



INTERNATIONAL CONFERENCE INFORMATION AND COMMUNICATION TECHNOLOGIES IN BUSINESS AND EDUCATION



CONFERENCE PROCEEDINGS



Publishing house "Science and economics"
University of Economics - Varna

International Conference
INFORMATION AND COMMUNICATION
TECHNOLOGIES IN
BUSINESS AND EDUCATION

Conference proceedings

**INFORMATION AND COMMUNICATION
TECHNOLOGIES IN
BUSINESS AND EDUCATION**

**Proceedings of the International Conference
dedicated to the
50th anniversary
of the Department of Informatics**

2019

University publishing house “Science and economics”
University of Economics – Varna

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Permission for use must always be obtained from University publishing house “Science and economics”. Please contact izdatel@ue-varna.bg

Published reports have not been edited or adjusted. The authors are solely responsible for the content, originality and errors of their own fault.

With the support of ADASTRA, 411 Marketing Business Services.

© University publishing house “Science and economics”,
University of Economics – Varna, 2019.

ISBN 978-954-21-1004-0

PROGRAMME COMMITTEE

Abdel-Badeeh M. Salem, Egypt

Aijaz A. Shaikh, Finland

Aleksandar Dimov, Bulgaria

Alexander Feldman, USA

Alexander Sergeev, Russia

Antoanela Naaji, Romania

Avram Eskenazi, Bulgaria

Dariusz Mrozek, Poland

Dimitrina Polimirova, Bulgaria

Dmitriy Berg, Russia

Elena Nechita, Romania

Emil Denchev, Bulgaria

Georgi Dimitrov, Bulgaria

Ivan Popchev, Bulgaria

Jeanne Schreurs, Belgium

Julian Vasilev, Bulgaria

Kameliya Stefanova, Bulgaria

Krasimir Shishmanov, Bulgaria

Maciej Czaplewski, Poland

Maciej Pondel, Poland

Maksim Medvedev, Russia

Maria Hristova, Bulgaria

Marian Cristescu, Romania

Marina Medvedeva, Russia

Michael Voskoglou, Greece

Nadezhda Filipova, Bulgaria

Nikola Nikolov, Ireland

Niv Ahituv, Israel

Pavel Petrov, Bulgaria

Rami Malkawi, Jordan

Sara Paiva, Portugal

Silvia Parusheva, Bulgaria

Snezhana Sulova, Bulgaria

Todorka Atanasova, Bulgaria

Valentin Kisimov, Bulgaria
Valery Trofimov, Russia
Veselin Popov, Bulgaria
Violeta Kraeva, Bulgaria
Vladimir Sulov, Bulgaria
Vladimir Zanev, USA
Zdzislaw Polkowski, Poland

ORGANIZING COMMITTEE

Chairman: Prof. Vladimir Sulov, PhD

Members:

Prof. Avram Eskenazi, PhD
Prof. Julian Vasilev, PhD
Assoc. Prof. Todorka Atanasova, PhD
Assoc. Prof. Silvia Parusheva, PhD
Assoc. Prof. Snezhana Sulova, PhD
Assoc. Prof. Pavel Petrov, PhD

Secretary: Tijen Talib

FOREWORD

These proceedings contain the papers of the International Conference “Information and Communication Technologies in Business and Education” which took place at the University of Economics – Varna, Bulgaria, 18 October 2019.

The international scientific conference is dedicated to the **50th anniversary of the Department of Informatics at the University of Economics – Varna**. The conference is also dedicated to the 100th anniversary of the University. The included papers describe recent scientific and practical developments in the field of information and communication technologies, information systems, and their applications in business and education.

The papers in the Proceedings are peer reviewed and are checked for plagiarism.

C O N T E N T S

1. Kamelia Stefanova, Dorina Kabakchieva Challenges and Perspectives of Digital Transformation	13
2. Julian Vasilev, Marian Cristescu Approaches for information sharing from manufacturing logistics with downstream supply chain partners	24
3. Abdel-Badeeh M. Salem Computational Intelligence in Smart Education and Learning	30
4. Marian Niedźwiedziński Proposal of the Multi-aspect Analysis of ICT's Needs in Management	41
5. Krasimir Shishmanov Digital Transformation in Bulgaria	52
6. Tatyana Makarchuk, Valery Trofimov, Svetlana Demchenko Modeling the life cycle of e-learning course using Moodle Cloud LMS	62
7. Vanya Lazarova Exploring the functionality of Bulgaria eGovernment site	72
8. Veselin Popov, Petya Emilova Big data and information security	83
9. Luben Boyanov Approaches for enhancing digitalization and digital transformation in supply chain management	91

