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Re-Imagining Learning Scenarios

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on behalf of the European Distance and E-Learning Network

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Introduction

Our current times have been framed by the concept of the information age, sometimes also known as the computer age. In a networked society as ours, digital technology has touched and changed many aspects of day-to-day life. Several long-standing societal, business and institutional systems have either lost their relevance or have transformed beyond recognition, the music, banking and travel industries being excellent examples.

Education does not stand untouched and we observe emerging and declining paradigms, changing expectations from society, our students now framed as consumers, with new and emerging types of informal learning experiences (take MOOCs for example) and all too frequently operating in unstable economic and policy environments.

The powerful combination of the information age and the consequent disruption caused by these unstable environments provides the impetus to look afresh and identify new models and approaches for education (e.g. OERs, MOOCs, PLEs, Learning Analytics etc.). For learners this has taken a fantastic leap into aggregating, curating and co-curating and co-producing outside the boundaries of formal learning environments – the networked learner is sharing voluntarily and for free, spontaneously with billions of people.

How do we as a community of educators respond to these directions? What could it mean for learning and the changing socio-economic demands of society?

We are set a challenge to really understand our learning environments. To create and invent responses that are possibly not even thought of yet. Perhaps there are new business models, new policies, different ways to understand technological influences, new ways to interpret the collaborative and social-networked society that we live in: the learning environment, in its widest sense.

Following up on the results of the EDEN Research Workshop (RW8) in Oxford in 2014 and the Barcelona 2015 Annual Conference, a clear focus has been awarded to the expansion of emerging learning scenarios, identifying an ongoing shift towards greater attention to the importance of context in the learning process. The EDENRW8 report from Tony Bates highlighted that openness needs to go beyond the content-centred focus. What is driving the need for new approaches is the massification of higher education and the need to find new ways to create openness, which requires a greater focus on the contexts of learning. This implies an integrated approach to online education and the various ways of openness in education which are now developing.

More present core questions include the tension between human and machine approaches to learning – raising the important question of what in education is best done by humans and what by machines? New knowledge is also needed regarding how to combine scalability with personalisation, as well as about learning context and contextualisation.
The social and socio-economic context is more important than ever. Society itself can be understood as a learning environment, with questions of learners’ connection with the community and the empowerment of the practitioners.

In the new learning environments, the core players and stakeholders – learners, educators, government bodies, educational and learning institutions – increasingly acknowledge the chance for constructive and positive changes.

How do we as a community of educators respond to these directions? What could it mean for learning and the changing socio-economic demands of society? What can we, the community of experienced educators, say about this?

The EDEN 25th Anniversary Conference in 2016 in Budapest aims to evaluate and invent better responses regarding these changing socio-economic demands, the functioning of institutions, the new tools and their usability, the collaborative learning cultures, digital pedagogy – in other words the learning environment in its widest sense.

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<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Invitation to Look at Enhancement in Technology-Enhanced Learning</td>
<td>1</td>
</tr>
<tr>
<td>Stéphanie Gauttier, Inmaculada Arnedillo-Sanchez, Trinity College Dublin, Ireland</td>
<td></td>
</tr>
<tr>
<td>Validation of Non-Formal Learning: Opportunities for Distance Education</td>
<td>10</td>
</tr>
<tr>
<td>Judy Harris, Christine Wihak, Thompson Rivers University, Canada</td>
<td></td>
</tr>
<tr>
<td>Academics’ Use of Academic Social Networking Sites: The Case of ResearchGate and Academia.edu</td>
<td>19</td>
</tr>
<tr>
<td>Hagit Meishar-Tal, Holon Institute of Technology, Learning Technologies, Efrat Pieterse, West Galilee College, Israel</td>
<td></td>
</tr>
<tr>
<td>New Methods in the Digital Learning Environment: Micro Contents and Visual Case Studies</td>
<td>29</td>
</tr>
<tr>
<td>András Benedek, János Horváth Cz., Department of Technical Education, Budapest University of Technology and Economics, Hungary</td>
<td></td>
</tr>
<tr>
<td>Adapted Learning Environment in Future Education</td>
<td>37</td>
</tr>
<tr>
<td>Shimon Amar, Ohalo College of Education, Israel, Frederic Roblin, Steelcase Education, France</td>
<td></td>
</tr>
<tr>
<td>Top-Down or Bottom Up: A comparative Study on Assessment Strategies in the STUDIO Adaptive Learning Environment</td>
<td>43</td>
</tr>
<tr>
<td>Christian Weber, Corvinno Technology Transfer Center, Réka Vas, Corvinus University of Budapest, Hungary</td>
<td></td>
</tr>
<tr>
<td>If Learning to Code is not about Coding, then what it is about?</td>
<td>52</td>
</tr>
<tr>
<td>Koen DePryck, Vrije Universiteit Brussel, Jens Vermeersch, Annemie Tytgat, GO! Onderwijs van de Vlaamse Gemeenschap, Belgium</td>
<td></td>
</tr>
<tr>
<td>Gamification for Online Courses to Improve Inquiry Methodology</td>
<td>55</td>
</tr>
<tr>
<td>Paula Carolei, Universidade Federal de Sao Paulo – UNIFESP, Eliane Schlemmer, Universidade do Vale do Rio dos Sinos – UNISINOS, Brazil</td>
<td></td>
</tr>
<tr>
<td>Development of a New Activity-Based Instructional Design Model</td>
<td>65</td>
</tr>
<tr>
<td>János Ollé, László Hülber, Eszterházy Károly University of Applied Sciences, Knowledge Center for Education Theory, Instructional Design, and Methodology, Henrik Sablik, Ágnes Kocsis, Nexius Learning – ELMS Zrt., Hungary</td>
<td></td>
</tr>
<tr>
<td>E-Learning Decision Making: Methods and Methodologies</td>
<td>73</td>
</tr>
<tr>
<td>Nikola Kadoić, Nina Begičević Ređep, Blaženka Divjak, University of Zagreb, Faculty of Organization and Informatics, Croatia</td>
<td></td>
</tr>
<tr>
<td>Sustainability for Whom? Planning for Student Success in Open Education and Distance Learning</td>
<td>83</td>
</tr>
<tr>
<td>Alan Tait, The Open University, United Kingdom</td>
<td></td>
</tr>
<tr>
<td>Mobilising Leadership for Innovative Open and Distance Education in the 21st Century</td>
<td>91</td>
</tr>
<tr>
<td>Don Olcott, Jr., Charles Sturt University, Australia and Carl von Ossietzky University of Oldenburg, Germany, Lisa Marie Blaschke, Carl von Ossietzky University of Oldenburg, Germany</td>
<td></td>
</tr>
</tbody>
</table>
OPEN EDUCATIONAL RESOURCES

