Externalization of a PLE: Conceptual Design of LeContract

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Abstract
A Personal Learning Environment (PLE) can be understood as an individual's perception of the resources and activities in relation to a particular learning project. Such an understanding of the individual's PLE can be externalized by following a personal learning contract procedure. Individuals themselves set up their objectives, select potential resources and design their learning strategy. Implementations of the learning contract procedure have shown that individuals would benefit from having guidance for explicating their learning objectives, procedures and resources. Generic tools (such as weblogs) that are often used for writing learning contracts do not provide this kind of scaffolding.

In this paper we present the design process and conceptual design of LeContract tool, which attempts to support the personal learning contract procedure. LeContract provides structural templates that define important parts of the learning contract. During the learning project the contracts can be reviewed and the achievement of individual learning objectives can be evaluated.

1. Introduction

There are various interpretations of the PLE concept (e.g. Arenas 2008; Harmelen 2006; Kolas and Staupe 2007; Wilson et al. 2007; Atwell 2007). Most of the educators and researches tend to talk about PLEs as instruments typically associated with social media (Johnson and Liber 2008) an individual can choose and control. A mainstream understanding is that a PLE is either a single technological application (e.g. Netvibes, Weblog, Flock) hosted and partially controlled by institutions or a collection of them chosen by each individual, rather than the institution (Jones 2008).

Fiedler and Pata (2009) define a PLE as a collection of instruments, materials and human resources that an individual is aware of and has access to in the context of an educational project at a given point in time. Thus, they stress the importance of a relationship between an environment and an educational project. While an environment is understood generally as (constructed) conditions that surround an individual and provide a setting in which the individual operates, it becomes a learning environment when one wants to carry out a learning project (Väljataga and Laanpere, forthcoming). In this case the individual starts to perceive potential activities and (lack of) resources (natural objects; people; mental, physical and digital artefacts) of his/her environment in relation to a particular learning project at a given point in time. The particular learning project gives a meaning and awareness to the perceived resources that are located in the individual's learning environment. Although the dominant thinking of PLEs is related to web-based technology, the authors of this paper want to point out that a PLE does not necessarily have to make use of technological applications. However, as much of our activities and life are gradually moving to Web, technological means in one's PLE start to be more and more a variety of social media applications, providing possibilities to extend one's perceived environment.

In order to understand and analyze individual's perception of a particular learning environment, his/her mental model of it needs to be externalized and articulated. One of the potential tools that serve the purpose of externalizing individual's learning intentions with a perceived environment is a personal learning contract procedure (Harri-Augstein and Webb 1996). Personal learning contracts allow individuals to describe their objectives, (preferably set up by themselves), explicate the design and formation of their learning experiences as well as selection (perception) of potential resources according to a particular project. However, such an explication is often hard to achieve unguided. As many learning processes are inevitably required to be mediated by emerging networked technology, a suitable medium should be chosen. Implementations of the learning contract procedure into existing teaching and studying practices in formal higher education have shown that individuals would benefit from having guidance for explicating their learning objectives, procedures and resources. However, existing generic tools (such as weblogs), that could be considered as one option for writing down learning contracts, do not provide this kind of scaffolding. The deficiency is seen in lacking a clear structure. Furthermore, combining written learning contracts with chronological, but at the same time miscellaneous, posts makes it hard for involved actors to carry out learning related conversations, monitoring and reviewing. Thus, the authors of this paper believe that a special personal learning contract tool — LeContract — that can provide the necessary scaffolding for learners and facilitators in technologically mediated learning settings would be beneficial.

2. Related work

While there are many static learning contract templates available in web there is little work done in the similar direction as LeContract.

MEShaT is a web-based tool for monitoring and experience sharing in a project-based learning (Michel and Garrot-Lavoue 2009). Among other features it contains a learning contract tool that is shared between the student, the tutor and the project team. Main focus of MEShaT is in monitoring the individual and group activities in a project based learning. Michel and Garrot-Lavoue do not mention any specific guidance for writing the learning contracts.

