Just4me: Functional Requirements to Support Informal Self-directed Learning in a Personal Ubiquitous Environment

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Abstract: The aim of this paper is to present the results of the first phase of a project called Just4me. The project proposes the design, and development and pilot test of a technological platform that supports a ubiquitous personal learning environment (PLE) designed for lifelong learners across different professional, social and training contexts. In this paper, we define functional requirements that might support informal self-directed learning also taking into account mobility factors (related with ubiquitous learning) from the standpoint of a practitioner in any field.

Keywords: PLE, self-directed learning, informal learning, lifelong learning, user requirements, online platforms.

1 Introduction and Project Aims

The Just4me project is funded by the INNPACTO Program (Spanish Ministry of Science and Innovation), and developed by a consortium composed of the Universitat Oberta de Catalunya, several technology and software engineering companies (ICA, BDigital and CIMNE) and the Official Medical Association of Barcelona (COMB). The innovation of our proposal is mainly based on the idea of developing a PLE that allows ubiquitous access from mobiles devices, and also on the integration of learning tools and patterns that might be of help to direct practitioners' learning across the continuum between informal and formalized learning scenarios and contents.

Our proposal is based in a conception of a PLE as a learning facilitator, when learning is considered in a holistic sense and from the learner perspective, throughout life in virtual and physical contexts, rather than the idea of a PLE as a technological platform that integrates a number of network services for this purpose. Thus, we believe the concept of a PLE is not delimited by a given technological solution, but is much broader and has to do with an "expanded" way of understanding learning. The Just4me PLE should support the lifelong learner in self-planning and self-structuring his or her learning pathways.

2 Background and Theoretical Framework

In order to elaborate the theoretical framework of the project, we have reviewed the main current research on the conceptualization and implementation of PLEs, i.e. [1-6]. Furthermore, a literature review has been carried out with the aim of defining the theoretical conception about learning that is underlying our PLE. With this purpose in mind, we have focused on concepts and theories around lifelong learning, informal learning and self-directed-learning from a sociocultural perspective. Our approach incorporates both dimensions of autonomous and social learning in the framework of a continuum from informal towards "formalized learning". Finally, we take also into account the connectivist view of networked learning [7] which stresses the importance of connections among people and knowledge objects.

Our conception the user profile is based on a professional adult, responsible for his or her own development. This responsibility leads to the need for learning throughout life, something that brings into play his/her ability to organise, plan, self-regulate, and engage jointly with others in this learning process. From a sociocultural perspective, any subject learns continuously through their participation in different contexts, whether more or less formalized, depending on the competences that he/she is able to deploy. We should therefore remember that the competences for learning throughout life are defined as a combination of knowledge, skills and attitudes to develop appropriately in a specific context. The DeSeCo Project [8] classifies key competences in three broad categories: to use a wide range of tools (both physical and socio-cultural) for interacting effectively with the environment; to engage with others and to interact in heterogeneous groups; and to take responsibility for managing own lives and act autonomously.

Autonomous learning and self-directed learning have been addressed by different authors as the pillar for professional development and lifelong learning [9]. It involves being able to use one's own competences and resources to strategically formulate goals, to organize and structure information and to build knowledge that is meaningful to one's aims. It also involves controlling, regulating and assessing consciously and intentionally one's learning process. This requires using different self-regulation strategies [10], including metacognition as the awareness of one's mental processes and the ability to reflect on these processes.

However, autonomous learning takes place in a wide sociocultural context, which involves relations, actions, shared objects and discourses, both in physical and virtual spaces that may belong to formal and confined institutions or to informal and extended communities and networks. In this case, and for the purpose of designing a lifelong PLE, we focus on informal learning contexts. Informal contexts offer opportunities to cultivate communities and relationships driven by conversation around knowledge objects. Informal learning processes can take place in any setting and involve actions such as exploration, reflection, integration, elaboration, sharing, etc. Informal learning has been defined by the European Commission [11] as "*learning resulting from daily life activities related to work, family or leisure. It is not structured (in terms of learning objectives, learning time or learning support) and typically does not lead to certification*". It may be intentional or non-intentional (incidental), but control of learning rests primarily in the hands of the learner.

