Using Informal Learning activities to make decisions and manage knowledge in business

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Abstract

The process of making decisions in businesses requires, amongst other things, the efficient management of information related to employees competencies. However it is not sufficient to deal with competencies acquired in institutional contexts, as employees also achieve competencies through informal learning activities outside the organizations. If an organization is to make well informed decisions, it must therefore gather information about the external activities of its employees which contribute to their competence development. This paper proposes a methodology to facilitate the identification and recognition of an employee's informal learning instances, supported by a technological framework. To validate the methodology, a pan-European project has implemented it and a panel of experts has evaluated how it works. The main findings from this study suggest that although it is possible to make decisions on the basis of informal learning instances, both the methodology and tools used should be flexible enough to satisfy the needs of the organization.

Keywords: Decision-making, informal learning, competences, information management

1. Introduction

Information is an essential element in the decision-making processes, and, from a theoretical point of view, the more useful the information available is, the easier decision-making becomes. Information and Communication Technologies (ICTs), which are now common in everyday activities, can generate a vast amount of information. However, not all of that data is truly meaningful and useful within organizations. Data mining or information visualization techniques may solve this problem, but it is difficult to apply these techniques in every possible context. Making business decisions on the basis of employees' informal learning activities is an especially complex case. This is because it implies not only a technological effort to gather the informal learning activities, but also a discussion between the process stakeholders – employees and decision makers - about how to evaluate and take into account the informal learning evidences.

Informal Learning is a longstanding mode of developing personal efficacy, because individuals—as social animals—learn in different contexts, including their interactions with other people, their experiences, etc. It is not a new concept; during the first half of the twentieth century there were several definitions (Dewey, 1938; Knowles, 1950), with more appearing at the end of the century (Coombs, 1985; Watkins & Marsick, 1990). Today, informal learning is again becoming the center of

discussion for several reasons: 1) the Bologna process recognized informal learning (European-Union, 1999) as a basic element in lifelong learning; 2) there is a necessity to apply learning obtained through observation and experience (Attwell, 2007); and 3) the emergence of the Internet, mobile devices and 2.0 Web tools that facilitate informal learning (Ajjan & Hartshorne, 2008; Fielding, 2000).

The recognition of informal learning in the workplace is especially relevant, because of a number of factors (Hager, 1998). For example, it enhances employability and produces positive benefits for managers and companies; it may help to develop task-oriented skills and knowledge and to communicate "social" norms and preferred patterns of behavior; it also gives employees the opportunity to learn and keep their skills up-to-date as a part of the overall workplace culture rather than just a training regime (Dale & Bell, 1999; Halliday-Wynes & Beddie, 2009). These issues lead to an interest in informal learning in the corporate world (García-Peñalvo, Colomo-Palacios & Lytras, 2012), driven by the desire to capitalize on the intellectual assets of the workforce, to manage organizational knowledge and to recognize that informal learning may prove to be a cost-effective way to develop competence (Attwell, 2007).

Informal learning takes place in the context of everyday experiences, especially among adults of all ages in both Higher Education (HE) and workplace contexts. One relevant characteristic of informal learning is that it emerges spontaneously from

everyday activities rather than from a planned activity, a fact that has brought

attention to this aspect of learning. Some examples of this attention are the CEDEFOP

"European Guidelines for validating informal and non-formal learning" (CEDEFOP,

2009); the ECOTEC Inventory of the validation of non-formal and informal learning

(Otero, McCoshan, & Junge, 2005); or the OECD Recognition of informal learning

(Werquin, 2010). Moreover there are several initiatives concerning competence

recognition in the EU, such as National Qualification Systems and the EQF (European

Qualifications Framework) (Bjornavold & Coles, 2008).

ICT may enable such recognition simply by providing support to make informal

learning evident; some projects in this field are the Tencompetence Project (Berlanga,

Sloep, Brouns, Bitter-Rijpkema, & Koper, 2008), which provides a set of tools to

support lifelong learning, the MyElvin Project (García-Peñalvo, González-González,

& Murray, 2012), Open Badges (http://openbadges.org), etc.

