

# ENTREPRENEURSHIP EDUCATION OF IT-SPECIALISTS THROUGH DISTANCE LEARNING TECHNOLOGIES

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## ABSTRACT

*The methodology of the use of distance learning technologies in the system of entrepreneurship education will be efficient only if it includes: the objective and the desired result of the use; the principles behind the use; ways, technics, forms, methods and tools behind the use, printed and electronic materials describing the corresponding method, and the main principles of its structure: reasonability, understandability, accessibility, repeatability, and feasibility. The methodology of the use of distance learning technologies of training the Bachelors in Computer Science at the university, developed in the framework of the research, demonstrated its effectiveness, and it can be recommended for introduction in the teaching process of the mentioned category of students. The research findings can be used to roll out a support system for distance learning at the university; to introduce distance learning technologies into the educational process; to improve skills of trainers; to establish electronic training courses in the system of Moodle.*

**Keywords:** Entrepreneurship Education, Distance Learning, Learning Content Management System, Sharable Content Object Reference Model, Qualification.

**JEL Classifications:** M5, Q2.

## INTRODUCTION

The rapid growth of information and communication technologies (ICT) has an effect on almost all fields of human activity, among which education takes one of the leading places upon introduction of innovations based on a distance learning support system (DSS). The change of a paradigm of learning is connected to free access to information resources of most populations and the growth in the role of personality traits in the course of development of information-oriented society.

These days, the notion of online-learning (education through the Internet) has firmly integrated into the mind of modern students, while the Internet network has become an educational space, providing students with wider opportunities related to access to information resources and collaboration. The rapid growth is also observed in the innovative approaches of

education: distance learning, mobile learning, online learning, and combined (mixed, hybrid) learning.

The world's leading universities actively apply distance learning, which grounds on the use of modern DSS and distance learning technologies (DLT), and includes the establishment of maximum comfort conditions for gaining knowledge, skills, and capabilities by students, corresponding to the chosen professional.

The goal of the research is to give theoretical grounds and develop a methodology for the use of distance learning technologies in training of the Bachelors in Computer Science.

## **REVIEW OF PREVIOUS STUDIES**

The key task of application of LT at the university is the establishment of the most favorable conditions for getting basic and high education, skills advancement through the introduction of innovative information and communication and pedagogical technologies in the educational process.

One distinguishes five main organization-pedagogical conditions of innovative technologies application in the teaching process of the Institution of Higher Education (IHE):

- The establishment of the required conditions at the IHE for the innovative activity that will take place based on a specially developed innovative program (Allen & Seaman, 2017; Clark, 2020).
- The introduction of innovations should not limit the rights of the participants of a learning process and have a negative influence on their health and development (Tetiana et al., 2019).
- The educational personnel of the IHE should use the innovations in their professional activity (Drobyazko et al., 2019a; Drobyazko et al., 2019b).
- The participation of teachers in the innovative activity should be followed by motivation, and readiness to positive changes in teaching and educational process of the IHE (Seaman et al., 2018; Gustafson-Pearce & Grant, 2020).
- The relationship between teachers, students, and other personnel members of the IHE should ground on the principles of cooperation (Hilorme et al., 2019; Bezkorovaina et al., 2019; Harashchenko et al., 2019; Sabat et al., 2019).

The above-mentioned conditions can be put into practice through the development of the concept for the IHE activity in the area of distance learning (DL), which will be based on the gradual transition from the provision of educational services on specific disciplines to building the all-in-one distance learning courses and mixed learning in the area of training (specialty occupations) to the application of a meaningful distance learning based on current regulatory framework.

## **METHODOLOGY**

The following research methods were used: theoretical: the analysis of psychological and pedagogical, scientific and technical, and educational and methodical literature on the topic of the research; the study and generalization of a pedagogical experience of applying the DLT in the IHE; accumulation of the data regarding the teaching process and introduction of DLT in training of Bachelors in Computer Science; empirical: observation and survey methods, surveys, interviews with teachers and students, regarding the use of distance learning technologies; statistical processing of the pedagogical experiment data for analysis and interpretation of

obtained data; generalization and prognostic methods were used for production of conclusions, recommendations, and determination of directions of a further research activity.

## RESULTS AND DISCUSSIONS

The formation and growth of an individual are mostly influenced by the environment he lives, gets an education, and works in. That is why it is quite important and relevant for the IHE to create such high-tech information and communication educational-scientific space that will ensure enough comfort for a student during the entire period of learning in high technical school.

Thus, the introduction and the use of DLT in the IHE will promote the arrangement of the most favourable conditions for people who learn and get high education; the creation of preparation programs for entering the IHE; skills advancement of teachers, based on the introduction of innovative information-and-communication and psychological-and-pedagogical technologies of education; the intensification of a learning process; the activation of a cognitive activity of students and realization of their creative potential; and the increase in the role of self-guided and individual work.