Opening Studies Through Virtual Exchange – Case Description .......................................................... 99
Airina Volungevičienė, Estela Daukšienė, Margarita Teresevičienė, Vytautos Magnus University, Lithuania

Advantages and Disadvantages of SPOCs (Small Private Online Courses): Experiences with Online Learning ........................................................................................................................................................................................ 108
Gerard Gielen, UC Leuven Limburg, Belgium

Educational System Interoperability – Challenges for Open Learning and Training Programs .......... 115
Christian-Andreas Schumann, Eric Forkel, Helge Gerischer, Janek Goetze, Thomas Klein, Claudia Tittmann, West Saxton University of Zwicau, Jana Weber, Technische Universität Berlin, Germany, Feng Xiao, Tongji University, China, Jorge Alejandro Manríquez Frayre, Tec de Monterrey, Mexico

Open Education as Disruption: Lessons for Open and Distance Learning from Open Educational Practice .......................................................... 123
Ronald Macintyre, The Open University in Scotland, Scotland

Dear Educator, How Open Are You? ........................................................................................................ 131
Fabio Nascimbeni, Universidad Internacional de La Rioja (UNIR), Spain

Researching Laureate’s European Hybridity Initiative ........................................................................ 141
Alain Noghiu, Laureate Network Office, The Netherlands, Pedro J. Lara Bercial, Universidad Europea de Madrid, Spain, Michael Vogelsang, BiTS, Germany, Marios Vryonides, European University Cyprus, Cyprus

MOOCS ISSUES – EXPERIENCE, UNDERSTANDING, ATTITUDES, HOPES

The ECO Project for E-Teaching: Social MOOCs at the Crossroads of Actors’ Cognitive Logics and Strategies ..................................................................................................................................................................................... 148
Divina Frau-Meigs, Sorbonne Nouvelle University, Adeline Bossu, Bordeaux 3 University, France

MOOCs for Motivation: Promoting Student Engagement in Higher Education Studies .................. 160
Steven Warburton, Maria Fragkaki, Sophia Vahora, University of Surrey, United Kingdom

MOOCs and Change Dynamics in Higher Education ........................................................................... 170
Cathrine Tømte, Siri Aanstad, Jørgen Sjaastad, Sabine Wollscheid, The Nordic Institute for Studies in Innovation, Research and Education NIFU, Norway

Do Our MOOC’s Work? Creative Ways to Assess Innovative E-Learning Programs ......................... 176
Michal Elran, Carmel Bar, Naama Bar-On, Yossi Elran, Davidson Institute of Science Education, Weizmann Institute of Science, Rehovot, Israel

Exemplars of Collaborative Learning Design in Online Courses .............................................................. 184
Afsaneh Sharif, Manuel Dias, University of British Columbia, Canada

A Benchmarking Study of K-Means and SOM Approaches Applied to A Set of Features of MOOC Participants .................................................................................................................................................................................. 191
Rosa Cabedo Gallén, Edmundo Tovar Caro, Technical University of Madrid, Spain

