Integration of Learning Management Systems with Social Networking Platforms

E-learning in a Facebook supported environment

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Abstract **- This document studies an e-learning process and its possibilities of integration with social networks. E-learning process, its supporting software and social networks are presented exposing the problem of low level of interaction among users in existing e-learning environments. Social networking tools that could improve the interaction among users in e-learning environments are being considered. As a possible solution to increase the interaction among users in e-learning an integration of learning management system with a social networking platform is being proposed. A working demo of the solution proposed closes the paper with the confirmation that integration of social networking platforms and learning management systems is needed and possible in practice.**

Keywords - e-learning; social network; user collaboration; user interaction; virtual clasroom; learning management system; video lecture.

I. INTRODUCTION

Social networks are large groups of individuals with custom connections. Nowadays there are numerous on-line social networking platforms with a range of different communication and interaction tools available to the users. Some of the social networking platforms support the integration of custom third party tools – social networking applications. Social networking platforms enable complete users interaction using different communication channels on different end-user terminals.

Through comparison of the social networking platforms with the Learning Management Systems (LMS) it is possible to determine that communication and user interactions in LMS are relatively low. A hybrid e-learning environment using social networking platform tools and LMS features can encourage collaboration and interaction among users [5].

Second section introduces general aspects of the e-learning process and its software (LMS). It exposes the weaknesses of LMS in the field of communication and collaboration among users. A virtual classroom approach is introduced with the basic requirements.

Third section deals with social networks. It introduces Facebook as the world's most used social network with more

than 800 millions of users [9]. Facebook functionalities that can be used to build a virtual e-learning classroom are presented.

Section four explains the idea of a hybrid e-learning environment combining a LMS and a social networking platform. Two options are considered – integration of a LMS into a social networking platform and vice-versa.

Section five presents the results of a practical integration of the Coome LMS system into Facebook platform. Basic architecture and implementation are explained including additional integration of the user progress tracking using an external tracking tool.

Last section explains the main aspects of the practical implementation and integration of the presented solution. It presents benefits and drawbacks as well as some guidelines for future work.

II. E-LEARNING PROCESS AND SUPPORTING SOFTWARE

E-learning is an interactive process of sharing of information, skills and knowledge by using information and communication Technologies (ICT) [1]. Considering the general requirements of e-learning in schools and universities, e-learning is a process where it is necessary to split users in different groups with different requirements [6]:

- **Learners**. Learners are users who study by using the available content in the LMS. The study process is either standalone or with collaboration of other users.
- **Teachers**. Teachers are users who track progress of learners according to LMS data log and give learners feedback on progress and assessments results.
- **Developers**. Developers are users who are in charge of preparing the e-learning content.
- **Managers**. Those users who create user accounts and user groups and assign the content to users and user groups.

Figure 1 shows the presence and relations of e-learning groups in an e-learning process. Not all groups are required to start an e-learning process. Where there are present and

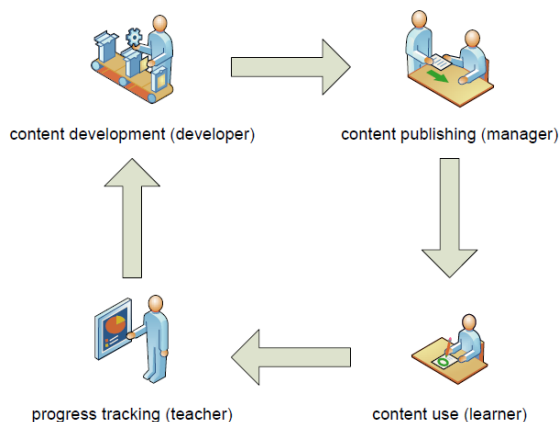active all e-learning groups, e-learning process is a guided process.

Figure 1   The e-learning process.

The main problem of existing e-learning environments is a lack of communication and interaction among users. There must be more interaction among learners and more communication among learners and teachers. It is expected of e-learning environments to be more like traditional learning, where the interaction among learners and teachers represents a common process. Therefore the goal is to provide the same learning experience as it is possible to achieve in a regular classroom. This is basically an engineering process of upgrading the LMS and a social process of converting the users into e-learning community members, which will start growing.

