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QUALITY MANAGEMENT OF E-LEARNING IN INFORMATION TECHNOLOGY MANAGEMENT TRAINING

T.A. Makarchuk (a)*, V.F. Minakov (a), V.V. Trofimov (a), O.S. Lobanov (b),
S.A. Demchenko (a), M.I. Barabanova (a)
*Corresponding author

(a) Saint-Petersburg state university of economics, 21, Sadovaya Street, Saint Petersburg, Russian Federation, tmakarchuk@mail.ru, +79312079256
(b) *Saint*-Petersburg Mining University, 2, 21st line, Vasilevsky Ostrov, Saint-Petersburg, Russian Federation, thelobanoff@gmail.com

Abstract

The level of intellectual potential in the modern society is being measured by the content, quality and availability of education and how far it matches personal demands. Establishment of knowledge info-space is being realized through such educational technologies as, for example, e-Learning when implementing the basic educational programs at the higher school. The majority of universities use Learning Management System (LMS) for e-Learning performance. The researches on e-Learning are pointing out that heterogenic character of the approaches to e-Learning courses creation through the LMS, what, in turn, causes some difficulties for the e-Learning quality management. It is necessary to develop a common e-Learning design technology for the higher school based on the LMS given there is the drivers of digital society, e.g. mobile apps, cloud computing, analytic tools and others. The article describes a reference model for the e-Learning lifecycle. The authors are demonstrating the way how one can use SCRUM Methodology to design the e-Learning course as a part of the quality standard for e-Learning ISO/IEC 19796-1 "Information technology for learning, education and training". Moreover, the authors are addressing the process of e-Learning course design with the Moodle Cloud LMS on the Master's Program in Applied Computer Science in Economics and Management. The article aids the development of e-Learning quality assessment management under the digital transformation.

Keywords: Quality management of e-learning.

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1. Introduction

With a rapid formation and development of digital economy, there are new requirements to hi-tech industries (Minakov, Lobanov, Makarchuk, Minakova, & Leonova, 2017) which shape a need for e-Learning courses revision in the higher education regarding users' demand for qualitative and reliable information (Doychev, & Stoyanova-Doycheva, Stoyanov, & Ivanova, 2016). When implementing the higher education degree programs, the majority of educational institutions use Learning Management Systems (LMS) to organize e-Learning process aimed at increasing availability of competent educational services (Stevens & Kitchenham, 2011). Still, researches in the sphere of e-Learning designing with the LMS reveals heterogenic nature of this domain (Ruth & Kaspar, 2017) linked to a variety of proposed approaches. Such diverse methodology in e-Learning courses designing is determined by particular bodies of situational factors such as IT-infrastructure, didactic restrictions on certain academic courses and the range of interested people as well. Institutional aspects included into the national academic programs increase differences when choosing the e-learning technique (Buthelezi, 2018).

2. Problem Statement

Heterogeneity in management approaches to e-Learning based on the LMS platform puts a risk on e-Learning quality assessment. Improving common design methods for e-learning courses with LMS would leads to more efficient e-learning quality management in the Higher School and make e-learning more available for students (Kumar & Owston, 2016).

According to the 3rd Platform of IDC – International Data Corporation, world leading supplier of information and consulting services (http://www.idc.com) – core requirements for the e-Learning lifecycle model are dictated by the key strategies of IT-development against a backdrop of digital society: mobile and cloud technologies, big data analysis procedures and social media techniques.

3. Research Questions

The performance of e-Learning relies on examination of e-Courses design techniques with LMS including the problem of IT-infrastructure selection and efficiency of user applications support (Yélémou, Sia, Mbadjoin & Jaillet, 2016). By applying a cloud infrastructure, it is possible to provide the best available price package for educational institutions – particularly for tutors and students – to launch the LMS (Veera Manickam, Mohanapriya & Suraj, 2017). The quality of e-Learning course will benefit if it is available on mobile phones. Such mobile education puts no space or time obstacles for the learning process (Kraut, Vosloo & West, 2013) and allows creating a specific type of educational space favourable to communication and education (Yépez-Reyes, 2018). On-line course interface in the LMS should help the user of e-Learning to focus their attention rather on learning than on technologies (Liliyana, et al, 2017). The researches on student-LMS cooperation in each academic activity will assist in predicting the student's behavior to provide them with necessary support in time (Mothukuri, et al, 2017).

