Human-centered Design Model in the Development of Online Learning Tools for International Security Training
CASE IECEU New Media based Learning Application (NMLA)

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Abstract: A need to enhance online training solutions among peacebuilding and conflict prevention actors in the field of international security has been addressed in order to raise the collaboration, information sharing and provide more effective training. The implementation of educational technologies is inherently difficult especially if it is technology driven. This paper presents the idea of human-centered design approach in line with the principles of human-technology interaction in order to tackle the possible training challenges that may occur in the development and implementation of online and Elearning environments for adult students. As part of research and development project, the design case for peacebuilding and crisis management online-based training was conducted and studied. The case study showed that before providing the technological solutions there is a need in dept analysis on the requirements as well as iteration of algorithms. Moreover, functionality and completeness of the instantiations, such as services, raised the motivation among the user community. The created human-centred design model for the learning environment development processes supports to meet not only with current training needs in security but also in identifying which parts of education and training can be facilitated by technology.

1 INTRODUCTION

Department for International Development (2005) listed 46 countries considered fragile states, in which 870 million people, or 14% of the world's population live and 250 million children worldwide has no access to education (UNESCO, 2014). The new threats from weak states, asymmetric conflicts, organised crime, and terrorism, traditional peacekeeping has frequently given way to complex peacebuilding in protracted conflicts. These kinds of global challenges and threats have led to the complexity of crisis and conflicts. It has been argued that international community needs to focus more on strengthening the emerging fragile or unstable state with preventive activities in early stage (IECEU-project, 2016. D1.2). The Lisbon Treaty highlights conflict prevention as key objective for EU's foreign policy and external relations (Treaty of Lisbon, 2009). The conflict prevention has been part of EU's Common Foreign and Security Policy (CFSP) and the development of European Security and Defence Policy (since 2009 the Common Security and Defence Policy, CSDP) with the aim of the EU to take action through its capacities in conflict prevention and crisis management. The complexity of EU engagement and current conflict and crisis areas requires continuously assessment on the effectiveness of different conflict prevention and crisis management activities (see for example European Parliament, 2012) also training and technology. The development of the international community's perception has changed towards international security, shifting from robust peacekeeping towards the stabilization of fragile states via conflict prevention and peacebuilding. (Morton and O'Hagan, 2009).

At the same time, around 80% of the world's population will have mobile connectivity and 60% will enjoy broadband access. Like any use of technology in the classroom, there is a need to unify content, technology and pedagogy (Mishra and Koehler, 2006). The digital possibilities enable the

learning distribution around the globe online (Zhang et al, 2004, p. 75-79) and already in the beginning of 21st century the online learning as a field has been described as complex, diverse, and rapidly evolving (Anderson and Elloumi, 2004). Technology has a significant influence on teaching and learning processes and the technology has re-organized the human life, communication and learning (Siemens, 2004). Due to current trends, Information Technology (IT) tools and resources have significant influence on teaching and learning processes (Sevillano-García and Vázquez-Cano, 2015. p. 106-118). With its potential for providing flexible access to content anywhere and anytime, it has become popular worldwide (IECEU –project, 2016. D5.2) and can benefit local counterparts as well as peacebuilding organisations. Information and Communication Technology (ICT) can provide the access to education and enhance the ability of minor and vulnerable groups to attend to education and training (Gulati, 2008).

Even with the opportunities that technology can provide, the researchers have seen the implementation of technology-supported collaborative learning environments as a challenge (Zheng, 2014. p.357). In addition, there is a need for academic practice-based design research when developing learning tools (Leinonen, 2010). Like any use of technology in the classroom, there seems to always be a need to unify content, technology and pedagogy (Mishra and Koehler, 2006). The Web 2.0 offers features, which are not always considered with human learning processes. Moreover, the flexible media options of digital environments are not currently fully benefitted in e-learning contexts (Clark and Mayer, 2016). It has been argued that the online learning should move beyond from traditional Learning Management Systems (LMS). Sevillano-García and Vázquez-Cano (2015) argue that "*institutions need to orientate methodologies toward the use of new mobile devices, from the possibilities offered primarily through open educational resources (OERs) distributed on wikis, blogs, mash-ups, podcasts, social software, virtual worlds, personal learning environments (PLEs), massive open online courses (MOOCs), and other emerging online practices*".

