E-learning Project Assessment Using Learners' Topic in Social Media

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Abstract. A correct assessment of e-learning projects is a complex task because there are several aspects (such as contents, technologies, organizations etc.) that must be considered and many actors (learners, teachers, pedagogues, etc.) each one with specific requirements to be met. In recent years, in order to standardize the evaluation and to define the quality features of an e-learning project, several sets of factors (called Critical Success Factors) have been defined. The Critical Success Factors are focused on many aspects but, in our vision, they don't consider properly the learners' opinions. The learner is exactly the main e-learning project stakeholder. Thus, he/she could be considered at the centre of the e-learning system and his/her opinions must be carefully evaluated. In this paper, we describe our idea to support the analysis of the learners' discussions posted on the web2.0 media (like forums, wikis, etc.) and to support the subsequent evaluation of the lacks and the benefits of e-learning projects.

Keywords: E-learning · Unstructured sources · Knowledge extraction · Social media

1 Introduction

E-learning can be viewed as the delivery of course contents via electronic media, such as Internet, satellite broadcast, interactive TV, etc. [1]. E-learning is one of the new learning trends that challenge the traditional "bucket theory" or the banking concept of education [2]. If the economic assessment of e-learning project is quite simple, it is really difficult to evaluate its efficacy because there are many parameters that must be considered. The quality of the e-learning is related not only to the quality of its contents but also to the usability of the system, to the organization, etc. A right evaluation has to consider:

- General Information and Accessibility: at the beginning of the course, learners must be informed correctly with general information that will support them in completing the course and in understanding the objectives and the procedures of the course. Moreover, the learners must find information quickly and must have easily access to the course material;

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- Organization: it is referred to the organization of the course content;
- Language: it evaluates the language appropriateness for the audience;
- Layout: a layout of good quality can facilitate the learning process. It is important to evaluate the attractive material for the course content;
- Goals and Objectives: the goals and the objectives are provided to outline learning expectations at the beginning of the course and of each module.
- Course Content: the contents are the core elements of the course; thus, it is important that they are appropriate according to the subject matter and the learners' background and abilities;
- Instructional or Learning Strategies and Opportunities for Practice and Transfer: the instructional or learning strategies enable the course participants to learn effectively in a variety of ways and to engage them in activities that promote the practice and the transfer of skills;
- Learning Resources: it is referred to the learning resources that should be accessible, appropriate, and accurate;
- Evaluation: the evaluation activities should be feasible, relevant, accurate, and compliant with the objectives, the contents, and the practical applications of the content.

In addition to the above parameters, it is really important to consider the overall aspects related to the evidence that the course has been piloted and that the learners can achieve the objectives of the course.

The evaluation of an e-learning project is still an open issue. In many cases, internal and external reviewers provide the assessment of the courses but the evaluation is strictly related to their experience and their expertise. Thus, in literature many approaches and assessment methodologies are defined. These approaches are related to the organizational aspects and the contents of the course but the opinions of the participants are considered only marginally. In our view the success of e-learning courses is closely related to the participants' satisfaction, considering that the e-learning systems are defined and developed according to the specific needs of the learners.

In this paper we propose a first step in the evaluation of e-learning projects based on the learners' topic posted on the social media. To develop this idea we use a software tool that is able to identify any positive or negative trend analysing the posts that the learners leave in the forum or in the wiki of the e-learning portal.

In the following, Sect. 2 describes the related works regarding the approaches and the assessment methodologies defined in literature. Section 3 illustrates the idea we propose in order to support the e-learning project evaluation. Section 4 describes the system development and implementation. Finally, in Sect. 5 we show the conclusions.

2 Related Works

In many cases the e-learning term is used as synonymous with web-based learning (WBL), web-based instruction (WBI), advanced distributed learning (ADL), online learning (OL) [3]. The term Critical Success Factor (CSF) describes "those things that must be done if a company is to be successful" [4]. It is possible to apply the idea of

CSF to the e-learning area. Papp [5] proposes a set of critical success factors for faculties and universities: intellectual property, suitability of the course for e-learning environment, building of the e-learning project, e-learning project content, e-learning project maintenance, e-learning platform and measuring of the success of an e-learning project. Mainwhile, Benigno and Trentin [6] proposed an evaluation system focusing on the learning aspects and evaluating the students' performances. They considered factors such as students' characteristics, effective support, student–student interaction, learning environment, learning materials, and information technology. On the basis of a survey submitted to 47 students, Volery and Lord [7] identify three groups of CSFs: technology (ease of access, interface design and level of interaction); instructor (attitudes towards students, instructor technical competence and classroom interaction); and previous use of technology from a student's perspective. In the same time, Soong and others [8] propose the following e-learning CSFs: human factors, technical competency of both instructor and student, level of collaboration, and perceived information technology infrastructure.