An Experiment of Social-Gamification in Massive Open Online Courses: The ECO iMOOC .................. 202
Eva García-Lopez, Antonio García-Cabot, Luis de-Marcos, University of Alcala, Spain, António Moreira Teixeira, Universidade Aberta and University of Lisbon, Maria do Carmo Teixeira Pinto, Universidade Aberta, Portugal

Openness, Multiculturalism, Attitudes and Experience in Online Collaborative Learning .................. 211
Noga Magen, Gordon College of Education, Miri Shonfeld, Kibbutzim College of Education Technology and Art, Roni Dayan, Ministry of Education, Israel
LEARNER NEEDS, CHARACTERISTICS AND THE E-LEARNING SOLUTIONS

Perceptions of Learning Activities and Learning Outcomes in a ROSE (Random Short-term Learning Environment) .................................................................341
Keren Levy, Elaine Hoter, David Burg, Ohalo Teacher College, Israel

Situated Formative Feedback – How a Moodle Can Enhance Student Learning through Online Feedback349
Niels Bech Lukassen, University College of Northern Denmark and Aarhus University, Christian Wahl,
University College of Northern Denmark, Elsebeth Korsgaard Sorensen, Aalborg University, Denmark

Examination of the Effectiveness of Electronic Learning Environments......................................................360
Erika Jókai, Budapest University of Technology and Economics, Hungary

The Integration of Information Literacy Skills into the Curriculum........................................................................367
Luis Guadarrama, Marc Cels, Athabasca University, Canada

Re-Imagining Coursework Masters for Online Learning Based on Research and Design Principles ........375
Lynette Nagel, University of Pretoria, South Africa

Pen or Keyboard – An Empirical Study on the Effects of Technology on Writing Skills .................................384
Benedetto Vertecchi, Antonella Poce, Francesco Agrusti, Maria Rosaria Re, Università Roma Tre, Italy

Guiding Students to Become Lifelong Learners: Flipped Classroom and Meaningful Participation in a
Blended-Learning Environment ...................................................................................................................393
Teemu Leinonen, Eva Durall, Aalto University, Finland

Immersive Learning – Learning Patterns inside Digital Cultural Immersive Experiences in Situ.............402
Patrizia Schettino, Università della Svizzera italiana, Switzerland

Amplifying the Process of Inclusion through a Genuine Marriage between Pedagogy and Technology411
Elsebeth Korsgaard Sorensen, Hanne Voldborg Andersen, Aalborg University, Denmark

Transformachines: Transforming City Data to Architectural Design Strategies ...........................................422
George Parmenidis, Nelly Marda, Olga Ioannou, National Technical University of Athens, School of
Architecture, Greece

SMART DIGITAL PEDAGOGY AND LEARNING METHODOLOGY

Curricular Development and ICT: From Technological Deficit to Methodological Deficit ............................ 435
Fernando Albuquerque Costa, University of Lisbon, Portugal

Use of Big Data in Education Efficiency Analysis ........................................................................................................... 448
György Molnár, Dávid Sik, Zoltán Szűts, Budapest University of Technology and Economics, Hungary

Integration of Virtual Learning Environment into the Educational Process ....................................................... 456
Sandra Kučina Softić, Ana Corić Samardžija, University of Zagreb University Computing Centre, Croatia

Using Hypervideos in Initial Vocational Education: Effectiveness and Motivation of Instructional
Scenarios ........................................................................................................................................................................ 464
Alberto Cattaneo, Florinda Sauli, Swiss Federal Institute for Vocational Education and Training,
Switzerland

How Social Networking Experience Relates to Social Presence and Attitude of Using SNS in Education472
Jieun Lim, Jennifer Richardson, Purdue University, United States of America

Online Courses Evolving Teacher Education Programs .............................................................................................. 482
Miki Kritz, Miri Shonfeld, Kibbutzim College of Education, Ilan Nagar, Hemdat Hadarom College, Israel
Extending Learning Environments in Higher Education: Online Peer-to-Peer Counselling in Professional Degree Programs of Social Work

Patricia Arnold, Munich University of Applied Sciences, Germany

How Do Faculty Members React Towards the Use of Personal Mobile Devices by Students in the Classroom?

