Architecture of eLearning System ELIS

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Abstract

The solution of the eLearning is one of the most discussed priorities of modern universities. The whole problem acquires global approach included in the strategy of given institution. From technical point of view it means building eLearning platform – eLearning system. This paper is focused on the eLearning system ELIS and its architecture and conception. The system ELIS is being developed at Mendel University in Brno by the in-house way and this fact classes the whole project into the group of interesting solutions of eLearning problems in the Czech Republic.

Keywords: eLearning system, ELIS, system architecture.

1 Introduction

Because of the current expansion of the information and communication technologies and their increasing relevance in all branches of human activities the role of eLearning systems increases too. eLearning systems build up a platform for the implementation of new study forms (especially with distance characteristic). The effectiveness of this platform depends on its involving into the integrated solution of the information systems at universities.

It is necessary to understand under the term eLearning system the complex information system primarily determined for the support of the pure set of eLearning activities. These ones include not only study activities, but also managing activities and governing of study courses. Generally, it means the integration of kind of systems as LCMS, LMS and virtual learning environment (VLE) or communication portals into the solitary complex system.

But there is one fairly peremptory problem. All kinds of noticed systems are usually distributed by various producers and the integration cannot be performed on the maximum. In the context of this fact users are usually compelled to use a few practically independent separated systems and harped on making endless authorizations, uploads or imports. These unwittingly actions can be eliminated only by the purchase of the complex system or the development of the own system. By this way the flexibility and the integration of all parts can be achieved.

The in-house development of eLearning systems is not the enlarged approach to the building the environment for the using information and communication technologies for the support of the educational process. But on the other hand, there are a few institutions in worldwide measure which have selected in-house way and have accomplished its applicability. One of them is Mendel University from Czech Republic where eLearning system ELIS is being developed. This project is in local scale very peculiar.

2 Basic modules of the system

The basic conception of the system comes out from outlets of analytic activities. These ones have been performed in the start phase of the project and have included the exploring various kinds of systems with the relation to eLearning education. On this base all important functions have been appreciated and the basic priorities of the development have been set. The rules of modern agile methodologies are being partially accepted during the developing process itself.

Each application of the system is now considered as a relatively independent part with strictly defined inputs, outputs, relations and affiliation to one of the main modules. The system ELIS consists currently of several modules, which are integrated at the data and also application level. The idea of the dividing system into modules is based upon the identification of common basic activities of the eLearning education. It means especially the creation of study texts, their distribution to student and the management of courses, which includes for example administration of students, tutors and courses, testing and evaluation and other activities necessary for running of eLearning courses. Due to this the basic modules of the system are [1]:

- *Author module* – the part of the system providing tools for the preparation of study texts and their storing in the system. Partial modules of this module are especially online editor, library of multimedia objects and submodule for the definition of relations between parts of courses.
- *Distribution module* – this part of the system facilitates the content of all courses to the authorized users with the help of various types of portals. The important types of portals are student's and tutor's portals.

- *Administration module* – the collection of submodules responsible for ensuring functions which are usually provided by LMS. Very important submodule is one for administration of user roles using of which enables possibility to manage activities of users in the system in the effective way. A lot of data for this module is taken over from study agenda of University IS (UIS) and that is why several usual administration applications are not implemented.
- *Communication and cooperation module* – the group of applications creating the virtual learning environment. It means especially asynchronous and synchronous communication tools, applications for assignments and support tools as calendars or student's notices.
- *Test module* – the set of submodules designated for the preparation of test questions, tests, statistics of tests, archive of tests and other functions with relations to tests.

3 Applications of the system

The concept of the system includes a set of applications for the support of various activities in the eLearning system. This set was determined in accordance to the results of the analysis of the available LMS and LCMS system which are being used at Czech universities [3,5]. The most important applications of individual modules are:

- *Author module*
  - Guide for course preparation – basic part of author module determined for the creation of the courses via a set of templates. The outputs of the application are parts of the course in the form of XML fragments.
  - Course managing – application for creating relations between lections of the course and definition of their dependency and sequence.
  - Import of courses and learning objects – import of courses or parts of courses from other eLearning systems and author tools. Support of SCORM model.
  - Export of courses – application for export courses in various output formats. (XHTML, PDF, RTF, etc.) by XSLT/FO styles.
  - Creation of output styles – definition of own styles for courses. Application should be accessible also to students.
- *Distribution module*
  - Course generating – generating course from xml source, sequencing learning objects and checking roles and requests for work with individual part of course.
  - Course passing – watching activities of students in courses and their evaluating.
  - Map of the course – creating map of the lections and other parts of courses. It means the construction of the hierarchical tree of course's parts.
  - Course statistics – statistical reports about using courses, time spending for study, rate of using tools etc.
- *Communication and cooperation module*
  - Assignments and tasks – administration of the tasks in courses.
  - Student's teams – creating teams of the students for solving team tasks.
  - FAQ - frequently asked questions.
  - Information sources – external sources of information suitable for better understanding problems of the course.
  - Glossary, examples, notices, calendar, news – applications for support of course study.
  - Email, chat, discussion boards, whiteboard – synchronous and asynchronous tools for communication and information exchange between students and tutors.
- *Test and evaluation module*
  - Exam's test – preparation of self-tests and tests for passing courses and their managing including possibility of printing.
  - Administration of test questions – preparation of the test questions' databases and their import from other systems.
  - Random generating of the test – randomized generating tests and their automated checking.
  - Archive of tests – library of passed tests and managing access to various tests from student's side.
  - Test analyses – tools supporting statistical evaluation of the test results, test reliability measuring, correlation of the results and graphic output of the analyses.
- *Administration module*
  - Administration of users' roles – granting roles making the managing of activities possible to the users.
  - Library of styles – archive of styles for determining of the visual look of the courses.