10. Monika Tsaneva	
Challenges of GDPR compliance in consumer financing companies	103
11. Todorka Atanasova	
Main factors influencing digitization in construction companies	116
12. Silvia Parusheva	
Digitalization and digital transformation in construction – benefits and challenges	126
13. Snezhana Sulova	
The Usage of Data Lake for Business Intelligence Data Analysis	135
14. Pavel Petrov	
Web security technologies used in banks of Estonia, Latvia and Lithuania	145
15. Tanka Milkova	
ABC analysis of inventory in MS Excel	155
16. Ivan Kuyumdzhev, Radka Nacheva	
Choosing Storage Devices with Consideration of Backup and Restore Performance in MS SQL SERVER	166
17. Yanka Aleksandrova	
Predicting Students Performance in Moodle Platforms Using Machine Learning Algorithms	177
18. Latinka Todoranova, Bonimir Penchev	
M-learning Applications	188
19. Boris Bankov	
The Impact of Social Media on Video Game Communities and the Gaming Industry	198

20. Velina Koleva, Svetoslav Ivanov	
Social media and the recruitment of IT professionals in Bulgarian IT companies	209
21. Deyan Mihaylov	
Modeling and Simulation of Some Functions of Two Independent Random Variables	225
22. Oumar Sy	
Using Association Rules as Semantics for Domain Ontologies	233
23. Ina Stanoeva	
Social media possibilities for improving arts marketing performance	247
24. Iskren Tairov, Vladislav Vasilev	
Perspectives on mobile devices adoption in healthcare sector	257
25. Angelin Lalev	
Deep Neural Networks for Detection of Credit Card Fraud	263
26. Miglena Stoyanova	
Priorities for Digital Transformation in Property Management	275
27. Mihail Radev	
Organizational Variants of IT Department at the University	284
28. Mariya Armyanova	
IoT problems and design patterns which are appropriate to solve them	291
29. Yavor Christov	
Corporate Big Data and Hybrid Integration Platforms	306

30. Ivan Belev	
Making financial data readable using Inline XBRL	314
31. Ivan Belev	
eXtensible Business Reporting Language (XBRL) – a technical overview	322
32. Anna Sobczak	
Entrepreneurship in the education of university students	331
33. Mihaela Markova	
E-commerce in the process of digital transformation: preparedness, requirements and technological tendencies	343
34. Petya Petrova	
Basic Soft Computing Methods In User Profile Modeling	353
35. Petar Dimitrov	
Methods for storing authentication data – a historical review	369
36. Svetoslav Ivanov	
Development stages of starting software company, problems and approaches for software development	382
37. Antonio Hadzhikolev	
The role of the smart city concept in the process of urban transformation	397
38. Oumar Sy	
Ontology-based materialized views for reverse engineering: Toward a set of conceptual guidelines	410

MODELING THE LIFE CYCLE OF E-LEARNING COURSE USING MOODLE CLOUD LMS

Tatyana Makarchuk¹, Valery Trofimov², Svetlana Demchenko³
¹ Saint-Petersburg state university of economics, Saint-Petersburg,
Russia, tmakarchuk@mail.ru
² Saint-Petersburg state university of economics, Saint-Petersburg,
Russia, twv@mail.ru
³ Saint-Petersburg state university of economics, Saint-Petersburg,
Russia, shh-svetlana@yandex.ru

Abstract

Many higher education institutions use Learning Management Systems (LMS) for e-learning. E-learning research shows the heterogeneity of approaches to creating an e-learning resource using LMS, which causes difficulties in assessing the quality of e-learning. There is a need to develop common e-learning course design technology using LMS for high school with considering trends in the development of digital society, such as mobile application, cloud computing, analytics tools and others. The article shows how you can use Scrum methodology for e-learning course development with Moodle Cloud LMS based on quality standard for e-learning ISO/IEC 19796-1 “Information technology for learning, education and training”, in particular, 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”. The authors describe the processes of creating e-learning course “Applied Informatics in Economics and Management” for masters with Moodle Cloud LMS.

Keywords: *e-Learning, cloud computing, Scrum-methodology.*

INTRODUCTION

With the rapid formation and development of the digital economy new requirements for employees of high-tech industries appears (Makarchuk, et al, 2017). These requirements determine the need for processing e-learning course in high school, taking into account the needs of users in obtaining high-quality and reliable information (Doychev, et al, 2016).

Many educational institutions with higher education programs use Learning Management Systems (LMS) for the organization of e-learning for increasing the availability of quality educational services (Stevens and Kitchenham, 2011).

