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Towards E-Learning Capability Maturity Model

Ludmila Penicina, *Riga Technical University*

***Abstract* – In the software development Capability Maturity Model (CMM) is a methodology for constantly optimizing organization's software development processes in order to meet project deadlines and customers' satisfaction in more efficient way. Nowadays e-learning becomes a valuable business tool not only for reducing costs and improving employees' competences in specific business areas but also for creating considerable Return on Investment (ROI) for the businesses. More and more companies choose an e-learning environment over classic classroom learning. When more companies are implementing e-learning it is time to create a common workplace e-learning CMM which defines the framework and best practices for e-learning business processes that can be used as standard and guidelines for companies which are starting e-learning projects as well as companies practicing e-learning. The paper proposes e-learning implementation and maintenance business processes incorporated in the classic PDCA cycle consisting of four e-learning project phases – e-learning project planning, e-learning system implementation, e-learning monitoring and e-learning optimization.**

***Keywords* – E-learning implementation methodology, E-learning business processes, CMM.**

I. Introduction

Nowadays e-learning becomes a valuable component of educational system – in the academic environments e-learning is put into practice providing the faculty with different teaching tools and techniques as well as applications for learning process management, students with learning resources and communication platform and the administration with reports, marketing platform for attracting new students, etc. In the academic environment it is possible to define clear advantages of e-learning in addition to classical form of studies; however the issue of workplace e-learning necessity and advantages has been raised repeatedly. In the business environment every investment has to be justified by creating measurable ROI, meaning that e-learning has to be seen not only as a platform for educating the employees (which can produce ROI in the long term), but also as the platform for improving the productivity, knowledge exchange between employees in different locations, communication with clients in different locations and instrument for saving organizational resources and gaining profit.

E-learning implementation is a continuous and constant process of jointly developing three main components of e-learning environment: the content, the services and the technology. Building e-learning environment is not only about implementing a technical solution, e-learning has to provide the learner with qualitative content and services, support the learning process lifecycle and provide the platform for assessment as well as communication between students and teachers. E-learning implementation requires adoption of new business processes, procedures, business rules and standards that need to be integrated in the existing organizational ecosystem. Without integration within existing organizational business processes and IT infrastructure implemented e-learning system can even incur financial losses [1]. The implementation of the workplace e-learning environment fundamentally changes the existing organizational methodology for employee's professional education since it provides a new system how learning content is delivered, how learning process is organized, how assessment is performed and how communication between a teacher and a student takes place. E-learning environment shifts learning process priorities – from accessibility of the teacher to student's control of the learning process – the student decides when to get in touch with the teacher and when to use learning materials. Without doubt every e-learning environment alters the way a teacher has to organize and perform his/her work and it is an essential part of e-learning CMM, but as stated earlier the e-learning environment puts students' priorities first.

There exists a number of workplace e-learning implementation success stories, e.g., Cisco Systems, Inc. – an analysis of expenditures on e-learning for employee development at Cisco in 2003 showed that every dollar spent on e-learning yielded 16 dollars in earnings contributions [1]. Cisco explains that such results are achieved due to constant e-learning process improvement and developing of best practices [1]. This positive finding has encouraged the author to look towards a possibility of creating a common methodology for defining the organizational CMM.

This article addresses the issue of e-learning application in the business environment and offers a framework towards workplace e-learning implementation methodology and development of organizational e-learning Capability Maturity Model (CMM).

II. Towards the Workplace E-Learning Processes Benchmarks

The best practice in the software engineering establishes benchmarking approach – the way for an organization to constantly improve the quality of information system development process lifecycle [2]. E-learning implementation in both academic and business environments is a complicated project incorporating organizational, administrative, learning and technological processes [3]. Potential benefits organization can obtain from an e-learning project besides improving employees competence level in certain areas also include enhancement of employees' productivity, saving up material resources of an organization, opening new communication channels with employees and clients in different geographical locations and enabling knowledge flow [1]. However, to achieve all the described objectives of the e-

learning organization requires a methodology of e-learning implementation describing methods, tools, standards and guidelines for reengineering existing business processes as well as integrating new e-learning processes in the as-is infrastructure according to the e-learning system requirements. At the moment there is no united de-facto methodology for e-learning implementation in the business environment. From the author experience very often e-learning project is approached just as another information system project neglecting other perspectives of e-learning, such as services, content, motivation, learning and assessment processes, etc.

If an organization is considering implementing an e-learning environment, it must weigh the possibility of setting up a group of people responsible for e-learning implementing and maintenance activities. This group of organization's employees – called the e-learning steering committee – must consist of organization's management, professionals and experts [5]. The e-learning steering committee will be responsible for all workplace e-learning activities, e-learning strategy development and maintenance.

