

Learn-B: A Social Analytics-enabled Tool for Self-regulated Workplace Learning

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ABSTRACT

In this design briefing, we introduce the Lear-B environment, our attempt in designing and implementing a research prototype to address some of the challenges inherent in workplace learning: the informal aspect of workplace learning requires knowledge workers to be supported in their self-regulatory learning (SRL) processes, whilst its social nature draws attention to the role of collective in those processes. Moreover, learning at workplace is contextual and on-demand, thus requiring organizations to recognize and motivate the learning and knowledge building activities of their employees, where individual learning goals are harmonized with those of the organization. In particular, we focus on the analytics-based features of Lear-B, illustrate their design and current implementation, and discuss how each of them is hypothesized to target the above challenges.

Categories and Subject Descriptors

J.1 [Administrative Data Processing] Education; **K.3.1 [Computer Uses in Education] Collaborative learning**

Keywords

Learning Analytics, workplace learning, self-regulated learning, collaborative learning, semantic technologies

1. INTRODUCTION

In the last few years, the growing emergence and acceptance of social software tools, social media and Social Web (Web 2.0) paradigm have brought forth a new perspective to the concept of learning [4][14][7], demonstrating a transition from conventional pedagogical approaches to a more social and collective knowledge paradigm of learning, in that creativity, social-embeddedness, and the capacity to gain knowledge from a sea of collective are highly expected and valued [9][13].

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Such a perspective to learning is especially important in the context of workplace [5], where learning is social, affects and is affected by the social context and the available collective knowledge.

To keep up with and adapt to the contextual needs of workplace settings, learning at workplace mostly happens as a by-product of work. This “on-demand” and informal approach to learning [1] requires contemporary knowledge workers to have Self-Regulatory Learning (SRL) skills in identifying their learning needs and conducting appropriate learning strategies to attain them [8]. The majority of conventional interpretations of SRL are based on an individualistic perspective, where the impact of the collective is often assumed less significant than individual-based factors [6]. Such perspectives contradict the nature of the workplace, where individuals’ work and learning activities are highly social and collective-centred. The recent research on workplace learning clearly stresses the role of the collective and other forms of social exchange in both individual learning and organizational development [4][1]; findings on patterns of defining learning goals in the workplace show that in the process of setting and managing their learning goals, individuals draw from and contribute to the collective knowledge in their organization [8].

To support users’ in their SRL processes in modern workplaces as well as scaffolding organizational learning, there is a need for systems that collect learning-related contributions, re-aggregate and analyse them to create further new knowledge, and make this new knowledge available to users. Such new knowledge can be beneficial to users in every step of their learning process from identifying their learning needs and setting their goals (e.g. they can get aware how other employees with similar organizational positions have defined their goals), to monitoring their learning progress and comparing it with that of their colleagues who hold the same position or work in the same project, and sharing and documenting their learning experiences (e.g. by observing how actively their colleagues are sharing their learning experiences and comparing it with their own sharing activities, or to see how their shared knowledge has been useful to other members of the organization).

Designing systems that unlock the collective knowledge, and the collective intelligence in higher levels of inference for the purpose of scaffolding learning, however, is not a straightforward task [4]. Semantic technologies and Linked Data paradigm could provide the required technical backbone for tackling this challenge. Today’s knowledge workers often use diverse tools

and services in their everyday working and learning practices; therefore, the traces and outcomes of their activities are dispersed among different tools/services that often lack the capability of interchanging and/or integrating user's data. If properly applied, the Linked Data paradigm and the associated Semantic Web technologies would enable meaningful data integration and knowledge structuring.

Needless to say, to be successfully deployed and to lead to the expected results, these advanced technologies need to be supported by proper pedagogical and motivational approaches. We base the foundations of our pursued pedagogical approach on a well-known organizational knowledge building model proposed by Nonaka and Takeuchi [10] (to address the challenge of harmonizing individual and organizational learning), and extend it with SRL practices (to support users' in initiating and conducting their individual learning processes) [11], and motivational elements [12] (to address the challenge of motivating users to share their personal knowledge and learning experiences, and contributing to the collective knowledge in their organization).

For this pedagogical framework to work effectively, we hypothesize that Learning Analytics (i.e. collecting users' contributions, aggregating them, analyzing them and reporting back to the users and the organization) play an important role: it allows for the organization to better align its learning objectives with those of its employees by knowing about their learning practices; it supports users' SRL processes by providing them with the necessary input from the social context of the workplace; and it enhances the motivation of individuals to take part in learning and knowledge building activities and sharing their experiences by providing them with feedback from the collective. In this design briefing, we introduce the Lear-B environment, our attempt in designing and implementing a research prototype to support workplace learning that addresses the above challenges. Lear-B stands for Learning Biosis ("biosis" meaning a way of life), i.e. learning as a way of life. In particular, in this design briefing we report on the learning analytics aspects presently supported by Lear-B.

