system, especially the geo-reference services that refer to the position in space of the user. Such functionalities are rapidly spreading due to the capillary diffusion of devices equipped with GPS modules.

In the first phase of the project, completed with the creation of the first version of the system, we have integrated into the mobile platform of the subset of COMOL services, previously selected in the design phase; the home page of the system is shown in Fig. 1.

For the development of MobiC we have chosen an Agile method development [11], that is an incremental process. The development contains of many small iterations and all iteration is 4 weeks long. All iteration includes specific features; in this way it is possible to look better at the development and detect problems through testing. All iterations consist of five parts:

1. Analyze: analyzing requirements specifications to meet expectations.
2. Design: create UML diagram if needed
3. Code: implement and write documents accordingly.
4. Test: code must pass test phase.
5. Deploy: latest version of the software, including any new features

These iterations don’t have to be made in any type of order. The two applications are connected in a bi-directional way: the changes applied to whichever of the two has effects on the other, making it irrelevant where the user carries out the action permitted by the service. The home page introduces the index of services available via the mobile device; from this page it is possible to select the community within which to carry out one’s activity (at the arrival of the system the last community visited will be shown) and, once access has been granted, the system shows the services available in that community. Thanks to the bi-directional integration, the user can use his usual access credentials.

In this work we present the mobile application that it will soon be made available to all the users though it is not yet active in our university (now it is in the test phase); the application will be available both to our students in the e-learning project and the workers in the life-long learning project.

The interface of the system is the result of usability studies carried out in collaboration with the Finnish group that has stimulated us to develop a very light application, preferably also easy to use.
IV. THE MAIN SERVICES OF MOBI\textsuperscript{C}

Introducing the main services at present implemented in MOBI\textsuperscript{C}, we need to distinguish the COMOL services made available in mobile environments, and services of the mobile universe. Hereafter we introduce briefly the two groups of services highlighting the differences and similarities for the groups transferred from the native COMOL environment.

Authentication and Access: The mobile user of COMOL connects him/herself to the URL of the system. The system recognizes that the user is connecting him/herself from a mobile device and provides an interface optimized for reduced size screens, at present 320x240 pixels. Once connected, the user can choose within which community to operate: in order the facilitate interaction on mobile devices it is suggested to default the access to the last 10 communities used, showing the last one visited.

Events Calendar: the user is enabled to keep a personal calendar and to access events shared within each community. In this way it is possible to create community events, for example, a meeting of the components of a work group so as to conclude a project in progress (fig.4).

Quiz: MOBI\textsuperscript{C} foresees also the possibility to offer multiple choice tests: we have chosen this type only, compared to the many types of the Web version (free text, drop down, self-composition, rating, etc.) because it is much easier for the mobile user. The insertion of a text is not required, which in many cases is most difficult, but only the choice of an option within a group of possible answers.

Blog: the integration of the blog service offers the participant the possibility to manage a personal space so as to be able to interact in a direct way with other users of the platform. This interaction greatly reduces the need of knowing how to publish contents (text and images), offering the user an active role in the community with the help also of the geo-referential tag of post and relating images/photos.

Chat: the availability of the QWERTY keyboard has made it possible to introduce a chat service into the mobile device, offering synchrony of communication among the members of the community, enriched by the functionalities of a closed community.

Personal profile and friends: each COMOL user has on hand a personal profile and a list of contacts among the participants in the community of the user him/herself, thus creating a small social network. The chosen mechanism differs from that used in other services such as Facebook\textsuperscript{TM}, that is, the net of friends [12] in which it is possible to access at the list of contacts of each user. This opportunity can be considered as positive to some experiences but also critical in formal learning contexts (universities, companies); indeed, some statistics [13] show that the majority of users involved in such nets spends more time in the so-called “peoplesurfing” (surfing among the profiles of friends visualizing images, personal information, list of friends, etc.) restricting the privacy of each user. The mechanism used in COMOL is, instead, based on self reputation; each user must necessarily ask the friendship of a potential friend who, in turn, must accept it. In no other way a user can access contacts of other users but only the list of participants in each community.