These identified needs, challenges and recommendations provide the basis for this research and online learning application case study. Human-Technology Interaction (HTI) with its broadest sense covers forms of interaction between technical and human interfaces and includes all roles in to the design process (Saariluoma et al., 2016, p.2). This

approach could be benefitted in the online training of peacebuilding and conflict prevention.

1.1 Objective and Purpose

Overall purpose of this paper is to analyse the learning technology that could be utilized for the peacebuilding and international security training. In order to tackle the challenges with learning technology, this study aims to provide the understanding between human and learning technology interaction. This study provides the analysis of the findings in the design and development of New Media based Learning Application (NMLA) during Improving the Effectiveness of the Capabilities in EU conflict prevention (IECEU) –project in years 2015-2017. Finally, this study provides a human-centered design model for the development of Elearning solutions and information sharing especially for adult education purposes in the field of international security, peacebuilding and conflict prevention. Ideally this will finally lead to research on successful implementation of online training initiatives in the field of international security and peacebuilding. The research purpose is to support the educational capacity building that concentrates to the societal education structures and enhancing the protection and successful delivery of education in online basis according to the principles of effective human technology interaction.

2 HUMAN-TECHNOLOGY INTERACTION IN CHANGING LANDSCAPE OF TRAINING

The technology has re-organized the human life, communication and learning (Siemens, 2004). In practice, the learning takes place partially or entirely over the Internet. With its potential for providing flexible access to content anywhere, it has become popular worldwide. The computers made the delivery of education possible and the material were able to deliver both print and electronical media. (Moore, 1990). The online learning includes different sets of learning applications, web resources, web-based applications and new collaboration technologies. Moreover, new type of hybrid approaches regarding online learning activities are increasing. (Means et al, 2009). The term distance learning evolved towards online learning, virtual learning, e-Learning, mediated

learning, web-based learning etc. (Conrad, 2002, p. 1-19). In the European countries especially tablets and smartphones are considered as an important development on the field of education (Eimeren and Frees, 2012). From the pedagogical point of view, the higher education institutes benefits of e-learning e.g. by revision of teaching methods, monitoring study progress and student learning, interactive collaboration among students and by enhancing learning and teaching in foreign languages (Gaebel, M. and al. 2014). In 21 century, the theoretical insights have raised the collaborative practices in online learning (Siemens, 2004). Dalsgaard (2006) argues that social software tools can support a social constructivist approach to e-learning by providing students with personal tools and by engaging them in social networks, thus allowing learners to direct their own problem-solving process. He points out that e-learning should move beyond from Learning Management Systems (LMSs).

The technologies in digital context enable new ways of narrating contents. The users are actively involved to building the content to different media and channels. (Katz, 2013. p. 129-133). It has been also argued that collaborative learning tools can be used from both a cognitive constructivist and social constructivist perspective (Bonk and Cunningham, 1998, p.35). It has been issued that the design of learning environments can be based on the learning objective, target audience, access (physical, virtual and/or both), and type of content (Moore and Dickson-Deane, 2011. p. 129). Different technology applications are used to support different models of online learning. Ideally, the online learning components are combined or blended with face-to-face instruction, in order to provide more learning outcomes. (Means et al, 2009). The engagement in Web 2.0 environments provides more avenues for self-representation, expression or reflection and more organized forms of collaboration and knowledge building. Web 2.0 tools can support associative pedagogies and be used effectively in terms of providing structured guidance through tasks and through provision of effective and timely feedback. (Conole and Alevizou, 2010). New media and technology resources are based on principles of mobility, collaboration and active participation. Ubiquity and mobility become recurrent principles for educational performance in this century. (Sevillano-García and Vázquez-Cano, 2015).

The overall purpose of human-centered design is on making systems or applications easy to use (ISO, 1999). Jounghyun (2015) defines the goals of Human–Computer Interaction (HCI): (a) functional completeness, (b) high usability, (c) aesthetic appeal and (d) compelling user experience. Firstly, the research interest can focus on technology-driven design with emphasis on products, systems or interphases. Secondly, the human-center or human-driven approach is seen as important as technology-driven. Further, the Human-Technology Interaction (HTI) research aims to support the design and develop usable technology for humans. The most emphasied aspect of HTI has been that difficult-to-use technology is easily rejected and weather people find it easy to use the systems and products (Saariluoma et al, 2016) and people should know how to use the products, services or systems. (Leikas 2008). Despite the early focus of HTI has been how to design interaction and implement interfaces for high usability, it has been used for specific user community. The critical components of successful integration of technology innovations within education and training settings and influences the adoption rate of such technologies are transparency in user interface design (Charalambos et al, 2004).