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4. Purpose of the Study

This study aims the problem of e-Learning lifecycle quality management on the LMS platforms under contemporary computerization strategies used in education, such as cloud computing, mobile apps, analytics and communication technologies.

Modelling the e-Learning lifecycle on the Moodle Cloud platform will assist in identifying strengths and weaknesses of the e-Learning course design technology as well as replicability of the results through the Moodle Cloud LMS.

5. Research Methods

The sphere of e-Learning quality management is mainly subjected to the following quality standards on e-Learning: ISO/IEC 19796-1 "Information technology for learning, education and training" and particularly to ISO/IEC 19796-1: 2005 "Information technology. Training, education and preparation. Quality management, ensuring quality and metrics. Part 1. General approach" and ISO/IEC 19796-3:2009 "Information technology. Training, education and preparation. Quality management, ensuring quality and metrics. Part 3. Reference methods and metrics".

In our observation, the e-course lifecycle model should be considered as a set of processes:

- Needs analysis for e-Learning course design
- Structural analysis of the course
- E-Learning course development plan
- E-Learning course design
- E-Learning course implementation
- E-Learning process
- Assessment of the course

The whole e-Learning lifecycle has involved Scrum Project Management, an agile development technique (Sutherland, 2014), to project, establish and implement the e-Learning course assessment. The Scrum methodology enables launching a high-quality e-Learning course in small design groups at minimum costs (Galván-Cruz, Mora & O'Connor, 2017).

As a Learning Management System we have employed the Moodle Cloud System (https://moodlecloud.com) accessible through the "Software as Serves" model (SaaS) under license from General Public License (GPU). The Moodle Cloud LMS has appeared to be the best option, which combines the means of open-source software available on a subscription basis (also in mobile version) for teachers and students. Alternatively, we have also analyzed such LMS-platforms as Blackboard LMS, Docebo LMS, eFont LMS, Litmos LM, Mirapolis, Moodle Cloud LMS and Fakel LMS that have been recognized by the Center of Learning Technologies and Performance Improvement as the best ones.

6. Findings

Saint-Petersburg State University of Economics (SPbSUE) relies on the Moodle 3KL LMS (de.unecon.ru) in its e-Learning implementation. The majority of academic courses delivered by the Department of Computer Science have been carried out with the Moodle LMS and posted on de.unecon.ru. Such application of the Moodle 3KL LMS does not replace on-campus education ("face-to-face" learning),

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but suggest an additional support through the AP automatization: academic content management, document management and learning management.

The first phase of e-Learning lifecycle model – needs analysis for the e-Learning course design – considers the following subprocesses: initialization, identification of interested parties, targeting and demand analysis – all of them are demonstrated in Table 1 by the example of the Master's Program in Applied Computer Science in Economics and Management at SPbSUE.

According to Table 01, the proposed e-Learning course is not aimed at gaining economic benefits directly, but rather regarded as an adequate tool for the master's program management and promotion.

The second stage of e-Learning lifecycle modelling studies the requirements imposed on on-line courses according to the basic educational programs and other reference documents.

The course of Applied Computer Science in Economics and Management has been built relying on the following standards:

- Federal State Education Standard of Higher Education in the Russian Federation on Applied Computer Science (Master's Degree)
- "IT-Manager" Occupational Standards provided by the Ministry of Labor and Social Security of the Russian Federation
- Competence Requirements to Chief Information Officer (CIO) for Information Process, System and Service Management.

Table 01. Needs analysis for e-Learning course design: Master's Program in Applied Computer Science in Economics and Management at SPbSUE

Subprocess	**Subprocess Description**
Initialization	Head of the Master's Program in Applied Computer Science in Economics and Management
Identification of Interested Parties	Master's Thesis Advisors Master's Degree Students External Partners (employers, partner universities, etc.) Third Parties (applicants, undergraduate trainees, etc.)
Targeting	Learning Management: - Academic Content Management - Communication Management - Performance Analysis - Document Management - Master's Program Promotion
Demand Analysis	Master's Degree Students – 50 % Master's Program Manager – 20 % Master's Thesis Advisors – 15% Third Parties –10 % External Partners – 5 %

As it has been suggested, the structure of Applied Computer Science in Economics and Management are divided on "Sections" which, in turn, should be entitled as "News", "Information", "Academic Modules", "Research Activities", "Practices" and "Program's Achievements".