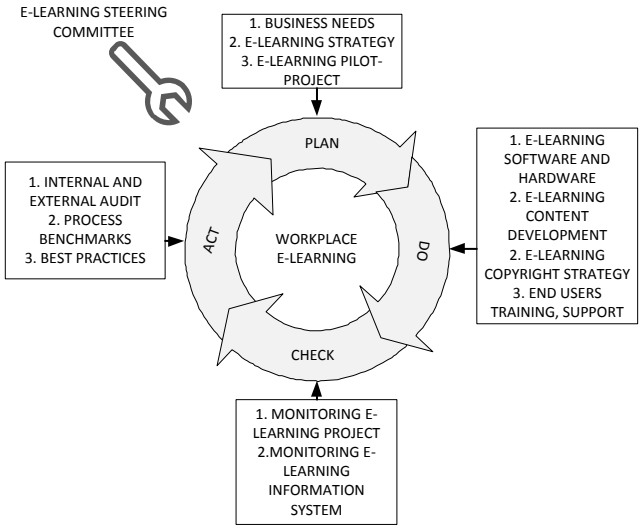

Fig.1. E-learning implementation cycle

A. PLAN Phase of Workplace E-learning

Potentially the planning phase of organization's e-learning environment consists of the following processes:

1. Feasibility analysis of the e-learning environment needs and requirements – process which defines business objectives of the e-learning environment as well as functional and non-functional requirements of the e-learning management system, the updates required to the existing organizational IT infrastructure, project stakeholders and the overall organization readiness for implementing e-learning;

2. Development of the e-learning strategy [4] – based on the results of the feasibility analysis of the e-learning environment, organization defines its e-learning strategy establishing the means for achieving business objectives of the e-learning as well as determining e-learning methods and guidelines for developing e-learning content;

3. Development of the e-learning pilot-project – based on the results of feasibility analysis and tasks defined in the e-learning strategy, the pilot-project for workplace e-learning must be prepared. A pilot project document must address a plan, timeline, priorities as well as e-learning procedures and processes.

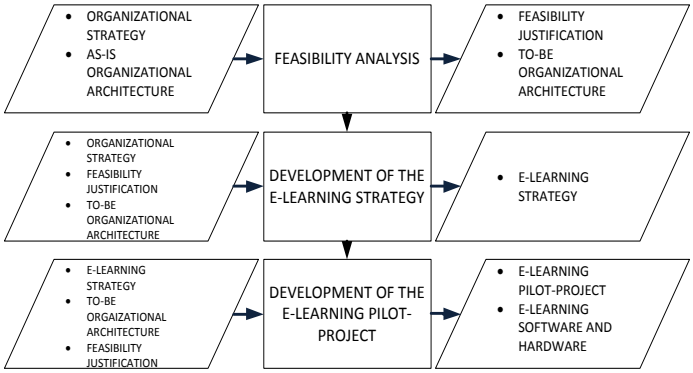

Fig.2. E-learning planning phase activities with inputs and outputs

B. DO Phase of Workplace E-learning

During the DO phase of workplace e-learning implementation the activities connected to launching the e-learning environment in the production mode are performed:

1. Implementation of the Learning Management System (LMS) is carried out by the organization's IT department or some outsourced IT resources. The solution feasibility study is performed during the planning phase and the system is chosen and accepted by the management before the implementation or system requirements are accepted and the development process can be initiated. During the DO phase e-learning information system is integrated within the existing infrastructure, customized and tested.

2. E-learning content development – the learning materials are developed by local subject-matter experts (SME) and/or outsourced experts and tutors. The guidelines, standards and business processes for developing learning contents as well as tools for creating learning objects are set up in the planning phase of the project. During this phase the organization has to produce its copyright strategy mandate which addresses the issues of the use of the e-learning content by employees.

3. End users training sessions and seminars to get a feedback from the end users as soon as possible, training sessions and seminars must be organized early in the testing phase of the e-learning solution, early involvement of the users will provide useful comments about the system and make users to get accustomed to the system.

4. End users consultations and support – during the e-learning implementation phase consultation services about the e-learning content development and use must be provided as well as technical support. During the launch of the system end user support must be till late evening hours making it possible for the users to become acquainted with the system being away from workplace.