Hagit Meishar-Tal, Holon Institute of Technology (HIT), Alona Forkosh-Baruch, Levinsky College, Israel

Repository of Inspiring Science Education Project about Space and Astronomy in Science Education

Panagiota Argyri, Evangeliki Model School of Smyrna, Greece

Online Mentoring: Strategies and Challenges

Swapna Kumar, Melissa Johnson, Catherine Coe, University of Florida, United States of America

QUALITY, ASSESSMENT AND EVALUATION

“First in Line” Student Assessments of Pioneering Examples of Blended Learning

Roderick Flynn, School of Communications, Dublin City University, Ireland

Opening up Higher Education: Quality Assurance for Innovative Approaches

Stamenka Uvalić-Trumbić, Senior Advisor to the US Council for Higher Education Accreditation; Former Chief of Higher Education Section, UNESCO

Quality Culture in Blended Learning: Self-Assessment as a Driver for Change

Hilde Van Laer, Koen De Pryck, Chang Zhu, Yves Blieck, Vrije Universiteit Brussel, Belgium

Evaluating Online Programs: Adapting the Community of Inquiry Survey

Swapna Kumar, University of Florida, United States of America, Helga Dorner, Central European University, Hungary

Implementing a Model and Processes for Mapping Digital Literacy in the Curriculum (Online Badges)

George Evangelinos, Anglia Ruskin University, Debbie Holley, Bournemouth University, Mark Kerrigan, Anglia Ruskin University, United Kingdom

INTERNATIONAL INITIATIVES AND COLLABORATION CASES

International Students’ Behaviour in Virtual Collaborative Learning Arrangements

Wissam Tawileh, Technische Universität Dresden, Germany

Digital Learning in Higher Education – “Lessons from America”

Gerard L. Danford, Haaga-Helia University of Applied Sciences, Finland

Exploring ICT Education Policies and Teaching Practices in Australian and Vietnamese High Schools

Thang Manh Tran, Dorian Stoilescu, Western Sydney University, Australia

School Displacement: Learning Outside Borders

Ana Mouta, Ana Paulino, Hélder Quintela, JP-inspiring knowledge, Portugal

ONLINE LEARNING NATIONAL CASE STUDIES

Design Challenges for an E-Learning Accreditation System for the Republic of Malta

Anthony F. Camilleri, Knowledge Innovation Centre, Alex Grech, StrategyWorks, Malta

Digital Creativity for Net Generation Students: Retooling the Art and Design Environment at School

Andrea Kárpáti, ELTE University, Faculty of Science, Centre for Science Communication and UNESCO Chair for Multimedia in Education, Tünde Simon, Szeged University, Graduate School of Education, Ágnes Gaul-Ács, KAPTÁR Visual Arts Workshop and Archive, Hungary
The Impact of the National ICT Program on the School from the Viewpoint of the Administration – A Case Study
Egoza Wasserman, Tami Targani, Herzog Academic College, Israel

Developing an Irish Professional Development Framework for Teaching and Learning, in the Changing Higher Education Learning Environment
Geraldine O’Neill, Terry Maguire, Elizabeth Noonan, National Forum for the Enhancement of Teaching and Learning, Ireland

INSTITUTIONAL INNOVATION AND DEVELOPMENT WITH ICTS

Current Situation of e-Learning in Higher Education: A Case Study
Yasemin Gülbahar, Hale Ilgaz, Ankara University, Turkey

The Technological Foundation of Disruptive Education at UNED
Timothy Read, Carmen García Llamas, Juan Cigarrán Recuero, PVC Methodology & Technology, UNED, Spain

The TU Delft Online Learning Experience: From Theory to Practice
Nelson Jorge, Willem van Valkenburg, Sofia Dopper, Delft University of Technology, The Netherlands

The Assessment Process as a Cornerstone of Quality Assurance in Higher Education: The UOC Case
Ana-Elena Guerrero-Roldán, M. Elena Rodríguez, Xavier Baró, David Bañeres, Ingrid Noguera, Universitat Oberta de Catalunya, Spain

POSTERS

Tell Me Your Story: A MOOC Model for Reducing Bias Through Personalizing Cultural Narratives in Small, Collaborative, Multicultural Student Groups
Elaine Hoter, Ohalo College of Science Education and Sport, Reina Rutlinger-Reiner, Talpiot Academic College, Nili Alon Amit, Kibbutzim College, Jen Sundick, David Yellin College of Education, Manal Yazbak Abu Ahmad, Sachnin College of Education, Israel

The Massive Open Online Course on Palliative Care Enables Communication in Six Languages
Anca Cristina Colibaba, Grigore T. Popa University Iasi and Fundatia EuroEd, Romania, Irina Gheorghiu, Albert Ludwig University Freiburg, Germany, Stefan Colibaba, Alexandru Ioan Cuza University Iasi, Ovidiu Petris, Grigore T. Popa University Iasi, Romania

Teaching to Teachers: A MOOC Based Hybrid Approach
Alessandro Bogliolo, University of Urbino, Rosanna De Rosa, University of Naples, Italy

Embedding MOOCs in University Courses: Experiences and Lessons Learned
Sólveig Jakobsdóttir, University of Iceland, Iceland

ICT Contests as a Road to Computer Literacy of Older People
Olga Grishina, Elena Sidorova, Plekhanov Russian University of Economics, Russia