2. THE LEAR-B ENVIRONMENT

The design of the Lear-B environment was driven by the requirements for effective learning and knowledge building in organizational settings. It is designed to integrate different tools that employees often interact with during their everyday (working and learning) practices. In particular, so far we have integrated a wiki (MediaWiki), a social networking and collaboration platform (Elgg), and a bookmarking tool (Tagging tool – implemented within this research as a Firefox plugin). Lear-B serves as the central hub for this integrated environment, and relies on an interlinked set of ontologies as its underlying (linked) data model. These ontologies are available at: <http://goo.gl/Sau4>. A current demo of the main functionalities of the Lear-B environment is available at: <http://goo.gl/RaiIm>.

Figure 1 illustrates the multi-layer architecture of Lear-B which can be adapted to and applied in a wide range of organizations. There is no strong boundary between the layers and components defined within each layer. In this design briefing, we only focus on the Analytics-enabled functionalities provided within the **Processing Service Group**. This service group is responsible for tracking all the events that happen in Lear-B, and other inte-

grated tools (i.e. MediaWiki, Elgg and the Tagging Tool), processing and analyzing the gathered data, and providing users with the resulting feedback and analytics. In particular, *Event Dispatcher* (Figure 1.K) is responsible for processing all of the events occurring in the Lear-B environment, storing them into the RDF repository (Figure 1.A) and distributing them to other services. *Analytics Service* (Figure 1.L) is responsible for processing and analyzing the data about users' learning activities and their interaction with diverse kinds of learning resources. It makes use of the interaction data stored in the RDF repository to provide users with feedback, primarily through different kinds of visualizations, to support them in planning, performing and monitoring their learning process.

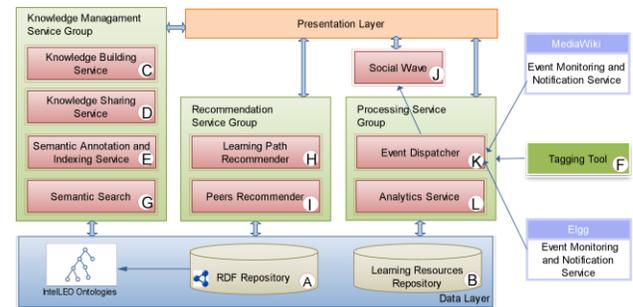


Figure 1. The architecture of the Lear-B Environment

Usage Information is one type of the provided analytics which comes in the form of statistics, Social Waves or the collective stand. Derived from the collected knowledge within the system, this functionality supports the recommender services (Figure 1.H-I) and more importantly, provides users with analytics representing the collective knowledge around a resource and assists them in planning their learning processes. Statistics and Social Wave analytics are implemented as a set of various visualization charts, each conveying the intended feedback/analytics data. The feedback reflecting the collective stand about a learning resource comes in diverse forms such as annotations, reflections (e.g. comments and notes), ratings and tags of other users.

For instance, illustrates how each organizational objective, defined in terms of *competences*, is accompanied by statistical analytics such as the number of users who have acquired that competence and their roles in the organization, and the Social Wave stream of that competence showing the activities performed on or events happened around it over a certain period. Such analytics represent the “popularity” of a given competence, indicating whether and to what extent it is (socially) alive. The comments of other users can be viewed under the Comments tab in . The recommendation of a *learning path*, via the *Learning Path Recommender* service (Figure 1.H), to achieve a competence (in this research, each learning path is comprised of one or more learning activities that lead to the attainment of a specific competence at a specific level) is further augmented with analytics such as the number of users who have successfully finished this learning path or a revision of it, or are still working on it, or have abandoned it. Users can also see the organizational positions of users in each of the above categories (i.e. active, finished, abandoned). Similar to the competences, each learning activity is also accompanied by Social stream and collective stand analytics.

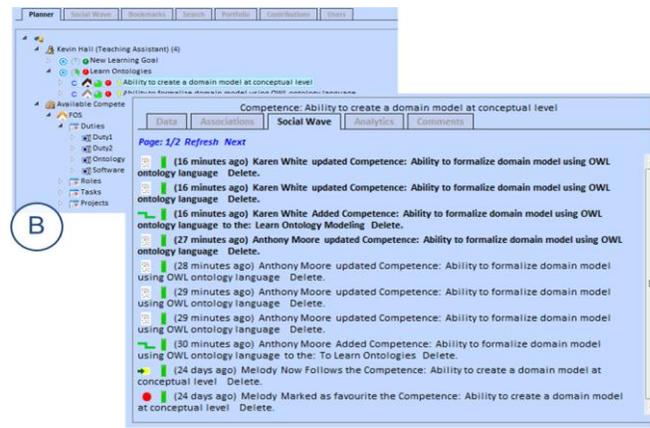
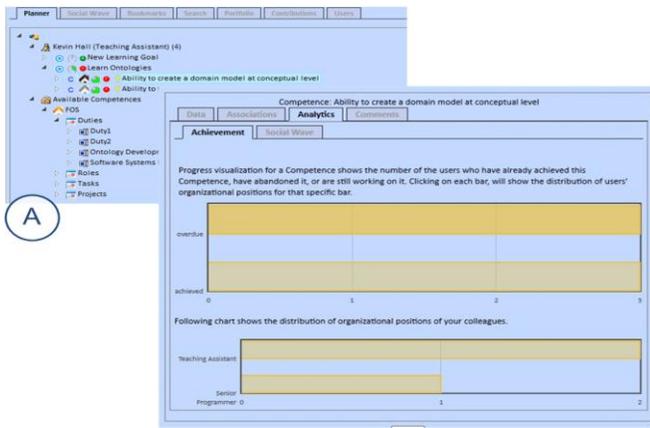