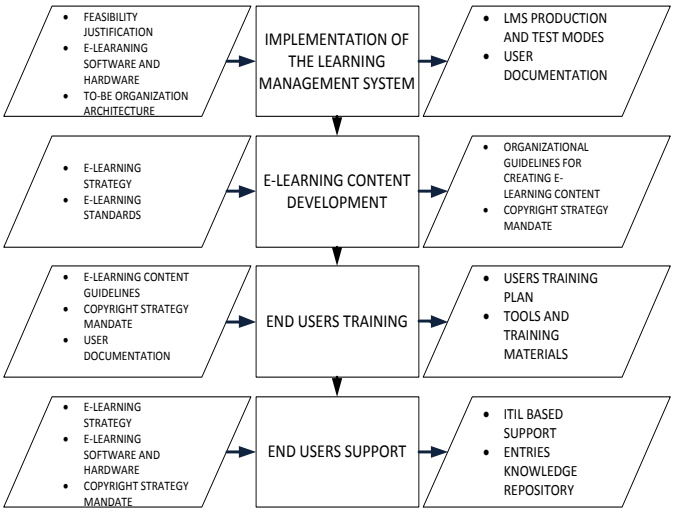

Fig.3. E-learning implementation phase activities with inputs and outputs

C. CHECK Phase of Workplace E-learning

During the CHECK phase of the existing e-learning environment the organization must determine:

1. What business objectives are met?
2. How existing business problems are solved?
3. What is the ROI of e-learning?
4. Are e-learning projects implemented based on the e-learning strategy?

Based on the results attained in this phase the e-learning steering committee can make a decision whether correction to the e-learning strategy must be introduced, e.g. priorities of the projects are changed or other e-learning information system is required, or hardware upgrade is needed because of detected insufficient performance

CHECK phase of the e-learning project consists of two stages [5]:

1. Monitoring of e-learning project – reports to e-learning steering committee about project timeline and deliverables, accomplished activities, problems and challenges met during the project, financial acquisition, bugs and change requirements identified during the project. Balanced scorecard method [6] can be used as the method for e-learning project result analysis.

2. Monitoring of the e-learning information system – hardware and software of the e-learning environment must be monitored to ensure performance, safety and security requirements are met. Results with monitoring indicators must be presented to e-learning steering committee in order to make decision about hardware upgrade.

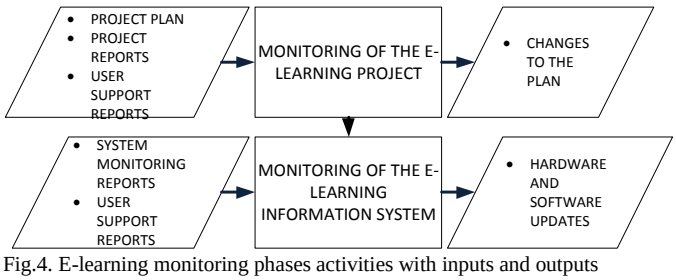

Fig.4. E-learning monitoring phases activities with inputs and outputs

Another way to perform the CHECK phase of the workplace e-learning environment is to initiate internal and/or external audit. The purpose of auditing existing e-learning processes is to identify bottlenecks of the e-learning processes, to discover deviation from e-learning strategy and to propose potential optimization activities of as-is e-learning environment. During the audit the following issues of the existing e-learning environment must be checked:

1. What is the level of justification of investment in workplace e-learning?
2. Does e-learning environment comply with e-learning strategy?
3. How the feedback from end users is managed;
4. The audit of hardware systems – performance of servers and client workstations, the audit of network infrastructure;
5. Are learning materials prepared according to standards?
6. How copyrights or e-learning materials are managed;
7. The safety and security of user data and learning materials;
8. The quality of end user support and helpdesk operation.

D. ACT Phase of Workplace E-learning

Based on the conclusions of the CHECK phase of the existing e-learning environment, the management and/or the project manager of the specific e-learning project can submit the results and proposals to the e-learning steering committee, internal audit workgroup based on the internal audit results, or external audit group based on the external audit results.

The purpose of the ACT phase of workplace e-learning is to improve existing e-learning processes by developing process benchmarks and best practice of the enterprise that will be used in the corporate e-learning projects or evolving existing e-learning platform.

The internal audit results have to show if and how the existing e-learning projects support the standards, project timelines and project plans postulated in the e-learning strategy and whether business objectives of the e-learning environment are met as described in the e-learning strategy.

In the result of the internal audit the guidelines and proposals are developed for organization's management team that need to be implemented in order to improve e-learning processes in the organization. The next step for e-learning steering committee is to develop and approve the e-learning process benchmarks

Based on the external result the management is provided with potential improvements for e-learning environment containing the best practices known to the external experts, which can be implemented within this organization.

III. TOWARDS THE WORKPLACE E-LEARNING CMM

In the software engineering industry organizations improve the quality of software development processes by establishing the benchmarks of processes. In the software engineering process benchmarks do not determine what technology to use in the development process, but are a means how to assess processes based on what technological solutions are chosen, developed, maintained and later replaced. CMM was

developed to provide the framework for defining process benchmarks for organizations. It provides guidelines how internal information systems developments processes can "mature" based on gained experience and it evolves over time [2]. Wide application of CMM standard in the IT companies promoted application of this concept of process maturity in other industries, for example, for workplace e-learning environment processes [2].

