VIRTUAL CAMPUS DEVELOPMENT AS A COLLABORATIVE SYSTEM TO SUPPORT MOBILE LEARNING PROCESSES

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Abstract. *The paper presents the university virtual campus as a collaborative educational system that supports mobile learning processes. The virtual campus structure is described and a comparison with the classical university is achieved. The architecture of virtual is designed and the categories of agents in virtual campus are analyzed. An aggregation of collaborative mobile learning systems is done in order to find the compatibility with their curricula and the needs of organizations on the labor market.*
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1. Introduction

The virtual campus refers to an effective collaborative system in which people and equipment cooperate in order to achieve certain objectives (Ivan et all, 2010a).

The virtual organization represented by the university campus is a collaborative educational system, whose role is to develop processes in which teachers post lessons and courses (Castro et all, 2010), realizes tests bases, organize schedule of evaluations. In the virtual campus, a student register for courses, participate at examinations and receives notes.

The main objectives of the virtual campus are the development and diversification of online education for all forms of learning, activities that takes place in the e-learning or m-learning platform of the university, providing logistical support, monitoring the e-learning activities, training of participants and development of electronic guide of students and teachers.

Teachers involved in the development, implementation and materials posting on the e-learning or m-learning platform can access online guides regarding the realization of an electronic course and the use of platform.

The m-learning platform of collaborative educational system allows the distribution of courses in text, graphics and multimedia formats, contains elements of synchronous and asynchronous communication and advanced testing systems.

The virtual campus includes specific work procedures and tools that facilitate self-study, with different and easily accessible means. Architecture used facilitates the access to m-learning platform of all registered users, regardless of where the access was requested.

The virtual campus promotes a set of quality standards for evaluation of educational services offered and for assist students, by providing them detailed information, available in electronic form, regarding the activities that take place within each course.

2. The structure of virtual campus and comparison with classical university

The virtual campus is an organization built for the development of online educational processes for all levels of training.

The virtual campus has internal components, like students, computers and portals, and external components, such as databases and teachers. The virtual campus structure includes the components in Fig. 1.

Fig. 1. Structure of virtual campus

Flows developed in the virtual campus aims educational activities by submitting homework and developing projects by students, evaluation of students' knowledge, and discussions on the campus associated platform.

Entries are given by students enrolled, projects developed, homework submitted for evaluation, courses posted on the platform. The outputs are represented by graduate students, diplomas, projects submitted.

The activities carried out are displaying courses on the platform, consulting materials support, ongoing self-study, development of homework and projects, achievement of test bases, organizing assessment calendar, and knowledge evaluation.

In Table 1 are compared the elements of classical university and virtual campus.

Table 1 – Comparison between classical university and virtual campus

	Virtual campus	**Classical university**
Objective	development of online education for all forms of learning	increasing the quality of educational process
Structure	includes internal and external components	includes internal and external components, buildings, equipment
Flows	carrying out educational activities	carrying out educational activities
Entries	students, projects, homework	students, projects, homework
Outputs	graduate students, diplomas, projects	graduate students, diplomas, projects
Activities	conducted online, on the e-learning platform	conducted physically, at the university

Virtual campuses are already a reality, taking into consideration the progress made in e-learning and web technologies, in the collaborative and distributed systems, in the broadband communications and considering the collaboration needs of universities to offer common programs of study (Tsekeridou et all, 2008).

3. Architecture of the virtual campus designed as a collaborative mobile learning system

The virtual campus designed to support mobile learning processes offer an innovative and interactive online platform for mobile learners, by utilizing the location services and other sensory components built-in mobile devices. On the online platform, the mobile learners can learn collaboratively and interactively either at a distance or face-to-face in the mobile learning environment (Qing et all, 2010).

The online platforms in the field of mobile learning have been constructed taking into consideration the connection with the elements used in the learning activities, such as learners and mobile technology users, and the control components in the learning activity system (Gil at all, 2010).

The virtual campus is implemented on a communications infrastructure that allows simultaneously and stable access of many users and that properly manage different electronic formats of educational resources.

According to (Bahrami et all, 2007), the architecture of collaborative mobile learning system includes the followings components: course authoring system, learning management system and learning content management system. These components are presented in Fig. 2.

Fig. 2. The functional model of collaborative mobile learning system

An agent from the mobile virtual campus is an entity that interact or exchange information in the collaborative system, be it people or applications. In the collaborative learning process, using e-learning or m-learning, there are five categories of agents:

C_1 – *student*, which obtains information and translates it into knowledge;

C_2 – *information provider*, that facilitates the process of converting information;

C_3 – *designer*, which process the information so as to be easily absorbed;

C_4 – *instructor*, that assists the student in the conversion process;

C_5 – *manager*, that provides an easy context to the process.

Fig. 3 presents the agents of collaborative learning process in the mobile virtual campus.

Fig. 3. The categories of agents in a mobile virtual campus

Every agent role is seen as a group of processes that the agent is able to execute. Each process is a set of actions that a user performs during the interaction in the virtual campus. A process is a way to use the collaborative system. The full set of available processes defines the scope for which the collaborative system is used and requires a specific configuration.