These initiatives demonstrate that recognizing informal learning is important, and

they provide validation with technological and institutional support, but the main

focus should be making it possible to obtain a strategic advantage from such informal

learning, for both organizations and employees. The recognition of informal learning

implies a dialogue between decision makers and the person who carried out the

informal learning activity. Such an interaction allows verification of what type of

competences the employees achieved and to what degree, so that the institutional environment can use the resulting information to facilitate decision-making. For instance, managers decisions concerning promotions could be made on the basis of skills acquired in the informal space, or they could improve the support which they provide for the learning needs of employees. This dialogue among employees and decision makers would enable the creation of a common portfolio of competences from which both the organization and its employees can benefit.

This paper proposes a methodology to articulate such a dialog. It goes beyond the existing initiatives focused on recognition of informal learning activities, and aims to facilitate decision-making by supporting the necessary discussion between employees and people in charge of the institutions. To empirically test the methodology, the TRAILER project (García-Peñalvo et al., In press), a pan-European initiative, implemented it as a proof of concept. The validation includes evaluation by experts to test if the proposed methodology really facilitates decision-making, and the extent to which different organizations may use that implementation.

Following this introduction, section 2 presents the research methodology and a tool to support decisions. Section 3 evaluates the DSS to check the adequacy of the different design decisions made on the basis of the methodology and how the

implementation works. Finally, section 4 offers some conclusions and implications from the evaluation results.

2. Methodology and Decision Support System

In order to make decisions on the basis of informal learning, the employee must first identify the learning and then the organization must recognize it. This process occurs through a dialogue between the employee and the organization.

Identification of learning by the employee implies the need to consider the various tools that he/she uses to carry out the informal learning activities that lead to that learning. These tools are not only related to an employee training platform but also to the tools the employees use in their everyday life to learn and manage knowledge. This issues raised by this type of learning are similar to those found in the discourse surrounding the concept of a Personal Learning Environment (PLE) or Personal Training Environment (PTE). PTEs facilitate the users' training process by allowing them to use the tools they want, freeing them from the constraint of being bound to a specific institutional context or training schedule (Adell & Castañeda, 2010). A variation of this is the PKN, the personal online networks that allow the management of tacit and explicit knowledge (Chatti, Agustiawan, Jarke, & Specht, 2010). Moreover, the identification of informal learning also implies a need to store and classify the informal evidence. A portfolio system, as a place to store and manage

knowledge, can be one solution to this problem (Attwell, 2007), as well using a

competence-based model to classify the evidence, as the European Union and other

organizations recommend, which stresses the commitment to recognize competences

and informal learning (CEDEFOP, 2009; European-Union, 1999; ISCO08, 2012).

When the identification process finishes, the organization should be able to

recognize the informal evidence that the employees have identified. This requires

being able to process the information that the employees have published to the PTN.

To address this requirement, this study proposes a methodology on the basis of a

technological framework. The methodology consists of a framework with several

different components and interfaces to enable the required level and types of

interaction. Figure 1 describes the framework.

Figure 1 here

The PTN groups the tools that the user interacts with in their informal learning.

Some examples of these tools include Wikipedia, YouTube, games, social networks,

LMS, Remote Labs, expert forums, microblogging sites, etc. One of the included

tools is the TRAILER portfolio, which stores and published informal, non-formal and

formal learning experiences.

The portfolio has an interface to facilitate the gathering of informal learning

activities. This interface is the Informal Learning Collector (ILC). In addition, there

are several organizational tools: a Competence Catalog that facilitates the categorization of informal learning experiences, taking into account both trainee and organizational perspectives; an Organizational Environment that enables the analysis of the published information, gives support to the dialog with employees concerning their informal learning, and facilitates decision-making by organizational agents related to organization-wide training issues (for example, in internal and external certification processes); and a Repository that stores the information for future analysis and has reporting capabilities to generate useful reports for both the organization and employees.

In this framework, the TRAILER project defines a methodology (Figure 2) to make informal learning experiences transparent to workers and organizations in such a way that both of them will benefit.