Dillon and Guawardena [9] and Leidner and Jarvenpaa [10] define three main variables that affect the effectiveness of e-learning environments: technology, instructor characteristics, and students' characteristics. Govindasamy [11] focused on the pedagogical aspects and defined seven CSFs: institutional support, teaching and learning, course development, course structure, faculty support, student support, evaluation and assessment. Baylor and Ritchie [12] studied the impact of seven independent factors related to educational technology (planning, leadership, curriculum alignment, professional development, technology use, instructor openness to change, and instructor computer use outside school) on the dependent measures (instructor's technology competency, instructor's technology integration, instructor morale, impact on students' content acquisition, and higher order thinking skills acquisition).

Focusing on the role of the student and considering that the learner's satisfaction is one of the most important CSF to evaluate the effectiveness of the e-learning project, we propose a first step towards a new approach. Our approach considers the learner at the centre of a complex system and bases the evaluation of the e-learning project through the analyses of the lacks and of the goodness that emerge from the learners post on the web2.0 pages related to the course. The idea to use information extracted from the social networking to improve the quality of the e-learning project is not new. Kadry [13] explores the role of web2.0 technologies in learning and their influence on the learner's behaviour. While Mahmood [14] studies how e-learning systems can improve their performances using Social Network Features. On this basis, we want to use the web2.0 technologies to evaluate the weaknesses and the strengths of a course through the learners' posts and discussions.

3 How to Support E-learning Project Evaluation

The idea described in this paper has the aim to support the e-learning project evaluation using the web2.0 unstructured data in order to analyse the perception of the learners and of the other actors involved in the project (teachers, pedagogues, etc.). It is clear that the

achieved information will allow improving the course organization. In the web, the learners express their opinions about something in a free form way and without any constraints. Thus, collecting unstructured sources, making them structured and extracting the hidden information, it is possible to obtain real perception of the e-learning project. As a consequence, improving the e-learning projects starting from this information means to really put in the centre of the attention the key stakeholders: the learners. In our approach, a key role is assumed by the domain knowledge base. In effect, the use of a knowledge base simplifies the comparison of the information present in the web with the information of the specific e-learning domain. Thus, the extraction, from unstructured sources, of the information related to the specific e-learning project is easier. Since there are several knowledge bases about the e-learning domain, it is very important to select the knowledge base the most suitable for the specific e-learning project in order to support the evaluation. In the next section a specific knowledge base will be proposed.

We have developed the idea using a tool realized for the agri-food sector and presented in [15, 16]. The system is able to analyse and to extract information related to specific agri-food products from the users' experiences posted on blogs and social networks. The obtained information can be used for many purposes such as marketing information (which product is more interesting for the customer?) or commercial information (what geographical zone is interesting for the product?).

It is clear that in order to use the already proposed tool in the e-learning context it is important to:

- Identify the source of information: in the e-learning context, the unstructured data are in the e-learning platform and/or in the specific "virtual place" where learners have access. It is important to know where sources are available.
- Define the connection between the information shared in the "virtual place" and the e-learning project.
- Develop a domain knowledge base in order to filter the information not associated with the specific e-learning scenario along with to suggest other concepts related to the exploration.

The output of the system will be:

- The lists of the items the most discussed by the users that take part to the e-learning projects: these items will be organized in a way as clear as possible for the reader.
- Information about how students and teachers talk about these items (for instance in positive or negative way);
- Suggestions, which help the domain expert to find interesting items he/she might not have discovered by himself/herself [17] both attractive and unexpected.

The output of the software will be more precise if a domain expert will interact with the software in order to propose the unstructured data to analyse and to refine the research starting from those obtained. To help in this software-expert dialogue, the software implements the PDCA (Plan-Do-Check-Act) cycle defined in the Fig. 1.

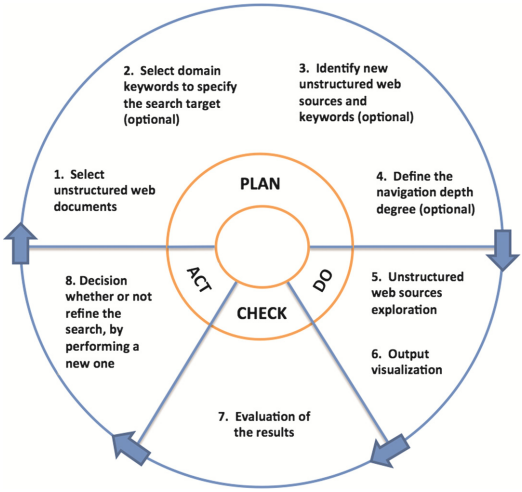

Fig. 1. PDCA cycle for information extraction

In order to support the PDCA cycle the software helps in the:

1. Suggestion of unstructured web sources in order to extract relevant information from them;
2. Suggestion of domain keywords (for instance representing the critical and the success factors of e-learning projects) that the domain expert can use in order to specify the target of the search;
3. Add and allow the analysis of the new unstructured documents and keywords;
4. Define the navigation depth degree within the document pages;
5. Explore unstructured web sources in order to extract significant information. This phase is supported by the use of the selected keywords and of the domain knowledge base;
6. Visualization of output in tabular or graphical form;
7. Support in the evaluation of the results by the domain expert;
8. Support in the research refinement by performing a new exploration.