In the last decade, several authors have proposed definitions that resituate the boundaries between formal and informal learning [12-15]. Some of them advocate considering the intersection between formal and informal education as a continuous

process. For instance, informal learning is also part of the organizational and professional contexts, where it allows coping with the tasks and contextual requirements and facilitates problem resolution. Other authors consider that the concept of informal learning is redundant, arguing that all learning occurs within social organizations and communities with more or less formalized structures, and constitutes an inseparable aspect of social practice [16].

One way or another, it is increasingly evident that the boundaries and relations between the two concepts are not as clearly distinguishable and polarized as has been claimed. In today's society, the contours of formal and informal learning are blurred and become more diffuse and problematic. This process has been enhanced and has become more evident with the emergence of social technologies. As expressed by Jokisalo & Riu [17] more than a means of learning, the Internet has become a playground where people can search and find the tools and content they need to set up, to suit their own learning environment. Consistently with this approach, we have explored and built on Cross [18] "learning mixer", according to which learning processes always consists of a transition, a mixture of formal and informal components that are determined along different criteria. This pattern is dynamic since the degrees of informality/formalization may vary along time.

If we understand learning as situated/contextualized, we have to admit that learning supported by PLEs involves certain degree of decontextualisation of information objects from their original milieu and their subsequent re-contextualisation in the PLE. This requires putting strategies into play to recognize which information objects are relevant, to integrate them into actual knowledge related goals, and to build relationships between objects, goals and domains, extending the learning context beyond specific sites and spaces [19].

Here, we find the idea of boundary-crossing objects and activities very appropriate to refer to social practices and objects that act as learning mediators, but stressing the idea that those objects may be part of many contexts. This perspective emphasizes the relational and flowing nature of the learning context [19]. This concept has been previously proposed by Atwell [20] to understand the fluid, relational and not-context-dependent nature of PLEs. From this perspective, a PLE may play the role of a boundary object itself enabling the learner to move from one domain to another, making connections among information objects on the basis of social relationships and mediating learning in this way.

3 Methodological Approach

Currently, the project is in the stage of conceptualization and specification of the functional requirements of the PLE and the underlying learning approach. The main goals guiding the data collection and analysis have been formulated as follows:

1. Conceptualize the educational approach of the environment.
2. Identify users' needs in terms or information management and knowledge production.
3. Determine the functional and technological requirements of the environment.

In the previous section we have already presented our theoretical approach. Secondly, we have conducted a needs' analysis in order to have a better understanding

of the target group. For this purpose, we have conducted a questionnaire addressed to the target group: medical professionals. A snowball sampling method has been used to reach the respondents (N=26). The aim has been to gather general needs in the medical sector regarding search, organization and use of professional content and tools, participation in specialized networks, as well as in more formalized courses, etc.

The questionnaire has been structured in seven multiple-choice questions regarding the following issues:

a) Web 2.0 tools and resources useful to learn;
b) Strategies for organizing information;
c) Integration of different tools/services;
d) Main features of a PLE that allows connection to the commonly used Internet tools/resources and to support learning.

In addition, and as a means of contrasting the information gathered through the questionnaire, we have interviewed an expert in using Internet and social tools to carry out his professional activity in the field of medicine. In this case we have gone into greater detail regarding significant information searching, organizing and knowledge building in self-directed learning processes.

Following and with the aim of determining the functional and technological requirements of the environment, we have revised some prominent projects regarding the development and implementation of PLEs in three different contexts: professional and corporative contexts (EPERe-PORT Project[i], MATURE Project Services[ii], Aristotele project[1], APOSDLE Project[iii]), higher education institutions (JISC CETIS PLE Project[iv]; Leicester PLE Project[v]; PLE Project at University of South Australia[vi], Responsive Open Learning Environments[vii]; PELICANS[viii], TU GRAZ[ix]; SAPO Campus[x], Proyecto Dipro 2.0[xi]), and open environments for lifelong learning (Hort Digital[xii], Ten Competence Project[xiii], Grapple Project[xiv], MyPlan Project[xv]).

