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Re-Imagining Learning Scenarios

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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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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 HigherDecison 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).

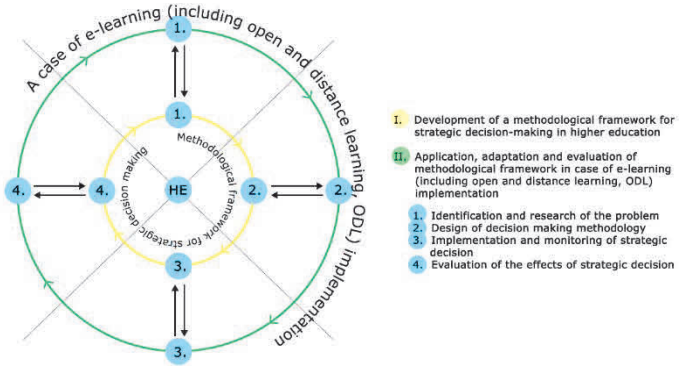

Figure 1. Double cycle of strategic decision making – case study of e-learning (including ODL)

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 (Begičević, 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 (Begičević, Divjak, & Hunjak, 2007b) dealt with the prioritization

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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, & Lendák, 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.

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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, Alecsandru, 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 (Ćukušić, Alfirević, 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,

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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 (Begičević & 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.

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Table 1: Summary of decision making methods in HE focused on e-learning

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

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

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engagement of supporting tools, additional human and financial resources as well as training of the staff involved in decision making.

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