A.   Learning management systems

Nowadays, a vast variety of LMS exist, where most of them mainly correspond to all general requirements of e-learning, like content management, users and groups management, assessments management and progress tracking. LMS completely support the standalone e-learning process based on content consumption and basically support the interaction among users. Learning through collaboration among users in real time is mostly not correctly supported. Nowadays lack is in LMS missing the direct relation between learning content and users' collaboration and in an inappropriate teachers approach towards e-learning. The next step of development of LMS packages is to create virtual classrooms where users' collaboration and social activities will be related.

B.   Virtual classroom

Virtual classroom is an approach to create the environment, where it will be possible to complete the learning process with a similar user experience as in a standard classroom [11]. Figure 2 shows the virtual classroom approach where by using information and communication technologies it is possible to achieve a major part of normal classroom experience. Basic requirements of a virtual classroom must be similar to standard classroom with some modifications:

- Entering and leaving the classroom must be easy, but also logged. Learners must be able to find their ways around the virtual classroom easily and be able to invite other learners. First entrance to the classroom must be approved by the teacher.
- Teacher must be able to lead the group through the learning process. Learners must be able to interact among each other and with the teacher. Virtual classroom must support individual chat between single users and chat between multiple users.
- Access to teaching material should be easy and available at any time.
- Learner should be able to share their own materials and comment and share other people's materials.

The goal of virtual classrooms is to make the online e-learning experience comparable to real learning experience.
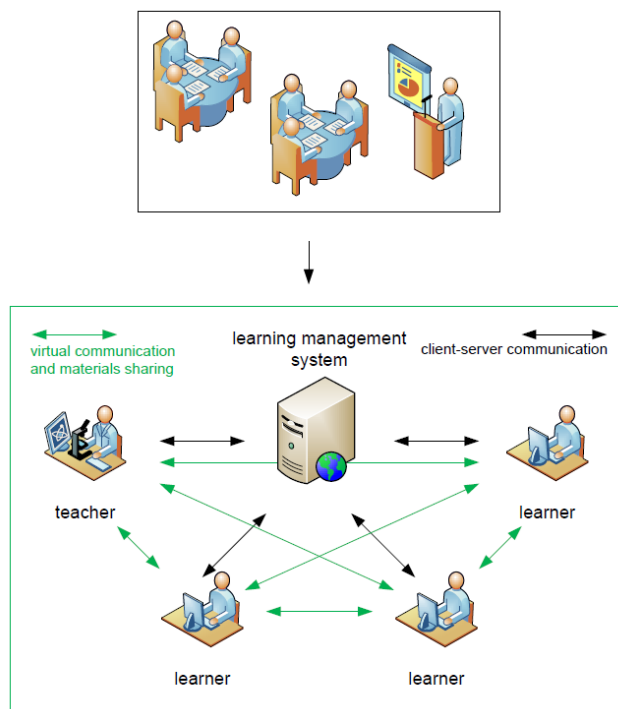

Figure 2   The virtual classroom approach.

To achieve the goal of basic virtual classroom we need to upgrade the existing LMS with social functionalities or update social network platforms to support e-learning processes.

III. SOCIAL NETWORKS

Social networks are networks of connected individuals who share custom common interests and custom content [12]. The content of social networks is completely provided by the members of social networking communities. Social networking platforms enable various tools of interaction and communication among users and various tools for grouping of users.

Facebook is the biggest and most known social network with more than 800 million subscribers. The Facebook social platform includes various social-connection tools that can enhance interaction among users in an e-learning environment [4]. Selected tools have been considered as useful for integration with the virtual classroom for e-learning:

- **User profile**. Facebook user profiles consist of user's data, user's pictures and user's wall where other users can append multimedia messages. Profile walls are good for general public communication, which can also be used for messaging within the e-learning process.
- **Users groups**. Users can create custom user groups and invite other users to join the groups. This feature can be used for management of LMS users and groups as well as for the control over content access.
- **Custom pages**. Users can create custom pages. Pages have the same preferences as user profiles. Pages can be used as information points for e-learning courses or groups of courses through the support for discussion boards as well as through custom third party control extensions.
- **Chat.** Facebook supports different types of chats. Text, audio and video chats are available to the users. Users can start many individual or group conversations. Use of chat is essential for real-time collaboration.
- **Like and comment functionality**. Users can comment on other users' shared content and/or set an "I like it" flag on it. This can be used to rate and comment the content of courses.
- **News feed**. Facebook news feed is an individual information feed shown in Figure 3. It consists of important news regarding a single user and its relations where news selection is done automatically based on the user's interaction with other users.

