WEILER 2013: Workshop on solutions that enhance informal learning recognition

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Abstract. The increasing presence of Web 2.0 media and tools in the workplace makes informal learning increasingly important and its recognition there becomes especially relevant since this can enhance employability, producing positive benefits for managers and companies, and give employees opportunities to learn and keep their skills up-to-date, etc. Thus, taking into account the technological and organizational innovation and the affordances of the Internet, it is necessary to define new methodologies and tools to make visible and manage this informal learning. This workshop will gather experiences about informal learning recognition, focusing on, but not limited to: validation of informal learning experiences, institutional management of informal knowledge, making use of representations of informal learning, decision making informed by informal learning experiences and using of learning analytics to document or promote informal learning.

Keywords: Informal Learning; Competences; Knowledge Management; Personal Learning Environments; Learning Ecosystems

1 Rationale

The increasing adoption of both web-based and mobile technologies, and their convergence, has for some years been making the existence of informal learning more and more transparent, especially among young and older adults in both Higher Education (HE) and workplace contexts [1].

The individual, as a social animal, learns in a range of different contexts, from her interaction with other persons, from her experience, etc. In many contexts the learning is neither planned nor structured. The concept of informal learning was coined in the middle of the twentieth century there are several definitions [2, 3], and more recent ones [4, 5]. Today, informal learning is becoming again the centre of discussion for several reasons: 1) The recognition that Bologna process is giving to informal learning [6] as a basic element in lifelong learning; 2) The pressing need to be able to demonstrate learning that in many cases is obtained by observation and experience

[7]; and 3) because of the emergence of the Internet, mobile devices and 2.0 Web tools that facilitate this kind of learning [8-10].

In the workplace the recognition of informal learning is especially relevant because among other reasons [11, 12] it enhances employability and produces positive benefits for managers and companies; it can develop task skills and knowhow and communicates "social" norms and preferred patterns of behaviour; it gives employees the opportunity to learn and keep their skills up-to-date, while being part of the overall workplace culture rather than just its training regime; etc. These issues have given rise to an interest in informal learning in the corporate world, driven by the desire to capitalise on the intellectual assets of the workforce and manage organisational knowledge and the recognition that informal learning may prove a cost effective way of developing competence [7].

Given this it is necessary to define new methodologies and tools to make visible and manage this informal learning. Such methodologies and tools should have the following characteristics. Firstly, these tools need to enable learners to identify the competences that they have achieved through activities in informal environments. Secondly, they should enable users to claim their competences across the range of contexts in which they are active. Thirdly, users should be provided with a view of the competences, which are most relevant for the institution that they are addressing, and the fit of their profile to the institution. Fourthly, users should be enabled to find other people with similar interests. The resulting system should be of value both to private individuals, in demonstrating their learning, and also to representatives of employers and education institutions in orienting and responding to informal learning. The workshop will gather methodologies and tools that address one or more of the aspects of the management of informal and non-formal learning which we identify above. This will form the basis for the topics of the workshop:

- Validation of informal learning experiences.
- Institutional management of informal knowledge.
- Making use of representations of informal learning.
- Decision making informed by informal learning experiences.
- The use of learning analytics to document or promote informal learning.

2 Methodology

In order to take part in the workshop prospective participants should send an 8-page manuscript in LCNS format. Each paper will be subject to a blind peer review process and if approved it will accepted to be presented in the workshop and be published in a conference post-proceedings volume published by Springer. Selected papers will be invited to be extended for a Special Issue related to informal learning experiences. At least 10 papers will be presented at the workshop.

Contributions will be sorted in sessions by topics. The different sessions will be held as panels consisting of a maximum of 5 presenters, with a chairperson moderating.

For each session, authors will briefly present an overview of their submission, with a maximum time allowance of 10 minutes. This presentation will be a summary of the submission but also could include a general description of their research.

Following the presentations, the moderators will start a debate with the authors addressing the main contributions of each paper, focusing on common and divergent points. This debate will have duration of between 30 and 45 minutes, and may include active participation from the audience via social networks –e.g. microblogging tools–. At the end of the debate, an open round of questions will be held, with a maximum of thirty minutes.

3 The workshop team

This workshop is edited by PhD. Miguel Ángel Conde (who is also the organization committee chair), PhD. Francisco J. García-Peñalvo (who is also the Programme Committee chair) and Prof. PhD. Dai Griffiths.

Doctors from different universities compose the scientific committee for the workshop. Most of them are or have been involved in projects related to informal learning, such as TRAILER project [13], TEN Competence project [14, 15], etc. The components are:

- PhD. Dai Griffiths, University of Bolton, UK
- PhD. Francisco J. García-Peñalvo, University of Salamanca, Spain
- PhD. Miguel A. Conde, University of León, Spain
- PhD. María José Rodríguez-Conde, University of Salamanca, Spain
- PhD. Marc Alier, Tech University of Barcelona, Spain
- PhD. María J. Casany, Tech University of Barcelona, Spain
- PhD. Peter Sloep, Open University of Netherlands, The Netherlands
- PhD. Francis Brouns, Open University of Netherlands, The Netherland
- PhD. Gustavo Ribeiro Alves, Polytechnic of Porto, Portugal
- PhD. Clara Viegas, Polytechnic of Porto, Portugal
- PhD. Miroslav Minovic, University of Belgrade, Serbia
- PhD. Milos Milovanovic, University of Belgrade, Serbia
- PhD. Mark Johnson, University of Bolton, UK
- PhD. Ricardo Colomo-Palacios, University Carlos III of Madrid, Spain
- PhD. Ángel Hernández-García, Tech University of Madrid, Spain

The scientific committee will be in charge of the peer review of the workshop papers in order to ensure the quality of the workshop.

3 Accepted papers

For the workshop 6 papers have been accepted and 3 rejected because they do not fit with the workshop topic.

The six accepted papers could be classified in to three groups:

- MOOCS and Informal Learning. The paper is entitled: Supporting crowdsourcing in MOOC informal face-to-face meetings. It poses an approach to lead face-to-face informal meetings and to gather the main conclusions.
- Situated Informal Learning. The paper is entitled: "Tag-based Experiences for Supporting Collaboration at the Workplace". It describes the potentiality of the use of mobiles and Quick Response (QR) Codes to enhance informal learning activities at the workplace.
- TRAILER project. There are four papers related to this project:
    - "Enhancing informal learning recognition through TRAILER project", that presents the project, its aims and some of the outcomes.
    - "Considering a pull mechanism for an Informal Learning Activities Collector". It describes the ILC TRAILER project component and poses a way to improve it based in a pulling technique.
    - "Managing Informal Learning in professional contexts: the learner's perspective". It presents the results of some of the TRAILER project pilots carried out to check the methodology and framework defined.
    - "What is Lifelong Learning About? – Reflections on the TRAILER Project". This paper explores the experience of TRAILER project and poses possible solutions to problems that have appeared during it, opening in this way new possibilities of research.

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Supporting crowdsourcing in MOOC informal face-to-face meetings

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Abstract. MOOCs are currently one of the main buzzwords in education. These particular online courses are characterized by the openness of their contents, which are typically packaged in video format, and by the large number of participants. This large number of potential learners facilitates creating distributed communities with similar interests around the world that can physically meet periodically to share their thoughts, discuss about the MOOC topics and help students with problems to overcome the difficulties. These meetings are informal since they are outside the course schedule and MOOC teachers do not normally participate on them. Nevertheless, it could be of interest for MOOC teachers to offer a tentative structure that leads the face-to-face discussions in these informal meetings, as well as to collect the main conclusions at the end, so that these conclusions can be the starting point in meetings held at other locations. This paper explains how this informal learning setting could leverage the advantages of using tags to connect MOOCs with face-to-face encounters and the tag-based authoring tool etiquetAR as the support for providing a structure for the discussions and collecting the conclusions of these meetings.

Keywords: MOOCs, informal face-to-face meetings, crowdsourcing.

1 Introduction

MOOCs (Massive Open Online Courses) have caused a disruption in education [1], allowing learners to receive affordable training from major institutions worldwide. MOOC also allow educators to reach thousands of learners interested in improving their knowledge in a given subject, no matter their origin, age or literacy [2]. This is possible thanks to the spread of the Internet and the appearance of initiatives like Coursera[1], edX[2], Udacity[3] or MiríadaX[4], which allow the centralization of MOOC contents and assignments, enabling the access to a large number of concurrent users.

From an educational perspective, MOOCs are positioned on the border between formal and informal learning. From the formal learning perspective, many MOOCs

[1] https://www.coursera.org/
[2] https://www.edx.org/
[3] https://www.udacity.com/
[4] https://www.miriadax.net/

replicate traditional face-to-face courses used in Higher Education curricula, but distributing the content online, generally in a video format [3]. Further, some Universities have already begun exchanging MOOCs for credits in formal education (e.g. University of California, Duke University, University of Pennsylvania, Deakin University) [4, 5], although drop-out rates are much higher in MOOCs than in traditional formal learning [6]. From an informal learning perspective, many of the MOOC participants do not seek credits, but to acquire knowledge in subjects of their interests as part of their life-long learning [7]. Here is the main disruption of MOOCs as they break with the tradition of academic disciplines of the need to recognize knowledge through certificates [7]. In addition, MOOC participants have the opportunity to learn whenever and wherever they want (e.g. at home, at work, while in the public transport), this being a key feature in informal learning settings.

MOOCs also pose new challenges for institutions, teachers and learners, opening up the opportunity for new business models and pedagogies [8]. For example, one of the main challenges concerning pedagogy in MOOCs is that teachers need to change their role because they cannot assume their traditional functions of centralizing the support to students' doubts, as it happens in the classroom or in online courses with a low number of students [9]. Actually, in MOOCs the community of learners is expected to support their peers, teachers becoming facilitators that encourage discussion, reflection and sharing during the course [10].

In MOOCs (and especially in the so-called connectivist MOOCs or cMOOCs [11]), interactions within the community of learners are a key issue, these interactions being usually mediated by social online tools, which sometimes are included in the MOOC platform (e.g. forums) and sometimes are external to it (e.g. Facebook or Twitter) [12]. However, the large number of participants in MOOCs also raises the opportunity to arrange informal face-to-face meetings between groups of people who live in the same location, in order to continue the discussion about the MOOC and support those peers with problems. Actually, it is possible to find MOOC communities in the Meetup[5] website for Coursera[6], edX[7] or Udacity[8]. These offline group meetings can be a motivation for learners to create a social network around the MOOC and get in touch with people that have similar professional occupations and passions. Actually, there are ongoing works researching the potential in learning of creating face-to-face study groups to discuss and reflect about MOOC contents [13]. Preliminary results on this line show that these kinds of informal face-to-face meetings encourage learners for not dropping out the course.

Nevertheless, while MOOC teachers can follow learners' contributions in the social online tools around the MOOC, in most cases they have no clue on what it is going on during informal face-to-face meetings. That hinders the detection of emergent topics generated during these meetings that may be of interest for the learners that cannot attend. Even more, it might be the case that those discussions that are closed in one face-to-face meeting are repeated in another different location, due to the lack of awareness of what happened in previous meetings.

[5] http://www.meetup.com
[6] http://www.meetup.com/Coursera/
[7] http://www.meetup.com/edX-Global-Community/
[8] http://www.meetup.com/Udacity/

In order to overcome the aforementioned limitations this paper proposes augmenting learners' experience in MOOC informal face-to-face meetings adding a layer of digital information about the MOOC contents and structure. This layer is added using Quick Response (QR) [14] codes generated with etiquetAR[9] [15], which is a web-based and mobile-based authoring tool that allows the creation of personalized QR codes. Thanks to etiquetAR, teachers can structure the discussion in MOOC informal face-to-face meetings, and learners can contribute *in situ* with the conclusions of their face-to-face discussion. Further, other groups at different locations can start working from these conclusions, generating more elaborated contributions, as a way of informal situated crowdsourcing in MOOCs.

