Available online at www.sciencedirect.com
ScienceDirect
Procedia Computer Science 43 (2015) 127 – 133
Procedia Computer Science

ICTE in Regional Development, December 2014, Valmiera, Latvia

Automated Learning Support System to Provide Sustainable Cooperation between Adult Education Institutions and Enterprises

Andra Jakobsone[a]*, Sarma Cakula[b]

[a]*Faculty of Natural and Social Sciences, Liepaja University, Liela 14, Liepaja, LV-3401, Latvia*
[b]*Faculty of Engineering, Vidzeme University of Applied Sciences, Cesu Str. 4, Valmiera, LV-4200, Latvia*

Abstract

One of the most important prerequisites for a long-term development of all countries is a high level of education for society. Nowadays the impact of technology on society is very deep. It is not story only about a group of people who share a defined territory and a culture. Technology plays a large role in many aspects of day-to-day life and many processes become automated. With automated learning support system is possible to work more closely with an adult to provide effective learning solutions that meet their unique needs. The problem is the inefficient or incomplete utilization of presence and cognition technologies and the non-usage of knowledge management technologies for the useful development of adults in an online environment. The goal of the paper is get a new perspective on knowledge sharing process and understanding of the future of automated learning support system involving the use of new technological opportunities. The main study question is how the automated learning support system could improve the efficiency and quality of further knowledge flow and provide sustainable cooperation between educational institutions and entrepreneurs. The research idea is to describe the principles of automated learning support focusing on an online system and knowledge management technologies for adults. The result of the research is the analysis of the information system as an online learning support platform, improved quality of knowledge flow, and recommendations for future work in this field.

Peer-review under responsibility of the Sociotechnical Systems Engineering Institute of Vidzeme University of Applied Sciences

Keywords: IS; Automated learning; Knowledge management; Online learning system.

* Corresponding author.
E-mail address: andra.jakobsone@gmail.com

Peer-review under responsibility of the Sociotechnical Systems Engineering Institute of Vidzeme University of Applied Sciences
doi:10.1016/j.procs.2014.12.017

1. Terms and definitions

Authors of this paper are using some specific terms. It is therefore necessary to explain terms and abbreviations used in this paper:

- Information system (IS) is an integrated set of components for collecting, storing, and processing data and for delivering information, knowledge, and digital products;[1]
- Information and communication technology (ICT) is defined, for the purposes of this primer, as a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information;[2]
- Work-based learning (WBL) generally describes learning while a person is employed. The learning is usually based on the needs of the individual's career and employer, and can lead to nationally recognized qualifications;[3]
- Automated learning is one method of acquiring knowledge through the use of electronic or mechanical devices. It is sometimes outside the scope of traditional institutions and includes individualized instructional modules, exercises, reading materials, interactive computers and online programs;[4]
- Presence technologies are a type of application that makes it possible to locate and identify a computing device wherever it might be, as soon as the user connects to the network;[5]
- Cognitive Technology's mission is to provide a forum for scientific analysis of new developments that can assist or augment cognitive functioning—areas of research and development that range from perception, memory, comprehension, decision making, problem solving, and reasoning, and functioning that may occur at the individual or the group level;[6]
- Knowledge Management (KM) comprises a range of strategies and practices used in an organization to identify, create, represent, distribute, and enable adoption of insights and experience;[7]
- Online learning systems are used to highest potential for collaborative learning which complements many persons' learning styles, and independent adults have also found online courses to be well suited to their needs.[8]

2. Introduction

Since 1989 there have been a number of changes in order for us to become members of a wired, globalized, knowledge-based, and networked society. The development of networks as a technological achievement and a way of understanding processes has brought some serious challenges to the conventional structures shaping most areas of work and education as most aspects of our society moved significantly towards exploiting the power of the ICT.[9]

Information and communication technology plays an important role in the knowledge management process, helping academically prepared adults to learn and solve lots of different problems more effectively. Work-based learning is used as a tool to achieve the goal of converting tacit knowledge into explicit by maximizing learning opportunities and internalizing knowledge by practical experience in the workplace. Learning is a cognitive activity that differs from person to person. Most of the learning support systems do not take into account individual aspects of a person, ignoring the different needs that are specific to existing cognitive profiles.