Incentivising Online and Open Education: Can Government Funding Change Practice?
Nick Baker, University of Windsor, Canada

Is E-learning an Option in Inclusive Post-Secondary Education?
Chrisann Schiro-Geist, University of Memphis, United States of America

Knowledge in Motion between Formal Education and Professional Practice – How to Design for Learning across Boundaries
Anne Mette Bjørgen, Line Kristiansen, Lillehammer University College, Norway
The Significance and Possibilities of International Cooperation between Institutions of Higher Education
Éva Sándor-Krisz, Anita Csesznák, Budapest Business School, Hungary

Redefining the Student Experience: Information-Seeking Behaviour – The Complete Picture
Sandra Tury, University of London, United Kingdom

Monitoring a Learning Community in a Hybrid Environment: A Sentiment Analysis
Ilaria Merciai, Marco Cerrone, University of Naples Federico II, Italy

Moving Beyond Access: Distance Education and Capacity Building
Adnan Qayyum, Pennsylvania State University, United States of America, Albert Sangra, Open University of Catalonia, Spain

Technological Pedagogical Content Knowledge (TPACK) Case Studies for Exemplary Mathematics
Dorian Stoilescu, Western Sydney University, Australia

Enhancing 21st Century Skills in a Regular University College Setting through Blended Learning
Sofie Vanmaercke, VIVES University College, Belgium

The E-Campus-Project – The Transformation of a Student Administrative Tool into a Personal Learning Environment
Mikael Reberg, Mid Sweden University, University Library and Learning Resource Centre, Sweden

Development of Shared Knowledge in a Virtual Reality Environment for Collaborative Learning
Laura Kiss, Balázs Péter Hámornik, Máté Köles, Budapest University of Technology and Economics, Hungary

Changing LMS: How to Manage Change about Technological Innovations in Higher Education
Eva P. Gil-Rodríguez, Ana Maria Delgado García, Mireia Leg Gil, Universitat Oberta de Catalunya, Spain

Blended Learning before a Learning Environment Change: Pre-Departure Training for Medical Exchange Students
Nynke de Jong, Laury de Jonge, Marijke Kruithof, University of Maastricht, The Netherlands

Is E-learning an Option in Inclusive Post-Secondary Education?
Chrisann Schiro-Geist, University of Memphis, United States of America

The Bavarian Virtual University – An Innovative Approach for the Information Age
Corina Erk, Regine Prem, Bavarian Virtual University, Germany

Diversity in Learning Environments and the Use of Technology for Education at UNAM
Jorge León Martínez, Edith Tapia Rangel, National Autonomous University of Mexico (UNAM), Mexico

10 Years of Experience in Virtual Mobility: Developing Competencies for Mastering the Virtual Learning Environment and Participating in Virtual Mobility Courses – The Case of DOBA Faculty
Nataša Ritonija, Anita Maček, DOBA Faculty for Applied Business and Social Studies, Slovenia

A Model of the Digital Maturity of Schools in Croatia
Lucija Dejanović, Croatian Academic and Research Network (CARNet), Croatia

Quality Pact for (E)Teaching – An Example from the University of Bonn
Cornelia Helmstedt, University of Bonn, Germany

Citius, Altius, Fortius, Reticulius: Opening up Volunteer Training for the Olympic Games to The Networked Age
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E-LEARNING DECISION MAKING: METHODS AND METHODOLOGIES

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Abstract

Strategic decision making implementation is still an important problem in higher education (HE). The shift in research moved from goals and activities towards recognizing decision making methods used for decision making (DM) and evaluation of the strategy implementation. The purpose of this paper is to investigate which decision making methods and methodologies are used in the decision making processes in higher education, especially strategic decision making problems connected to the implementation of e-learning. In order to achieve this goal we reviewed 40 research papers. Results show diversity of methods, methodologies and approaches used in the strategic decision making in HE which proves complexity of the topic. We summarize them in four phases and also recommend methods that can be successfully applied based on the literature review presented in this paper and authors’ practical experiences.

Introduction

For the purpose of this paper the term e-learning covers a range information and communication technologies (ICT) usage in formal education; starting from using ICT in classrooms, blended learning, open and distant learning, online learning to the use of massive open online courses (MOOCs), e-portfolios, social media technologies, open badges, and so on (Divjak & Begicevic, 2015). The implementation of e-learning in HE is one of the important strategic decision making problems because it influences all HE participants, from students and teachers to HE management (Lerner, 1999) and, as well as a smart implementation, it requires a shift in the pedagogical paradigm. Different approaches, methodologies and decision making methods can be used in decision making processes in HE. On the other hand all of them are not appropriate for the problems that relate with the application of some e-learning form/technology. The research on this paper is in the scope of the project “Development of a methodological framework for strategic decision making in higher education – a case of open and distant learning implementation” (HigherDecision) supported by Croatian Science Foundation and planned for the period 2015-2019 (http://higherdecision.foi.hr). The primary goal of HigherDecision project is to develop a complete methodology for strategic DM and monitoring of its implementation in HE. Two basic components of the project are: (a) Development of methodological framework for
strategic DM and monitoring of its implementation; (b) Application, adjustment and 
evaluation of methodology on the example of decision implementation on e-learning (ODL).