3 METHODOLOGY

In the research and development program of IECEU (H2020) –project, the methodology concept and quality assurance system for technology systems were created by co-created methods in early stage of the project, in the year 2015. The group of developers, IT specialists and researchers worked together during years 2016 and 2017 and design process included the engagement of end users.

This particular study followed the principles of Design Science Research (DSR) approach and focused on the HTI during the design and development of online learning solution for EU conflict prevention and international security training. DSR approach has been used for develop and evaluate IT artifacts in order to understand, explain and improve them. Artifacts within DSR are constructs (vocabulary and symbols), models (abstractions and representations), methods (algorithms and practices) and instantiations (systems and services). (Hevner et al., 2004). This paper analyses the design and development process of IECEU New Media based Learning Application (NMLA) and findings from the data collection by end users. The overall framework of NMLA included the selection of pedagogical approach, technology in design of NMLA, understanding of new media interactive solutions and intercultural competences.

The selected user community representatives participated to participatory learning application testing and provided the self-assessment on the learning and evaluated the application interface. The test groups consisted of both men and women of different age. The majority presented experienced academic researchers from different disciplines. The participants were divided into three groups: group of educators, professors and trainers (n=5), a group of end user experts (n=14) and higher education students (n=43). Firstly, each participant tested the NMLA with use of device (mobile, iPad or laptop) and answered to the survey. The survey included multi-choise and open questions and the results were analysed through quantitative and qualitative methods. Secondly, the discussions around user experiences were facilitated. The survey gathered the first impressions and user experiences. The discussions focused on analysing the learning objectives and relevance of the NMLA with end user needs in peacebuilding training.

The researchers analysed the interaction between users and the different devices (PC, laptop, mobile devices) based on research findings and observations. The findings were further tested (triangulation) in the discussions with the selected key representatives in order to further improve the learning application. The collected information was then assessed and fed into development process

3.1 Design Case: IECEU Learning Application

The purpose in the NMLA was to transfer the original IECEU (Improving the Effectiveness of capabilities in EU conflict prevention, H2020) – project research findings and identified good practices in the online format. In order to the learn of key competences needed in the field of crisis management and peacebuilding, the NMLA was developed. The objective of the tool was primary to exhibit the selected eight IECEU case studies and further disseminate the findings of the comparative analysis. Secondly, the development aimed at creating an interactive training tool which could be used in various crisis management training or as a basis to introduce the new Common Security and Defence Policy (CSDP) personnel to the roots and dynamics of different conflicts either in their future deployment areas or in general. During the development process it was identified that the tool can also be used among the larger audience of stakeholders and other communities of interest (civil servants, trainers, higher education, students etc.)

The IECEU NMLA offers a complimentary tool to enhance the knowledge of a broad end-user audience on themes related to selected crisis case studies and crisis management decision making and planning. The term new media was used to differentiate between old media (print press, TV, radio) and the new information technology based media. The learning content is also supported by the social media and rich digital contents as selected algorithms. These algorithms often include interactive elements and possibility to communicate and provide feedback. Examples of new media include websites, games, augmented reality, multimedia and various learning platforms. (IECEU, 2017, D5.2). This also because in spite of the presented benefits Eearning can provide to various training, "digital tools do not substitute face-to-face methods, but complement them by enabling more constant interaction with users and lowering certain users' participation thresholds." (Friedrich, 2013).
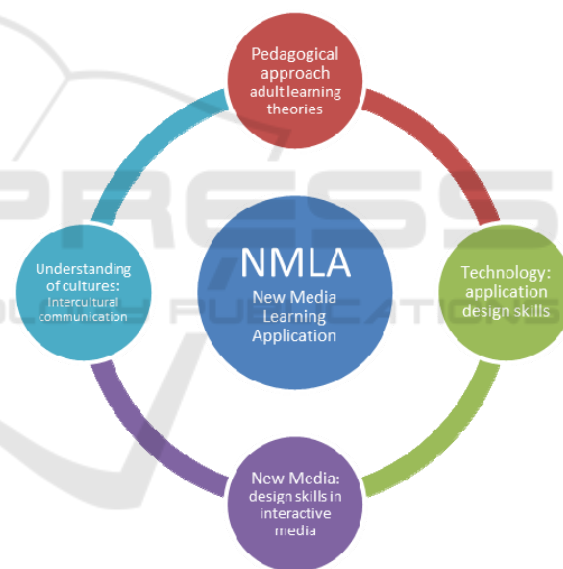