Figure 2 here

The starting point of the TRAILER methodology is the moment when the user performs an online activity that may have an impact on a competence defined in the Competence Catalog. The employee may then identify and match an activity with the set of possible competences from the catalog or store it for later identification. The processes of collection, inspection and reflection result in a methodology with three stages:

1. **Identification and storage:** in this initial stage, the user classifies the activity, taking into account the competence catalog that includes general competences, organizational competences and user-defined competences. Next, the system records the identified activity in the portfolio.

2. **Organization:** once the system has stored the information about the informal learning activity, the user can complement it with information about the associated competences or classify it by using the catalog. In addition the user can organize the stored information in the portfolio in different categories or views. When the user has organized the information properly, he/she can publish it and make it available to the organization. The employee can decide what to publish and who has access to that information. This information allows organizations to perform analyses on competencies and workers to find peers with similar interests.

3. **Analysis:** the published information, once it is available, is suitable for making decisions about the training needs of workers, including the tools and contents used by the organization and the specific skills each user has, both at the individual and group levels. The published information and the portfolio views facilitate a common analysis of the gathered information that can be a starting point for a dialogue among the different stakeholders. The system, once it has

carried out the analysis, can give recommendations regarding organizational skills, knowledge gaps or personal recommendations for the learner/employee.

According to the proposed methodology and framework the Decision Support System (DSS) is a key component. It includes an analysis layer and a set of decision tools.

The analysis layer is in charge of gathering the information that the ID workers publish to the portfolios, as well as facilitating a preliminary analysis of the data to allow for presentation of this information.

The analysis layer accesses the data through two interfaces. One of these is an interface to the portfolio called PersonalPortfolioView, which gives information about the informal activities and competences published by the employee. The competence catalogue implements the other interface, which provides information about the competences. The information these two interfaces provide:

- **Informal Learning Activities (ILAs)** gathered by each user or the organization, including specific information about the activity (URL, title, content, comments) and the competences associated with the activity.

- **Information about competences associated with a user or the organization.** This information about the competence includes data such as the ID in the catalog,

if it is associated with an ILA –and to which ILA, the associated working areas, the last time it was used or accessed, etc.

- **Information about the nature of the relationship between the users and the organization**.

- **Information about competences, working areas and tags,** which includes competence names, associated tags, associated working areas, types of competences (general, organizational, user-defined), whether the competence needs validations or not, etc.

All this information is suitable for decision-making at the personal and organizational levels. However, to make this process simpler, it is helpful to show this information in a more convenient manner for managers and other agents involved in decision-making. To this end the information can be presented in several ways:

- **Text-based.** This is the traditional way to show information, as a list, a table or just a number. For example, decision makers might need to see a list of the employees who published that they have achieved a specific competence through some informal learning activity. The DSS shows this information as a list with links to the information about the ILAs.

- **Chart-based.** For instance, by using the Google Chart API some information can be presented in a chart so that managers may have useful information at a glance.

An example of this may be the number of organizational, user-defined and general competences used by the learners/workers (top of Figure 3) to classify their work or their classification in categories (bottom of Figure 3). If employees do not select any organizational competence, this might mean that their informal learning is not properly focused or that the training strategy of the organization is not clear.

Figure 3 here

- **Data visualization techniques.** This includes visualizations such as tag clouds (Figure 4), which can give a quick, "eye candy" insight into the competences used by the workers of an organization in their informal learning, so that it is possible to see which is the most popular at a glance.

Figure 4 here

3. Methods and results

As previously mentioned, TRAILER project has empirically implemented the research methodology as a proof of concept. The system integrates the main components (the competence catalog, the organizational environment, the ILC and the portfolio). All of these components are to be tested through two pilot activities —one focused on the users (workers) and the other on the organization. However, before these tests were carried out, it was necessary to determine if the system really facilitated the dialog between employees and the organization and therefore the

subsequent decision-making process, and what design errors might arise that would have to be corrected before the pilot projects and final release of the system.