The problem is the inefficient or incomplete utilization of presence and cognition technologies and the non-usage of knowledge management technologies and work-based learning potential for the useful development of adults in an online environment. The goal of the paper is get a new perspective on knowledge sharing process and understanding of the future of automated learning support system involving the use of new technological opportunities. In order to find the most efficient application of ICT resources and knowledge management technologies with an aim to save time and use work-based learning to its utmost potential, it is necessary to study different theories, which will help us understand how information system have to be created and structured to reach the set goals.

The research idea is to describe the principles of a work-based learning support focusing on an online support system for adults and conditions influencing stakeholder's interest in the achievement of common goals. Personalization is the next step in the evolution of online learning support systems. The result of the research is the analysis of the information system as learning support system, improved quality of knowledge flow, and recommendations for developing work-based learning with regard to the encouragement of efficient knowledge

management. It's been said that unified communications is the next big thing in networking, but presence may be the next big thing in unified communications. In this case presence technology is very important as a type of application that makes it possible to locate and identify a computing device wherever it might be, as soon as the user connects to the network. Cognitive technology refers to technologies that carry out cognitive operations. Thus, rather than augmenting human physical capacity, these technologies augment mental capacities.[10]

With technologies constantly evolving, authors are debating another relationship, and that is between education and technology, as adults are getting used to new technologies and expecting more flexible learning schemes. EU Programme "Horizon 2020" is for research and innovation 2014-2020. It is built upon three pillars which will support research and innovation for "Excellent Science", "Industrial Leadership" and for tackling seven "Societal Challenges". One of the topics is „Knowledge sharing platform". The topic aims to foster the sharing of 'Science With and For Society' experience and know-how in Europe, and beyond. Activities shall envisage building a Knowledge Sharing Platform (KSP) to federate Responsible Research and Innovation communities and make RRI and its key dimensions more effective research and innovation policy support tools. [11]

To live effectively in an information society, people need rich in content and demonstrative information, they need to be able to accept change and adapt to it. Companies are increasingly thinking about the education of their employees, contributing to the development of the company. Employees, who continually gain new knowledge, follow current trends of one or more sectors, are not only able to perform their duties much better, but also come with their own initiatives and are flexible in sectorial cooperation issues.

3. Knowledge management technologies

Knowledge management requires technologies to support the new strategies, processes, methods and techniques to better create, disseminate, share and apply best knowledge, any time and any place. It is a systematic process that focuses on the acquisition, transfer and use of effective, topical knowledge and best practice, thus promoting sustainable operation of an organization. The work with knowledge implies creation of content: generation of a new knowledge in order to stimulate the development of innovative processes. There are a number of different factors interfering with the successful knowledge formation process. New technologies, which act as intelligent agents and assistants to search, summarize, conceptualize and recognize patterns of information and knowledge are rapidly emerging.

Different environments can have different influences on learning. In order to better organize successful flow of knowledge for entrepreneur. Knowledge sharing through participation and social interaction is an important facilitator of knowledge acquisition, and hence of learning.[12] To enable successful knowledge flow, a online system must ensure services allowing user to learn everything they need at any given moment and share their experience in the most effective way if they are willing to do so. The key challenge in an automated learning support system is to encourage knowledge sharing through social interaction, participation, and engagement in various forms.

4. Work-based learning

Work-based learning (WBL) as a new concept and understanding of learning at workplace and knowledge management conceptualized as a spiral of knowledge creation by enabling the dynamic knowledge conversion process between the individual and the organization, and between the tacit and explicit knowledge deliver the grounds for organizational learning.[13] Many companies are using tacit knowledge to augment a person's academic learning and experience. Tacit knowledge based on common sense, and explicit knowledge based on academic accomplishment is both underutilized. Methods to balance the use tacit and explicit knowledge at work and practical, proven ways to improve the understanding and use of knowledge are presented. Organizations must begin to create worker-centered environments to encourage the open sharing and use of all forms of knowledge.[14]

Pfeffer and Sutton[15] point to the knowledge-doing gap as a fundamental problem with the conversion of knowledge into something of value. Organizations make the mistake in that they interpret what others do without sufficient attention to how such tacit knowledge evolved. They do not give enough attention to the underlying philosophy and values that guide what people do and why they do it.