Figure 3   Facebook news feed.

IV. MERGING OF SOCIAL NETWORKS WITH LEARNING MANAGEMENT SYSTEMS

LMS are supportive software for management of users and content for e-learning. Content creation and distribution is well supported in many LMS, while interaction and possibility of active participation of the users in the e-learning process is not. On the other hand there are social networks with excellent support for interaction among users and creation of communities without any support for e-learning. Nevertheless there are social tools that can be used for e-learning and can improve the e-learning process [10], they are not widely used as they are not integrated with LMS. The opportunity here is to integrate social tools of social networking platforms to LMS or vice-versa. Both types of integrations can be done via open application programmable interfaces (open APIs), which need to be supported at the social networking platform and at LMS. As LMS have a good support for users' progress tracking a hybrid system must support tracking of users' collaboration. This way users' collaboration can be considered to be a part of users' final success, forcing the users to collaborate actively by increasing theirs' motivation.

The first step is a choice of the social network, which fits the required e-learning needs and offers all necessary open APIs to integrate it with an LMS. In case of the pilot implementation, described later in this paper, the Facebook social network has been selected as it comes out as to be the only reasonable choice due to its best support for third party controls and numerous active users. In the field of LMS selection there are several choices available. In general there are no LMS with open APIs available. The possibility is to choose one of the open source LMS and upgrade it with custom open APIs. In both cases the social networking platform is being used as a backend for social tools and LMS is being used as a backend for e-learning elements.

A. Integration of social networking platform tools to a learning management system

Social tools are essential tools of social networks. Some social networks offer easily understandable open APIs that allow usage of selected social tools in custom applications. The focus is on upgrading of an existing LMS with the social tools. If all the steps of an upgrade are achieved, the selected

LMS can support a basic virtual classroom. This option is mostly not considered as it requires more social networking APIs to be available – for all the needed social tools.

B. Integration of a learning management system to a social network

Integration of a LMS to a social network is possible only when social networking platform supports third party controls to be added for custom users. In this case a new interface of an existing LMS with a look and feel of the selected social networking platform must be created. As the complete process is depending on the social networking platform, all social tools available in the platform can be used.

V. SOCIAL NETWORK AND LEARNING MANAGEMENT SYSTEMS IN PRACTICE

In practice the integration of the LMS Coome with the social networking platform Facebook was made. Facebook was selected due to its large user base, support for third party applications, good development documentation and provisioning of all social tools needed to complete a basic virtual classroom. Coome is a LMS developed to support the production and distribution of multimedia based lectures and is being used as the tool of online synchronization of videos and presentations [8]. It has been selected as the LMS of choice due to its support for multimedia lectures.

Figure 4 shows the main architecture of the implemented solution. A custom application was made for Facebook social networking platform and Coome LMS was extended with specific open APIs. Custom Facebook application communicates with Coome LMS and Facebook social networking platform via open APIs. Facebook social networking platform accepts users' requests and renders final content to the users.
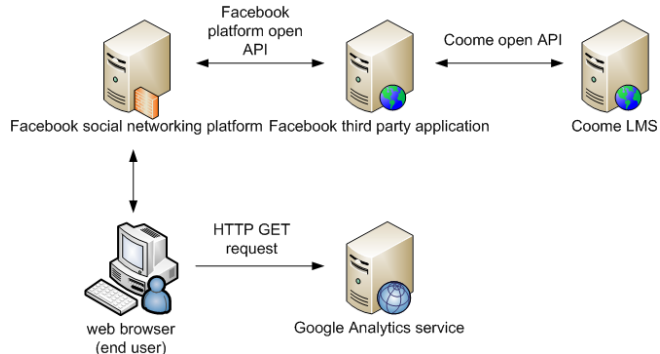

Figure 4   Architecture of the practical implementation of integration of Coome LMS with Facebook.