The remaining of this paper proceeds with a brief overview of the etiquetAR authoring tool, including the main features that make it of interest for supporting these particular informal learning settings. After that, the paper details a scenario in which QR codes generated with etiquetAR will be employed to support crowdsourcing in MOOC informal face-to-face meetings. Finally, conclusions and future work serve to close the paper.

2 Brief overview of etiquetAR

etiquetAR is both a web-based and a mobile-based application that supports the design and enactment of augmented learning experiences based on QR codes. Fig 1 shows an overview of etiquetAR. The functionality offered by this tool varies depending on the stakeholder: teachers use etiquetAR as a web-based authoring tool for the creation and management of QR codes, while learners use the mobile-based version of this application to access the content related to the QR codes.

Through the web-based version of etiquetAR, teachers can create QR codes and include them in a collection that will be managed from the etiquetAR web interface. Each QR code supports different profiles in a way that teachers can associate different contents to the same QR code. Teachers can include questions within each content to foster discussion in augmented learning experiences in which learners employ etiquetAR. Teachers can visualize the answers provided by learners to these questions, and hide those that are unrelated or inappropriate. Finally, etiquetAR allows exporting and downloading QR codes as images that can be printed and placed at any locations.

Through the mobile-based version of etiquetAR, learners can access the content associated to each QR code through any QR code scanner. After reading the code, learners are requested to select one of the multiples profiles defined for that QR code. Further, learners can read the questions included as part of the contents and the existing answers to these questions, as well as contribute with new answers.

[9] http://etiquetar.com.es

Fig. 1. Overview of etiquetAR with the logo on top: (a) Web application (b) Mobile application

In summary, etiquetAR is a tool that allows teachers creating and personalizing QR codes, as well as learners accessing and commenting these QR codes. etiquetAR is conceived to support the creation of innovative scenarios for sharing, collaborating, reflecting and learning.

3 Situated crowdsourcing in MOOC informal face-to-face meetings with etiquetAR

MOOC informal face-to-face meetings have the problem that teachers (and other students that cannot attend) are not aware of what goes on in these meetings. Further, if students do not have the ability to lead the discussion by themselves, then teachers should be responsible for providing a structure. In order to overcome these limitations, we propose the use of QR codes and etiquetAR for MOOC informal face-to-face meetings as shown below. To the best of our knowledge, QR codes have not been used in face-to-face group discussions beyond providing access to static contents, and major MOOC initiatives do not include specific fields in the course description to include a QR code that allows identifying and accessing the course. Therefore, we consider the use of QR codes and etiquetAR an innovative initiative to improve MOOC informal face-to-face meetings.

In a first step, the teacher generates a QR code for the course with etiquetAR. This QR code can be for instance part of the course logo, redirecting to the course home page whenever scanned. As the course advances, the teacher creates different profiles associated with the same QR code using etiquetAR. These profiles act as labels that redirect students to particular URLs. For example, the teacher may choose to create a profile every new week. That profile would redirect to the MOOC contents that are addressed during that week, or to the threads that learners should discuss in the

informal face-to-face meetings held across the globe during that week. Also, and thanks to etiquetAR, the teacher associates a set of questions to each of these profiles. These questions can be employed to lead the debate in the face-to-face meetings. Thus, with etiquetAR, MOOC teachers are able to associate different contents and questions to one single QR code, which in this case acts as the banner of the MOOC.

In a second stage, learners attend the face-to-face meetings. One of the attendees prints the course logo and carries it with him with a twofold purpose: identifying the people participating in the face-to-face meeting (if they are in a public place they need a way for recognizing themselves because they probably do not know each other); and letting participants scan the QR code with their smartphones or tablets. In this way, they can easily access the content for that session and the questions posed by the teacher. After the discussion, one of the attendees submits the conclusions answering each of the questions set by the teacher. Since etiquetAR tags allow adding comments, the attendees can see the conclusions of other meetings that were held before. Therefore, learners can be aware of their peers' contributions, and do not need to start the discussion from scratch, ensuring richer conclusions as the overall outcomes of these informal meetings. Further, this awareness mechanism can also be useful to refute some of the arguments given in other groups of learners and finding differences arising from the culture or language depending on the location.

After that, the teacher uses the web-based version of etiquetAR to see the contributions generated in the informal face-to-face meetings, and detects emerging issues or potential conflicts. These new issues and conflicts can be addressed in the social tools of the MOOCs or in subsequent video lectures. It is important to note that if the teacher finds responses to the questions that are not relevant for the MOOC or that may be confusing, he can hide them through the etiquetAR web interface.

This scenario aims to answer two research questions. The first one is whether the use of QR codes and etiquetAR enriches the discussion in MOOC informal face-to-face meetings. In order to answer this question two experiments will be conducted, each with five different discussion groups gathered at different locations. In the first experiment, groups will not have access to their peers' conclusions, while in the second experiment they will be able to see them by scanning the QR code. The teacher will assess the accuracy and correctness of the answers to see if they increase in the second experiment, concluding in that case that QR codes and etiquetAR can be useful as a way of informal situated crowdsourcing. The second research question is whether students increase their awareness of what is happening elsewhere around the MOOC. The same two experiments will serve for addressing this question.

All in all, the use of QR codes generated with etiquetAR aims to give support to the three main problems detected in MOOC informal face-to-face meetings: teachers can structure the discussion; teachers and students are aware of what goes on in the meetings; and students avoid wasting time on issues that were already solved in other meetings.

4 Conclusions

MOOCs are learning environments that combine features of traditional formal education, arranging learning contents in many cases according to Higher Education

programs; but also of informal learning, allowing students learn anytime, anywhere with the support of a large community of peers. Actually, one of the main potentials in MOOCs is the opportunity for generating rich discussions among learners, which can take place in online software tools and within informal face-to-face meetings held at different locations. Nevertheless, the problem with these face-to-face meetings is that, in general, they are not bound to the course, and teachers and learners are not aware of what happened in them, despite the great interest their conclusions may have to detect hot topics and lay the groundwork for other meetings organized at other places.

This paper proposes the use of QR codes generated with etiquetAR to facilitate connecting MOOCs and informal face-to-face meetings related to these MOOCs. The features provided by etiquetAR support the detection of the main contributions that happened during these meetings, serving also to promote further discussions in the meetings hosted at other locations. Moreover, etiquetAR gives support to MOOC teachers for providing a structure of questions aimed at guiding the discussion during these face-to-face meetings.

As future work, an experiment will be carried out on the next edition of the MOOC Digital Education of the Future [12], in which QR codes generated with etiquetAR will give support to informal face-to-face meetings. Also a further study will be conducted aimed at detecting and classifying the kinds of informal learning settings that may appear in the context of MOOCs, stressing those that can entail collaboration among learners.

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Tag-based Experiences for Supporting Collaboration at the Workplace

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Abstract. Nowadays, mobile devices and applications offer new possibilities to learn anytime and anywhere. These technologies caused a disruption in traditional learning, opening up a new range of opportunities for learning at the workplace. Quick Response (QR) codes are one example of technology popularized with the adoption of mobile devices. When attached to an object or location, QR codes add a digital layer of information that transform and extend the way workers interact in their daily routines. This paper presents an illustrative scenario in which QR codes are used to support collaboration at the workplace. These QR codes are generated with etiquetAR, an authoring tool that allows creating personalized QR codes that users can access and contribute to with comments. In this scenario, QR codes act as the element for triggering interactions, opening a new communication space that promotes collaboration, sharing and discussion among workers while enhancing reflection and facilitating decision making processes.

Keywords: mobile learning, QR codes, informal learning, collaboration, workplace.

1 Introduction

Traditional learning practices are changing led by the advance of Internet, mobile devices and the evolution of Web 2.0 applications and other software tools [1, 2, 3]. Nowadays we have the opportunity to learn anywhere and anytime through our mobile devices, moving and changing our learning context continuously. Also, mobile technologies open up a new range of situated learning scenarios that combine activities taking place at several locations. In these scenarios learning occurs through conversations across multiple contexts (workplace, home…) and among people using their personal devices [4]. Moreover, when integrated as a support into people's daily work routines, mobile technologies act as facilitators to mediate in the interactions between workers and the workspace, offering new possibilities for collaborating at the workplace.

Augmented reality and tag-based technologies such as QR (Quick Response) codes or Near Field Communication (NFC) are example technologies that can be easily integrated as a support for daily work routines. This type of technologies enable new

forms of interaction with the environment, adding layers of digital information over physical spaces to augment users' experiences in context [5, 6]. When these layers contain information and resources related with people interests, workspaces become digitally augmented physical environments able of encompassing engaging situated learning experiences [7, 8].

In this paper, we focus on the potential of QR code technologies for supporting collaboration at the workplace. Particularly, this work presents an illustrative scenario in which a research institute is augmented using QR codes generated with etiquetAR[10]. etiquetAR is a mobile and web-based authoring tool designed for learning purposes that allows creating personalized QR codes that users can access and contribute to with comments [9]. The illustrative scenario aims at enhancing and promoting collaboration among workers in the research institute in order to improve and facilitate decision-making processes. QR codes are proposed as an element for triggering interactions in this scenario by opening a new communication space to promote sharing and discussions among researchers.

Before presenting the scenario, Section 2 introduces a small review of QR code technology and its context of application found in the literature. Section 3 provides a glimpse into the main functionalities of etiquetAR and the characteristics of the QR codes generated with this tool. Section 4 describes the aforementioned illustrative scenario, which takes advantage of all the functionalities enabled by the QR codes generated with etiquetAR, using them as elements, not only for providing information, but also for workers to bind content and contributing with information and maintaining conversations. Section 5 details the experimental design, the research questions addressed, and the evaluation methodologies that will be employed for analyzing the data extracted. Finally, Section 6 highlights other research avenues that could be derived from the scenario.

2 QR codes & contexts of application

QR codes are gaining traction in Europe and its use is becoming extensive [8, 9, 10, 11]. Currently, QR codes are used mainly in store windows, posters, TV commercials, offices or CV cards as a marketing technique for providing information to the consumers and also for capturing their interests. However, in the last few years QR codes have been applied in other several contexts apart from the commercial, mainly due to their lower cost and easier production as compared with other similar technologies such as NFC. Further, QR codes can be read with most smartphones using multiple applications in any operating system, this being one of the main advantages over other technologies in more cultural and educational contexts. In Ashford words: "QR codes are a low-threshold technology. Low-cost, easy to implement, and easy to use, they are a technology that provides a lot of bang for the buck, when implemented wisely" [6].

Libraries, University Campus or cities in Europe have been exploring the potential of QR codes as a link between physical and virtual worlds [11, 12, 13, 14]. The results of these studies show that QR codes are a good mechanism to add the virtual

[10] http://etiquetar.com.es

to the physical for providing useful situated content [11]. For instance, the work by Schultz, which researched the usage and adoption of QR codes in a library and in a museum, concludes three key aspects about this technology [13]. First, although the usage of QR codes was low, young people and smartphones' owners use them. Second, QR codes are only used for providing one-way information but not for starting a conversation. And third, QR codes have a great potential for personalizing a visit to an institution.