Differences in the design of e-learning training courses are determined by aggregations of situational factors, such as IT infrastructure, didactic restrictions for training programs, a circle of interested persons. The heterogeneity of approaches to the organization of e-learning on the LMS platform causes difficulties in assessing the quality of e-learning. Improving the unified design methods of e-learning course with LMS will increase efficiency of quality management of e-learning in high school and reduce student barriers e-learning accessibility (Kumar and Owston, 2016.).

According to the concept of the third platform of the company IDC (<http://www.idc.com>), the world's leading provider of information and advisory services, and Information Technology development trends in 2013-2016 Gartner Inc. (<http://www.gartner.com/>), the basic requirements for the designing of e-learning's training course is determined by key strategies for the development of information technology in a digital society: mobile and cloud technologies, big data analysis methods and social networking technology. Special care when choosing technology for designing electronic courses with LMS need to pay to IT infrastructure and its effectiveness in supporting custom applications (Yélémou, et al, 2016). Using cloud infrastructure provides optimal affordable pricing package for educational organizations, in particular for coaches and students, for LMS launch (Veermanickam and Mohanapriya, 2016). Quality of e-learning course wins if it is accessible from mobile devices. Mobile learning has no limits in space and time (Kraut, 2013) and allows you to create special type of educational space conducive to communication and learning (Yépez-Reyes, V., 2018). Interface of on-line course in LMS in LMS should help e-learning participant to focus on learning, not on technology (Liliyana, et al, 2017). Analyzes student interactions with the learning management system during each learning activity will help predict student behavior so that provide the necessary support in a timely manner (Mothukuri, et al, 2017).

Project management at different stages of the e-learning course life cycle improves the quality of the e-learning course with the current trends: smart education, cloud computing, mobile apps, analytics, communication technologies.

1. MODEL OF THE LIFE CYCLE OF THE E-LEARNING COURSE

The main documents in the field of quality management of e-learning are quality standard for e-learning ISO/IEC 19796-1 “Information technology for learning, education and training”, in particular, ISO/IEC 19796-1 “Information technology for learning, education and training”, in particular, 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”.

The authors of the article consider the model of the life cycle of the e-learning course as a set of processes:

- Analysis of the need to design an e-learning course.
- Analysis of the structure of the e-learning course.
- Project development of the e-learning course.
- Development of the e-learning course.
- Implement the e-learning course.
- E-learning process.
- Evaluation of the e-learning course.

Throughout the entire life cycle of e-learning a flexible methodology Scrum Project Management has been applied for design, development, implementation and evaluation of e-learning course. Scrum methodology allows you to develop e-learning course of high quality in small groups of developers with minimal costs (Galván-Cruz, et al, 2017).

Moodle Cloud LMS (<https://moodlecloud.com>) was used as a Learning Management System, which is accessed by the model “Software as service” (SaaS) under the General Public License (GPU). Moodle Cloud LMS turned out to be the best alternative that combines the possibilities of open-source software available by subscription, accessi-

ble from student and teacher mobile devices As LMS alternatives were considered the best LMS platforms according to the Center learning technologies and improving productivity (Hart, 2016):

- Blackboard LMS;
- Docebo LMS;
- eFont LMS;
- Litmos LMS;
- Mirapolis;
- Moodle Cloud LNS;
- Torch LMS.

Building an e-learning life cycle model on the platform Moodle Cloud will help identify the strengths and weaknesses of this technology and the possibility of replicating the results of further work in the environment of e-learning.

2. DEVELOPING THE E-LEARNING COURSE WITH MOODLE CLOUD LMS

At St. Petersburg State University of Economics (UNECON) uses Moodle 3KL learning management system (de.unecon.ru) for implementation of e-learning. Most of the training courses offered at Department of Informatics, made in LMS Moodle and presented on the portal de.unecon.ru. Using the Moodle 3KL Learning Management System does not replace face-to-face full-time training and offers additional support of applied processes: management of educational content, document management, learning management.

At the first stage of the e-learning course life cycle model “Analysis of the need to design an e-learning course” were considered subprocesses: initiation, stakeholder identification, target setting and demand analysis, presented in Table 1 on the example of the organization of training master program “Applied Informatics in Economics and Management” UNECON.