A. Coome

Coome is a multimedia based LMS. It supports creation and management of video lectures synchronized in time with the lecturer's presentation using Microsoft PowerPoint or

other related tool. Coome is a complete tool for editing and delivery of video lectures. Delivery of video lectures is done in the same way the content delivery is done in other LMS – according to user management and assigned user rights. Figure 5 shows Coome detailed WEB 2.0 based editor tool for video lecturers. The process of final creation of a video lecture is made in 4 steps:

- A lecturer uploads a presentation in Microsoft PowerPoint (PPT) or Portable Document Format (PDF). Coome processes all pages of the presentation and imports them into the data storage.
- Once the presentation has been imported into the system, the lecturer can give the lecture using the Coome system. All transitions of the presentation pages are being tracked and indexed, while the lecturer can be recorded using a standard camera or a webcam.
- After the lecture presentation is concluded, a post production of the lecture recording can be made. The video recording of the lecture can also be replaced with custom video, which can be uploaded or set as an external link. Transitions between presentation pages can be updated or removed.
- Once the editing process is completed the lecture can be published and made visible to other registered users. Lecture can also be assigned to custom categories.
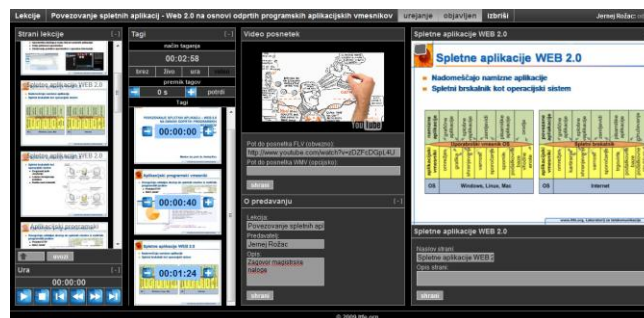

Figure 5   Coome LMS lecture editor.

With the goal of integration e-learning elements with Facebook, the Coome LMS had to be extended with 3 representational state transfer (REST) based open APIs. Authentication of users allows the employment of the APIs through the application key (API-key) method or a validation of client's internet protocol address (IP address). API-key is a user unique value, which is provided as a parameter of all HTTP requests. The newly implemented APIs are:

- **Search lectures API**. This API enables the search of lectures present in the system. It returns a list of maximum 20 lectures with basic description data.

This API accepts two parameters – search and page. Search is the parameter to be set as the value of a search string and page is the parameter, which determines the ordering of the returned group of lectures.

- **Lecture data API**. This API enables the retrieval of lecture specific data such as video location, lecture presentation location and lecture presentation transitions. Lecture identification number must be provided as the API parameter.

- **Categories API**. Returns categories' data including the number of lectures assigned to each category. API accepts parent category identification number as an optional parameter. If this parameter is not set, API returns top level of categories (those without a parent category).

The development of open APIs is essential for the completion of the solution. Only this way the Facebook application can access the data from the selected LMS. To do this, direct access to database and to source code of the LMS must be available. Thus the development of open APIs is not possible with all LMS as well as the integration with a social networking platform.

B. Facebook pages

Facebook pages represent a good starting point for the virtual classrooms. Facebook users can decide to follow the newsfeed of the pages by liking them – click on the "I like it" button.

Inside a Facebook page the communication among users is possible through a discussion board or a page wall. All interactions and page changes are automatically set to users news feed. In a practical implementation described in this paper, a custom Facebook page has been created as a starting point of the e-learning process.

C. Facebook application

Facebook applications are third party controllers that can be integrated into the Facebook platform the way that users' request are always forwarded through Facebook to an external application [2][7]. Facebook application represents a controller with e-learning functionalities.

A custom Facebook application has been made with the goal to integrate basic Coome application functionalities. Before the first use of the application, Facebook users must confirm the installation of the application to their profile and confirm the application rights to access their data – e. g., list of friends. Once the installation is completed and the access rights are confirmed user can use the application and the application can access user data in the read/write mode. This is important to encourage interaction among users by messaging actions to other users' news feeds.

Using Coome open APIs, Facebook application can display two basic screens.

Home screen displays the list of lectures according to user's search input parameters. At the top of the home screen the lecture categories tag cloud is displayed. Lecture list is displayed at the center of the screen with associated thumbnail pictures. At the bottom of the home screen there is a list of selected users of the application.