4. The aggregation of collaborative mobile learning systems and companies on the labor market

In order to realize an aggregation of virtual campuses, represented by collaborative mobile learning systems, and organizations to offer a complete curricula, will be considered the matrix of collaborative m-learning systems that contains, on rows, the name of systems and, on columns, the curricula offered by each system, as presented in Table 2 (Ivan et all, 2010b):

Table 2. The matrix of collaborative mobile learning systems

	$SCurricula_1$	$SCurricula_2$	…	$SCurricula_n$
$CMLS_1$		*		
$CMLS_2$	*			
…				
$CMLS_i$	*	*		*
…				
$CMLS_k$			*	*

The matrix of organizations that require specialists in different fields, which are prepared or not inside virtual campus, is shown in Table 3:

Table 3. The matrix of organizations

	$OCurricula_1$	$OCurricula_2$	…	$OCurricula_p$
$Organization_1$	*	*		
$Organization_2$				*
…				
$Organization_i$	*	*	*	
…				
$Organization_m$			*	*

If $n>p$, then the mobile virtual campus prepare more specializations than the market requires. In the case in which $n<p$, the mobile virtual campus produce fewer specializations

than the market requires. If $SCurricula_i \equiv OCurricula_i$, where $i=\{1, 2, \ldots, min(n, p)\}$, then the mobile virtual campus produce exactly the specialists required by the labor market. If the intersection between *Scurricula* and *Ocurricula* is empty, then the mobile virtual campus produces something else that the market requires.

Currently, the aggregation between a collaborative learning system, represented by a university that produce specialists, and an organization that hires them, is realized by flows, as presented in Fig. 4. The inputs *I* are represented by people that go to study in universities and, on the other hand, are hired in companies in order to get work experience.

Fig. 4. Aggregation by flows between universities and companies

The normal situation is given by a linear aggregation, in which people go first to the university and after finishing the studies goes in companies to be hired and to apply the theoretical knowledge acquired from the university.

Fig. 5. Linear aggregation between universities and companies

The universities have also other outputs than specialists which become inputs for companies. Also, companies hire people that are not coming from universities. It is very important that a part of the companies' outputs become entries for the universities. These entries are represented by people that want to achieve new knowledge, by information necessary to update the curricula for the new specialists, or by money donated by former graduates. If the graduates of a university are proud by their studies and their teachers, then they will become alumni of that university and will make donations or sponsorships.

5. Conclusions

A virtual campus that supports mobile learning processes is a collaborative educational system oriented to all partners, such as teachers, learners and administrators.

The development of virtual campus as a collaborative system is accelerated, along with the extension of wireless networks and must be taken into account that the quality characteristics become strictly related to the security characteristics.

The learning process from a collaborative mobile learning system can be achieved through an internet mobile learning platform. The collaborative learning system should focus on how to instruct and stimulate mobile learners to achieve knowledge, and the system to simulate traditional classroom education and learning environment (Pocatilu et all, 2010).

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References

1. Bahrami, K., Abedi, M. and Daemi, B., 2007, "Implementation of Distributed E-Learning System on Power Line Network," *The Third Advanced International Conference on Telecommunications, AICT 2007*, 13-19 May, pp. 29.
2. Castro, H., Rosales, E., Villamizar, M. and Jiménez, A., 2010, "UnaGrid: On Demand Opportunistic Desktop Grid," *2010 10th IEEE/ACM International Conference on Cluster, Cloud and Grid Computing (CCGrid)*, pp. 661-666.
3. Gil, D. and Pettersson, O., 2010, "Providing Flexibility in Learning Activities Systems by Exploiting the Multiple Roles of Mobile Devices," *The 6th IEEE International Conference on Wireless, Mobile, and Ubiquitous Technologies in Education*, pp. 166-170.
4. Ivan, I., Ciurea, C. and Milodin, D., 2010a, "Collaborative Educational System Analysis and Assessment," *Proceedings of The Third International Conferences on Advances in Computer-Human Interactions, ACHI 2010*, February 10-16, Saint Maarten, Netherlands Antilles.
5. Ivan, I. and Ciurea, C., 2010b, "Collaborative Systems Aggregation," *Journal of Applied Collaborative Systems*, Vol. 2, No. 3, 2010.
6. Pocatilu, P., Ciurea, C. and Doinea, M., 2010, "Security Evaluation in Collaborative M-Learning Systems," *Journal of Applied Quantitative Methods*, Vol. 5, No. 4, ISSN 1842–4562.
7. Qing, T. K., Yu-Lin, J. and Yueh-Min, H., 2010, "A Collaborative Mobile Virtual Campus System Based on Location-Based Dynamic Grouping," *2010 IEEE 10th International Conference on Advanced Learning Technologies (ICALT)*, pp. 16-18.
8. Tsekeridou, S., Tiropanis, T., Christou, I. T. and Vakilzadeh, H., 2008, "Toward Virtual Campuses: Collaborative Virtual Labs & Personalized Learning Services in a Real-Life Context," *WBE '08 Proceedings of the Seventh IASTED International Conference on Web-based Education*, pp. 87-92.

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