The research also reveals that within organizations, knowledge resides within teams of individuals who are respected and who maintain it through their contacts. Knowledge emanates from actually doing the work and making the best judgments in specific contexts. Knowledge exists in work and in what works. However the question of what works is a matter of judgment. In addition the power dimensions of knowledge cannot be ignored. To share tacit knowledge benefits the firm; however it may reduce the power of the individual job holder.[16] However when work-based learning is used as a tool to make tacit knowledge implicit company can overcome this problem as workers gain academically credit on undergraduate or postgraduate level and acquire an advantage on the labor market.

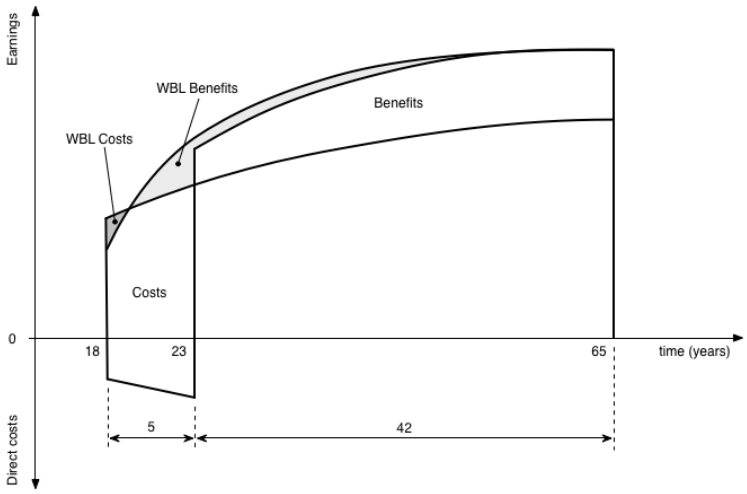

Fig. 1. Personal value of WBL over time.[17]

With ICT constantly evolving, authors are debating another relationship, and that is between education and technology, as adults are getting used to new technologies and expecting more flexible learning schemes. According to Bradley[18], for example, well-designed e-learning programs can offer similar benefits of flexibility and learning choice as with distance learning, but can also offer additional benefits as well. Given the nature of WBL and its relationship to distant learning we can assume that ICT can help facilitate WBL just as it does with distant learning Figure 1 reflects personal value of WBL over time (see Fig. 1).

5. Successful and sustainable system of cooperation

Confusion from overly large amount of information and rapid development of technology is often observed in the society. It is often heard that a successful and sustainable system of cooperation between educational institutions and industry would be necessary. In this case adult education institutions are meant, which would be ready to educate people at various levels and in different occupations. In adult education formal and non-formal programs can be offered. Entrepreneurs are also interested in raising their staff's competence levels. In continuing education, as well as in primary education, adults need to find an opportunity to choose their own training content that would be as suitable to their needs and desires as possible.

In order to ascertain the views of the involved parties on the necessity of developing an automated learning support system for promoting sustainable cooperation between adult education institutions and industry, 40 interviews with experts were conducted. Most respondents believe that such a system is topical, and increase of staff qualification is very important and necessary. Interviewed experts from both educational institutions and the industry believe that offering or requiring training content and other necessary information by using information and communication tools will create no problems. You only need high motivation, personal interest and user-friendly, interactive support system environment. Target audience's needs and desires are many and varied, but there has not been a system yet developed that would be very easily perceivable and well-functioning. Nowadays information

systems are becoming increasingly self-developing. Analysing the opinions of experts it is quite clear that we need to offer all parties an automated training system of support.

The most common suggestions for building a mutually successful cooperation

Needs and desires of educational institutions' representatives:

- Active participation of manufacturers in curriculum development
- More workshops in training programs in collaboration with companies
- Creating a suitable cooperation website for both interested parties
- Developing a Community of Practice

Needs and desires of industry's representatives:

- Knowledge of current events through direct contact with industry representatives
- Electronic access to information on the knowledge and skills of students in educational institutions
- Common seminars, inviting business and education representatives
- Database development of the necessary staff / trainees

Representatives of both involved parties recognized that the preparation of training is needed after a specific employer demand. In response to the question of IS development, experts believe that the tool would in deed accelerate the educational system's response to industry requirements, because currently the response time is too long.