All these data have been triangulated and analyzed taking into account the following two axes: a) dimensions of technology use (access to information, content creation, planning and self-management, social outreach, and communication and social relationship) and b) learning context (professional, social or academic).

4 Results on Users' Requirements

The results of the questionnaire indicate that the most popular tools are e-mail (25)[2], search engines (23), word processor (21) and social networks (19) (i.e., Facebook and Twitter) while the lesser-known tools are LMS (4), video and audio editing and recording (4), social bookmarking (3), and virtual worlds (3).

Most of the participants search for information using keywords on search engines (25) or consulting paper (15) and online (12) journals, while few of them use social networks (9), presentations (5) or open book repositories (4). Regarding the way they organize the information, normally, they create folders on the computer's screen (23) or use the e-mail (19), just a few of them have a start page (2) or a virtual desktop (1).

[2] The number indicates the amount of people who have chosen this option (N=26).

The participants that integrate their social networks in the same environment (27%) do so through Twitter (3), Facebook (1), blog (1) or other tools (2). The participants usually learn by attending to conferences (18) and in face-to-face courses (18), however, just some of them do this through University courses (9) or web 2.0 content (8).

Regarding the features of an environment that allows them to connect the tools and resources used on a daily basis (see Figure 1), most of the participants imagined an environment that helps them gather and find information and plan work. Features like uploading their CV or presenting information in different formats are not essential to them.

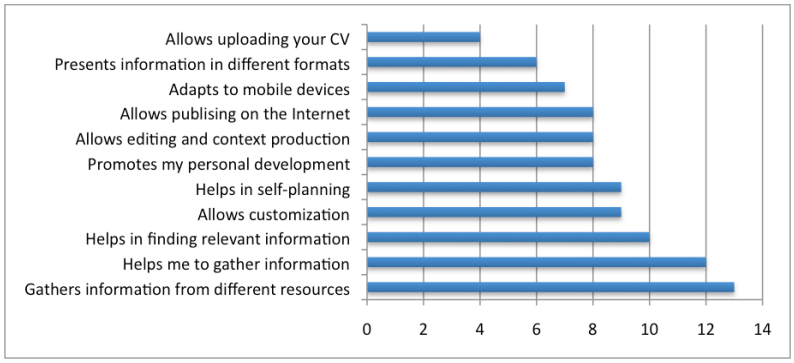

Fig. 1. Features of an environment that allows integrating usual tools/resources

Concerning the features that could support their learning processes (see Figure 2), the participants prefer an easy-to-use environment easy to use, which shows and guides the user how the tool works, helps them to make a critical selection of information and resources and offers a space to store their learning activities. Just a few of them request for features related to offering or receiving feedback on learning activities or assessment.

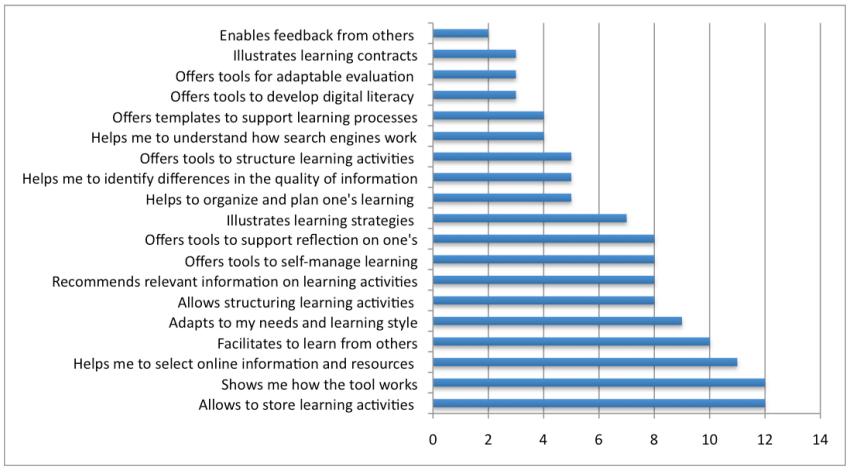

Fig. 2. Features of an environment that supports self-directed learning

Contrasting the information extracted from the questionnaire with the information obtained from the interview, we have identified the following as the key points regarding users' requirements:

- Information collection and sharing from/with different resources.
- Plan own work/activity.
- Customizable (can be adapted to personal needs and learning styles).
- Easy to use, intuitive (useful for users with different level of digital competence).
- Store and organize information and resources.
- Learn from others and help others to learn.
- Help in critical selection of information.