There are attempts to standardize learning actions in a formal and uniform way. These attempts have resulted in the Learning Path Specification (Janssen et al. 2008). The aim of Learning Path Specification is to enable the exchange of courses by making the learning actions comparable. Special tools that are based on the Learning Path Specification have been developed in TENCompetence (Herder et al. 2010) and IntelLEO (IntelLEO 2010, 76) projects. However, there is a major difference between describing learning paths and writing learning contracts. In a personal learning contract the learner is expected to describe the learning objectives, resources, strategies and evaluation criteria in his/her own words.

There is no known social software tool that has specific support for writing learning contracts. A social networking site 43 Things enables people to share their goals and hopes. Many people are using this site to share their learning goals and find people with similar interests. Some ideas in 43 Things have influenced the design of LeContract.

3. Design methodology

The design process of LeContract is based on the research-based design methodology (Leinonen et al. 2008). We have used this methodology in several

earlier projects (Leinonen et al. 2010; Põldoja and Laanpere 2009) and it has proven to be a flexible and lightweight methodology that supports end-user participation in any stage of design. The research-based design process is divided into four iterative stages, which may happen partly in parallel: (1) contextual inquiry, (2) participatory design, (3) product design, and (4) production of software as hypothesis.

The aim of *contextual inquiry* phase is to define the context and preliminary design challenges. In the case of LeContract the main context is higher education and professional training with self-directed learners. The design challenge is to support the writing and reviewing of learning contracts. In recent years the authors have organized six local and international master level courses where students used blogs to write down learning contracts. In total more than 200 students participated these courses. In the contextual inquiry phase we observed how learning contracts were written and reviewed in these courses. Students found that the main difficulties were related with setting up meaningful learning objectives, strategies and measurable evaluation criteria. It could be argued that having a clear structure and guidelines would scaffold this process. On the other hand teachers perceived the main difficulty being related with following and reviewing the learning contracts in a distributed learning environment. We also interviewed several students to find out how learning contracts supported their learning process and what kind of difficulties they encountered. Based on the interviews we compiled a list of goals that students and teachers have with learning contracts.

As an outcome of contextual inquiry we created four personas that describe goals and motivations of the archetypal users. The creation of personas is a user modeling method where composite user archetypes are created based on the behavioral patterns and motivations of real users. According to Cooper et al. (2007) personas can be divided into six types: primary, secondary, supplemental, customer, served and negative. Our primary persona is a master student Maria who is a self-directed learner (see Figure 1). Secondary personas are mostly satisfied with the primary persona's interface but have some specific additional needs. In our case these include teacher who has to review the learning contracts and adult learner who is interested in the social networking aspects of LeContract. Fourth persona is a supplemental persona about a teacher with slightly different goals. Each persona includes a short description, goals and a photo. Persona goals were written in the first voice to draw a stronger connection between the design team and the personas.

Maria

Maria has studied information science and now she is doing her Master's studies in interactive media. At the same time she has a full time job as a school librarian. Therefore she is interested in combining school assignments with her work as much as possible. At the same time she is a self-directed learner who likes to go in depth in topics that are interesting for her.

Goals:

Personalization: "It is hard to have a full time job and be a master student at the same time. If possible, then I try to choose assignments that can be connected with my work."

Scaffolding: "I feel that often it is difficult to specify all the resources and actions that I have to make in order to achieve my learning objectives. Good examples from other learners help me to refine my contract."

Awareness: "It was good that we had to review our learning contracts. This way I was constantly aware of my objectives and thinking about the strategy to achieve my goals."

Age: 26

Education: Master student

Occupation: librarian

Photo by Alessandro Valli,
taken from http://www.flickr.com/photos/liquene/4435467897/

Figure 1. Primary persona of LeContract

The second phase of research-based design process is *participatory design*. Participatory design approach emphasizes the importance of involving all the stakeholders from the early phases to design process. Its roots go back to the 1970's when members of workers and trade unions in Scandinavia started to participate in the design and deployment of computer systems at their workplace (Ehn 1992). Participatory design process should be carried out in the context of actual use rather than in design laboratories. LeContract project started quite recently but in the coming autumn term 2010 we have plans to integrate the design process of LeContract in one of the courses where our students will use learning contracts. In participatory design process we are not only designing a concrete piece of software but we have to understand how it fits into a larger system. This system includes networks of learners, their current practices and other tools that they are using for learning purposes.