In this paper we present a scenario that advances on the research of QR codes in two ways: its usage and its context of appliance. First, and related with Schultz's second finding, we propose using QR codes as mechanism not only for facilitating information, but also as situated-crowdsourcing elements to share ideas. Second, we want to apply QR codes as a support at the workplace. Up to now, and to the best of our knowledge, QR codes have been mainly applied in non-formal educational contexts for delivering contextualized information. The scenario proposed here aims at understanding the benefits of using QR codes in a more informal context and, specifically, learning at the workplace.

3 etiquetAR: creating dynamic QR codes

In the scenario that we propose in this paper, we use a particular kind of QR codes generated with etiquetAR (Fig 1). etiquetAR is a mobile and web-based authoring tool for supporting the design and enactment of learning experiences based on QR codes. With etiquetAR, any user can create their personal QR codes with three main particularities.

First, QR codes generated with etiquetAR can contain a link to more than one resource. This is managed using profiles, which allow assigning a label to each of the resources in the tag so as to enable the user, when reading the tag, to select the most appropriate content according to his/her interests (profile).

Second, tags can be dynamically changed once they are created. That is, the image of the QR code is always maintained and users can use the web application to change its content whenever they like.

Third, the different resources in a tag can be commented. When a user scans a tag and selects the content, s/he can add comments related to each of the resources and read the observations posted by other users. Finally, QR codes generated with etiquetAR do not require any special application to be read, so that people can use any QR reader to access their content.

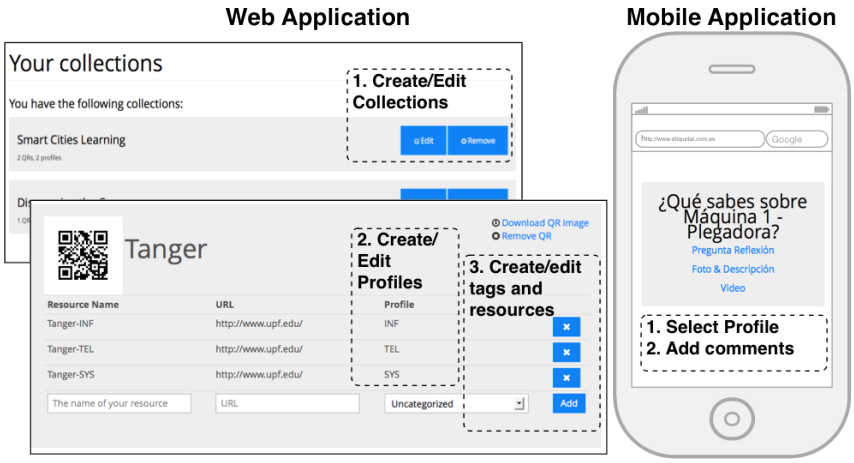

Fig. 1. EtiquetAR (http://etiquetar.com.es) Web and Mobile application interfaces.

4 The scenario: tag-based experiences supporting collaboration at the workplace

This summer, the Center for Technology in Learning (CTL) of the Stanford Research Institute (SRI) starts an initiative that aims at augmenting the visibility of their research work with the rest of the centers of the institute. At the same time, this initiative wants to promote collaboration among CTL members to facilitate decision-making processes related to their current research advances.

One of the activities proposed for this initiative consists in using QR codes generated with etiquetAR to augment the center with information about the running projects. For this activity, each member or group of members of the CTL working in the same research project registers to etiquetAR and generates a QR code containing two links: (1) a text or a web page explaining the objectives of the projects currently running in the center and (2) open questions that the team members working in this project need to revolve to advance in the project. The first link is associated to the link (or profile) "About the project" and the second one to the link "Open Questions to Explore". In this way, anyone reading the tag could select one of the two links.

The QR codes generated will be printed three times and attached to different locations at the research center. One tag will be located at the dining room so that members of other research centers can read them and learn about the running projects. A second tag will be attached at the entrance of the building so that people from surrounding research centers and universities can see what is going on in the CTL. The third one will be situated at the entrance of the research member offices, so that anyone of the CTL can read what the different team members are working on.

QR codes are going to be placed in their locations for 3 to 4 weeks. During this period, researchers of the institute are expected to use their mobile devices to read the tags distributed along the different locations. Researchers could also contribute to the open questions posed by their colleagues by adding comments or suggestions on the

tags. Every week, the team members would meet and discuss the contributions to the tags to see whether they can use these proposals to advance on their research.

5 Experimental design and evaluation methodology

In the scenario proposed in Section 4, QR codes are expected to become a new communication channel among researchers for discussing and exchanging ideas and suggestions to advance in their projects. In order to analyze the validity of this hypothesis, we propose an experimental design that addresses the following research questions:

(1) Are QR codes generated with etiquetAR (which support dynamic changes and comments) a good mechanism for triggering conversations among researchers at the CTL and facilitating collaboration?
(2) What is the adoption of QR codes at the CTL?
(3) What are the usage of QR codes and the communication patterns among researchers at the CTL?

A total of 57 researchers of the CTL at the SRI are expected to participate in the experiment. In order to evaluate and analyze the results we propose an experimental design divided into 3 phases (Fig 2).

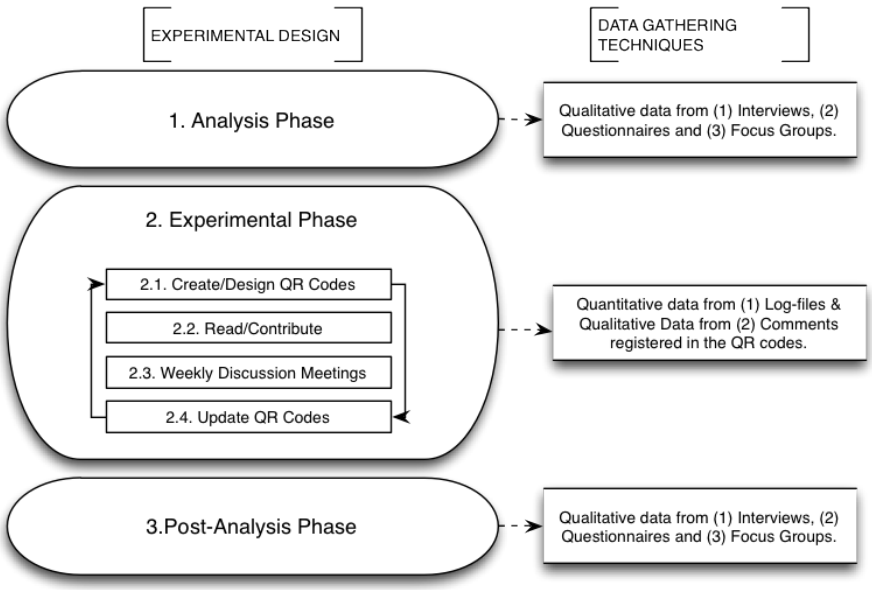

Fig. 2. Experimental design schema and data gathering techniques.

(1) **Analysis of the current collaboration patterns:** This phase will consist in analyzing what the current collaboration patterns established between CTL researchers are. Aspects such as how often they collaborate and the type of collaboration mechanisms they usually employ are the type of information that we expect to collect in this phase.
(2) **Experimentation**: During 3 to 4 weeks, the researchers will be asked to create and design their QR codes (2.1), read and contribute to others' content (2.2), make weekly discussions for sharing ideas about others' contributions (2.3) and update their QR codes if necessary. This process will be repeated weekly during the experimentation period.
(3) **Post-analysis of the collaboration patterns with QR codes**: In the same way that in the first phase, the idea is to analyze the impact of using QR codes based on researchers' interactions and opinion about the experience.

As shown in the left side of Fig 2 we will use different data gathering techniques depending on the phase of the experiment. In the first and third phases, we will conduct tests with open and closed questions, interviews and focus groups. In the second phase we plan to register the interaction with the tags using log-files as well as the comments left by the participants. This combination of data gathering techniques will allow us to obtain both qualitative and quantitative data from different sources.

For the data analysis we will follow a mixed evaluation method [15] combining both the qualitative and quantitative data obtained. Then, we will triangulate the evidences extracted from the different data sources for extracting the partial results that will allow us to answer the three above-mentioned research questions.

6 Conclusions and future work

This paper proposes a scenario that employs QR codes as the basic elements for supporting collaboration at the workplace. These QR codes are created with etiquetAR in order to provide more than one unique link from the same QR code image and to enable other researchers to contribute to the tags with comments. The QR codes generated are used in this scenario as communication and collaboration channels where researchers can contribute with ideas and suggestions for their colleagues.

The scenario presented here is going to be carried out from October 2013 to January 2014 in order to understand whether QR codes are a useful mechanism for supporting informal situated collaborative learning at the workplace. Specifically, the three aforementioned research questions are going to be explored in this experiment.

However, this scenario also opens other research avenues. For example, it would be interesting to analyze how QR codes can be used in other similar contexts to transform any object into an augmented research object to support learning. Another idea would be to understand whether adding elements physically located at the workplace, such as screens summarizing the information collected from the tags, could be prompters of informal meetings between members of other centers. Finally, other aspects related to how an idea evolves from the moment that it is tagged to a particular location could be analyzed from the data collected in this study.

These questions, and many others related with the potential of QR codes for supporting situated informal learning scenarios at the workplace can be discussed. This paper only provides a first idea about how a real scenario of these characteristics could be addressed.

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Enhancing informal learning recognition through TRAILER project

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Abstract. The evolution of new technology and its increasing use, has for some years been making the existence of informal learning more and more transparent, especially among young and older adults in both Higher Education and workplace contexts. However, the nature of formal and non-formal, course-based, approaches to learning has made it hard to accommodate these informal processes satisfactorily. The project aims to facilitate first the identification by the learner (as the last responsible of the learning process), and then the recognition by the institution, in dialogue with the learner, of this learning. To do so a methodology and a technological framework to support it have been implemented. This project have been tested in several context and it is possible to say that an informal learning dialogue between learners and people in chargé of the institutions is possible

Keywords: informal learning, knowledge management, competences, recognition, dialogue

1 Introduction

Education is a key factor in the individuals' development. The set of competences and skills that persons achieve is determined by what they learn during their life. However learning is not only something that happens in the context of an institution (the school, high school, universities). People learn also along their life, from the interaction with peers in different context (at home, in their work, in social events, by using the Internet, etc.). This kind of learning which the users acquire away from an institution in the course of daily life, spontaneously and in non-structured way, is known as informal learning [1].

Informal learning is nowadays a trending topic specially because:

1) There is an effort to recognize informal learning. The Bologna process take it into account as key element in lifelong learning [2] and there are several initiatives to validate and recognize informal learning such as: the CEDEFOP guidelines for the recognition of informal and non-formal learning, the International Labour Organization classification of occupations [3, 4], the OECD Recognition of informal learning [5], etc.

2) It is necessary to make visible both for the employees and for the companies and institutions the learning obtained outside the institutional context [6]. This can benefit both employers and employees. It increase the employability workers that have the opportunity to learn and improve their knowledge and also to promote depending on the skills they have not achieved in institutional contexts [7, 8]. In addition it gives the companies more knowledge about their employees and a real perspective about what they can do and what they need.

3) Technological and organizational innovations, and the affordances of the Internet, are facilitating increased access to knowledge and training for individuals that range from formal courses to informal ad hoc learning. However, the greater part of the informal learning that takes place, both within and outside institutional and organizational contexts, remains unacknowledged. Though informal learning has always taken place, the advent of Information and Communication Technologies - ICT and, particularly, social media approaches, have facilitated these processes and, at the same time, have made them more visible [9].