This required the definition and testing of several scenarios. A panel of experts did the testing. Each of the TRAILER project partners provided two experts in the problem domain with varying degrees of familiarity with the project, of whom 50% had experience of decision-making. 60% of the experts belonged to universities, 25% to technology based companies and a 15% to training companies. A number of different techniques were used in testing. Thus, a Cognitive Walkthrough (CW) (Polson, Lewis, Rieman, & Wharton, 1992) was used to explore the scenarios within the project and the experience of carrying out project tasks in an early prototype of the system. The CW results were complemented by a Think Aloud (TA) technique (Lewis, 1982). Screen and voice-capturing software were used to support these methodologies.

In addition, surveys were used to gather the users' perceptions of the system, and a System Usability Scale (SUS) form (Brooke, 1996) was administered to assess the final user satisfaction. The perceived ease of use (PEOU) was also measured following Venkatesh and Bala's adaptation of TAM, TAM3 (Venkatesh & Bala, 2008).

Finally, system testers were asked some open questions that were used in a qualitative evaluation. The answer texts were analyzed and classified according to the topic of the answer. The results are shown in two matrixes, with the conclusions extracted from that information (Miles & Huberman, 1994).

From all these techniques, some interesting results were extracted. For instance, 58 moments of breakdown were identified and classified according to Nielsen's severity classification, none of which were associated with the DSS. The SUS survey returned a result of 49·6 percent, far from the 68 percent recommended satisfaction levels. The PEOU returned an average of 4 (neutral value). These values are not desirable but are normal for a proof of concept. At this stage the developers have not finished completely the system, as it requires improvements in the interface and in the integration of the system components.

Regarding the DSS, specific information was retrieved from the experts' answers to the open questions. This information was analyzed in a qualitative manner, with the opinions classified in three different categories: "easy to understand", "usefulness" and "improvement suggestions" (Table 1).

Insert Table 1 here

In response to the question asking if the DSS provided easy-to-understand information, several of the experts suggested that they need more tips and options,

while other thought that the system was quite straightforward and easy to use. Others

suggested the need for more training in the use of the tool to assess the potential of the

system, and this could be resolved by conducting workshops focused on system use

before an organization begins the implementation stage.

Most of the experts found the system useful for decision-making, while a

minority reported that there was too much data and it was not easy to understand. This

implies that for most organizations it is desirable to have a lot of data available at a

glance, but others may need very specific information about competences, informal

activities, employees, etc.

Finally, the experts were asked for ways to improve the system. Several

suggestions were made related to the inclusion of more options, a wizard for data

interpretation, new types of representations and more information about the data

shown. This fact highlights the need for new filters so that the information shown

reaches high levels of customization.

Following this discussion, it becomes evident that for most of the experts the

information given by the DSS was easy to understand, although it would be valuable

to include more training for decision makers and users, as well as a better explanation

of its features and functionalities. The DSS, then, is useful in informal learning

settings, but some of the experts suggest that there should be less information available.

It is noteworthy that, for future successful implementations of such systems, each organization may define very specific indicators and data presentations on the basis of their needs. It would then be possible to define a scalable system of atomic indicators that the user of the DSS can combine to satisfy their needs. In this way, the DSS can fulfill the needs of each organization regardless of how the methodology is implemented.

5. Conclusions

This paper has presented a methodology for decision-making on the basis of informal learning, as well as the technological framework necessary to support it. The methodology aims to facilitate knowledge management both for employees and for organizations. On the basis of this framework, employees would be able to identify and classify the different informal learning activities they carry out in their everyday life outside the organization and then make them visible to the organization, which can use this information for making training-related decisions. In addition, the framework allows organizations to begin a dialogue with employees about the knowledge they are acquiring and their training needs and use this information to formulate or evaluate the organizational strategy. The TRAILER project has

implemented the methodology as a proof of concept, and several findings related to the potential use of the system for decision-making have been identified.

We conclude that it is possible to apply this methodology to manage knowledge making use of informal evidence. However, each organization has different needs and requires different information to use as an input for decision-making. This implies a need to redefine the DSS so that it is able to work with atomic indicators that can be combined to satisfy the organizations' information needs. It is also necessary that it can easily create new indicators to resolve specific organizational needs.