In our methodology, the Deming cycle was modified as shown in Figure 1. Deming cycle 
implies constant improvement of the system’s ability, this being the aim of quality 
management. This cycle consists of four phases: P (plan) – determination of the mission, 
vision and strategy, planning and establishing of objectives; D (do) – applying the processes, 
performing; C (check) – supervising and measuring of the process and their results 
considering objectives and indicators; A (act) – improvement of the process. The cycle of 
strategic decision making, consists of four phases: (1) Identification and research of the 
problem, (2) Development of the methodology of strategic DM, (3) Implementation and 
monitoring of strategic decision and (4) Evaluation of the effects of strategic decision. Details 
can be found in (Divjak & Begicevic, 2015).

Figure 1. Double cycle of strategic decision making – case study of e-learning (including ODL)

Research – systematic literature analysis

In the fields of e-learning, strategic decision making and higher education there are a lot of 
papers dealing with these topics individually. In this paper we consulted papers which deal 
with topics from at least two of three mentioned fields at the same time. Name of fields were 
used as the keywords in database search. Databases included in the search were the following: 
Scopus, Science Direct, Wiley Online Library, Web of Science and Academic Search 
Complete. Search results gave us more than five hundred papers which meet the selected 
criteria, especially when searching without search limitations (searched keywords in abstracts 
and paper keywords; last 10 years; journal papers/proceedings). Finally we got to 40 papers 
presented in the continuation of this paper.

Example of AHP and ANP use

E-learning implementation is a strategic decision for HE institutions (HEI). Phases of strategic 
planning of e-learning implementation are defined in the paper (Begićević, Divjak, & Hunjak, 
2007a). Authors dealt with the problem of prioritization of e-learning alternatives at the level 
of department/course. In the presented case study, after applying a four phase decision 
making cycle, factor analysis and AHP method (Analytic Hierarchy Process), the most 
appropriate form of e-learning, at the level of department/course, was blended learning. The 
same authors in their paper (Begićević, Divjak, & Hunjak, 2007b) dealt with the prioritization
of e-learning alternatives at the level of HEI. For HEI level Analytic Network Process (ANP) was used. After applying the given method to the case study, the most appropriate form of e-learning at the level of faculty was blended learning. The AHP and the ANP methods were also used in the paper. Authors (Shu-Hsiang, Jaitip, & Ana, 2015) used ANP and AHP as well to measure the degree of alignment of a university’s strategic objectives with results obtained by faculty through its knowledge transfer mechanisms. In case of Universidad Nacional de Colombia misalignment was detected. When talking about the application of AHP to strategic problems in HE, there are some other examples of AHP application. In the paper (Liberatore & Nydick, 1997) AHP was applied to two problems: the evaluation of academic research papers and institution-wide strategic planning; and two models were defined: model for awarding best papers and model for making a strategic plan of HE. Yusuf and Salleh used AHP method to create the model of evaluation of HE institutions in order to decide about upgrading the status of private HE institutions (Yusof & Salleh, 2013). In the paper (Gregov & Hunjak, 2014) authors discussed the development of a criteria set for employment in HE. Other example of applying the AHP method in HRM (human resource management) in HE is the evaluation of faculty employees’ performance (Badri & Abdulla, 2004). Authors came with the model that can be applicable at department, faculty and university level. In (Huang & Chiu, 2015), AHP method is applied in creating Evaluation model for CAML (context-aware mobile learning). AHP method is often applied in combination with some other method. Ho, Higson and Dey used integrated approach, and by using AHP method and goal programming they dealt with resource allocation to project proposals at faculty level (Ho, Higson, & Dey, 2007) which is also useful when talking about e-learning projects. In (Labib, Read, Gladstone-Millar, Tonge, & Smith, 2013) AHP method is applied together with knapsack method in the problem of creating framework for the formulation of a HEI strategy. They defined a novel approach for classification (prioritization) of one of the most critical issues in HE – strategic investment. The way that HE institutions contribute to economic development by drawing on evolutionary economics and the national innovation systems approach is given in (Kruss, McGrath, Petersen, & Gastrow, 2015) and Social Network Analysis (SNA) is applied.