Given this context it seems essential to make visible informal learning. However, despite the previously mentioned initiatives to recognize informal learning, and other focused particularly on issues related to the certification and qualification [10-12] [13]; [14] [15], a problem remains unresolved, how it is possible for employees and employers to exchange knowledge about informal learning activities (ILAs) carried out in different contexts. This is what TRAILER (Tagging, Recognition and Acknowledgment of Informal Learning ExpeRiences) project aims to solve. To do so it defines methodologies and tools that facilitate an informal learning based dialogue.

This paper presents TRAILER project. To do so the following section describes its main objectives and outcomes (Section 2), followed by the methodological approach and technological framework that support it (Section 3). This section also includes a

brief description about how the main components are implemented and how the methodology is tested. Finally some conclusions are posed.

2 Project Overview

The TRAILER project [9, 16] is a research project funded by the European Union through the Lifelong Learning Programme. The project is based on the premise that though technology may afford practical solutions to problems of personal learning, technological approaches can present new issues of ownership and control. The desire is that learning processes are under the control of the learner, and this entails that integration of informal learning with formal approaches balances personal inquiry and coordination with the need for institutional accreditation of evidence of competency.

The project aims to achieve this balance by bridging the learner's activity with institutional processes. The learner identifies episodes and evidences of informal learning in any of the different spaces in which she learns (formally or informally). She then links to these or uploads them to the TRAILER tool, located within her portfolio, and then tags them in relation to a predefined but evolving catalogue of competences. The tool is linked to the institutional interface in such a way that relevant experiences are accessible to the institution. Other experiences that may be personally relevant to the learner are accessible to her alone.

In this way informal learning experiences become transparent and useful both for the individual, who can thus monitor and justify to others the development of her competences, and for the institution, which can follow the progress of individual and group competences, and identify emerging new competences.

Five Universities (University of Salamanca, Universitat Politècnica de Catalunya, University of Bolton, Open University of the Netherlands and Polytechnic of Porto University of Belgrade) and one learning company (Dom Szkolen i Doradztwa) are developing the project. All of them have proven expertise in different areas covered by the project and some have work together in other research experiences with add value to the consortium.

Several of them have work together in other projects and all of them have experience with informal learning

3 Methodology and architecture

The TRAILER project involves learners and institutions. 'Learners' may be workers in a workplace, or traditional learners in an educational institution. Through transparency of communication, the TRAILER environment enables discussion between the different stakeholders and institutions concerning informal learning activities, the associated competences and how this information can be exploited. In order to achieve this, a staged methodology supported by a technological framework has been deployed.

3.1 The technological framework

The TRAILER methodology comprises a framework with several components and interfaces to make possible the interaction required [9]. The framework is described in Fig. 1 where it is possible to see a Personal Learning Network (PLN) that groups the tools that the user employ to learn in an informal way such could be Wikipedia, Youtube, Games, Social Networks, LMS, Remote Labs, Expert Forums, Twitter, etc. One of the tools included in such component is the portfolio in which informal, non-formal and formal learning experiences can be stored and published. Such tool has an interface to facilitate gathering informal learning activities the informal learning collector (ILC).

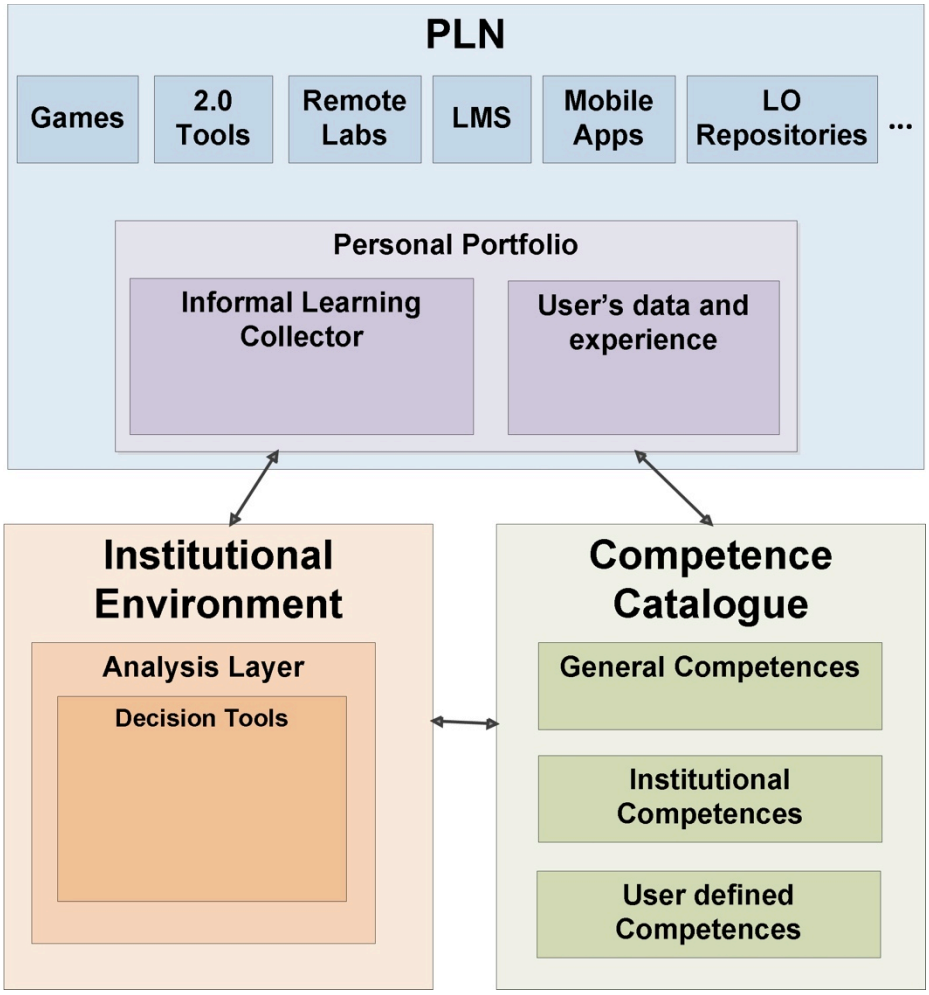

Fig 1. TRAILER framework components

On the other hand there are several institutional tools. These are: a Competence Catalog that facilitates a way to categorize informal learning experiences taking into account learner or institutional perspectives; an Institutional Environment that facilitates the analysis of the published information in order support dialog with the learner and to facilitate decision-making concerning learning issues within the institution (for example, accreditation processes).

3.2 TRAILER Methodology

The starting point of the TRAILER methodology is the moment in which the user carries out an activity online which may have a bearing on a competence. The learner can identify and match an activity with the set of possible competences presented by TRAILER, or store it and identify it later. The processes of collection, inspection and reflection result in a methodology with 3 stages:

1. Identification and Storage. It implies that the user classifies the activity taking into account a competence catalogue that includes general competences, institutional competences and competences defined by the user. After that the identified activity is recorded in the portfolio.
2. Organization. Once the information of the ILA is stored, it can include information about the associated competences or can require organizing it by employing the catalog. In addition, once it is stored, it can be classified into the portfolio in different categories or views. When the information is properly organized it can be published to the institution, with the learner determining what is published and to whom it is visible. With this information, institutions can conduct analyses on competencies, or the user could find peers with similar interests and/or worries.
3. Analysis. The public published information can be analyzed in order to make decisions about the learning requirements, tools and contents used by the institution and the skills a user has, taking into account a specific individual or a group. The publication of information and the views of the portfolio facilitate a common analysis of the gathered information, which can facilitate a dialogue among the stakeholders. The analysis system can produce recommendations regarding institutional skills or knowledge gaps or personal recommendations for the learner/employee. With this dialogue and recommendations, a global portfolio of knowledge can be co-created between the user and the institution. The components involved in this stage are the Portfolio, the Catalogue and the Institutional Environment.

3.3. Implementation of the framework components

The framework that supports TRAILER methodology is implemented as a proof of concept in order to test the methodology proposed. The implementation of this framework is not an easy task because it is not a solution defined from scratch. It involves different components developed in different programming languages that should interact and exchange information among them.

The main elements are:

- The ILC. It allows learners gathering ILAs. The users send their activities to the ILC, where they get the chance to review them and define them using tags, competences, content (in the form of text) and comments before sending them to the portfolio. It provides a *Javascript* gateway to send the activities gathered from the browser and a set of web services to consider other informal learning activity sources. In addition the ILC facilitates an interface that the learners can use to initially complete the ILAs information (Fig. 2).

Fig 2. ILC competences configuration tool

- The portfolio. It allows the learners to manage, organise and categorise their learning activities and competences acquired both in formal and non-formal learning contexts. It provides functionalities to manage competences, informal learning activities, to control what is published to an institution and what is not, to create showcases share it with peers and to look for peers with similar aims. It has been implemented using *Java* and *Liferay*. Fig 3. shows one of the portfolio functionalities.

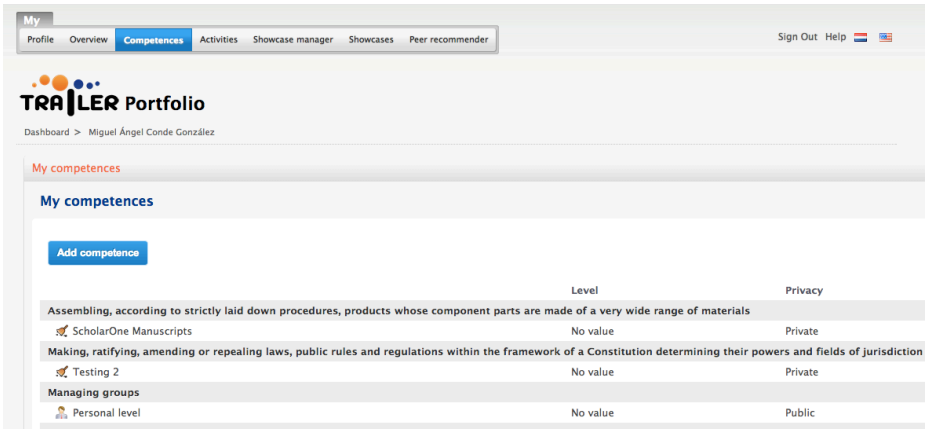

Fig 3. Competence management option in TRAILER portfolio.

- The Competence Catalogue. The Competence Catalogue is a tool that facilitates the association by the user of competences and tags to their ILAs. It is hierarchically stated in three levels. The first level consists of a local catalogue that contains the competences added by the user and not (necessarily) validated by the institution. Whenever a competence from the local catalogue is validated by a responsible of the institution, such competence will become part of the institutional catalogue, which represents the second abstraction level. Finally, the third level is the general catalogue, which provides to all institutional catalogues a set of institutionally reviewed and accepted competences, it is initially filled with the competences and skills provided by the ISCO-88 [3].
- The Institutional Environment. It is a component that provides a way to manage the competence catalogue, tools to facilitate making decision and tools to generate reports. Fig 4. shows an example of a visual representation of the competences used by the employees of an institution that can be further use to make decisions about what more competences the employees should have.

Fig 4. Example of tagcloud results

In addition to these components several interfaces have been defined based on the use of web services.

3.3. Testing TRAILER project

In order to check the validity of the methodology TRAILER project has tested through an expert testing and some pilots actions.