Lecture screen is used to displays a single lecture as it is shown in Figure 6. A lecture consists of a video synchronized with presentation pages. On the lecture screen there is a video player located on the left, currently active presentation page on the right and a list of all presentation pages below. All presentation pages can be previewed with hover action on the pages list. Users can comment single lectures using a field below the lecture screen.
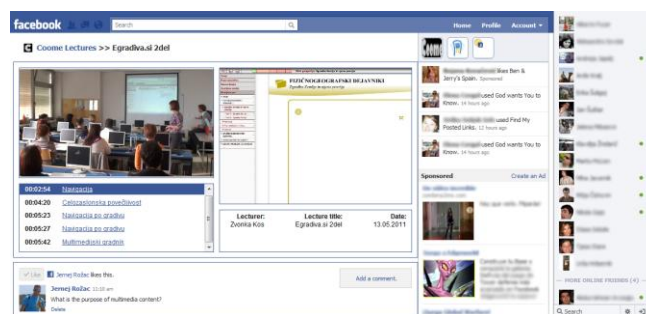

Figure 6   Lecture screen of the practically implemented solution of integration of Coome LMS with Facebook.

As the application is integrated within Facebook, users can use it only if they have registered the application and after they have logged into Facebook with their account.

Read only functionalities can be achieved without the need for registration with the Facebook application. By doing it this way there it is enough to append the Facebook application to previously created Facebook page. Without requiring from users to register with the application it is not possible to access profiles of the users or to read or write user profile data, comments, etc. This is a problem, if tracking of the learning progress is required.

D. Tracking users' progress

Progress tracking can be performed by sending progress requests to Coome. In this case Coome application needs to be extended with an open API to store progress of the users. In case of the described integration a different approach has been selected. Facebook application has been adapted in such a way that it forwards Facebook users requests to Google Analytics service. Requests of the users are mapped to different virtual permalinks, which are forwarded to Google Analytics as general web page requests. Information included in each permalink is about the user, the lecture and the lecture page. Each user's request is mapped to 4 groups of permalinks:

- **Log tracking**. It covers a complete tracking of access. Permalink includes 3 virtual paths – user, lecture and lecture page. This structure of permalinks enables complete tracking of user requests in Google Analytics.
- **Lectures tracking**. It enables to track lectures views. This is important for keeping the basic statistics of lectures. By using this approach, only the lecture name is tracked.
- **Lectures pages tracking**. By tracking lecture pages we can retrieve information about a single page visit like visit count number and time spent on the page.
- **Users tracking**. It enables calculation of users' ratings according to different parameters such as: number of followed lectures, number of visited lectures, etc. This permalink consist of user related data only.

Google analytics enables tracking of custom permalinks. Permalinks do not need to be valid. All example permalinks are not valid, but are used to track different e-learning statistics.

Users' access data are sent to Google Analytics service directly from users' web browser. By doing this Google Analytics gets all the data regarding the e-learning item being tracked as well all the data present in regular HTTP headers. Google analytics creates aggregated reports according to received data.

In some scenarios transferring access data to a third-party service can be considered as a privacy issue. Only learning object data provided in the URL can be protected by using an encryption method. HTTP requests to Google Analytics service can be done using the secure connection to exclude possibilities of network traffic attacks.

VI. CONCLUSION

It seems obvious that the existing e-learning processes must be complemented with social networking tools. With the presented pilot implementation we have shown that it is possible to use a modified LMS platform and the Facebook social network as a virtual e-learning classroom. Nevertheless, despite the fact that our implementation has been based on the Facebook social network and Coome LMS, it can be implemented also by using other social networks supporting the implementation of third party controls or using other LMS where the access to source code is available – e.g., open source LMS or self-developed LMS.

Standard web users are familiar with social networks, but not with LMS. Introducing LMS features to social networks enables an immediate start of e-learning process for the end users without the need of understanding the integrated LMS. Other benefits are in use of communication tools, simplified users communication and easier information push to users.

During an e-learning session the users are always able to use all social networking tools. It is not possible to limit the use of unnecessary and undesirable social networking functionalities for e-learning. This is a drawback as users can always use social networking tools for other purposes rather than e-learning.

According to initial feedback of lecturers and university students, the social networks will be used for e-learning in the future. All lecturers and learning data are stored locally on LMS servers. This reduces potential problems with Copyright issues. Use of the e-learning material can be managed according to user accounts and enabled only to selected users.

In the future a real case scenario of social network e-learning will be evaluated on a group of students to obtain the real feedback and thus improve the benefits and reduce the drawbacks of the current system.

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