4 System Development and Implementation

The software operation flow is characterized by a preliminary identification phase of unstructured web sources from which to extract information. They are in the e-learning platform and/or in "virtual places" like wikis, blogs, forums, tweets, etc. and contain the comments along with the discussions of the students and the teachers that take or have taken part to the e-learning project.

These documents can be classified by type (i.e. wikis, blogs, social pages, etc.) and geographical reference (i.e. Southern Italy, Northern Italy, etc.). So, we have searched, identified and inserted in the system database the web addresses of pages and documents of some interesting web sources (Fig. 2).

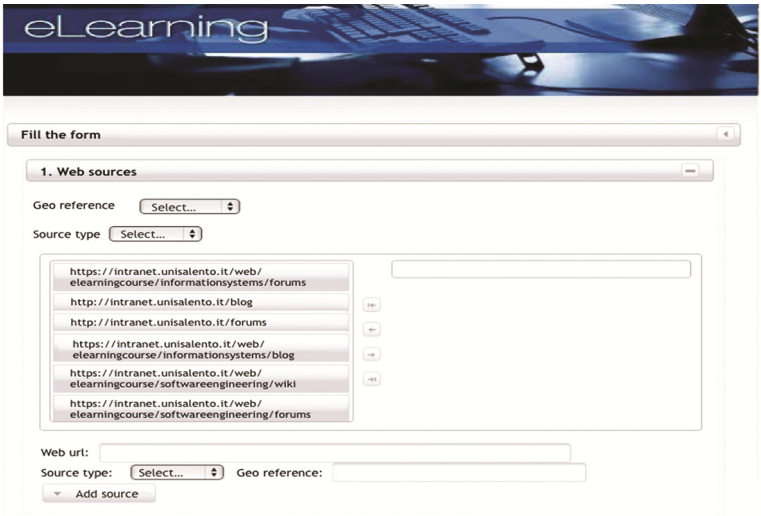

Fig. 2. Web source selection and insert form within the tool web page

In order to retrieve information to improve the assessment of the goodness and the weaknesses of an e-learning project, the content of these unstructured web sources must be structured and cleaned from data not compliant with the specific domain. In this regard, a valid contribution is offered by the use of conceptual modelling that is the definition of domain knowledge bases (often called ontologies) from scratch or from existing ones. In general an ontology is a formal, explicit specification of a shared conceptualization [18].

We have performed a scouting on already defined e-learning knowledge bases that has led to the selection of the ontology shown in Fig. 3. It seemed to be more complete and rich of concepts than the other ontologies found. It has been searched through the tool *Swoogle* [19]. It is a search engine for the semantic web that crawls the web for a special class of web documents called Semantic Web Documents. As said by Sridevi and Umarani [20], even though there are numbers of semantic web search engines, *Swoogle* is placed first, because it ranks the ontologies using an adaptation of the Google Page Rank scoring method.

We have also identified and inserted in the system database the main concepts related to the e-learning domain, that are the critical success factors.

The content elaboration starts from the selection, by the domain expert, of one or more unstructured web sources and, optionally, of one or more keywords, followed by an indication of the navigation depth degree.

At the end of the data processing phase, the software can generate different outputs: A tag cloud, that is a visual representation of concepts the most relevant in relation with the processed documents, the knowledge base concepts and the keywords, if selected. The relevance of a concept is estimated according to the total occurrence within all the analysed web sources and the relative occurrence within each examined document. Another output is a tabular representation with detailed information about concept occurrence in each unstructured web source and about the concepts detected in the same documents.

Fig. 3. e-learning project tag cloud within the tool web page

In order to get the representation in the form of a tag cloud, the system examines the selected web sources, interrogates the knowledge base (for example the rdf file available at http://jelenajovanovic.net/ontologies/loco/user-model.rdf), checks whether it is possible to obtain other concepts semantically related to the search along with discards the information not connected to the e-learning project. Then, the software tool extracts for each web source the concepts the most recurrent in the analysed web sources and calculates the number of occurrences in the text, which are graphically represented by different font size (Fig. 3).

5 Conclusions

The evaluation of the effectiveness of e-learning projects and of the achievement of its goals and objectives is a good practice in order to understand advantages and disadvantages along with strengths and weaknesses of an e-learning project. Thus, many set of critical success factors like contents, technologies, etc. are defined; but, in our opinion, the learners and teachers' point of view must be relevant. This could be done analysing the participants and teachers' comments and the discussions posted in the e-learning platform and in the "virtual places" related to the e-learning projects.

The presented idea focuses on the unstructured information that are analysed through a specific ontology using a tool realized for the agri-food sector. In detail, the system is able to analyse and to extract relevant information related to a specific domain from the users' experience posted on blogs, wikis, social networks, etc. Because of the free form characteristic of web2.0 pages, the system interacts with an e-learning knowledge base in order to not consider the information unrelated to the specific domain. In spite of the subjective opinion of the involved actors, the extracted information about the course is objective because is based on a large number of posts.

As a result the system provides a structuring of unstructured information extracted from the web and a support to the e-learning domain expert in order to identify the goodness and the weaknesses of e-learning projects.

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