Figure 1: The framework of IECEU NMLA (IECEU, 2017, D5.2)

3.1.1 Instantiation: The Context for Service

The selection of service as part of instantiation process was clarified after the analyses on the context of use in early stage of design and development. The project reseachers and developers interviewed, made observations of the context and participated to project workshops in order to build comperehensive picture of the context. The special attention was addressed to functional completeness in this solution design process. Moreover, the criteria for the solution selection was that the

platform needed to based on open source code featuring desired functions: options for gamified learning, mobile friendly (meaning a website or web application that displays correctly in mobile devices), multi-browser compatible (meaning that it must be displayed correctly in multiple browsers). The platform can be easily gamified with artifacts such as badges, user scoring, certification awards and H5P module integration, all of which are pre-installed in the package or obtainable via the free app store. H5P is an extension developed for WordPress, Moodle and Drupal from a separate organization that is used to gamify Elearning with ease, all done in HTML5, including video quizzes. The NMLA, which can also be downloaded to laptop, tablet or mobile phone, could be utilized as a part of the training conducted in fragile and crisis areas. The IT instantiations were identified by the developers. The service as instantiation was selected with in depth understanding of the context, end users and other requirements.

3.1.2 Construct Framework: Vocabulary and Symbols

After instantiation, the key end users and stakeholders of NMLA were analysed by the project expert group. The IECEU Advisory Board provided further guidance and support to understand key training and education providers that may benefit with the use of learning application in the future. IECEU NMLA focused on European security and defence network training initiatives as well as higher education institutes and university. The research of IECEU built the overall constrcuts for the NMLA in line with end users' vocabulary and symbols. The learning objectives and outcomes were set according to the needs and gaps identified during the IECEU – project research. The end users group discussions supported the identification of current training needs that technologies could support. Learning objectives are regognised among the training and education community and they provided the contruct framework for NMLA.

3.1.3 Quality Assurance Requirements

The requirements for the NMLA were also set in IECEU Quality Assurance plan according to technology development. At this phase, the designer analysed wheather the instantiation, constructs and representations were in line with quality assurance requirements.

3.1.4 Iteration of Methods (Algorithms and Practices)

There is a possibility to organize the technology supported learning and training in decentralized or centralized way (IECEU -project, 2016. D5.2). The methods were agreed by the designers with understand of algorithms and practices. It was decided to use cartoon like visualisations from one hand to keep the developing and programming time manageable and on the other hand rather flexible to accommodate any possible changes. Also the field of international security and peacebuilding support the use of animations rather than authentic pictures or videos. Although the serious topic of crisis management is linked to human suffering, the visualisations were preferred to keep light. Finally, perhaps most importantly, peacebuilding and crisis management topics are often sensitive.

3.1.5 Models: Transfer of the Content

The research studies and analysis (content) were transferred to rich digital online learning content. Instead of written texts, the learning content finally included more visual solutions such as videos, animations, gamified quizes, and other more visual material. These representations of information provided the key models for NMLA design.

3.1.6 Evaluation and Assessment

In order to guarantee a systematic and comprehensive assessment of the NMLA and its impact, IECEU Consortium representatives conducted different types of evaluation that correspond to the four levels: NMLA evaluation by the producers, NMLA evaluations by the users, In- and Out-Tests for the users and possibly a NMLA Impact Evaluation Mission (IEM). The evaluation of NMLA against the requirements (needs, gaps, curriculas) included the analysis based on the end users and quality assurance review. The end user groups finalised the testing, completed the individual survey and attended to group discussions. The data collection led to analysis to further improve the NMLA. The most important step from the pedagogical point of view in the development process of NMLA was to test and assess the learning outcomes when using the tool in trainings and education. Before and after the use of NMLA, their knowledge and skills were tested to identify the first learning and development. The final learning outcomes will be further identified in the real life context.