The availability of special software and powerful tools for developing support systems for distance learning provides all the necessary conditions for setting an educational space at the IHE for distance learning (Figure 1).

The distance learning support system, as one of the most important components of this environment, must include the following subsystems: a user management subsystem, a testing subsystem, a subsystem for access to distance learning courses, a testing subsystem, a subsystem for accounting the results of educational activity of students, and a management subsystem of distance learning support system.

The target direction of distance learning is an information system that is sufficient enough to be used for training the participants of the educational process, set remotely from each other, upon specific disciplines through the indirect interaction in a specialized environment that operates based on psychological-pedagogical and information-communication technologies.

The distance learning support system should not only provide the students with access to learning materials but also ensure communication with a teacher so that he can consult him when it is needed, get a timely response, and communicate with other students, learning the same course.

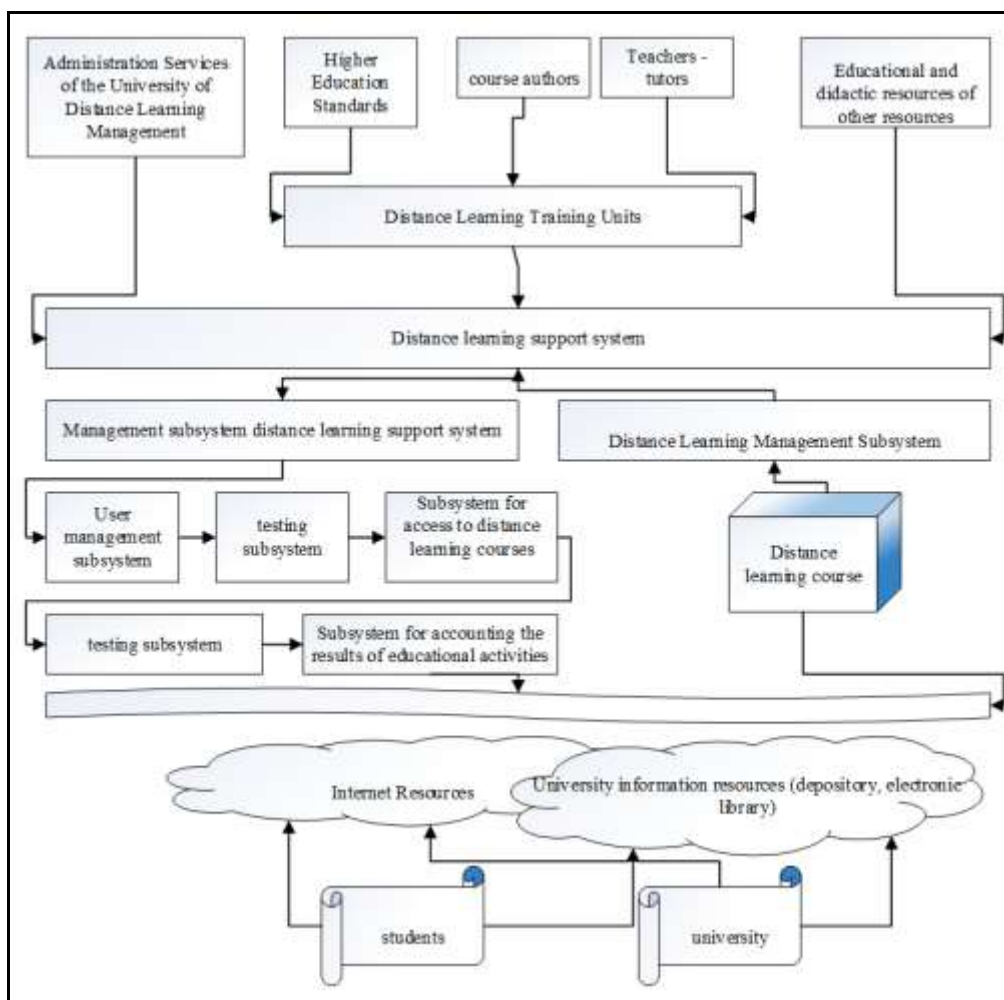
The efficiency of the use of DLSS is determined by the possibilities of input, editing, and composing of educational materials, including modern tools of multimedia and hypertext, the types of exercises and tests (multiple-choice, numeric answer, descriptive, etc.), user-friendly interface, etc.).

The software for support of distance learning is represented by both simple static HTML-pages and complex web-oriented systems like LMS, LCMS, SIS, and VLE (often marked by the abbreviation CMS), which are used in the corporate computer networks for teaching IT-companies and the IHE students.