In order to communicate the design ideas with all the stakeholders we need simple communication tools. One of the methods that is commonly used in the participatory design is scenario-based design. Scenarios are simple stories of people and their activities. Typical scenarios have several characteristic elements. They take place in a certain setting and include actors who have specific goals (Potts 1995). The main purpose of scenarios is to evoke reflection on the design issues. Scenarios can be written from many different perspectives. For example problem scenarios can describe the current situation and encourage discussions about it. Scenarios can be easily revised by end-users who may understand the actual context better than the designers (Carroll 2000).

In this phase we wrote five scenarios that describe typical use cases of LeContract. These scenarios included (1) first experience with LeContract, (2) writing a learning contract, (3) reviewing the learning contracts, (4) creating learning contract

templates, and (5) browsing the learning contracts. Previously created personas were used as actors in the scenarios. With each scenario we also wrote a set of questions to start up the discussion. An example scenario with questions is presented in Figure 2.

Maria is a master student who is taking a course on learning theories. In the beginning of the course all the students are asked to write a learning contract. Their teacher is suggesting to use LeContract web site to compose their learning contracts.

Maria goes to LeContract website. She explores the site for a minute and then creates a user account for herself. After logging in she finds quickly how to create a learning contract. LeContract provides learning contract templates in different languages. Maria will choose a template that their teacher suggested to use and will start writing her learning contract. The template has fields for the learning objectives, resources that she will need, strategy to achieve the objectives and evaluation criteria. There are also short help texts that explain what she could write in the learning contract.

When she is done with the learning contract she will add a few keywords that characterize her contract. It is possible to choose from the set of predefined keywords or add her own keywords. In this course she is interested in constructivism, planning to read Piaget and Vygotski.

Finally she is ready to save and publish the learning contract. She will notice that it is also possible to adjust the privacy settings, share the learning contract to social networking sites and get an embed code. When the contract is published she will copy the embed code and add it also to her study blog.

Questions:

- Did this scenario evoke any thoughts?
- Is there something you would like to change in that scenario?
- Could you image yourself to the role of the learner?
- Are there privacy issues related to the learning contracts? Can any learning contract be public?

Figure 2. An example scenario about writing the learning contract

The scenarios were used in participatory design sessions with three teachers and learners who have previous experience with learning contracts. The participants were reading the scenarios and we had a discussion about each scenario. The design sessions were recorded with an audio recorder. A short summary was written about the main outcomes of each design session.

As a result of the participatory design phase we defined the preliminary concepts of LeContract. These concepts are (1) learning contracts, (2) learning contract templates, (3) learners and (4) courses. Relationships between these concepts and key features of LeContract are described in details in the next section.

We are currently in the third phase of research-based design process. The aim of a *product design* phase is to define the use cases and basic interaction with the system. Two main methods that we have used in this phase are user stories and paper prototyping.

User stories are part of an agile software development methodology where they are used to build the bridge between the developers and the end-users. Typical user story describes one feature or requirement in two or three sentences in the everyday language of the user. Cohn (2004) suggests that user stories should be written by end users. In our case the initial set of user stories was written by the designers. Users stories will be negotiated with the end users and additional stories will be written in the upcoming participatory design sessions. From the software development perspective it is important that the user stories are independent, it is possible to estimate the time needed to implement the story, and to test the implementation. User stories are published in the software development

environment Trac where stakeholders can discuss and revise the user stories. When the stories are finalized they will be accepted by the main designer.

User stories focus only on the functionality, not on the appearance. Therefore we prepared paper prototypes about these user stories that required a detailed description of the user interface. When making the paper prototypes we followed the practices suggested by Snyder (2003). We divided the required interface into smaller elements so that each screen form, dialog box or a drop down menu was drawn on a separate piece of paper. This way it is easy to rearrange the user interface elements in a different way. Also, a new version of the interface element can be drawn quickly. In a paper prototyping phase it is possible that we find required features that are missing from the initial user stories.

We are planning to organize additional participatory design sessions with paper prototypes. In these sessions we will give open-ended tasks in which the users have to interact with the paper prototype. In case of problems we will also discuss and revise the related user stories.