4 FINDINGS

Firstly, the findings of the case study interviews of experts working currently in the conflict setting (IECEU Case Studies) corroborated the assumption that up until now eLearning and learning applications have been not been broadly and systematically utilized in the peacebuilding training. The main shortfalls in the EU conflict prevention and peacebuilding training focus on information sharing and the content of Elearning modules. The general findings of the NMLA design elaborated experiences of NMLA use by end users. Especially the evaluation and assessment phases gave valuable feedback for the NMLA design process and its further development. The survey findings identified the benefits and shortfalls of initial version of NMLA by end users. The introduction of the NMLA (landing page) paid crucial role in motivation of the users. The higher motivation raised the level of continuing the use of service. The users described the functionality and completed interface of NMLA to support their active use of service. For the master level higher education students the content was seen rather advanced and hard to understand. It was identified that higher education students were not identified as key end users in construct framework. The qualitative analyses pointed out that experts experienced positively the rich media contents, especially visualisations and video animations. The positive implications were addressed on succesful descriptions of the challenging and culturally sensitive topics of peacebuilding. The methods and algorithms used were seen easy to understand.

In the group discussions it was observed that the content of peacebuilding training material must be updated and changes must be completed to the application in line with the global situation. It was addressed that research could contribute to online training with providing new knowledge and updated content. NMLA enabled learning taking place by adapting knowledge via different methods such as reading, watching, and hearing. There was also a possibility to use learners' earlier experiences and knowledge and combine them with NMLA content. Opposite than teacher-centered pedagogy, the learner-centered pedagogy acknowledges students' needs, ability and learning styles (Weimer, 2013). The digital rich media contents were identified motivating compared to traditional learning contents. The survey findings described how video scenarios described well the conflict setting (24 mentions) and enabled the possibility of problem-based learning. The gamification features (stages,

certification) raised the learners' motivation when the objective was clearly mentioned. The shortfalls of NMLA were discussed in both end user groups. Massive reading materials (such as research articles or research reports) were analysed challenging to adapt by the learner during learning process. Moreover, the necessity of the possibility for feedback and reflection was underlined in order to ensure learning. The researcher observed that the learning tool must be easy to use in order to ensure positive learning experience through technology. Most of the users (17 out of 19) felt the NMLA easy to use. The clear navigation and structure help to ensure humans interacting with learning tools. The end users using only mobile devices paid attention to scaling of the learning content such as videos. As an additional key finding, the user group that did not receive the information on how to use the learning application, mainly produced feedback on clarity of navigation in the platform. From the HTI point of view, it can be discussed that human aims to receive the guidance on how to use the technology solutions before the actual use. The clear navigation helps the learner to focus on learning rather than guidance. The relevance of guidance to be available for online learning tool users would be beneficial to further study. According to the interviews, the practitioners of peacebuilding and conflict prevention mainly look for technical instantiantions for training that are ease to use without any further guidance needed.

During the NMLA design, the The Human-Centered Model for Online Learning Tool Design was created. The case study of IECEU NMLA design and development provided an overall model for successful online learning tool development, which follows the principles of DSR, human-centered design and successful human-technology interaction. The online based and new media supported educational tools aim to reach well the end user needs and ensure several learning methods. It was identified that if different communities of practice are engaged through test, review and feedback during the design, it will provide motivation and possibility to better integrate online tools for training. Figure 2 presents the Human-Centered Model for Online Learning Tool Design.
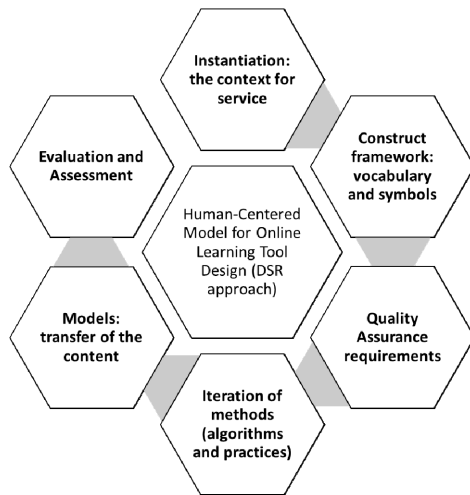
Figure 2: The Human-Centered Model for Online Learning Tool Design (Hyttinen, 2017).