6. Customization

In the process of customization we must take in account goals, needs and distinct environment properties given to the specific company. As work-based learning is very individual to the workers as well to the company it is important to define what goals we want to achieve, what needs we want to satisfy and what working environment specifics are in place. We can split up this process to analysis and implementation (see Fig. 2).

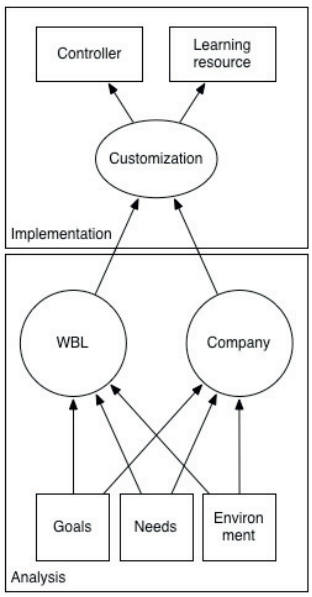

Fig. 2. Implementation and analysis[17]

This idea comes from a concept called an abstract arc. which is the process of transforming real problem in this case need for effective transformation of tacit knowledge into implicit, to an abstract and conceptual information in this case analysis, back into a real solution of a problem in this case customized work based learning support system. The process of customization can be described as a transformation of real goals, needs and environmental specifics through complex analysis taking account of WBL and company specifics into a working online information system.

7. Information system

Research idea is to describe principles of an information system. The main idea of an information system is to provide complete utilization of ICT and work-based learning potential as a useful development model. Authors define principles which will help to understand what kind of information system needs to be used to reach the set goals. In order to achieve maximum affectivity learning resource design is based on the specific environment, analysis of adults' needs, current level of knowledge and on goals of WBL implementation in the learning process.

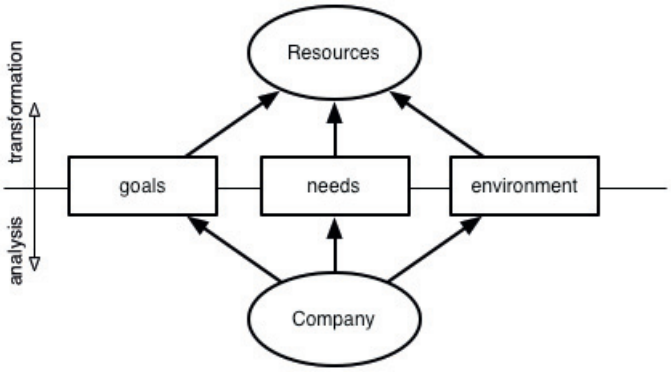

Fig. 3. Didactical analysis (decomposition) and transformation[19]

Analysis is the first part of creating successful learning support system. In the process of analysis it is important to identify goals, needs and environmental points. Didactical transformation of gained information is a subsequent step and resulting learning resource can be used in company along with the controller (see Fig. 3). To enable successful knowledge flow, a online system must ensure services allowing user to learn everything they need at any given moment and share their experience in the most effective way if they are willing to do so.

First a modifiable content information system using Ruby on Rails, MySQL, CSS3, HTML5, ERB, JavaScript and Bootstrap technology is established, where the administration and the user see the content addressed to them. The user must be able to specify their skills, knowledge, desires and needs and, according to them, will receive recommendations for the future knowledge for deeper understanding of their industry. Information system is deployed on a virtual private server that works with Ubuntu 13.04 operating system and powered by Apache2 web server software.

8. Conclusion

For a long time already there is question how successfully build a modern co-operation between educational institutions and industry representatives. ICT can directly influence such key future success factors as creativity and the innovation skill, which are the main resources of competitiveness and growth.

Learning support system must more actively deal with the assessment, change and improvement of individual's skills and behaviour, for it is a tool for raising adults' satisfaction and the quality of life. A user-friendly automated training system of support has to be created as soon as possible, that would be able to hold the interest of all parties involved and a positive attitude towards a convenient, fast and accurately matching information accessibility.

Authors believe that it is the best way to create a deeper understanding of the knowledge sharing as an integral value of sustainable cooperation.