Thus, initial results have shown specific requirements in terms of personalization that can make the environment adaptable to the users' different levels of digital competence, learning style and needs. The platform should be close to everyday technologies, and in turn, be able to integrate and operate with other environments, tools and resources. It should also incorporate specific features and tools specially conceived to support learning, and to structure and plan the knowledge that learners acquire along and across their academic, social and professional pathways. Finally it should recommend relevant information to learners on the basis of their fields of interest.

This phase has allowed us to identify features and requirements of a PLE that integrates "knowledge services" used on a daily basis in different contexts (social, professional and academic), as well as to reflect on specific affordances that might support learning in the transitions between those contexts on the basis of the notion of boundary objects. Next, we define the uses and functionalities of the Just4me PLE organized in three final dimensions that are described in the following section.

5 Functional Requirements and Product Specification

Most of the research and projects on PLEs implementation is being done in higher education institutions where virtual campuses (LMS platforms) are being replaced by institutional PLEs (also called iPLEs). On the other hand, the developments in professional contexts tend to propose the use of virtual environments where the company organizes the training activity of their staff. In neither of these two cases, is the learner completely free to decide what, when and how to learn. Learning is still guided or promoted by an institution and therefore processes and activities supported by the PLEs are, to some extent, shaped by those specific institutional purposes.

However, adopting a learner-centered design implies taking the user point of view to conceive all the features of the environment in the design process. Users should feel this environment as their own and adapted to their needs in every moment and any place. In fact, each individual user through his/her personal selection and setting of objects, tools and connections builds the Just4me PLE. The technological environment provides the means to integrate all those elements, enhancing knowledge building through specific affordances.

More than a learning environment the idea is to build an integrated ecosystem for dynamic learning established by and among users, through their actions and the connections they create with multiple objects. Users decide which topics and issues are at the focus of their ecosystem (knowledge goal) and build a network of contacts, objects and tools around them.

The following table summarizes the three dimensions of activity/use that configure the design of the Just4me PLE.

Table 1. Dimensions of the Just4me PLE design

		DIMENSION 1: Information management	DIMENSION 2: Planning and knowledge creation	DIMENSION 3: Social connection and open publication
INFORMAL	SOCIAL DOMAIN	Searching and accessing external information (docs, tools, videos, presentations, etc.) from different sources (networks, open repositories, blogs, etc.). Tagging and classifying information objects. Organising and storing information objects. Searching and managing internal social contacts and followers. Selecting recommendations of information objects and contacts provided by the PLE intelligent system. Searching internal information objects (through a folksonomy system).	Managing tasks and events (agenda). Making lists and annotations Creating, editing and planning "knowledge goals". Assigning objects to "knowledge goals". Creating "knowledge maps". Writing the "knowledge goal diary".	Connecting with social networks and web services. Sharing information objects with contacts. Sharing "knowledge goals" with contacts. Communicating around "knowledge goals" with contacts. Making recommendations and asking for advice Editing and publishing own profile.
	PROFESSIONAL DOMAIN			
FORMAL	ACADEMIC DOMAIN			
		USER ACTIVITIES		
		TOOLS AND FUNCTIONALITIES		

As argued in the first section, a fundamental aspect of any learning process, either individual or in teams, both in informal and formal and highly institutionalized training, is self-management, planning and time regulation of daily activity. Those self-directed activities are understood in a broad sense, maintaining the idea of integrated learning from different contexts (social, professional and academic).

In Dimension 2 (*Planning and knowledge creation*) we identify issues regarding the organisation and planning of "knowledge goals". We define a "knowledge goal" as an aim related to a knowledge domain. This knowledge domain can be as specific or general as the user determines. It can either be associated with a period of time or with a knowledge map depending on the learning purpose. Knowledge goals are configured by related information objects that may take the form of activities (tasks, deadlines, events) or information resources (documents, videos, links, contacts, notes, etc).