For the expert testing a Cognitive Walkthrough (CW) [17] has been used to explore the scenarios within the project and the potential experience of completing

project tasks in an early prototype of the system, complemented with Think Aloud technique [18]. With this testing was possible detect and solve errors before the pilots. Specifically 52 moments of breakdown were identified. Also a technique to measure usability was applied, the System Usability Scale (SUS) form [19] and a measure of the Perception of Ease Of Use (PEOU) by following a Venkatesh and Bala adaption of TAM3 [20]. From this experience it was possible to conclude that the usability of the system was not the desirable, something normal for a proof of concept. Bugs were solved and pilots have been carried out.

These pilots have involved companies and learning institutions from the partners' countries and were carried out taking into account the learners and the people in charge perspectives. The results of these pilots are being analyzed and will be presented in other papers.

4 Conclusions

Nowadays informal learning has gained special attention and has specially impact in the workplace and educational contexts. Employees need to show what they have learnt beyond the institution in order to promote in their jobs and/or find new ones. In addition the institutions needs to know the competences their employees have, in other to make decisions and to determine the tasks they can or cannot carry out. In the case of learners they can show to the institution what they know and the people in charge of them can adapt learning pathways depending on this knowledge background. This implies the articulation of a dialogue related to informal learning activities between employees/learners and people in charge of institutions. TRAILER project facilitates a methodology and a technological framework to do this.

The framework has been implemented has a proof of concept and test in several context. The results shows that the dialogue is possible but open other challenges such as if the informal learning is really being considered in the companies, if what is needed is a technological solution, if it is necessary to measure and recognize all person merits, etc. From a technological point of view the system can be improved introducing ways to deal with competences ambiguity, sematic layers enhance the decision support system and to propose competences to the learners, etc.

Finally it can be said that TRAILER project facilitates a dialogue to make visible informal learning but there is a need to see how informal learning can be really exploited.

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Considering a pull mechanism for an Informal Learning Activities Collector

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Abstract. There is a recent interest in the research of Lifelong Learning and other related kinds of learning (formal, non-formal and informal). Some projects have been held in order to propose frameworks for managing all these types of learning, giving special attention to the informal learning. The TRAILER project is one of them. It supports the identification and management of informal learning activities. It gathers informal learning activities with an Informal Learning Collector (ILC) and a Portfolio is used to make visible how much a learner acquires informal learning. The main way for registering informal learning activities data into the ILC is using push mechanisms where the users explicitly introduce such information. In this paper, we propose an alternative way to register information about informal learning activities, but using a pull mechanism, where the ILC collects data from external applications. In this sense, we improve ILC usability.

Keywords. Informal learning, activities, collector, usability.

1 Introduction

Lifelong learning is not a new term [1], but recently there is an increasing interest in this concept. Some organizations, foundations and projects such as the University of the Third Age (U3A) [2] and the Lifelong Learning Programme of the European Community [3] are working to promote and facilitate continuous learning for all kind of individuals.

In the field of lifelong learning, three main types of learning arise, formal, non-formal and informal learning. As defined in the European Community:

- Formal learning is structured, organized and intentional. It is given by an education center, institution or organism with a defined curriculum and leads to a recognized certification. Contemporary History Course in an example of formal learning.
- Non-formal learning is usually organized and intentional and normally takes place alongside formal learning complementing it. The purpose of this learning is not to lead in a certification although some programs end with an accomplishment certification. Security at work training course is an example for adults. English as an extracurricular course is an example for children.
- Informal Learning encompasses all the learning resulting from everyday activities, those skills obtained through life and work experiences. Informal learning is not

structured in terms of goals and time and can be intentional or unintentional. A baby learning social norms is an example of informal learning for children. An experienced employee mentoring a new hired employee is an example of informal learning for adults.

Informal learning is often seen as a residual concept of any type of not organized learning which does not take place within a learning organization [4] not deserving too much attention. Others argue [5, 6] that informal learning enhances employability, gives employees the chance to keep learning in the workplace, and helps them improve their conditions and continue being relevant throughout their career. Informal learning supports what Polanyi [7] understands as tacit knowledge, a concept that has been largely discussed [8, 9]. A type of knowledge that has more to do with experience, skills and competences than with theoretical concepts. To compete in a global market, organizations are looking for its employee's talent, the embedded knowledge of the organization or the acquired tacit knowledge, which can be visible by identifying and recording all the kinds of employees learning.

European Union and UNESCO efforts attempt to highlight the important role of informal learning in the Knowledge Society. As noted in the proposed definition, informal learning is intrinsic to human behavior, that is, it occurs from birth and throughout the individual's life. Essentially, it is the way in which an individual learns how to perform their daily activities. Thus, informal learning takes place everywhere including inside formal and non-formal education organizations [10] as a hidden curriculum.

Learning is happening everywhere all the time. Formal and non-formal learning are recognized, but informal learning is not well understood, remains invisible and it is not recognized. Informal learning leads to skills, competences and know-how which is relevant and significant at the workplace. Then, it deserves the same attention and recognition that formal and non-formal learning. The initiatives above mentioned pretend evaluate and validate all kind of individuals learning, giving visibility to the informal learning.

2 Informal Learning Projects

Historically the learning acquired through informal means has been largely ignored in more formal contexts like a curriculum, but this is starting to change [2]. The gradual recognition of the importance of informal learning has led to the development of a number of projects aimed to manage it. Some examples are the following.

FREE [11] (Fostering Return to Employment through Entrepreneurship, Innovation and Creativity). This project defines an interactive tool aimed towards people working with the unemployed. Its aim is to help these people improve their hard and soft skills so that they may provide a better service to the unemployed.

IBAK [12] is an EU funded project addressed to professionals working in the field of lifelong learning and aims to help adult education institution by providing a framework for identifying, assessing and recognising informally acquired competences.

The TRAILER project [13, 14] , funded by the European Union, aims to facilitate the identification of informal learning by the learner, and provide a set of tools that will help the learner present it in a way that will be easier to be recognized and valued by an institution, a company, an organization, etc.

All of them have in common that store and collect data relative to Informal Learning Activities. In the particular case of the TRAILER project, the component that gathers information about Informal Learning Activities is the Informal Learning Collector, described in the following section.

3 The Informal Learning Collector

The TRAILER framework consists basically of an Informal Learning Collector (ILC) and a personal Portfolio. The role of the ILC is to act as a gatherer of all the Informal Learning Activities a learner undertakes and provide an interface for the learner to add metadata to each activity before sending it to the Portfolio. These metadata include tags, comments, activity content, activity type and association with specific competences. After the learners have defined all the metadata they wish, they can send the Informal Learning Activity to their portfolio where they can create activity showcases and export their informal learning curriculum in a more formal format.

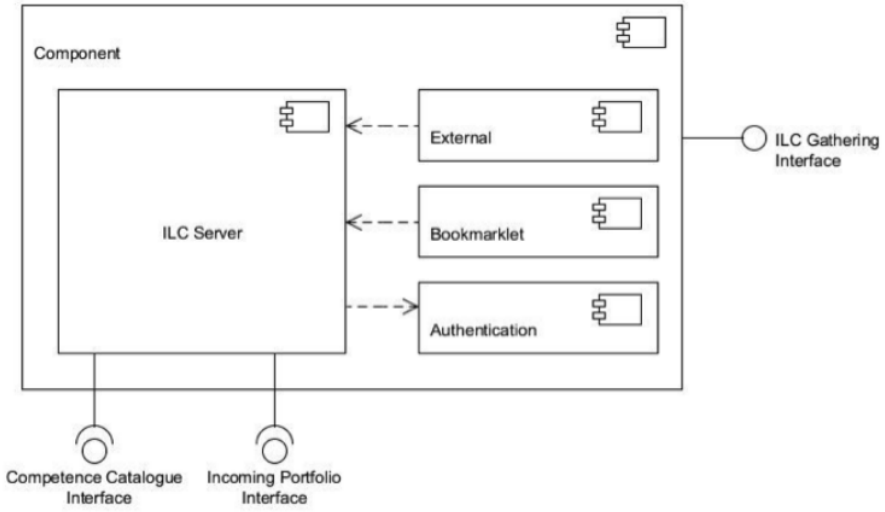

Fig.2. ILC internal architecture

The ILC architecture (Fig 2) provides three different ways to send Informal Learning Activities to the ILC: manually, a bookmarklet and a set of web services.

With the manually method, the user enters the informal learning activity information directly to the ILC by means of a specific web-based interface. This process implies that the user must change his/her activity context disrupting from

his/her current work activity. Moreover, to keep up to date all desired activities in the Portfolio it requires some extra effort by the user.

The bookmarklet method is less disrupting, since it allows registering Informal Learning Activities while browsing the net. It requires less effort than the above method since some data is collected automatically from the web (i.e: url, title, etc.). However, other data like tags also requires to be entered manually by the user.

Finally, the ILC provide a set of web services used by external applications to get user information and to register informal learning activities information. These services provide a mechanism to allow the communication between the ILC and external applications. In order to ensure as much connectivity as possible, ILC supports the most common communication protocols.

The first two methods for registering data of informal activities are based on a push mechanism while the third one is based on the pull mechanism. With the push mechanism, the user has the responsibility to initiate and perform the data entry action, meanwhile with the pull mechanism, an external application notifies that the user has performed some activities in some external application, and the ILC must gather activities information from the external application.

With respect to the push strategy used in the manual and bookmarklet methods we have some user feedback:

- The data entry is cumbersome: All users found tedious to search net resources they have read and enter them into the ILC even with the bookmarklet.
- Yet another tool: Some users were complaining about having to enter data in another tool. Some of them had their own practices using cloud services to store related information about resources they have read.
- Users were wondering to have any tool to easily retrieve information from other applications and send it to the ILC.

We have also recollected statistics about the use of these push strategies (Fig. 3.). We recollected the method (manually or bookmarklet) used to send any informal learning activity to the ILC. Informal activities were, mostly, sent using the bookmarklet method: 78% of informal learning activities were sent using the bookmarklet method while only a 22% of informal learning activities were sent manually.

From the data presented (user feedback and use statistics) we conclude that users prefer more automatic and guided methods for entering data.

Therefore, we wonder if the user experience can be enhanced by adding a pull method to introduce Informal Learning Activities into the ILC. That is, if we can integrate a large set of third applications, extract data concerning knowledge activities from these applications and send them to the ILC as an informal learning activity. In this sense, we have designed a first experience of such strategy based on an external application called Pocket.

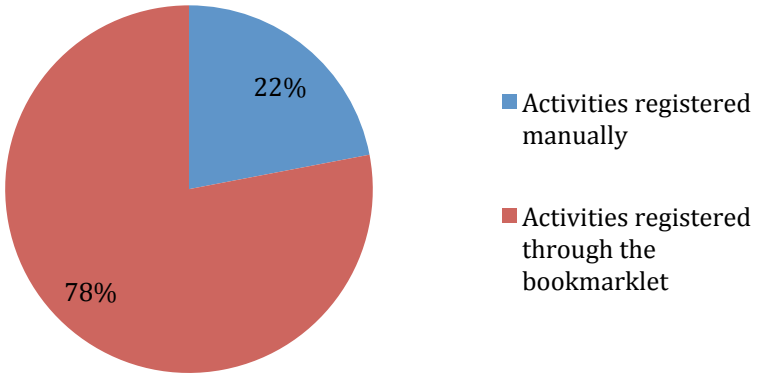

Fig.3. Chart depicting the activities sent using the manually and bookmarklet methods

4 Pull entry data method for ILC

In a pull mechanism is the application that retrieves information rather than asking the user to introduce it. This information is retrieved from other external applications. For security reasons, the user has to authorize the application to have access to any other external application. This is done once and for each external application.