Figure 2. Analytics - Usage Information provided for each organizational objective a) Statistics b) Social Waves

Progress-o-meters represent another type of the provided analytics; they aid users to monitor their learning progress in the organizational context, by showing them their progress flow in achieving their defined learning goals and the competences included within those goals, and are implemented as a set of line charts (Figure 3). Moreover, *Progress-o-meters* provide users with a comparison of their progress flow with that of their colleagues who have the same learning goal (e.g., a goal shared by the members of a project), or are working on the same competence. We hypothesize that observing oneself within the social context of the organization helps users to monitor their progress toward achieving their goals, thus also assisting them in further regulating their learning strategies.



Figure 3. Analytics - Progress-o-meters

Knowledge Sharing Profiles inform users of their reflections, in terms of sharing their learning resources, within an organization. Via this type of provided analytics, users can see how actively they are sharing each of their learning resources, and also compare their sharing activities with the average within their organization (Figure 4). As a factor targeting individuals' extrinsic motivation [12], we hypothesize that such feedback can help users to regulate their knowledge sharing activities.

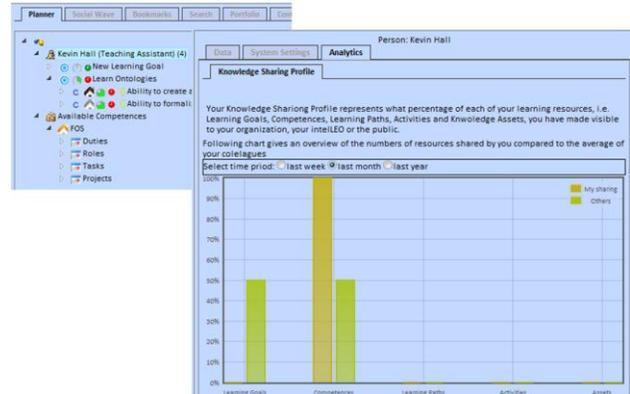


Figure 4. Analytics - Knowledge Sharing Profiles

Motivational Messages are another type of provided analytics which aim to support users' stronger engagement with the system. Generally, a user (learner) model represents user knowledge, goals, interests, and other features that allow for better recommendations or provided adaptivity by the system. Opening the learner model may bring additional benefits to users, allowing them to take charge of their own learning experience. However, collecting explicit data from users is often challenging and a strong motivation is needed on learners' part to provide explicit feedback about their learning [1]. *Motivational Messages* aim to tackle this challenge by providing users with personalized messages indicating to what extent the collective has opened their models in terms of sharing their personal preferences and learning experiences. For instance, Figure 5 shows a set of motivational messages related to the degree of completeness of a user's 'preferences' compared to other users, where these preferences are used to adjust the recommendations generated for the user.



Figure 5. Analytics - Motivational Messages

Last but not least, the *Analytics Service* supports the harmonization of individual and organizational learning objectives. Browsing the different forms of *Analytics* available for a certain competence, updates the managers of an organization on, for instance, how frequently this specific competence has been used within the organization, in the context of which learning goals it has been used, by users of what organizational positions, and what the main issues regarding this competence are. This allows managers to apply any necessary modifications in the definition of the competence itself or the learning paths associated with it, to better harmonize organizational and individual learning needs. Also discovery of emerging competences or other learning resources can be learned via this service. On the other hand, if some user-created competences are frequently being re-used by members of an organization; the managers might consider them as ‘emerging’ organizational goals. As can be seen, organizational goals are also dynamic and can evolve via the contributions of the community members. Accordingly, this targets individuals’ intrinsic motivation for knowledge sharing by giving them the feeling of being competent in contributing to the organization’s goals and objectives.

3. CONCLUSIONS

In this design briefing, we demonstrated the analytics-based features of Lear-B, which are built on Semantic technologies and Linked Data paradigm, and backed with an extended pedagogical and motivational framework. In our empirical work with Lear-B, we aim to answer if and to what extend these features, along with the other functionalities provided within Lear-B, address the existing challenges in supporting workplace learning. In particular, to support users’ self-regulatory practices in the context of workplace learning, we hypothesize that the *usage information* analytics accompanying each learning resource in Lear-B (i.e. statistics, Social Waves and the collective stand) assist users in planning their learning goals; *Progress-o-meters*, on the other hand, provide users with feedback on their progress flow and thus help them with monitoring and evaluating their learning progress. *Knowledge Sharing Profiles* inform users of their reflections, in terms of sharing their learning resources and experiences within an organization. Accordingly, we propose that these profiles support users to align their reflections and sharing of their learning resources and experiences. *Motivational Messages* are another analytics-based means designed to foster users’ contributions and to motivate them to provide higher quality inputs to the system.

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