This planning space should be fully configurable by the user. Thus, the user can create "knowledge goals", frame them in a specific period of time, assign them different type of information objects, label them and share them.

Information objects are units of information that the user collects. These objects may or may not belong to a "knowledge goal" or not, but any object added to the PLE is part of its knowledge network. This information network is labelled through an open tagging system generated by the users (*folksonomy*). Each type of object is represented by a different icon to facilitate its identification. Objects may also be signalled according to different criteria: done/pending, degree of interest or urgency, input/output, etc. They can also be placed in the timeline of a specific "knowledge goal". Users may remove, relocate in time, or change the configuration of any information object at any moment.

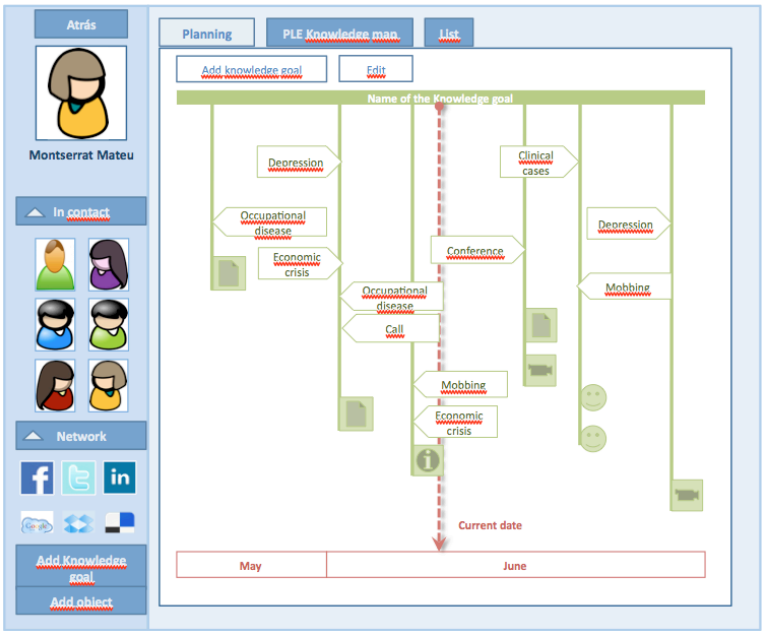

Fig. 3. Interface of the Just4me PLE: timeline screen

The system offers two visualisation metaphors of the PLE knowledge network: the timeline (which can embrace a long or a short period) and the mind map (which shows connections and interactions between objects and knowledge goals through the tags system). The timeline shows the degree of achievement of the knowledge goals, taken as a criterion. Therefore, the interface of the planning dimension operates through the following main screens: one screen showing all the "knowledge goals" in a given time period and a screen for each knowledge goal.

6 Conclusions and Future Steps

PLEs are a promising area that is gaining interest in the e-learning domain. In many institutions, the use of LMS is showing limitations for learners who need to manage an increasing number of resources both in formal and in formal settings. This is the reason why most of the efforts in implementing PLEs are supported by universities with previous experiences in online learning. Our proposal aims to complement this approach focused on the role of the practitioner as learner.

The idea of PLEs emphasizes the importance of continuous learning and recognizes the role of the individual in organizing his or her own learning. Moreover, PLEs are based on the idea that learning will take place in different contexts and situations and there is not a unique learning provider. For this reason, our proposal considers that it is important to provide support in three main dimensions, crossing informal and formal contexts: a) information management, b) planning and knowledge creation and c) social connection and open publication.

Just4me aims to provide special support to self-directed learning in information management and planning processes by using a visual approach that combines a timeline and a mind map view to show connections and interactions between objects, contacts and knowledge goals.

There are also many unresolved issues, including the development of technology services, automation of the recommendation system, enabling access from different devices or ownership and protection of learners' data that will be tackled in following phases.

The expected results, in terms of environmental design and their usage, may be transferable to other learning contexts, hybrid or blended learning, both in the formal education sector as in the non-formal and in any discipline. We consider that this work might contribute to the reflection on the relationship between informal and online learning through a self-directed learning approach. On the base of this analysis it also advances the functional requirements of a ubiquitous PLE platform.

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