In line with these conclusions, the revision of the DSS reorientation is a key line of future work. Indeed, before moving on to more substantial pilots the TRAILER development team has resolved the breakdowns detected and has improved the DSS to clarify the information which it presents, and to include a greater range of information. In forthcoming activities TRAILER teem expect to receive more feedback that the researchers can analyze and use to further improve the system before the final implementation.

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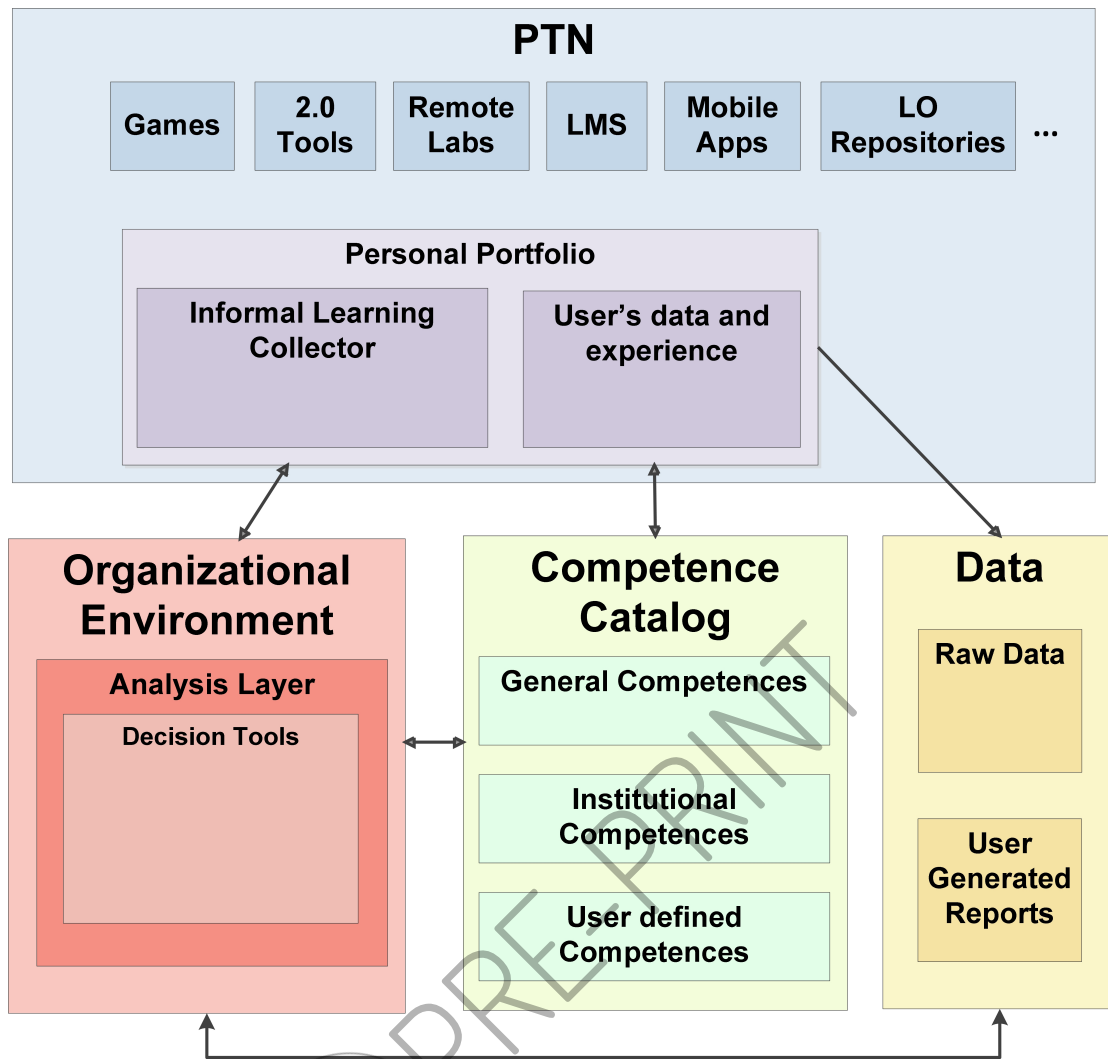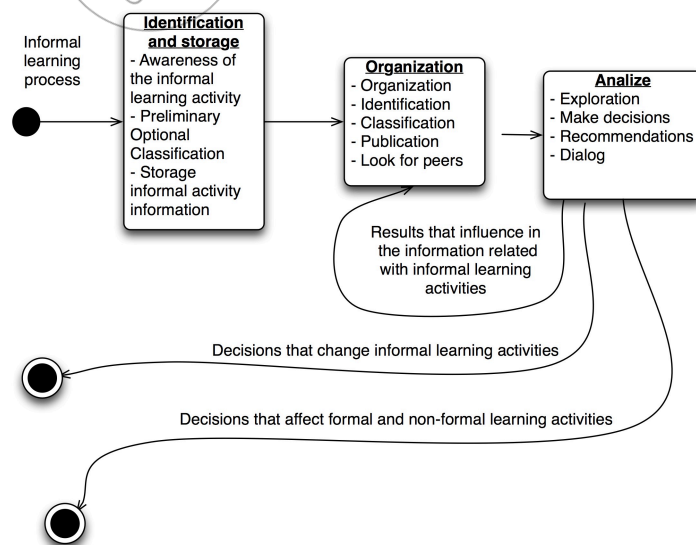
Figure 1. – Research framework