This chapter describes guidelines for developing the framework for workplace e-learning business processes maturity model. Workplace e-learning CMM framework can be used as a business instrument for reviewing, monitoring and analyzing workplace e-learning projects. Workplace e-learning maturity model has to include at least process improvement of the following issues:

1. Improvement of learning experience – usability of the LMS and user navigation, content searching and browsing functionality, graphical user interface, download speed, user client workstation performance, system availability;

2. Helpdesk operation – helpdesk services according to worldwide accepted standards (e.g. ITIL (Information Technology Infrastructure Library)) and best practices, new ways and channels for communicating with users (e-mail, Skype, instant messaging, face-to-face communication, phone calls, etc.);

3. LMS safety and security – confidentiality of the user and the learning materials, safety of the e-learning environment;

4. E-learning business objectives analysis – how cost and ROI analysis of the existing e-learning projects can be improved;

5. Requirements analysis – how business and system requirements for workplace e-learning environment are elicited, gathered, analyzed, validated and communicated between all e-learning project stakeholders;

6. E-learning workflow processes – the optimization of e-learning workflows – how e-learning content is developed, reviewed, delivered and used by learners;

7. E-learning hardware upgrade – monitoring and enhancement of the performance indicators, increase of storage capacity, optimization of backup and restoring processes, stress tests;

8. E-learning content:

8.1. Personalization of the content – the content in the e-learning environment has to be based on learner individual knowledge and competence level;

8.2. Copyright strategy – how copyrights of the learning materials – economic and moral rights of learning materials – are managed;

9. Assessment quality – how assessment in the e-learning environment is organized, how it can be improved to become more objective, how self-assessment of e-learning can be introduced or improved.

10. E-learning standards – what e-learning industry standards need to be implemented?

11. Learning object repository – to ensure repeated use and preservation of learning materials the repository of learning objects needs to be developed.

IV. CONCLUSIONS

The literature review has shown that at the moment united accepted methodology for workplace e-learning implementation does not exist. To create the framework of organizational e-learning capability maturity model first of all the e-learning processes benchmarks must be introduced in the organization. E-learning processes benchmarks can be established within the e-learning implementation methodology. The paper describes the e-learning implementation methodology based on the classical PDCA project management cycle. Using this methodology organization can define the CMM of workplace e-learning taking into considerations guidelines provided in the third chapter.

Considering e-learning project implementation, high level work group needs to be created at the organization, e.g. e-learning steering committee, which main responsibilities will be e-learning project monitoring and e-learning strategy realization.

REFERENCES

1. **Kelly, T., Nanjiani, N**. *The Business Case For E-Learning*. Cisco Press, 2004. 216 p.
2. **Marshall, S. A.** Quality Framework for Continuous Improvement of e-Learning: The e-Learning Maturity Model. ***In:*** *Journal of Distance Education Vol. 24, No.1.,2010,* p. 143-166
3. **Baruque, L.B., Baruque, C.B., Melo, R.N.** Towards a Framework for Corporate e-Learning Evaluation. ***In:*** *Proceedings of the 2007 Euro American conference on Telematics and information systems*. 2007
4. **Guralnick, D., Kaleidoscope Learning, & Larson, D.** A successful e-learning strategy for a large U.S. retail organization. ***In:*** *Kaleidoscope Learning i-Learn Forum*, 2007.
5. **Blondet Baruque, L., Blondet Baruque, C., Nascimento Melo, R.** Towards a framework for corporate e-learning evaluation, 2007
6. Balanced Scorecard Institute, http://www.balancedscorecard.org/

Ludmila Penicina was born on June 1, in 1986 in Rezekne, Latvia. In year 2008 she graduated Riga Technical University, Riga, Latvia with bachelor's degree of engineering science in computer control and computer science. In year 2010 she graduated Riga Technical University, Riga, Latvia with master's degree of engineering science in computer control and computer science. In 2011 she graduated Riga International School of Economics and Business Administration with master's degree of business administration.
Author currently is 1st year doctoral student at the Faculty of Computer Science and Information Technology, Institute of Applied Computer Systems, Riga Technical University, Riga, Latvia. She is currently also working as a Scientific Assistant at the Faculty of Computer Science and Information Technology, Institute of Applied Computer Systems and as a System Analyst in Information Technology Department, Riga Technical University, Riga, Latvia. During June 2007 – May 2008 she worked as a Tester Specialist at Lattelecom Technology, Riga, Latvia. The author has received the International Business Informatics Challenge 2009 (IBIC'09) Best Paper Award for the contribution on "The Mapping of Multidimensional BPMN models to BPEL."