**Example of DEA use**

Authors (Ho, Dey, & Higson, 2006) reviewed 25 papers which focus on four major HE decision problems: resource allocation; performance measurement; budgeting; and scheduling. Methods used in that paper are the following: statistical models, DEA, regression, AHP and goal programming. In another literature review (Jani, 2013) Jani presented several applications of TRIZ (Theory of solving inventive problems) in HE. Data Envelopment Analysis (DEA) is also used in strategic decision making in HE, for example in paper (Kabók, Kis, Csüllög, & Lendáč, 2013) in which competitiveness of higher education in selected countries / regions in Europe is discussed and (Furková & Surmanová, 2015) where scientific activities of Slovak economic faculties are evaluated by using DEA together with PROMETHEE.
Example of BSC, TQM and KPI use

Authors (Fooladvand, Yarmohammadian, & Shahtalebi, 2015) gave recommendations for the application of strategic planning and Balanced Score Card (BSC) in higher education quality. In paper (Hladchenko, 2015) comparative analysis of 4 case studies, in which BSC is used, is done. Author defined a general framework of BSC for HE institutions. Authors (Akyel, KorkusuzPolat, & Arslankay, 2012) presented strategic planning of the Sakarya University based on Total Quality Management (TQM). Paper by (Lillis & Lynch, 2013) considers whether the strategic planning models used in the past decade will be able to meet the challenges presented by unprecedented economic circumstances and the new national strategy for HE in Ireland. Strategic planning of marketing campaigns in reaching the target audience is discussed in (Alotaibi & Muramalla, 2015). In paper (Ahmad, Farley, & Naidoo, 2012) the improvement of the efficiency and effectiveness of strategic planning in higher education institutions by using Key Performance Indicators (KPI) is discussed. Marshall suggested maturity modelling for measuring the quality of e-learning (Marshall, 2012). Authors (Ghavifekr, Afshari, Siraj, & Abdul Razak, 2013) presented key strategies and policies for effective organizational implementation of systematic change in the context of an ODL organization. Important factors that help determine the success or failure of online programs were identified in (Rovai & Downey, 2010).

Examples of theories use

Paper (Garnett, Bevan-Dye, & de Klerk, 2011) uses quantitative methodology for analyzing performance measurement of HEI that use deliberate strategies. In (Gorgan, 2015) data driven decision support system for higher education is designed. Authors (Raluca, ACSandru, Aniela, & Vasile, 2012) applied game theory in strategic planning. Furthermore, (Broad, Goddard, & von Alberti, 2007) used grounded theory to present the relationship between strategic planning, accounting and performance measurement systems in local government and higher education. A framework for institutional adoption and implementation of blended learning in HE is created in (Graham, Woodfield, & Harrison, 2013). By using the results of focus groups and individual interviews, King and Boyatt explored factors influencing adoption of e-learning within higher education: institutional infrastructure, staff attitudes and skills, and perceived student expectations (King & Boyatt, 2015).

Examples of EDM and LA use

In paper (De Morais & De Araújo, 2013) Educational Data Mining (EDM) approach for identifying which factors are most relevant at an e-learning course is analyzed. Decision Tree is the decision making method used in this approach. Authors (Čukušić, Alfiirević, Granić, & Garača, 2010) presented a comprehensive model for managing the e-learning process in HE. When talking about managing e-learning, Yamada analyzed Japanese case studies and presented practices in which MOOCs acted as catalysts, implementing component technologies and development strategies for e-learning (Yamada, 2016). Critical success factors of MOOCs are discussed in (Poy & Gonzales-Aguilar, 2014). Four factors were identified and measured, namely, educational software design, dropout rates, universal scope,
and business strategy. Authors (Macfadyen & Dawson, 2012) use change management methods to give the answer to the question of importance of learning analytics (LA) for strategic decision making. They concluded that e-learning analytics form should be combined with data visualization and participant observations. In (Bassoppo-Moyo, 2008) the importance of incorporating needs assessment and strategic plan when implementing any instructional innovation that is governed by basic learning principles is pointed out.

**Examples of SEM and CBA use**

Structural Equation Modelling (SEM) is also used for decision making on e-learning in HE. For example (Ahmed, 2010) assesses hybrid e-learning acceptance by learners using three critical success factors: instructor characteristics, information technology infrastructure, and organizational and technical support; paper (Dachyar, 2015) deals with the development of strategy model for organizational innovation through information systems in higher education in Indonesia. In higher education, the most significant factor in improving organizational innovation performance is organizational change. Cost Benefit Analysis (CBA) is used in methodologies of identifying variables that influence the development of e-learning services (Fenu & Picconi, 2010). Whether the e-learning services will be successful or not depends on many factors. By using literature review, paper (Rovai & Downey, 2010) examines those factors. These factors are planning, marketing and recruitment, financial management, quality assurance, student retention, faculty development, online course design and pedagogy.

**Conclusion**

As we can see from the previous section, many different methods, approaches and methodologies have been used in research papers dealing with strategic planning and decision making in higher education or e-learning. AHP method was especially used in several papers on strategic decision making in higher education. One of the reasons lies in the fact that it enables group decision making which is being often applied to problems in HE. Other frequently used approaches are Balanced Scorecard, Total Quality Management, Change Management, Process Management and more general approaches like four phase decision making model and Deming’s cycle (Plan-do-check-act). Many papers we considered deal with case study approach and analyze how certain problem is solved in a concrete context, and those papers make useful recommendation for solving similar problems in other context.