From the results of research and author's conclusions:

- It is very important to figure out the principal directions for implementing knowledge management technologies and work-based learning strategies in the learning process;
- Innovations in the learning process needs to be real and simple enough to help adults find a way to solve their problems;
- Needs have to be acquired and accurate content and quality must be offered according to merchant's expectations;
- Preparation of training is needed after a specific employer demand and knowledge sharing has to be equally active on both interested sides.

The result of the research is the analysis of the information system as an automated learning support platform, improved quality of knowledge flow, and recommendations for developing work-based learning with regard to the encouragement of efficient knowledge management. Based on the theory-based model and the first version of developed technological solutions, the system of cooperation provides the latest knowledge sharing for promotion of industrial competitiveness and educational institution development.

Acknowledgements

This work was partly funded by European Social Fund, project “Development of Doctor Studies in Liepaja University”, grant No.2009/0127/1DP/1.1.2.1.2./09/IPIA/VIAA/018.

References

1. Zwass V., Information system, http://www.britannica.com/EBchecked/topic/287895/information-system, 2014.
2. Blurton, C., New Directions of ICT-Use in Education, http://www.unesco.org/education/educprog/lwf/dl/edict.pdf, 2002.
3. The Data Service, Work Based Learning (WBL), http://www.thedataservice.org.uk/datadictionary/businessdefinitions/WBL.htm, 2008.
4. Psychology Dictionary, What is automated learning? http://psychologydictionary.org/automated-learning/.
5. TechTarget, Presence technology, http://searchunifiedcommunications.techtarget.com/definition/presence-technology, 2008.
6. Stephen, M. F., Cognitive technology journal, http://www.cognitivetechnologyjournal.com/, 2011.
7. Vatuiu Virginia Elena. Dimensions and Perspectives for Knowledge Management and Information. Journal of Knowledge Management, Economics and Information Technology, ISSN 2069-5934. MA of Reohampton University, London, 2010.
8. Illinois Online Network and the Board of Trustees of the University of Illinois. Learning Styles and the Online Environment, http://www.ion.illinois.edu/resources/tutorials/id/learningStyles.asp, 2010.
9. Bruns, A. & Humphreys, S. Wikis in Teaching and Assessment: The M/Cyclopedia Project. In WikiSym’05, San Diego, CA, U.S.A 16-18 October 2004. U.S.A: National Research Counsil of Canada. p.25-32. (2005).
10. Dror, I., Yearbook of science and technology, http://www.cognitiveconsultantsinternational.com/Dror_MH_Cognitive_Technology.pdf, 2013.
11. European Commission, Research&innovation participant portal, http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/topics/2420-issi-3-2015.html, 2014.
12. Jakobsone, A., Cakula, S., Online Experience Based Support System for Small Business Development. Proceedings of the 8th WSEAS International Conference on Educational Technologies (EDUTE’12) Porto, ISBN 978-1-61804-104-3, ISSN 2227-4618, 2012.
13. Seufert S. Work-Based Learning and Knowledge Management: An Integrated Concept of Organizational Learning, in: Proceedings of ECIS. 2000.
14. Elizabeth A. Smith, The role of tacit and explicit knowledge in the workplace, Journal of Knowledge Management Volume 5, number 4, p. 311-321, http://ww.basicknowledge101.com/pdf/KM_roles.pdf, 2001.
15. Pfeffer, J. and Sutton, I.R. (1999), ``Knowing `what' to do is not enough'', California Management Review, Vol. 42 No. 1.
16. Gravan, T., Morley M., Gunnigle P., Eammon C., (2013) Human capital accumulation: the role of human resource development.
17. Jakobsone, A., Moteljek, J., Cakula, S., Customized work based learning support system for less academically prepared adults in online environment. // Proceedings of the IEEE Global Engineering Education Conference (EDUCON2014), ISBN: 978-9934-8271-1-2.
18. Bradley, C., & Oliver, M., Developing E-Learning Courses for Work-Based Learning. Proceedings of the 2002 International World Wide Web Conference, USA, 2002.
19. Cakula, S., Jakobsone, A., Moteljek, J., Online Business Support Infrastructure for Entrepreneurs. Proceedings of the International Conference on Online and Augmented Reality in Education 2013, ISBN: 978-9934-8271-1-2.