With a pull mechanism for entering Informal Learning Activities, the ILC can prompt to the user a list of Informal Learning Activities recollected from the data of external applications. At this point, we can consider two alternatives for selecting the relevant activities for the ILC. One alternative is to notify the ILC when there are Pocket activities considered as relevant. Then the ILC gathers and introduce these activities. The other alternative is to retrieve all activities from the Pocket, display them to the user and let him/her to mark which activities he/she wants to record in the ILC.

When starting to design the integration of an external application some questions arose, the majority, related with how to extract external application data:

- Which applications can be considered as data providers for Informal Learning activities?
- Which data from external applications should be recollected by the ILC.
- With which detail level the data is going to be recollected.
- And finally, how to match external data with required ILC data?

In next section we explain our solution and how we answered these questions.

5 The Pocket Case

Pocket, formerly known as “Read It Later”, is an application for managing a reading list of articles from the Internet. Pocket allows saving articles, videos or images from the web, tag, search and share them. Saving articles to Pocket is easy and there are a variety of ways to perform this operation: via e-mail, from over 300 third-party applications, using Chrome, Firefox and Safari extensions, with a bookmarklet for any other web browser, manually through the Pocket Web Application and with Share Page Menu on Android and Kindle Fire [15].

A Pocket item is any stored resource (i.e.: articles, videos, etc.). For each item, Pocket application saves the title, the URL and a short description extracted from the net. For each item the user is able to store more information tagging it, marking as favorite item or as a read item.

We have developed a component integrated into the ILC architecture called “Pocket to ILC”. Its main feature is to pull information from Pocket and list it to the user. Then, when the user enters into the ILC is able to register Informal Learning Activities extracted from its Pocket account. For this purpose, we selected the second alternative to allow the user registering related informal learning activities. We implemented a new component into the ILC to gathers all items from Pocket and then lists them to the user. The user can mark all the items he/she wants to send to the ILC. Once the user has selected all the items he/she wants to send to the ILC, the user can send them as Informal Learning Activities. Finally, the ILC save the activity.

Taking into account the questions we have stated to guide how to design the data extraction on the integration process between two applications, in our case, we have considered this aspects:

- Which applications can be considered as data providers for Informal Learning activities? In our case, we only consider Pocket application as a first pilot application.
- Which data from external applications should be recollected by the ILC? Data we collect from the Pocket application is related to the activity a user performs with the Pocket application. Pocket and ILC are used to register activities a user does while navigation through the web (Pocket) or while performing Informal Learning Activities (ILC). We have considered that registering information a user finds while he/she navigates through the web is an Informal Learning Activity. Therefore, the Pocked to ILC component gathers the same basic information Pocket collect in each their items: Title, URL and Tags.
- With which detail level the data is going to be recollected? In our case, we gather the information as stored in the Pocket application without additional aggregation nor simplification. Our component does not consider additional information of a Pocket item such as description, observations, favorite or read status, etc. The main reason is because such comments and annotations may be different from a learning point of view (ILC) than from a simple recorder of Internet resources (webpages, images, videos, etc.) like Pocket. Whit the ILC interface the user can maketheir own annotations and descriptions.

- And finally, how to match external data with required ILC data? Our component obtains the basic information from a Pocket item, which it matches perfectly to the required format of the basic information of an Informal Learning Activity stored in the ILC.

We have run the Pocket to ILC pilot in order to get user's perception about the third way to register information into the ILC. During one week the users were ask to send Informal Learning Activities to the ILC. For this purpose they had available all three methods to send activities to the ILC, those supplied by push mechanisms (bookmarklet, and manually) as well the Pocket to ILC pulling mechanism.

After that week, we ask users for feedback. They valued positively the pull mechanism. Most of them highlighted that, with the new method, entering Informal Learning Activities was less tedious. They found that being notified about Informal Learning Activities by the ILC was a good improvement. Some also stated that pulling information from Pocket was less disrupting. They only had to save an item into Pocket (which is done automatically by Pocket application) and then was automatically included into the ILC. We have to note that most of our users were currently using Pocket to store and retrieve net resources.

6 Conclusions

Informal learning is just as important as formal and non-formal learning, however identifying, managing and giving visibility to informal learning is not an easy task. Concerned about the importance of informal learning, several projects have been held in order to recognize this type of learning.

The TRAILER project [13, 14] facilitates the identification of informal learning activities but we have seen that can be improved by means of usability. The main way for adding informal learning activities was using pushing mechanisms. We have added a pull mechanism to the ILC and test this new feature. According to the received feedback from users we concluded that adding such a mechanism improve the ILC. Users are more willing to use the ILC when the data entry is simplified and requires less effort and time for them.

The new pulling mechanism is useful but does not resolve all the problems regarding the introduction of Informal Learning Activities. Firstly, it should be implemented for a large list of external applications to be able to notify to the user the maximum number of Informal Learning Activities. A priori we don't know which other applications individuals are using to learn informally. Secondly, each external application stores different data and with different granularity. The matching between external application data and ILC data could not be so direct like in the Pocket case. Finally, it should be studied which data is going to be recovered from the external application, obtaining directly from the external application only those activities that are relevant for the ILC portfolio.

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Managing Informal Learning in professional contexts: the learner's perspective

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Abstract. Informal Learning is present in everyone's life but its awareness only recently has been reported. The need to keep track of the knowledge acquired this way is increasing as its sources diversity also increases. This work presents the pilots trials on the use of a tool developed to help keeping track of the learners' informal learning, within a number of companies spread out in three countries. This tool developed through the European Commission funded project TRAILER, is still under development, which will allow integrating the set of improving suggestions obtained from users during the piloting phase. The overall idea of managing one's informal learning was well accepted and welcomed, which validated the emerging need for a tool with this purpose.

Keywords: informal learning, curricula management, competences, recognition, motivation, knowledge management

5 Introduction

The distinction between formal, informal and non-formal learning started being fostered in mid last century [1-2]. According to recent studies, informal learning (IL) can account for over 75% of one's continuous learning through life [3-4]. Even though most of the methods of developing IL were always used, their awareness as far as contributors to learning and enhancer of competence development is more recent [2].

Most companies still focus only on formal learning programs loosing valuable knowhow employees develop [3]. Nevertheless, in companies many practices have been reported in literature as being equally or even more productive, such as informal

meetings or simply coffee breaks [4]. In fact, there is a paradox referenced in literature [4] that argues that companies spend 80% of their money effort to re-qualify their employees in formal learning workshops and courses, while 80% of what their employees are really learning, they do it by themselves in activities that involve IL. This implies that only 20% of that money spent was actually well spent. Jay Cross [4] argues that since IL initiative starts from the learners, they become more responsible, which makes it more effective. This author sustains that employers should create a supportive organizational culture helping employees to develop and improve their skills, supporting IL processes within companies. Since todays' challenges are increasing and both, employees and employers, feel the need to work in a more productive way than before, while competitive pressures drive them to be more organized and more rational [5, 6], IL developed by employees naturally should be enforced and credited for. In fact, since employees and employers can both benefit from IL, it is important to watch and harness the informal methodologies that employees are already using to develop their competences and expertizes [2]. In order to understand the learning in an organization, the first step will be to recognize IL already taking place and then make it visible to that community in order to potentiate liaisons, exchanges or collaborations that otherwise would be more difficult to visualize. This is the aim of TRAILER project [7].

TRAILER [7, 8] is an ICT multilateral (two years) project funded by the European Commission, started on January 2012, with the aim of developing an innovative ICT-based service working in two (complementary) fronts: employees and employers [7]. It allows employees to identify evidences of IL and link them with competences being developed. These learners will then choose which ones will be relevant to make visible to their employer. The employer will afterwards work upon this information in order to support knowledge management and/or human resources management within the company. This work analyses and compares a number of companies in three countries by using a group of learners from the contacted companies which were involved in the pilots testing of the TRAILER project technological framework. Section 2 of this paper starts with a summary of what learners can expect from their interaction with the tool, followed by a description of the methodology used in the pilots testing and its population characterization. The obtained results and their discussion are presented in Section 3, organized in three topics: usage, the TRAILER idea and participants' IL profile. Finally, some conclusions are summarized in Section 4.

6 Methodology and cases description

6.1 The TRAILER project technological framework: learners' perspective

As already stated, this set of tools is structured in two perspectives. Although a brief statement of the aim of the institutional perspective is needed to framework the learners' perspective, this work is only focused on the latter and its results obtained from the group of companies collaborating in the pilot trials. The TRAILER project technological framework [7, 8] is an integrated environment where the institution defines a set of competences considered important for their mission or purpose. These

competences can then be seen (and used) by learners within their TRAILER accounts. From here onwards, the term - institution - implies the stated context.

As said, the aim for learners is to collect evidences of Informal Learning Activities (ILA's) related to the IL they are gathering and, at the same time, associating it with competences being developed. This process can be undertaken in two stages: first, collecting ILA's and secondly, further describing and associating competences to those ILA's. The tool also provides a "peer recommender" option, showing people with similar competences to the ones defined by the learner. This feature is most useful to find people with the learner can somehow collaborate with.

1.1 Methodology of TRAILER implementation

One of the objectives of the TRAILER tool testing was validating the TRAILER idea, as well as assessing the learners' perspective and acceptance on using this type of tool to organize their IL. The TRAILER project technological framework testing consisted on allowing the pilots institutions to explore it in the learner's perspective during approximately one week, with a set of tasks to be accomplished during that period. This period started with a hands-on introductory workshop, where it was explained how to use the tool, which was attended by the expected learners (employees who had previously agreed to participate in the trial). These workshops were conducted separately in each institution. The testing period ended with a focus group meeting to discuss their perceptions and experiences and to gather their suggestions. This meeting was planned to gather not only information about the perceptions on IL but also information related to usability, usefulness and friendliness of the tool. These issues were also addressed in pre and post questionnaires answered by the learners in the beginning of the workshop and before the focus group discussion, respectively. During the whole testing period, each learner's activity was registered in the platform, gathering information to characterize the users profile for each institution, frequency of use, IL provided evidences and associated competences, and also, at some extent, try to assess the learners' will to publish personal information.

1.2 Methodology of Analysis

This analysis is based on a study case research. There are five cases from professional institutions (companies) for which results will be compared in this work.

Even though the professional working areas of these companies are different (see Table 1), four (out of five) groups involved deal directly or indirectly with informatics. PT_C and S2_C are technology-based companies. It is important to say that one of the institutions belongs to a military training facility (S1_C2) and the related group of participants was enrolled in the Virtual Learning Environment (VLE) Program, even so quite familiar with computers and learning technologies. S1_C1 represents an informatics department. Only the polish company (PL_C) has a line of work somewhat different since it mainly deals with management and consulting. In terms of dimension, three companies are small, with less than 15 employees (PT_C, S2_C and PL_C). S1_C1 together with institution S1_C2, are both part of big state offices, with a large number of employees. In all of them, almost all employers had a

university degree and some also had an MSc. All groups of participants have ages between 26 and 40 years old, apart from S1_C2 participants (military context) which are older (41 - 60 years old). In order to establish a dimension comparison level for all the institutions, in this work each institution universe is considered the number of participants who intended to participate and, each institution sample is the number of those who actually used the tool.