Table 1

**Analysis of the need to design the e-learning course
“Applied Informatics in Economics and Management” UNECON**

№	Subprocess	Subprocess description
1	Initialization	The head of the master's program “Applied informatics in economics and management”
2	Stakeholders identification	Supervisors of Undergraduates Undergraduates External partners (employers, partner universities, etc.) Third-party students (applicants, student interns and etc.)
3	Goals Definition	Learning Management: - management of educational content - communications management - activity analysis - document management Promotion of the master's program
4	Demand analysis	Undergraduates – 50 % The head of the master's program – 20 % Supervisors of Undergraduates – 15% Third-party students –10 % External partners – 5 %

According to Table 1, the proposed e-learning course for as a goal, it does not directly involve economic benefits, but regarded as an effective tool for managing Master’s program and its popularization.

At the second stage of the e-learning course life cycle model «Analysis of the structure of the e-learning course», the requirements for an on-line course are studied according to the main educational program and other regulatory documents.

For the training course "Applied Informatics in Economics and Management" the course structure was created according to the following standards:

1. Federal State Educational Standard of Higher Education in Russian Federation Applied Informatics (Master's level);

2. Professional standard of the Ministry of Labor and Social Protection of the Russian Federation “Information Technology Manager”;

3. Chief Information Officer (C.I.O) Competency Requirements for Management information processes, systems and services.

In the structure of the course “Applied Informatics in Economics and Management” was proposed “By section” structure and the sections of the course were created: “News”, “Informational”, “Training modules”, “Scientific activity”, “Practices”, “Achievements of the program”.

The third stage of the e-learning course life cycle model “Project development of the e-learning course” is conceptual and can be implemented with using the flexible SCRUM methodology, the advantages of which are: iteration, minimization of risks, transparency of development, focus on end user, tight communication of project participants and their effective interaction (Faniran, et al, 2017.).

The project for the development of the training course “Applied Informatics in Economics and management” in LMS Moodle Cloud has been implemented in accordance with the main provisions of the SCRUM. According to this flexible methodology the following roles were approved: product owner, scrum master, development team, for each of which are defined relevant activities of roles: consulting, coordination, execution of works. As product owners were lecturers (professors and supervisors of undergraduates), as a scrum master was the head of the master's program. Development team was consisting of undergraduates “Applied Informatics in Economics and management”. Task list (sprints) was formed for a certain period, as a rule, constituting one to two weeks. In the framework of the project in question, the sprint was determined by weekly range, which is appropriate for the organization of the work of the teacher-student. Before each sprint for the future period determined the requirements, goals, objectives and the result to be obtained. Based on the analysis of the results for the period the team carried out either an iteration with the correction of defects, or execution next sprint.

At the stage “Project development of the e-learning course” special attention was paid to tool selection - learning management platform. Main criteria for choosing an LMS platform in a digital economy can be considered:

- support of mobile learning as one of the most popular forms the implementation of e-learning, available in time and space;
- access to the application on the SaaS model “application as a service”;
- the ability to view and edit content in various formats, including text, audio, video;
- supporting of various forms of social communication;
- data analytics in e-learning, incl. KPI Methodology Support (key performance indicators) and Performance Management.

At St. Petersburg State University of Economics an additional criterion of choice of the LMS platform is software with open source code.

To develop the training course “Applied Informatics in Economics and management” was chosen LMS Moodle Cloud, as the most popular among e-learning platforms available on the SaaS model and distributed under the General Public License (GPU). As of January 2017, according to GPU LMS Moodle Cloud license provides the ability to register 50 users and allocated 200 MB of free space, which can be increased using “personal clouds” (Makarchuk, 2017). On platform can accommodate an unlimited number of courses, there is supporting of mobile version.

At the stage of the e-learning course life cycle model “Development of the e-learning course”, the result is the finished product, in the project considered in the article - training course “Applied Informatics in Economics and Management”. At the development stage of the e-learning course, special attention was paid to user interface. When designing a digital educational environment, it is important to keep in mind that users from different cultures may have different expectations when interacting with the LMS interface. Limitation of functionality in Web platform design settings can complicate the interaction between LMS user and user interface (Bournel-Bosson and Kostov, 2018). In LMS Moodle Cloud user interface settings can have a different view for users with different roles on the site - guest, student, assistant, course developer and administrator. In this project the user interface was configured separately for users of each role with desktops or laptops and mobile users.

The subprocesses of the development stage of the e-learning course are presented in Table 2.