CMS (Course and Content Management System) – these are systems that are used for deployment and support of a website. The systems of such a type are deployed, first of all, to ensure the communication of a big group of participants.

LMS (Learning Management Systems) – it is an education management system, which is the foundation for the educational process. It acts like infrastructure and a database, providing the possibility to get an operational evaluation of knowledge and skills of each individual employee and provide effective control upon the learning process of the organization. It includes

testing and reporting subsystems, which make it possible to evaluate and analyse the degree of professional suitability of employees and the effectiveness of the entire training process in the framework of the organization.



**FIGURE 1**  
**THE MODEL OF DISTANCE EDUCATIONAL ENVIRONMENT AT THE**  
**UNIVERSITY, BASED ON THE DISTANCE LEARNING SUPPORT SYSTEM**  
**(AUTHORING)**

LCMS (Learning Content Management System): It is a soft and hardware complex that is used for creation, preserving, processing, and delivery to a user of personalized content in the electronic form.

SIS (Student Information System): It is a software module for managing various types of student data. This module usually gives the possibility to manage the students' assessment journal, to plan the learning process using scheduling tools, track the attendance, generate various reports, and stay in touch with parents of students.

VLE (Virtual Learning Environments): It is a set of methodological and educational tools, the use of which is focused on the improvement of students' education level through the use of the Internet tools, which are engaged in the educational process. Its main components

include curriculum mapping, student attendance tracking, online teacher and students' support (e-mail, chats, web-publications), and the Internet links leading to external sources.

Table 1 demonstrates the short form of the grounds for the choice of either LMS or LCMS-decisions for the establishment of the distance learning environment at the university, based on the distance learning support system.

| <b>If you are concerned about. . .</b>   | <b>Then You . . .</b>   |
|--|---|
| Control of students' access to a list of educational courses, which have already been developed.                                   | Perhaps, you need only LMS  |
| Control of students' registration for a course, developed using your LCMS  | You can probably use the LMS functions of an existing LCMS, and you don't need to buy a separate LMS.     |
| The need to develop a lot of courses, using use the developed "learning tools" and the need to manage online and offline learning. | There is a need to use both LMS and LCMS for getting a system for managing copyright content and courses. |

Before the establishment of DLSS in the IHE, it is important to find out the requirements put to the tools of setting DLSS in the IHE. First of all, it is the problem related to the choice of a platform, that will house distance learning support system, and this choice depends on a range of factors: what are the requirements to the environment, what functional characteristics should be present, what type of a user it focuses on, and what the support system of the platform is.

Here are the main criteria for the choice of tools of DLSS of the IHE.

Support for SCORM and other standards. SCORM (Sharable Content Object Reference Model) is a special standard of multimedia materials for distance learning support systems (DLSS). It provides component compatibility and the possibility of their multiple usages. The usage of such a standard determines the structure of learning materials and interface of the environment of implementation, due to which the training objects can be used in various courses of DLSS.

SCORM describes this technical structure through the use of several main principles, specifications, standards, based on the activity of already existing specifications, and standards of distance learning.

Standard SCORM is an international ground for electronic courses exchange and the absence of its support in the system lowers the mobility of courses and does not provide the possibility to create movable courses.

The availability of the control system of students' training activity: It makes it possible to evaluate students' knowledge online. This system usually includes tools for creating tests, test tasks of various types, and control of students' activity within forums.

The ease of use: When creating the system, it is necessary to provide ease of use. It is an important criterion as the potential listeners will never start using a technology, which seems to be clunky or difficult in terms of navigation. The user interface should be intuitive. The training course should make it easy for a student to find the help menu, an easy shift from one section to another one, and the mode of synchronous and asynchronous communication with the teacher-tutor.

**Modularization:** The course of modern DLSS can manifest itself as a set of micro-modules or blocks of learning material, which can be used in other courses.

Another aspect of modularization is that the administrator of the course can engage various modules and blocks for managing the course:

- Block “*Search by features*” allows users to search the required messages within forums, using the queries for search, which can be used in different variations, depending on the needs of a user;
- Block “*Guidance*” is the main tool of education management in the framework of an electronic educational course;
- Block “*Calendar,*” showing all events, occurring in the framework of a specific course;
- Block “*Latest news,*” including the reference to the last news in the news forum of the course. The last news automatically update at the home page of the course, they show what happened on the course since the last visit of a user, including the new messages, notes about adding new members, etc.;
- Block “*Coming soon,*” including the news about the events, which are scheduled for the course soon;
- Block “*Last actions,*” reflecting the full report regarding the activity of users of the course during the last few days. The notifications in the block form automatically without hindrance from the side of a teacher of the course;
- Block “*Online*” shows names and pictures (if there are any) of the users, who entered the website of a system.