- Evaluation of the course – evaluation of the courses' quality. The result is important for opponent control of the pedagogical and didactical aspects of the courses.

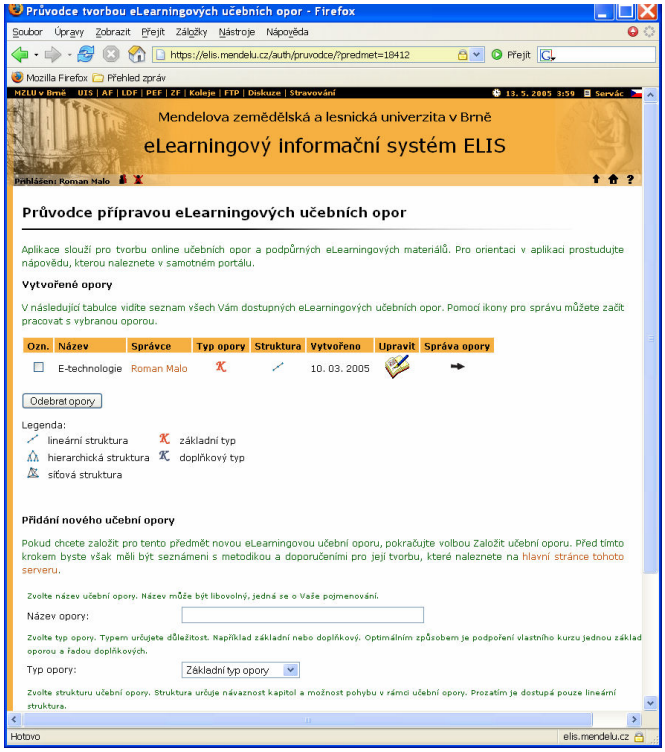

Figure 1: The example of application.

4 User's interface

One of the priorities of the eLearning system ELIS development is user-friendliness and lucidity. That is why the system is at the presentation level integrated with University information system of Mendel University (UIS) which is used more than 5 years by all persons at university. Users are apprised of it and the using should not induce problems [4].

The access to applications itself is based upon the principle of set of portals. All logical modules of the systems contain own portal with links to the inferior parts. All portals create hierarchical structure [2].

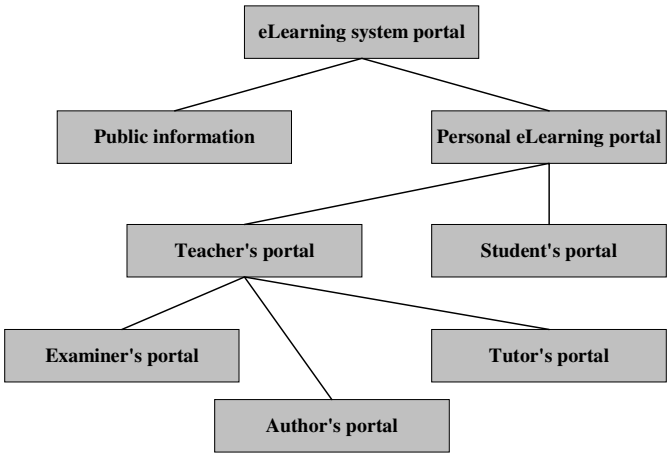

Figure 2: Portal structure.

5 The system development

During the development of the system pre-described modules are being incrementally improved and enlarged. The main attention is being dedicated to keeping modularity of the system. Owing to this, the process of the innovation and next development of the system is more then facile. All applications are being implemented in the basic version with basic functionality and during the time are being improved according to their conception and users' suggestion. This way is relatively difficult, because of the needs of the flexible reaction of the development team to these suggestions and requests, but on the other hand it is warranty of the dynamical expansion of the whole system. The primary characteristics of the development are:

- the incremental expansion of the system,
- the iterative improving of the functional versions of applications,
- analysis with brainstorming,
- the persistent communication between developers and users,
- small development team,
- sharing program codes,
- refactoring,
- getting information from system working.

According to the list of characteristics, it is clear the development is based upon principles, which are usually described in the context of the agile methodologies. It is the one of the factors with the positive influence to the rapid development and expansion of the system. But, at the beginning of the system building, there was no idea about using agile principles. The current approach results from the needs and request of users and institution.

There is one important question about the level of keeping this state. Actually developers (especially students) in the

team are being motivated by especially non-financial means as the pertinence to the team, getting knowledge and experience from development process, access to modern technologies etc.

But together with the expansion of the system breaking point is still closer. Then the current approach will be unmaintainable. This situation must be predicted and reflected in the development.

6 Conclusion

The complete architecture of the eLearning system ELIS and the description of all significant modules, their applications and the way of their design are very important for next works in the project. The in-house development of the system enables, that outlets of the theoretical research of various problem of eLearning can be composed in the terminal solution. Due to the complex approach to the system, many advantages issuing from the modular structure and the integration are being achieved.

Although the real development process runs less than 18 months, the system ELIS now offers support for all relevant activities during using eLearning courses in the educational process. The set of applications covers functionality, which is usual in other projects (especially commercial) and over and above this fact, it is possible to share data with UIS and react in flexible way to users' suggestions. From this point of view the whole project is fulfilling its role.

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