5 CONCLUSIONS

The education technology accesses the people to the larger community and provides learning opportunities via online solutions for people in a cost effective way. As a conclusion of this study, it can be suggested that the development of online learning and education tools for peacebuilding should follow the principles and theories of adult learning and human-technology interaction. This study argues that human-centered approach supports with better interaction between human and technology. This study shows the benefits of considering Human-Technology Interaction (HTI) in the development of learning solutions for international security, conflict prevention and peacebuilding. The importance of the interaction was observed high especially when the motivation to use technology in learning is in low level. The commitment of end users may support the engagement of human to continue the use of services. Saariluoma et al (2016, p.148) discuss the motivation beign rather relevant in explaining the use of technologies by human. This study showed, the functional and completed user interface was seen important to raise the motivation. A relation of the motivation to use of learning tools could be further assessed among different communities.

Before development of the online solutions it is suggested to conduct in dept analysis on the current needs and requirements, context as well as end users. Therefore, I argue that implementation of educational online technology should focus more on user centric approach and Data Science Research.

The created model for development process of learning tools support to meet with current training needs and to identify which parts of education and training can be organised in an online learning basis the most effectively. Moreover, the model supports when seeking the services for online learning. The emphasis must also focus on transfering the learning content to rich online format (videos, animations, gamified solutions). Also, blended training possibly consisting feedback and interaction with a trainer, teacher or mentor deepen the understanding of the learner and/or users of the content. It would also provide a fast way to collect feedback to improve the content or functionalities of the platform further. Instant hot-wash-up with a trainer/mentor could be considered beneficial in order to deepen users' understanding and learning as well as to identify possible knowledge gaps to be covered better in various training activities. Based on this paper analyses and desk study, there is still need for deeper analysis regarding online education possibilities in conflict prevention and crisis management training and education, such as:

1) How can the online learning solutions more effectively be implemented in current training and education practices?

2) How will the artificial intelligence and machine learning affect to the training and information sharing in international security?

REFERENCES

Adebahr, C. 2011. *The Comprehensive Approach to Crisis Management in Concerted Weimar Effort*. Stiftung Genshagen, 2011.

Bonk, C. J. and Cunningham, D. J. 1998. *Searching for Learner-Centered, Constructivist, and Sociocultural Components of Collaborative Educational Learning Tools*.

Buckland, P. 2004. *Reshaping the Future: Education and Post-Conflict Reconstruction.* World Bank Publications. ISBN 9780821359594

Burbules, N. 2000. *Does the Internet constitute a global educational community*? In Burbules, N and Torres, CA (eds) Globalization and Education: Critical Perspectives, New York, Routledge, pp. 323–355.

Bruner, Jerome. 1990. *Acts of Meaning*, Harvard University Press, 1990

Carlson, S. and JBS International. 2013. *Using technology to deliver educational services to children and youth in environments affected by crisis and/or conflicts*. United States Agency for International Development

Charalambos, V., Michalinos, Z. Chamberlain, R. 2004. *The Design of Online Learning Communities: Critical*

Issues. Educational Media International. ISSN 1469-5790 online © 2004 International Council for Educational Media.

Clark, R. and Mayer, R. 2016. *E-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning.* John Wiley and Sons, 2016. ISBN 1119158664.

Conole, G. and Alevizou, P. 2010. *A literature review of the use of Web 2.0 tools in Higher Education. A report commissioned by the Higher Education Academy.* August 2010, The Open University, Walton Hall, Milton Keynes, UK.

Conrad, D. 2002. *Deep in the hearts of learners: Insights into the nature of online community.* Journal of Distance Education, 17(1), 1−19.

Department for International Development (DfID). 2005. *Why we need to work more effectively on Fragile States* (London, DfID).

European Union External Action, 2016. *Strategic Assessment of 2016 EU Global Strategy on Foreign and Security Policy.* Accessed in February 2016.

European Parliament, 2012. *CSDP Missions and Operations: Lessons Learned Processes.* European Union, 2012. Directorate-General for External Policies, Policy Department. ISBN: 978-92-823-3756-1. Accessed September 21, 2017.

Friedrich, Pirjo. 2013. *Web-based co-design. Social media tools to enhance user-centered design and innovation process,* University of Tampere, 2013.

Gaebel, M. and al. 2014. *E-learning in European higher education institutions.* Results of a mapping survey conducted in October-December 2013.

Gulati, S. 2008. *Technology-Enhanced Learning in Developing Nations: A review.*

Hevner, A., March, S. T. Park, J. 2004. *Design Science in Information Systems Research.* MIS Quarterly (28:1) 2004, pp. 75-105.

