

STRATEGIC DECISION MAKING CYCLE IN HIGHER EDUCATION: CASE STUDY OF E-LEARNING

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ABSTRACT

This paper presents the methodology for strategic decision making in higher education (HE). The methodology is structured as a cycle of strategic decision making with four phases, and it is focused on institutional and national perspective, i.e. on decision making that takes place at institutions of HE and relevant national authorities, in case HEIs are public. Case study of e-learning implementation in HE is presented. E-learning refers to technology enhanced learning, blended learning, open and distance learning as well as massive online courses (MOOCs) delivered by HEIs.

KEYWORDS

Strategic Decision Making, Multi-criteria Decision Making, Diffusion of Innovation, E-learning, Open and Distance Learning, High Education

1. INTRODUCTION

Higher education's (HE) key mission is to develop human potential with beneficial effects for social and economic development. Higher education institutions (HEIs) have been evaluated through the performance in triple mission: teaching, research, serving to society (outreach). Until the end of the 19th century, universities were mostly focused on teaching along with conservation and dissemination of knowledge. At the end of the 19th century, universities directed their mission to teaching and research. Adding the so-called third mission, which refers to the contribution to the society, economy as well as personal development, happened at the end of the 20th century. Since then it has had a remarkable influence on the development of the universities and HE in general. The way in which HEI meets its mission is becoming a first-class research problem (Cortés-Aldana et al. 2009). HE as a system, along with HEIs, must be innovative and strategically managed to be able to fulfil its mission. Therefore, the decision making (DM) accompanied by evaluation of its implementation in higher education is an issue of the highest priority.

This paper presents the methodology for strategic decision making in HE. The methodology is focused on institutional and national perspective, i.e. on decision making that takes place on institutions of HE and relevant national authorities, in case HEIs are public. Application and adjustment of the proposed methodology of strategic decision making in HE is given on the example of implementation of e-learning.

Many different terms have been used in the literature to describe learning supported by information and communication technology (ICT). Here, we use the term e-learning in a broader sense to cover a variety of forms; starting from using ICT in classrooms, blended learning, open and distant learning, online learning as well use of MOOCs, e-portfolios, social media technologies, open badges, etc.

The methodology is structured as a cycle of strategic decision making with four phases:

- (1) Identification and research of the problem - problem identification and research of the problem, adjustment and implementation of methodologies such as readiness assessment and diffusion of innovation
- (2) Design of decision making methodology - improvement of multi-criteria decision analysis enabling better strategic decision making in HE
- (3) Implementation and monitoring of strategic decision – individual/group decision making supported by multi-criteria decision making methods, implementation of decision, identification of key factors that determine effectiveness of strategic decision, their correlation and design of the measuring model for maturity and effectiveness of strategic decision implementation in HE

(4) Evaluation of the strategic decision effects - evaluation by standard methods such as stakeholder evaluation, alignment with strategic goals but also by application of structural causal models for identification of strategic decision effects (Pearl, 2000).

These four phases will be explained in the paper, and a case study of e-learning implementation will be presented. The case study's complex nature, while technology is an obvious component of e-learning and educational pedagogy, must also focus on participation (Tucker, Gentry, 2009). There are also specifics of HE environment that have to be taken into account when analyzing strategic decision making. Most HEIs have a certain level of institutional autonomy, but also the academic freedom of researchers and professors to research and teach due to their best knowledge and according to their own discipline values and personal academic integrity. Besides that, HE can be seen as private or public good, and this introduces different stakeholders into the process of decision making (Marginson, 2011). However, the decision making process at HEIs can be very complex and essentially different from decision making in other private or public organizations. The public good, the historic purpose such as universities and colleges, is replaced in many HE systems by the demands of private interests and economy in many HE systems. However, it still has considerable influence on governing the HEIs. In this paper we are going to refer mostly to HEIs that have a certain level of autonomy from state, but are seen as a public good where staff and students participate in the process of strategic decision making.