Table 1. Companies pilots trials characterization

Company Pilot for Employees (E)		
PT_C	**S1_C1**	**S1_C2**
Context: Engineering – Space, Energy, Transports and Health Dimension: 12 E Typically with a degree or MSc Ages: 26-40 years Universe: 11 E Sample: 11 E	Context: City Council – Informatics Department Dimension: 1063 E Typically with a degree Ages: 26-40 years Universe: 7 E Sample: 4 E	Context: Military –training (VLE courses) Dimension: 900 E Typically with a degree Ages: 41-60 years Universe: 67 E Sample: 11 E
S2_C	**PL_C**	
Context: Engineering - ICT Specialists Dimension: 10 E With high school or a degree Ages: 26-40 years Universe: 10 E Sample: 10 E	Context: Training - Consulting and Management (administrative workers, professional trainers and informatics) Dimension: 13 E Typically degree or MSc Ages: 26-40 years Universe: 13 E Sample: 10 E	

The data collected during the pilots was related to different sources of evidence, in order to enable triangulation of results [9]. Quantitative data was collected from the platform usage, characterized by several parameters. Qualitative data was produced from the focus group sessions for each case (company) held at the end of the piloting week. Data from pre and post-questionnaire was processed in order to assess participants IL perception modifications.

2 Results and Discussion

2.1 Learners usage characterization

In a prior phase of the pilots' trials, each employer was contacted and invited to participate in the pilots' phase of the TRAILER project and was asked to choose a group of employees willing to participate in this type of collaboration. Table 2 shows the participants who accepted the invitation (previewed) and those who were actually present at the introductory workshop. Only one group (S1_C2) had problems in complying with what was previewed showing a dropout percentage of 81%, which may be explained by the difficulty in scheduling both the initial and final dates for the pilots trial. On the other hand, taking into account those participating in the workshop, in average, 76% were considered "active users" as 24% were considered dropouts (in

this phase). Being an "active user" implies collecting ILA's (in the 1st stage) and describing them and associating competences (in the 2nd stage). There were two critical cases each with almost 50% dropouts – S1_C2 and PL_C – again, for the former scheduling difficulties were the reason, but for the latter, no apparent reasons were brought up. To classify the learners' usage effort, the number of ILA's collected in the 1st stage and worked with in the 2nd stage was registered per learner (i.e. user) and the average number of ILA's per learner was calculated (Table 2). A common profile observed in all the pilots trials, was that users collect a lot more ILA's in the 1st stage than the number of those they work with in the 2nd stage. These results show a poor usage (below average) in all the institutions with the exception of employees from the city council (S1_C1), collecting an average of 12.5 ILA's per user, which is almost twice the global average for all institutions (see Table 2). Also, considering the 2nd stage, this trend is maintained in spite of the number of ILA's worked with in this stage being in average only 64% of the total in the 1st stage. The low usage can be explained by the fact of not being fully aware of the importance of registering ILA's and their associated competences, but also with the difficulty of integrating the usage of this tool in their daily routine during a period which was later considered by themselves as too short for the intended purpose.

In order to have an idea of the amount of work learners put in characterizing their ILA's, namely by associating competences, the number of competences per ILA for each collaborating institution was collected. Comparing them to the overall average of 2.3, only the military are well above this value. Apart from this case, in general, the groups of learners associated 1 or 2 competences to each ILA.

Table 2. Learners participation in various stages interaction

Institution	TRAILER tool pilots testing									
	Previewed	*Users*	*%*	*Active users*	*Non-users*	*1st stage ILA's*	*2nd stage ILA's*	*%*	*1st stage ILA's per user*	*2nd stage ILA's per user*
PT_C	11	10	91	8	2	52	26	52	5.2	2.6
S1_C1	4	4	100	4	0	50	41	82	12.5	10.3
S1_C2	69	13	19	9	4	70	43	49	5.4	3.9
S2_C	10	10	100	8	2	59	42	61	5.9	4.7
PL_C	11	9	82	6	3	45	26	81	5.0	2.9
Totals	***105***	***46***	***44***	***35 (76%)***	***11 (24%)***	***276***	***178***	***64***	***6.0***	***4.1***

Even though this way of measuring the amount of work put in the usage of the tool allows differentiating between learners, another meaningful input is gathering information about the average number of interactions per user per day and the absolute maximum number of interactions in a day (within the 2nd stage), for each institution. This can also be correlated with the average number of days of use and its absolute maximum number, for each institution. Comparing all these results, in general all the institutions had a similar performance in their 2nd stage interaction, with close to average number of interactions per user per day (23.1±5.8). But tracing

this average with the maximum number of interactions in one day, the highest dispersion of results appears in the military group (S1_C2), where one learner had 133 interactions with the tool. In spite of it, this group used the tool for more than two days (2.4 days) which is above average (1.9 days). Somehow surprisingly, if considering the business area, is the case of S2_C with an average of 1.2 days of use and a maximum of 2 days. Almost everyone had the opinion that only one week to work with the tool was a too short period. They referred that they ended just testing it and not really getting engaged and constructing something that could be more resembling of their profile in terms of their IL developments.

Regarding the learners' assessment of the tool based on their usage, they helped identifying some particular issues they considered the tool would need improvement. These were mainly usability related enhancements (e.g. simplifying some issues due to time consuming and too much detail while describing activities and competences) and improving its user friendliness. Curiously, it was the two state department groups who considered the tool more facilitator in terms of visibility and presenting their IL. In all the questions, the lowest score was found for the group with an area of business not so much related with ICT (PL_C), even though in focus group session they did considered it professionally useful in order to "collect the team with the appropriate competences". On the other hand, this group is one of the cases that refer that an interface to work on smartphones or androids should be developed. In a broader perspective, results for PL_C might also be related to an issue reported in focus group: they questioned the transparency of the tool regarding the use of competences definitions, which might be named differently by different users, by the simple fact of using distinctive words. This problem with synonymous competences might generate difficulties or even biases, if not properly taken care when employers use this data.

As said before, learners decide whether or not to make their competences and ILA's public to others. In evaluating this aspect, which somehow exposes their personal information, it could be found that the great majority (88%) of the collected activities are not made public. Learners have used the tool as a personal record facility, rather than a communication platform between them and their employers through their published activities. At least at this stage, employees want to keep their activities for themselves. This was a common feature in all the institutions involved with the exception of the military group, where, even considering they are trained to follow orders and obliged to a certain discipline in pursuing objectives without questioning, the obtained ratio for published (40%)/not published (60%) was of 2/3, is not too high. Another possible interpretation for these results is considering that all the learners realize they could use the tool only for personal use, for organizing and managing their IL evidences and associated competences. When looking at competences, they are much more keen on sharing them (46% are published), maybe because they understand it could have some impact on the type of tasks they are assigned to do, or even to be chosen to embrace new projects requiring new competences. Even so, 77% of the user defined competences are published when compared to 39% of the ILA associated competences, indicating that when learners are willing to introduce new information they have a higher predisposition to publish those competences. From these results two cases stood-up both representing state department companies. Both, S1_C1 and S1_C2, published over 90% of their user competences, which for the ILA associated competences is considerably different

only for the city hall group. At the same time and still related to competences, it can be shown that learners tend to choose competences from the competences catalogue (86%) rather than define new ones themselves, which is understandable since user defined competences lack validation from their employer. In the approach of this tool, validating a competence means only that the employer accepts it as of interest for the company.

2.2 The TRAILER idea

Even though the company participants have caution stating their recognition about their IL, their answers in the post questionnaire became more coherent, in some cases showing a lower standard deviation. This could indicate that through the work performed during the piloting week, participants not only tend to better acknowledge their IL, but also in this case, it helped participants who had more reserves about it.
In fact, this rather level of recognition is in agreement with the goals each institution' employees state they seek when they develop IL. The company who states a better acknowledgment of their IL (PL_C) is in fact the company who scores higher in the analysis of specific goals, apart from the goal "amusing myself". In this item, the ones scoring higher are institutions more directly related to ICT tools, where perhaps the use of videogames in order to learn is more common.

The usefulness of a tool like this is, in the overall, seen with a medium benefit, but even so the majority of participants were willing to work with a tool like this in the future because they could sense that this kind of tool could indeed be of a personal and professional benefit. However, as some participants said *"a regular use will require time until it could be incorporated in our daily routine, but only then we will be able to see its profits"*. And also *"when its usage within an institution will already have meaningful content of the overall of the employees, will we see its full potential"*. In both questions, S1_C2 participants showed a higher receptivity to the idea, but the only case that stands below average is PL_C. This data is in accordance to what was reported in the focus group session, where participants stated that this unusual process of gathering and analyzing their IL could be very useful and, particularly, with high impact in knowledge management. Looking at different ways participants used to develop IL, "reading" scores very well, as "searching in the internet". This does not present novelty towards what was anticipated, but regarding "watching other people" or "conversations", it was expected higher scores for company environments. After all, the majority of employees use this type of IL on a regular basis, talking to colleagues, discussing problems, seeing how other colleagues solve some issues, etc. So, either learners do not realize they are doing it often, or, they do not realize they are learning while doing these activities. Either way, this reveals that their IL perception and its importance on their daily professional activities can still be improved.

3 Conclusions

The TRAILER idea was successfully accepted by the learners, who considered a good way of collecting, recording and sharing IL that, otherwise, could easily be forgotten.

Professionally, several benefits were reported such as being helpful in managing competences within an institution as well as for human resources. However, the results show that from a learner point of view, the importance IL recognition and its usefulness in their daily professional activity can still be improved. From a personal point of view, participants agreed that in its current state, the tool was a little too time consuming, but nevertheless, in general they would like to try an improved version of the tool for a longer period, in order to get some more content and be more able to potentiate its usability. Also, since using this tool demands integrating it in the learners' daily routine, the trial period should be extended. Learners also shared some concerns regarding the use their employers could make out of their IL. This was a real constraint in order to fully understand the TRAILER objectives because it still lacked the way around: the employer feedback about their IL and the benefit they may take from it. These difficulties might have had some impact in the low level of usage observed during the pilots' period. Nevertheless, the overall receptivity was highly positive, especially from the two companies having their business related working area, and important remarks and suggestions were identified for further tool improvement and usability.

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What is Lifelong Learning About? – Reflections on the TRAILER Project

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Abstract. Lifelong learning is specially linked with the idea of gathering learning instances in order to take them into account. Along life learning can carry out in the context of an institution or outside of it. TRAILER project defines a methodology and technological framework to facilitate the dialogue based on informal learning evidences between the leaners and the people in charge of making decisions in institutions. However during the definition and especially during the application of the methodology some problems arose. This paper describes a approach to solve them drawing on metagames.

Keywords: informal learning, meritocracy, meta-games, tagging, competencies

1. Introduction

Learning and living are inseparable processes, but what is generally referred to as the "lifelong learning" agenda is about more than stating the obvious. It reflects, amongst other things, a position of political economy which broadly affirms 'meritocracy'. Meritocratic advancement has usually been connected with the outward signs of achievement and skill through formal processes of accreditation, usually (but not exclusively) by Universities and Professional Bodies. Michael Young, who coined the term 'meritocracy' in his satire "The Rise of the Meritocracy" [1] railed against the fact that the idea had apparently been taken seriously by politicians:

"It is good sense to appoint individual people to jobs on their merit. It is the opposite when those who are judged to have merit of a particular kind harden into a new social class without room in it for others." [2]

Young warns against meritocracy because he worries about the hegemony of educational institutions. Whilst few can argue with the idea of 'lifelong learning', finding effective ways of recognising merit acquired informally which circumvents the power of formal institutional accreditation has proved elusive. In pursuance of this, the TRAILER project [3] has been funded through the 'Lifelong Learning' programme of the European Commission. What does TRAILER tell us about the lifelong learning agenda and its place in the drive for meritocracy?