IECEU –project. 2016. *D1.2 Analysis of the current preventive activities.* Accessed in April 2016. http://www.ieceu-project.com

IECEU -project, 2016. D5.2 *Design and Development Processes of the NMLA.* Accessed March 2017. www.ieceu-project.com

ISO, 10015:1999. *Quality Management- Guidelines for Training.*

Jounghyun, G. K. 2015 *Human–Computer Interaction Fundamentals and Practice.* Taylor and Francis Group. ISBN 978-1-4822-3389-6

Katz, J. 2013. *Mobile gazing two-ways: Visual layering as an emerging mobile communication service.* Mobile Media and Communication, 1, 129-133.

Kirk, J. 2007. *Education and fragile states.* Globalisation, Societies and Education. Vol. 5, No. 2, July 2007, pp. 197

Leinonen, T. 2010. *Designing Learning Tools. Methodological Insights*, Aalto University, 2010.

Leikas, 2009. *Life-Based Design – A holistic approach to designing human-technology interaction.* VTT Publications 726. ISBN 978-951-38-7375-2.

Marsick, V., and Watkins, K. 2001. *Informal and Incidental Learning. New Directions for Adult and Continuing Education*, no. 89. Spring 2001 © Jossey-Bass, A Publishing Unit of John Wiley and Sons, Inc

Means, et al. 2009. *Evaluation of Evidence-Based Practices in Online Learning: A Meta-Analysis and Review of Online Learning Studies.*

Mishra, P., and Koehler, M. 2006. *Technological pedagogical content knowledge: A framework for integrating technology in teacher knowledge.*

Moore, J. Dickson-Deane, C. Galyen, K. 2011. *e-Learning, online learning, and distance learning environments: Are they the same?* Internet and Higher Education 14 (2011) 129–135. 2010 Elsevier Inc.

Moore, M. G. 1990. *Background and overview of contemporary American distance education.* Contemporary issues in American distance education (pp. xii−xxvi). New York: Pergamon Press.

Morton, K. and O'Hagan, J. 2009. *Humanitarianism then and now: Exploring the boundaries of civil–military relations in a post-9/11 world* in Humanitarianism and civil– military relations in a post-9/11 world, ed. Jacinta O'Hagan and Katherine Morton, (Canberra: The Australian National University, 2009), 1-7.

Rutkowski, 1982. *New Soft Computing Techniques for System Modelling, Pattern Classification and Imafe Processing.* Springer.

Roto, V. Kaasinen, E. Heimonen, T. Karvonen, H. Jokinen, J. Mannonen, P. Nousu, H. Hakulinen, J. Lu, Y. Saariluoma, P. Kymäläinen, T. Keskinen, T. Turunen, M. Koskinen, H. 2017. *Utilizing Experience Goals in Design of Industrial Systems.* Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems. ACM, 2017.

Saariluoma, P., Cañas, J., Leikas, J. 2016. *Designing for Life - A Human Perspective on Technology Development.* Macmillan Publishers Ltd. London. ISBN 978-1-137-53047-9 (eBook)

Sein, M., Henfridsson, O. Purao, S., Rossi, M. and Lindgren, R. 2011. *Action Design Research.* MIS Quarterly, (35: 1), pp. 37-56.

Sevillano-García, M. L., and Vázquez-Cano, E. 2015. *The Impact of Digital Mobile Devices in Higher Education.* Educational Technology and Society, 18 (1), p. 114.

Siemens, G. 2014. *Connectivism: A learning theory for Digital Age.*

Smith, J., 1998. *The book*, The publishing company. London, 2nd edition.

The Treaty of Lisbon, entered into force on 1 December 2009. Accessed September 25, 2017.

UNESCO, 2014. *Teaching and Learning – Achieving Quality for All.* ISBN 978-92-3-104255-3,

Weimer, M. 2013. *Learner-centered teaching: Five key changes to practice.* John Wiley and Sons.

Zhang, D., Zhao, J. L., Zhou, L., and Nunamaker Jr., J. F. 2004. *Can e-learning replace classroom learning?* Communications of the ACM , 45 (5), 75-79.

Zheng, B., Niiyab, M. and Warschauerb, M. 2014. *Wikis and collaborative learning in higher education.* Technology, Pedagogy and Education, 2015. Vol. 24, No. 3, 357–374.