4. Key concepts of LeContract

We will present the conceptual design of LeContract through explaining the key concepts that we have indicated in the current phase of the design. These concepts and relationships between them are presented in Figure 3.

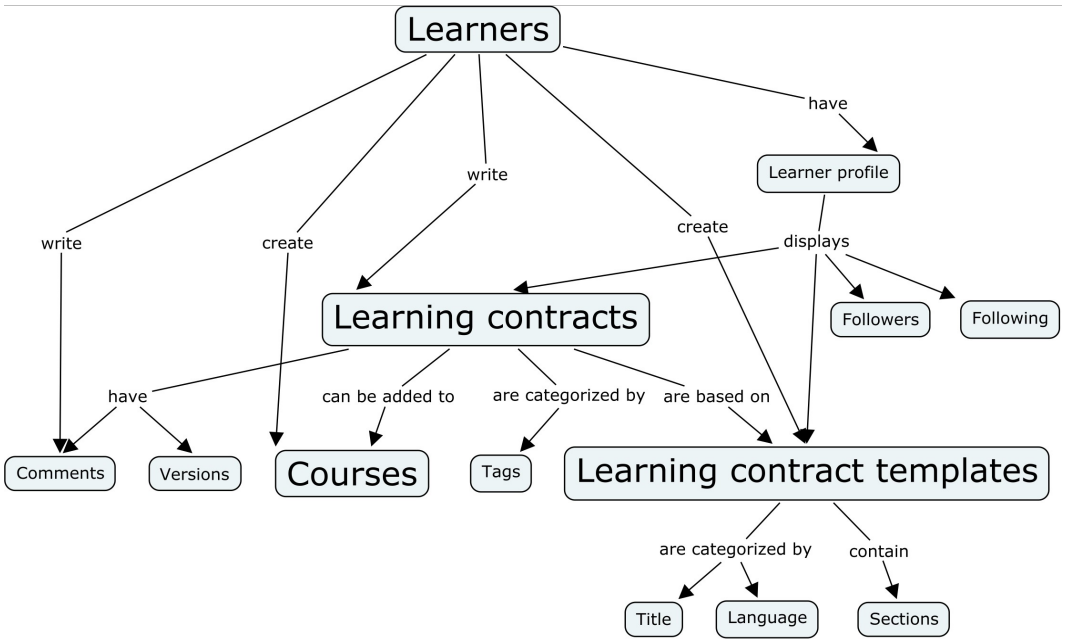

Figure 3. Key concepts of LeContract

4.1 Learners

LeContract is designed according to the principles of social software (Crumlish and Malone 2009), not according to the common design principles of learning technology. Therefore we have decided not to make a technical distinction between the roles of a teacher and a learner. While they have different goals and motivations for using LeContract they will share the same user interface and user rights.

We have currently decided to name this role a *learner*. This was preferred to more technical choices like *member* or *user*. We expect that LeContract will be used in

learning settings where the teacher is in the role of a facilitator and fellow learner. In the design sessions it came out that one of the teachers was also writing learning contracts in her courses.

Each learner has a *learner profile* that contains links to all learning contracts and learning contract templates that s/he has created. Social networking is implemented as asymmetric following. This type of connection is suitable when content (learning contracts) are more important than a personal relationship. Learners can start following other people whom they know or who have similar learning objectives. The person will be notified about the new follower but is not required to make a two-way connection. Learner profile will display links to *followers* and to people whom the learner is *following*.

4.2 Learning contracts

Engeström (2005) suggests that successful social networking services are built around 'social objects'. For example Flickr is built as a photo sharing site and Delicious is built around bookmarks. In case of LeContract the main social objects are *learning contracts*.

Learning contracts in LeContract are based on templates that are scaffolding the writing process with a certain structure and guidelines. Each *section* in the learning contract provides some guiding questions that help the learner to specify his/her learning objectives, strategy or evaluation criteria. The default template that is presented in Table 1 is modified from Anderson et al. (1996) and Harri-Augstein & Webb (1996). The reflection section is not displayed when the learner is writing the initial version of the learning contract. In the tags section the learner is expected to summarize his/her main learning objectives as *tags*, free user-generated keywords. These tags will be used to link learners with similar learning objectives. The table also specifies whether the template field is a single-line text input or multiple-line textarea.