2. STATE OF THE ART

There are different approaches to strategic planning and strategic decision making that are applied within HE. Lerner (Lerner, 1999) gives a review of access to the strategic planning process in HE and presents process model of strategic planning and decision making in HE. Related to the methods of the strategic planning and decision making, GAP analysis, SWOT analysis, method five competitive forces, methods of strategic programming and some other methods are applied. Further, Clayton (Clayton, 1997) proposed Delphi method as the method for making strategic decisions in education. In the paper, Jani method (Jani, 2013) based on the theory of inventive problem solving (TRIZ) is modified to become suitable for problem solving in HE.

In the book (Saaty, Cillo, 2008) analytical network process (ANP) was used for decision making in the field of education, but mainly for individual decision making. For example: to make personal decisions about the choice of direction for further education and for ranking of HE institutions. Possibilities of improving AHP and ANP methods for multi-criteria group decision making, with applications within HE, are explored in the paper (Begičević, Divjak, 2006). The methodological framework for strategic planning and decision making of e-learning has been developed and published in the paper (Begičević et al., 2007). However, this methodology has been developed for a narrower application than the methodology presented in this paper.

According to Okumus (2001), there are 10 key factors that affect the implementation of the strategy: its formulation, uncertain environment, organizational structure, organizational culture, operational planning, resource allocation, individuals, controls and outcomes. Key factors that influence strategic changes at universities are leadership, decision-making procedures, communication and evaluation (Stensakers et al., 2014). Application of DEA method (Data Development Analysis) in the evaluation of the effectiveness of education is presented by (Jablonsky, 2011). We can emphasize several models for estimation of some aspects of e-learning effects: Anderson's conversational e-learning model (Anderson, 2007), decision making model on introduction of e-learning in HE (Begičević et al., 2007), EVEDIN model for evaluation of effects of learning and teaching in e-learning systems (Grubišić et al., 2007). None of these offer a complete framework for estimating the effects of strategic decisions in e-learning. According to Mahsood and Chenicheri (Mahsood, Chenicheri, 2013), literature on development and implementation of strategies in universities is limited. In that respect this paper contributes to the research in the field of strategic decision making in HE.

3. STRATEGIC DECISION MAKING CYCLE IN HIGH EDUCATION

Initial pattern in developing methodology for strategic decision in HE is a methodological framework called Deming cycle (PDCA circle) and Dyer’s model (Dyer, 1991) of decision making and implementation.

According to Dyer, there are four phases of decision making and implementation process: Intelligence phase, Design phase, Choice phase and Implementation phase. The tools that can be used in these phases are: data acquisition, storage and retrieval, data base management systems, interactive query, data bases, data analysis and decision analysis (Dyer, 1991).

Deming cycle implies constant improvement of the system’s ability, which is the aim of the quality management. This cycle recognizes 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 argument for choosing this methodological pattern is that Deming cycle is widely used in different areas, in its original or modified form. Besides being an effective process improvement guide it offers a systematic improvement method. The Deming cycle informs future improvement by providing feedback and maintains order during strategic planning, decision making and problem solving. It is useful for daily routine management, problem-solving process, project management, continuous development, vendor development, human resources development, new product development and process trials, etc.

In our methodology, the Deming cycle was modified as shown in Figure 1. The methodological cycle for strategic decision making in HE was upgraded with the application and adjustment of the methodology on case study of e-learning implementation in HE. It consists of two wider goals as two concentric cycles; the inner cycle representing different phases of general methodological approach described below, and the outer cycle representing case study of e-learning implementation in HE described in the following sections. Further iterations may add additional cycles representing new use-cases of given methodological framework (technology transfer, human resources development, inclusive curriculum development etc.). They can provide validity checks, as well as motivation for methodology upgrade.