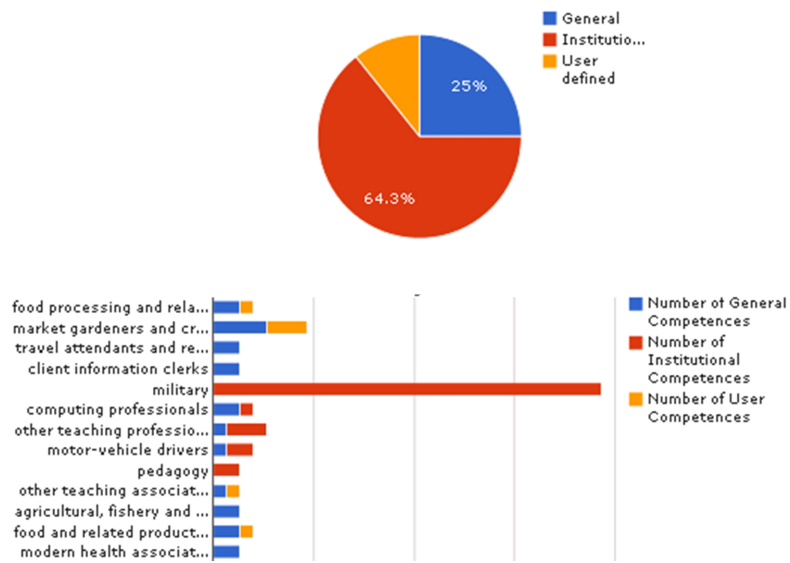

Figure 2. – Methodology description

Figure 3. – Competences distribution chart

Figure 4. –Tag cloud for the workers in an organization

	Easy to Understand	**Helpful**	**Improvements**
E1	Quite easy	Very useful	It is ok as is
E2	More explanation needed	Quite useful	Look and Feel and Descriptions
E3	-	Lot of information at a glance	More options
E4	Need more tips	-	More filters
E5	Wizard	Facilitate making decisions	Create a wizard to guide the search
E6	More filters	It can be more still more useful	New filters about competences and ILAs
E7	Good	Ok	-
E8	-	Useful	Other kind of charts
E9	Clear	-	-
E10	Very easy	Great	-
E11	-	Solve my needs	-
E12	Straightforward	Easy	-
E13	-	Too much data	Description of data, other kind of representations
E14	Teaching needed	Not sure	More info about the data shown

Table 1. – Matrix of the experts' opinions. Each row represents the opinion of an

expert, classified by the categories.