Table 1. Structure of the default learning contract template.

Section	Guiding questions	Field type
Topic	What is the topic I wish to learn about?	text input
Purpose	What is the purpose of my task? Why do I wish to learn about or learn to do a particular task?	textarea
Resources	What kind of technological, material and human resources do I need? How can I get access to these?	textarea
Strategy	How do I intend to go about learning this particular topic/task? What action may be involved and in what order will these be carried out?	textarea
Outcome evaluation	How will I know when I have completed the task/topic successfully? How shall I judge success?	textarea
Reflection	How well did I do? What has worked? What has not worked? Why? What remains to be learnt? What are my strengths and what are	textarea

	my weaknesses? What shall I do next?	
Tags	What do I want to learn? My main learning objectives as tags, separated by commas.	text input

Important part of LeContract is reviewing the learning contracts. Facilitator and fellow learners can *comment* the learning contracts. It is common that the initial learning contracts lack details in several areas. In the design sessions it came out that teachers had difficulties with commenting learning contracts when these were published as blog posts. They would like to have a way to attach comment to a certain section in the learning contract. When the learner has revised the learning contract according to the comments s/he can save a new *version* of the learning contract. Older versions of learning contract will also remain available, so that it is possible to see how the learning contract has evolved over the course. LeContract is designed with an understanding that writing learning contracts is an iterative process.

It is possible to embed the learning contracts to any web site that supports embedding (for example web log, forum, etc.). Embedded version of the learning contract works as a teaser that will invite people to read the complete version of learning contract in LeContract. We expect that the review process will be carried out in LeContract, not in blog post comments.

With learning contracts we also have to think about privacy issues. While we promote the use of open learning environments (Põldoja and Laanpere 2009), we understand that not all learners are ready to share their learning strategies in public. There are sensitive topics that can be better discussed in closed learning environments. In LeContract it should be possible to create private learning contracts and share them only with a person who is going to review the contract.

4.3 Learning contract templates

Learners can also create new *learning contract templates* from scratch or through customizing the existing templates. At first this is important for translating learning contract templates to a different language. Secondly some facilitators may feel that the default template is not suitable for their needs. For example they would like to have guiding questions that are specific for their course. Facilitators can then point learners into certain learning contract template. Also self-directed learners may have a need for their personal template. The number of sections in the template is not fixed but topic and tags are required in every template. All created learning contract templates can be browsed by *language* and *title*.

Learning contract templates created in LeContract will be published under the Creative Commons Attribution license. This way learning contract templates can be considered as open educational resources (Schaffert and Guntram 2008). We reckon that creating a learning contract template is a micro-contribution and attribution requirement is enough to protect the authors. Attribution license is most compatible with other open licenses and makes it possible to reuse the learning contract templates in a wider ecosystem of open educational resources.

4.4 Courses

In the design session it came out that in a formal learning setting teachers would need a possibility to link together all the learning contracts from the same course. For satisfy this requirement we introduced the concept of *courses*. Every learner can create a course in LeContract. Each learning contract can be added to one course.

Having all learning contracts from one course categorized gives us also other benefits. For example it is possible to create a tag cloud that presents all the learning objectives from that course. In an informal learning setting learners can simply ignore the course feature.

5. Conclusions and future work

LeContract can be a considerable support tool for an individual. It provides a framework for structuring learning activities and helps to 'mirror' the learning process to the learner and facilitator. As the needs of learners are articulated into specific purposes, the resources identified and the strategies developed it is a promising mechanism that can provide evidences whether there has been a valued change in one's own ways of thinking and perceiving. On the other hand LeContract is a great source for a facilitator to understand the learner's progress and its dynamics.

This paper described the design work that is still in progress. In the current phase we have indicated the key features that are needed for writing, reviewing and sharing learning contracts on the web. More design work is needed for reviewing the learning contracts and connecting learning objectives with evidences in learners' blog or e-portfolio.

The development process has shown that research-based design methodology provides a flexible framework for designing new tools for learning. Scenario-based design enables to involve the stakeholders to the design process and receive constructive feedback for early design ideas. Personas, scenarios and other artefacts developed in the design process are published in LeContract development site (2010).

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