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The third phase of the e-Learning lifecycle – development plan – remains conceptual and can be implemented through the SCRUM with such advantages as: interactivity, risk minimisation, design transparency, focus on end-users, close communication between the participants and effective teamwork (Faniran, Badru & Ajayi, 2017).

The development project on Applied Computer Science in Economics and Management in the Moodle Cloud LMS has been actualized given there is basics of SCRUM. According to this adaptable methodology, the project should be performed by such participants as project owners, scrum masters and development teams – each of them, in turn, with its pragmatics, e.g. consultancy, coordination or execution, relatively.

Thus, the product owners are represented by the Master's Program Teachers, scrum masters – by the Master's Program Manager, development teams – by the Master's Degree students of Applied Computer Science in Economics and Management. The project's task list (sprints) has been set for a particular period of time, most commonly, for one or two weeks. In the context of this project, the sprint has been limited within one week, which is reasonable for the teacher – student activity management. Each next sprint should be followed by specifically set requirements, targets, challenges and results to achieve. Basing on the analysis of one-period findings, the team has either carried out a correcting interaction, or another sprint.

During the development plan stage, a great attention has been focused on tools selection – on the education management platform. The main criteria for choosing the LMS platform in terms of digital economy can be:

- Maintaining mobile education as one of the most demanded forms of e-Learning implementation available in space and time.
- Access to the SaaS Model Application.
- E-Learning data analytics, including KPI (key performance indicators) and performance management.

In Saint-Petersburg State University of Economics, an additional criterion for the LMS platform is open source software.

To design the learning course on Applied Computer Science in Economics and Management, we have taken the Moodle Cloud LMS as the most popular with the e-Learning platforms available on SaaS and under license from General Public License (GPU). According to GPU's license on January 2017, the Moodle Cloud LMS has been able to register 50 users and available with 200 MB of free space – both of which, in turn, can be extended owing to "personal clouds" (Makarchuk, 2017). This platform may include an unlimited number of courses and, moreover, it can be altered in a mobile version.

The next stage of e-Learning lifecycle modelling – e-Learning course design – has resulted in a final product, i.e., thus, in Applied Computer Science in Economics and Management course. At this stage, a special emphasis has been put on the user interface settings. When designing any e-Learning space, it is worth regarding that users from different cultures may have their own expectations of the LMS interface. Restricting the web-platform's design settings can challenge the user – interface interaction (Bournel-bosson & Kostov, 2018). The Moodle Cloud LMS's user interface customization can flow differently, depending on the role performed by the users, i.e. guest, student, assistant, course designer and

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administrator. In this project the user interface has been set for each of these roles separately from PCs, laptops or mobile phones.

The e-Learning design stage has been accompanied by the subprocesses included I Table 02.

Table 02. Example of e-Learning course design made on the Master's Program in Applied Computer Science in Economics and Management at SPbSUE

Subprocess	Subprocess Description
Content Implementation	Master's Program Teachers (process users): academic content development under a unified framework
Project implementation	Teacher – Project Manager (scrum-master) Students of the Master's Program in Applied Computer Science in Economics and Management (SPbSUE) (agents)
Space Implementation	Moodle Cloud LMS
Technical implementation	Students of the Master's Program in Applied Computer Science in Economics and Management (SPbSUE) (agents) basing on the one-week sprints posted in the Moodle Cloud LMS
Support	Provided throughout this and next stages by the development team

Intermediary results on the e-Education quality assessment for Applied Computer Science in Economics and Management (SPbSUE) modelled on the e-Learning lifecycle have shown a 15% increase in the number of participants due to added guest access; content modification time has been reduced by 40% according to the data from Moodle 3K UNECON and Moodle Cloud LMS.

7. Conclusion

The suggested e-Learning lifecycle model based on ISO/IEC 19796-1:2005 (GOST R 53723-2009) "Information technology. Training, education and preparation. Quality management, ensuring quality and metrics. Part 1. General approach" and ISO/IEC 19796-3:2009 (GOST R 54837-2011) "Information technology. Training, education and preparation. Quality management, ensuring quality and metrics. Part 3. Reference methods and metrics" and examined through the electronic Master's Program in Applied Computer Science in Economics and Management (SPbSUE) with the application of SCRUM and Moodle Cloud LMS available under the SaaS Model and GPU's license enriches the studies on the learning courses design in the LMS. The intermediary results of the academic course building modelled on the e-Learning lifecycle have indicated improvement in the quality of teaching.

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