**Description of the process “Development of e-learning course”
on the example of a training course for undergraduates
“Applied Informatics in Economics and Management”**

№	Subprocess	Subprocess description
1	Content implementation	Master program lecturers (process owners): development of course content within a single structure
2	Project implementation	Lecturer – Project manager (SCRUM master) Undergraduates of the program "Applied Informatics" in economics and management", UNECON (performers)
3	Media implementation	LMS Moodle Cloud
4	Technical implementation	Undergraduates of the program "Applied Informatics" in economics and management", UNECON (performers) based on the tasks of weekly sprints in the environment LMS Moodle Cloud
5	Maintenance	It was carried out throughout this and subsequent stages by the development team

Intermediate results of E-Learning Quality Assessment Master's program “Applied Informatics in Economics and Management” (UNECON) on the model of the life cycle of e-learning showed an increase in the number 15% of students of the training course by adding guest access, time content editing reduced by 40% according to data in LMS Moodle 3K systems UNECON and Moodle Cloud LMS.

CONCLUSION

The proposed model of the life cycle of e-learning is based on International Standards ISO/IEC 19796-1 “Information technology for learning, education and training”, 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. Refer-

ence methods and metrics” on the example of e-learning of the master's program “Applied Informatics in Economics and Management”, UNECON with using a flexible SCRUM design methodology and learning management platform Moodle Cloud, available on the SaaS model and the GPU license, contributes to development of the theory in the field of research development of training courses in the system LMS. Intermediate results of building a training course on the model of the life cycle of e-learning has shown improving the quality of learning.

REFERENCES

1. BOURNEL-BOSSON, C.-Y. and KOSTOV, J. (2018) Inspiring self-confidence in French for academic purposes through the use of Moodle. *Recherche et Pratiques Pedagogiques en Langues de Specialit.* 37 (1).
2. DOYCHEV, E. et al (2016). *Agent-Based Support of a Virtual eLearning Space*. International Conference on Computational Collective Intelligence, ICCCI 2016: Halkidiki; Greece. pp.35-44.
3. FANIRAN, V.T. et al (2017). *Adopting Scrum as an Agile approach in distributed software development: A review of literature*. 1st International Conference on Next Generation Computing Applications, NextComp 2017: Mauritius; Mauritius. pp. 36-40
4. GALVÁN-CRUZ, S. et al (2017) *A Means-ends design of SCRUM+: An agile-disciplined balanced SCRUM enhanced with the ISO/IEC 29110 Standard*. 6th International Conference on Software Process Improvement: Zacatecas, Mexico. pp.13-23.
5. HART, J. (2016) *Modern Workplace Learning. Centre for Learning & Performants*. Technologies Publishers, USA.
6. KRAUT, R. et al (2013) *Mobile learning for teachers: Global themes*. UNESCO Publishers, Paris, France.
7. KUMAR, K. and OWSTON, R. (2016) Evaluating e-learning accessibility by automated and student-centered methods. *Journal of educational technology research and development*. 64(2). pp. 263-283.
8. LILYANA, F.N. et al (2017) *Techno MOOC development of the basis of remote lab access*. International Conference "Quality Management, Transport and Information Security, Information Technologies". St. Petersburg, Russian Federation. pp. 680-684.

9. MAKARCHUK, T. (2017) *Mobile learning on the basis of the cloud services*. International conference on e-learning, EL 2017. Lisbon, Portugal. pp. 175-178.
10. MAKARCHUK, T. A., MINAKOV, V. F., TROFIMOV, V.V. et al (2018) Quality management of e-learning in information technology management training. International conference on research paradigms transformation in social sciences: Irkutsk, Russia. pp. 742-748.
11. MOTHUKURI, U.K. et al (2017). *Improvisation of learning experience using learning analytics in eLearning*. 5th National Conference on E-Learning and E-Learning Technologies.
12. RUTH, M. and KASPAR, K. (2017). The E-Learning Setting Circle: First Steps Toward Theory Development in E-Learning Research. *Electronic Journal of e-Learning* (EJEL). 15(1). pp. 94 - 103.
13. STEVENS, D. and KITCHENHAM, A. (2011). *An analysis of mobile learning in education, business and medicine*. IGI Global Publishers, Hershey, USA.
14. VEERAMANICKAM, M.R.M. and MOHANAPRIYA, M. (2016) *Research paper on E-Learning application design features: Using cloud computing & software engineering approach*. International Conference on Information Communication and Embedded Systems, ICICES 2016: Chennai, Tamilnadu, India.
15. YÉLÉMOU, T. et al (2016). *Eliminate the delay backlog in the conduct of pedagogical activities by distance learning*. 8th International Conference on e-Infrastructure and e-Services for Developing Countries, AFRICOMM 2016: Ouagadougou, Burkina Faso. pp. 273-277.
16. YÉPEZ-REYES, V. (2018). *Mobile learning: Challenging the current educational model of communication studies*. Journal of Advances in Intelligent Systems and Computing. 721. pp. 1014-1021.