This paper addresses this question by focusing on the nature of information in the context of TRAILER. It draws attention the relationship between information, competency and learning, and how that relationship may be analysed in different ways. Drawing on analysis of TRAILER data, misconceptions of 'competency' and

the information required to justify it have, to some extent, been revealed by the project. By focusing on an analytic approach drawing on 'metagames' behind decisions made by learners to reveal data about themselves, an alternative approach to identifying individual merit and skill is suggested.

2. The Information challenge of TRAILER

Certification by the educational institution still has the fiduciary qualities of the kind of 'exclusive club' that Young worries about. With its license to print degrees (which nobody else has) the University is the filter of choice for most employers, leaving little room for self-certified routes, or personal learning. The requirements for jobs increasingly state "must have a degree", and whilst this is the case, there is little an individual without a degree can do. With online communications and 'informal' learning opportunities are there ways of overcoming this? Are there ways in which informal personal development may be recorded by learners which does carry the trust of employers? Is the electronic information environment a challenge to institutional hegemony?

To address these questions, the nature of the information that is revealed through certificates, and through non-institutional statements about learning needs to be examined. Yet information is a contested concept. Different aspects of information have established characterizations, and yet none of those definitions are consistent with one another. Bateson's definition "a difference that makes a difference" is perhaps the most famous definition, although this is very different from Shannon's influential work [4], or indeed from conceptions of information harboured by geneticists or physicists. As Deacon has recently argued: "We have no coherent theory of information" [5].

3. Information, Decision and Metagames

It is difficult to 'see' information. We see websites, the creation of 'online artefacts' which results from decisions taken by individuals who put them there. The political sphere of action is illuminated by information, but constituted by decisions. Often, decisions have an impact on the nature of the information that is available. For decision theorists [6], a decision is a move in a game taken in the light of information available to them. However, this position is criticised for being overly rationalistic.

A way of addressing the overly-rationalistic approach to decision-making is to consider the 'meta-game' [7]. Metagames present a way of thinking about decisions by considering that there is a "game about a game", and successive "games about games about games". The challenge in decision-making within the context of metagames is deciding which strategy to play in the context of insight into how that strategy might unfold across the levels of metagames.

As learners learn they have to behave strategically. There may be strategies related to passing a qualification, or gaining the favour of a teacher, or gaining the favour of other students. In a metagame, all the possible repercussions of a particular act must

be considered. Here then, there is a need to think about what information is available about others, and the nature of that information.

4. Formalising the metagame in TRAILER

In using the TRAILER system, users had to make decisions about choosing resources and labelling them with competencies. Such decisions can often result in dilemmas for people as they try to decide what they should say, fearing the consequences of each option, and (sometimes) either settling for the least damaging option, or not saying anything at all. A metagame of a dilemma situation like the "prisoner's dilemma" [8] is a game about the game. The recursion down a level of thought can be notated in game theoretical terms as a next level of moves. The notation in Table 1 indicates the probability of success of P1's strategy against the probability of P2's strategy (so, if P1 plays a against P2's b, the outcome is notated P_a, P_b). The probability of a successful communication depends on anticipation of likely future communications of others. Table 1 shows a 1st level metagame of a simple 2-strategy game (like the prisoner's dilemma), where player 1 considers all the strategic possibilities of whether to play a or b. Using Howard's notation, these are represented as xly, which means "play x if P2 plays a, and play y if P2 plays b".

Table 1. Normal form meta-game on a simple two-strategy game

P2 \ P1	ala	blb	alb	bla
A	P_a, P_a	P_b, P_a	P_a, P_a	P_b, P_a
B	P_a, P_b	P_b, P_b	P_b, P_b	P_a, P_b

What's important here is that the probabilities do not change. For example, a meta-strategy which says "play a if P2 plays a, and b if P2 plays b" ultimately has no effect on the probability of the particular move a or b actually taking place. In short, it doesn't matter how much we might think about a move, the chances of success are unaffected. What does happen is that thinking about meta-strategies helps us to make a better choice. However, another implication of this is that if all options are unaffected by the depth of recursion, there is no way of distinguishing one option from another, and no way of determining the 'equilibrium point' for decision-making.

In conventional game-theory, options are 'ordinal' which means that they carry a calculated value of cost/benefit. Without this, what is to determine a decision? This is fundamentally a question about the role of information, and it has been suggested [9] that information acts as a constraint on the construction of the meta-game tree, so that the metagame tree is never complete. As a result, those options that are more present in the metagame are preferred over those that are not. The implication of this is that it is not what we can think about that determines our decisions; it is what we cannot think about.

5. Information, Shared Absences and Concepts within TRAILER

Information, in the context of a metagame, is the context within which the game is played. It conceals some options and accentuates others. Information, seen in this way, is not immediately visible to the decision-maker, although they will be shaped by it. This idea of the "absence" of information has a cybernetic pedigree. First proposed by Bateson [10], "information as constraint" has been presented recently in a number of guises [5]. Deacon suggests that absences relating to information are 'autocatalytic': in other words, they contribute to the growth of structures. A contribution to the growth of structures for meaning-making has recently been suggested by Leydesdorff and Ivanova [11].

In TRAILER, users are asked to reveal information about themselves. The revealing of information is a strategic move, taken in the knowledge of the effect it may have on the decisions (reactions) of others. The question as to reveal much or little information about oneself depends on many factors. What 'much' or 'little' means in this context is an important question in information theory, but according to Shannon's theory the 'amount' of information is proportional to the departure from expected norms of communication. To reveal an interest in football is (in most contexts) less informative than the revealing of sexual preferences!

In TRAILER, the two items of information that make up a submission are a "resource" demonstrating a competence, and a competency statement about that competence. Much can be gleaned from this data about the strategic thinking of the individual submitting it. Internet resources like videos can be mined for additional texts and ways in which they are described. Similarly, a competency statement may be mined for richer contextual information about it. Using data mining techniques, the 'topics' of these resources can be calculated. Consequently, with both a competency statement, and a resource, a two-dimensional dynamic involving the relationship between corpuses of descriptive text around both resources and competencies can be created. A document-term matrix is easily created for these two corpuses, and text-mining tools can produce deep comparisons between the document-term matrices of the two corpuses. In cases where individuals choose to submit little information about themselves, we would expect a close fit between the document-term matrices at a low level (i.e. immediately). In cases where individuals choose to reveal more information about themselves, the fit at the basic level will be less. Repeating the process of identifying topics and generating corpuses can indicate the fit at subsequent levels. The further down the levels of recursion in the analysis, the more generic the terms become and the more likely a fit is made. The level of recursive depth in producing a fit is an indication of the amount of information a learner has decided to reveal.

In TRAILER, users performed the submission of competencies with resources a number of times with different resources. With a sequence of competency statements, there is more analysis that may be performed. On the one hand, we might expect to see a reduction in the difference between a competency statements and the resources chosen. Typically in the use of the TRAILER system, a variety of competencies are selected and a variety of resources chosen. Taken as a totality for an individual person, emerging patterns can be analysed. The coincidence of resources creates a new region of "coherences of coherences" where the difference between the

coherence of the document-term matrices for one competence and the coherence between the matrices for another can be inspected by further recursing into the key topics which relate the two.

Most of the data submitted in TRAILER was shallow in the sense that there was little information exposed by users. But this fact raises the question as to why this was the case. How much does this reveal about the individuals? How much does it reveal about the context (including the system and the situation within which it is used)?

6. Relating the Depth of Match with the Metagame

By measuring the depth at which a recursive data mining operation most closely matches the resource and the chosen competency, we can gain an assessment of the metagame strategizing that went into making the particular information submission. This is indicative of the information environment within which a decision was taken. For example, if a resource and competency are matched at a level 5 in recursive depth (where everything else is matched at level 0 or 1), we can assume a desire on the part of the individual to reveal more information about themselves. Why might they choose to do this?

The decision to reveal deeper information is to examine the meta-game tree in more depth. Here the consideration of the likely actions of others entails a consideration of the absences bearing on others (and the likely responses that they might have) which further entails a deeper inspection of the absences that are shared. The process of making an utterance with more information is therefore a process of determining an absence which is shared amongst the group. The determination of a new absence entails the production of new redundancies of communication, which in turn can transform the communicative situation. With a determined shared absence, a strategic move which causes fundamental change in the communication dynamics of those around the individual can be made.

7. What does this mean for businesses?

The dynamics of business are complex. Individuals possess different talents, but within any organisation, the shared goals of the business, social cohesion and wellbeing amongst workers, freedom to self-expression, etc all remain key components of ‘learning organisations’ [12]. Managers may ask the kind of fundamental questions addressed by techniques like ‘Balanced Scorecard’ [13], but without a grasp of the social dynamics of the institution (part of what Senge calls ‘systems thinking’) and consultation with other employees at all levels to build ‘shared visions’ and ‘team learning’, few decisions arising from these questions, including target setting and the monitoring of metrics are likely to be effective.

The competency agenda in TRAILER aims to provide information about skills, and a rationalistic identification of ‘skills needs’ is envisaged to be generated by the use-cases for the TRAILER system. In reality, however, there is little to indicate that data

collected by TRAILER will give much information about individual skill beyond attaching a few labels to individuals. What it may do, however, is provide insight into the extent individuals are willing to reveal rich information about themselves, the extent to which individuals have integrated their skills into their personas, the extent to which individuals can be creative in conceiving themselves and their skills in rich contexts (and how flexible they might be), and the extent to which individuals have capacity for transformative agency in the organisation. To what extent is this useful for employers?

The information that businesses have access to in making decisions is a constraint on those decisions. Political behaviour in business can create situations where information is selected in order to justify decisions made on the basis of favour or prejudice. Data from TRAILER indicating the depth of engagement with skills, and confidence in revealing information can provide a way in which deep competencies relating to transformational potential of individuals, creativity and integrity can be more objectively discerned. Potentially this could produce a way of identifying those individuals whose skills profiles and communicative competence are demonstrably better than those who might otherwise have been selected on the basis of favour or prejudice. Since the latter management situation can lead to institutional failures, there is a strong argument for suggesting that deeper insight into the personal qualities of individuals revealed through rich analytics may be more significant than tick-box competency profiles.

8. Conclusion

Lifelong learning and meritocracy are abstract ideas. The realities of business and personal life involve daily challenges for each person and dilemmas that must be addressed. “Merit” measured by abstract indicators is unlikely to be an effective way to run organisations, nor is it likely to encourage the kind of rich personal development that engenders personal and professional integrity. Instead, developing the techniques that individuals have at their disposal for dealing with dilemmas, overcoming fear, increasing confidence and pursuing strategically valuable personal and organisational goals is a more potent recipe for personal, social and professional success.

TRAILER has both exposed some of the problems of a metric-based, competency oriented approach, and revealed potential for new developments which can exploit the power of ‘big data’, data analytics and new discoveries in information theory and semantics. Understanding the relationship between metagames for decision-making and the dilemmas faced by individuals, particularly in the absences that constrain decision-making can provide insights into the underlying constraints behind those decisions. This may provide deeper and valuable information for businesses in understanding the deep social dynamics of their organisation.

In place of ‘competencies’, it may be possible to proceed with analysis based on a “personal corpus”. Analysing and understanding the communicative patterns of employees may well be more important than labelling competencies. The TRAILER exercise of labelling competencies appears to have been powerfully revealing of

patterns of decision-making amongst employees. For recruitment and staff development processes to pursue deeper revealed personal qualities, may, in the final analysis be of greater organisational value in producing powerful social ecologies within the business than trying to fit bureaucratically-oriented descriptions of 'skills gaps' with equally abstract labellings of competence.

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