Some of the other existing methods related to the decision making on e-learning implementation in HE are: ANP, DEA, cost-benefit analysis, qualitative and quantitative analysis based on questionnaires, focus groups and interviews, TOWS, Promethee, TOPSIS, goal programming methods, social network analysis, factor analysis, structural equation modelling and game theory. In order to systemize and improve the use of decision making methods we proposed the methodology called strategic decision making cycle including four phases as is described in (Begićević & Divjak, 2015). We also listed methods that can be used in each phase, as well as some specifics of decision making in HE, especially regarding e-learning. A summary is given in Table 1.
Table 1: Summary of decision making methods in HE focused on e-learning

<table>
<thead>
<tr>
<th>Phase of the cycle</th>
<th>Approaches</th>
<th>Specifics of HE and e-learning</th>
<th>Methods and methodologies</th>
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<tbody>
<tr>
<td>Identification and research of the problem</td>
<td>Needs and situation analysis, Readiness assessment, Diffusion of innovation</td>
<td>Stakeholders’ involvement, E-readiness, Consciousness raising</td>
<td><em>Situation analysis (Document analysis)</em>&lt;br&gt;Case study research&lt;br&gt;Different types of qualitative analysis&lt;br&gt;Structural Equation Modelling (SEM)&lt;br&gt;Social Network Analysis (SNA)&lt;br&gt;Grounded theory Game theory&lt;br&gt;<em>Educational Data Mining and Learning Analytics (LA)</em>&lt;br&gt;Methodology for e-readiness assessment&lt;br&gt;<em>Problem tree with Decision tree</em>&lt;br&gt;Statistical methods&lt;br&gt;BOCR AHP and ANP, PROMETHEE, ELECTRE, TOPSIS&lt;br&gt;Ideal point-based MCDM&lt;br&gt;Multi-criteria variant of cost-benefit analysis&lt;br&gt;Hybrid methodology of risk management – Monte Carlo simulation and Sensitivity analysis&lt;br&gt;Different types of qualitative analysis&lt;br&gt;Factor analysis, Clustering&lt;br&gt;Game theory&lt;br&gt;Goal programming, Knapsack method&lt;br&gt;TRIZ (Theory of solving inventive problems)&lt;br&gt;Decision Tree&lt;br&gt;<em>BSC Balanced Scorecard</em>&lt;br&gt;Enterprise Architecture for BPM (Business Process Management)&lt;br&gt;CMMI (Capability Maturity Model Integration)&lt;br&gt;Econometric methods (ROI, productivity, efficiency, profitability)&lt;br&gt;DEA (Data Envelopment Analysis)&lt;br&gt;Total Quality Management&lt;br&gt;Interpretations of econometrics and use of KPIs and PPM</td>
</tr>
<tr>
<td>Development of methodology for DM and decision making</td>
<td>Analysis of potential solutions, MCDM, Cost-benefit and risk analysis</td>
<td>Benchmarking of HEIs, Modelling dependencies and group DM (AHP &amp; ANP with BOCR)</td>
<td>BSC, KPI, BPM&lt;br&gt;CMMI&lt;br&gt;PPM&lt;br&gt;Interpretations of econometrics and use of KPIs and PPM</td>
</tr>
<tr>
<td>Implementation and strategic decision monitoring</td>
<td>Qualitative, quantitative and mixed methods, Structural causal models</td>
<td>Stakeholder perspective analysis, In-depth case study to find out causes &amp; effects</td>
<td>BSC Balanced Scorecard&lt;br&gt;Enterprises Architecture for BPM (Business Process Management)&lt;br&gt;CMMI (Capability Maturity Model Integration)&lt;br&gt;Econometric methods (ROI, productivity, efficiency, profitability)&lt;br&gt;DEA (Data Envelopment Analysis)&lt;br&gt;Total Quality Management&lt;br&gt;Qualitative methods - stakeholder perspective, document analysis, internal consistency of the strategy and external effectiveness, benchmarking, <em>in-depth</em> case study, Delphi&lt;br&gt;Quantitative methods - econometric analysis, cost-benefit analysis, <em>multi-criteria analysis and regression analysis</em>&lt;br&gt;Causal modelling&lt;br&gt;<em>Educational Data Mining and Learning Analytics (LA)</em></td>
</tr>
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</table>

There are recommended methods (bold letters) in each phase that can be successfully applied in HE setting based on the literature review presented in this paper and authors’ practical experience. Application of other methods and methodologies is feasible only with the
engagement of supporting tools, additional human and financial resources as well as training of the staff involved in decision making.

References