**Authorization:** The listenership should have unlimited access in terms of time and space to educational resources according to the access terms.

## **Multimediality**

The possibility to use not only text, hypertext, and graphic files in the role of content but also audio, video, gif- and flash animations, and 3D-graphics of various file formats.

**Scaling and expansibility.** The possibility of expanding the listenership at the course and electronic training courses.

**Platform development perspectives:** DLSS must become a tool, constantly growing based on new, advanced system versions, supporting new technologies, standards, and tools.

## **Cross-Platformness**

In an ideal scenario, the DLSS depends neither on the operating system nor the environment at both server and computer clients’ levels. Users should use standard system tools without downloading additional modules, software, etc.

**The quality of technical support:** The ability to support serviceability and stability of the DLSS, eliminate its errors and weaknesses through the involvement of both the specialists of the DLSS developer company and its own specialists.

The cost is another significant aspect influencing the choice of computer software for the establishment of DLSS. We will choose between the commercial and Open Source (free) computer software.

The advantages of commercial computer software are well-known: the majority of them are reliable products (especially if they appeared in the market), they have a proper level of user support, regulatory updates, and latest versions.

At the same time, there are some drawbacks. First of all, the source code is not accessible for technical support of the IHE, which makes it impossible for a user to make even slight changes. Moreover, the high cost of any commercial product, regular payments upon the license, and an increased number of users can be also regarded as disadvantages.

Another possible way is the implementation of DLSS based on Open Source decisions. The definitive advantages of such support reside in the fact that Open Source is the most natural variant for educational projects as its roots reside in the idea of collaboration, while the ideology itself provides the possibility to unite talents and experience of many teachers, students, and volunteer-programmers for the development and advancement of educational software products. Moreover, such educational software can act as a student-oriented tool as well as the grounds for a flexible and adaptable learning system.

A lack of users' confidence in the quality and reliability of programs and inattention to the accessibility standards, fear of piracy (when they can illegally misrepresent what they have created based on Open Source), and many other issues are among the main disadvantages of Open Source.

Despite the practical absence of what is called aggressive advertising, the network makes it possible to find sufficiently comprehensive Open Source rating tables, which reflect pedagogical philosophy, aspects of functionality, ease of use, technical reliability, the size of users' community, and predicted term of life of a specific project.

## **RECOMMENDATIONS**

The question of the transition of the IHE to free software is been frequently discussed nowadays in the user communities at both executive and legislative levels. The open-source software provides free access to the source code. Moreover, considering the increased control upon the purity the software usage at the IHE, the task of a shift to licensed software, which does not require significant financial investments and has sufficient functionality, becomes more urgent.

The process of informatization in the technical IHE has a certain specificity, compared to classical and humanitarian IHE: as a rule, the technical IHEs have a more sufficient material-and-technical base of informatization, the training of its students is carried out upon the directions and occupations, requiring a systematic use of the ICT, for the vocational training the senior students of computer branches work upon their occupation.

All those issues become the agent for higher requirements to DSS of the competencies of students and teachers of the technical IHE. The mentioned peculiarities require the implementation of innovative approaches to the organization of an educational process in the technical IHE as soon as possible.

## **CONCLUSIONS**

At present, the traditional higher education system does not fully meet the needs of students and requirements of the information society on the preparation of future professionals. The collaboration of students and teachers over the Internet and mobile technologies makes the educational process more effective not only in the framework of the university but beyond its territory as well. At the same time, it does not mean that one has to refuse from traditional forms of organization, methods, and learning, which are well-known to the public and, in some real pedagogical situations, are irreplaceable.

Here are the real ways to improve the quality of professional training in the system of higher education: the activation of educational-cognitive and scientific-research activity of students, revealing their creative potential, increase in the role of independent and individual work, the development and introduction of distance learning technologies in the educational process of universities, which are based on the organic combination of traditional and computer-oriented forms, methods, and tools of teaching.

The educational process that is carried out based on DLT includes the use of both psychological-pedagogical and information-communication technologies.

In the course of the use of the psychological-pedagogical technologies of DL, one observes a significant increase in the cognitive motivation of students, which is connected to the novelty effect, and an opportunity to use ICT to get independent personal study.

The use of information-communication technologies DL provides the possibility to overcome some of the issues of traditional education (the linkage to a specific territory, time slices, and insufficient independent activity of students), promotes the expansion of the listenership of the distance courses, makes it possible to please individual educational needs of students and realize their creative potential.

Based on the held analysis and personal experience of the author, one has determined a distance learning support system of the IHE as a multifunctional, modular, multimedia, hardware-in-the-loop complex for remote teaching of students, which was built with the use of network and web-technologies.

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