Service of geo-location. Geo-location functionalities indicate our position on the surface of Earth thanks to the GPS system. Generally the ideal solution is a connection between a GPS module and a mobile phone browser through the interface of specific programmes. Such connection is solved through the installation and application dedicated to that purpose, in our case the software created for this carries out two specific operations:

- access to the GPS coordinates using the APIs offered by the device;
- send the coordinates through an HTTP request to the service of geo-location uploaded in the browser (in our case MOBI\textsuperscript{C}).
The geo-location service within MobiC enriches the application with information that otherwise could not be used in the web version. Indeed, it is possible to:

- visualize on the map the position of the personal’s contacts (if the latter decide to make it available). Our work group has for some years now been engaged in designing proximity learning services such as, for example, “What Are You Studying” (WAYS) [10], that is partially integrated into MobiC,
- link a new post within the blog to a specific position in space; as for instance by adding to the description of a photograph the place in which it had been taken.

The software at present is compatible with the devices that support Java. As mentioned, at the end of the process of development of MobiC, a further test has been introduced, in order to understand the level of usability of the interface respect to users [14].

The typical users of COMOL platform are university users, well prepared in used modern technologies and not scared about learning new interfaces / devices, if there is any convenience to do that. Nevertheless, from first experiments, we discovered that the usage of the system was complicated by some aspects related with the interface, rather than the functionalities provided. Consequently, we decided to test the new interface with users following the User-centered design philosophy. This is an approach to analyze human-computer interaction, a process that focuses on cognitive factors that come into play while people are interacting in general with things, and specifically with computers.

We in fact have already some problems of interfaces in the online version of COMOL, due to some factors:
- the interface has been sacrificed to technical constraints and JIT needs
- we are continuously adapting COMOL for some partners, so the interface normally is customized by the organization adopting COMOL
- the platform has grown in different years, since 1998, and the interface has always been the last aspect to be incorporated, as we preferred to concentrate on developing new features to be experimented

users evidently experienced some problems in using the platform, both for the complexity of some features (the hierarchical organization of communities, for example) and for the poor quality of our interface. This test has been conducted on the main services of Mobic, i.e., log in, Profile, Blog, Events, Log out and Geo Locate service. Following Jakob Nielsen’s suggestions [15] we used 5 users to highlight the possible mistakes and slips in our MobiC interface. We mixed different techniques, like different observation, “think aloud”, a written questionnaire with open suggestions, trying to identify usability issues and possible solutions also proposed by users. The space here is too limited to describe the whole test, which has been repeated in a series of rounds to different users, but the final results have conducted to a mobile interface that has improved a lot the success factor of users in interacting with MobiC. One typical example regards the long screens on the mobile phone, where the initial design and implementation has revealed some usability issues, like shown in fig. 8.

V. CONCLUSIONS

This paper presented one integration experience between a virtual communities platform and the mobile, transferring Web services to the mobile world. Following this approach it is possible to enrich these services with peculiarities offered by mobile devices. This aspect revealed an amplification of problems related with the usage of the online platform: in Mobic, the same services used on mobile phones demonstrated some interesting suggestions for improving both services, web-based and
mobile-based. MobiC offers the possibility to access transparently both to traditional services / new versions of existing services thanks to the peculiarities of modern devices. The experiments showed other complexities, not necessarily technical. For example, porting a “desktop” app into mobile settings is a critical issue: in our experiment, although mobile browsers today have a great visual performance, it has been better to develop the services from scratch, specifically for the mobile device). We have still performance issues, especially in the case (like the geo-referenced blog) where you supply an interesting opportunity to people to upload pictures directly into the community (or personal) blog, but in that case performance are crucial. We found still development framework issues, not talking about the different platforms, different SDKs, different view of a mobile device respect the operating system, and the tradition problems related with mobile devices, like connection management, devices’ memory management, offline / online management. Finally, due to the critical aspect of security and closure typical of COMOL, the management of roles and permissions on mobile phones has been a not so easy task, with a sort of “mobile frustration” of users in dealing with security issues.

At this moment Mobile Communities is a testing phase; the next phase will be the re-design and experimentation of the platform in didactic contexts. One of the important aspects of the new version will be the possibility to read RFID devices (at least the passive ones) or bi-dimensional bar codes (QR-Codes). This will make it possible to use these tags for obtaining web sites for specific didactic material.

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