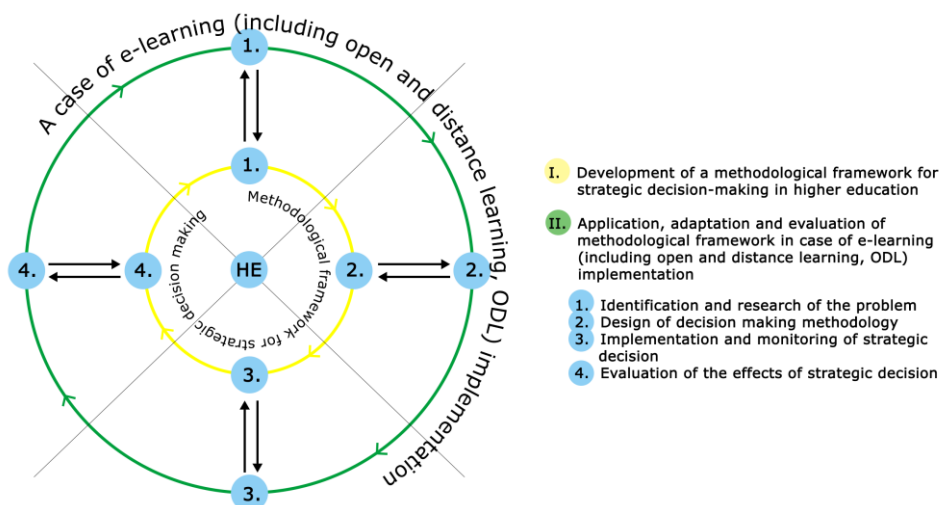


Figure 1. Double cycle of strategic decision making – case study of e-learning (including ODL)

The cycle of strategic decision making, in our case it is the one in HE, 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.

In the first phase called Identification and research of the problem, the problem is going to be identified and the research of the problem, using situation analysis, conducted. In this phase the methodology for institution readiness assessment can be applied. Further, an additional modelling - the diffusion of innovation (DOI) developed by Rogers (Rogers, 2003), is valuable in this phase. According to the theory of DOI, diffusion is a process for transfer of innovations through certain channels, over time and among the members of a social system. Thereby, innovation implies every “idea, practice, or project that is perceived as

new by an individual or other unit of adoption” (Rogers, 2003). In this phase key factors for assessment of organization’s readiness for a decision about adoption of innovation and key performance indicators for the measurement of diffusion of innovations performance in a specific implementation case can be defined.

In the second phase called Design of decision making methodology, based on the improvement of multi-criteria decision analysis enabling, better strategic decision making must be done. The methods used in this phase are multi-criteria decision making methods (MCDM) such as the AHP (Analytic Hierarchy Process) and the ANP (Analytic Network Process) (Saaty, 2001). Other methods can be also used, for example PROMETHEE and ELECTRE, or some of the ideal point-based multi-criteria decision methods (Estrella et al. 2014). In our experience and research it is convenient to use the AHP and ANP BOCR (Benefits, Opportunities, Costs, Risks) models for group decision making (Begičević et al., 2007). The results can be analyzed by using sensitivity analysis. According to the purpose and aims of decision making, the multi-criteria variant of cost-benefit and risk analysis can be used.

In the third phase called Implementation and monitoring of strategic decision, decision making supported by developed decision making methodology is conducted. This methodology helps decision makers to prioritise objectives and alternatives. The objectives and alternatives are presented in a hierarchical (AHP), network BOCR (ANP) structure or in a decision making table (PROMETHEE or ELECTRE). Decision makers are able to drill down to their level of expertise, and apply judgments to the objectives and alternatives considered important for achieving the goals as well as prioritize alternatives.

In the process of group DM, the alternatives are prioritized and decision is made and implemented based on the obtained results. Parallel with the implementation, it is crucial to have a monitoring of the implementation of decision. To ensure monitoring, it is important to identify factors that determine effectiveness of implementation, their correlation and design of measuring the model for maturity and effectiveness of the decision implementation (KPI – Key Performance Indicators). In order to build a model for the assessment of the organization’s maturity to implement and monitor the decisions, BSC Balanced Scorecard, Enterprise Architecture for BPM or CMMI (Capability Maturity Model Integration) can be used.

Monitoring the process of implementation of the strategic decision is based on milestones and other measurable indicators. Monitoring and evaluation are strongly linked and must be both based on reliable, accurate and updated data. Therefore, the purpose of monitoring is to collect relevant data to demonstrate the results of strategic decision implementation. The purpose of the evaluation is a rigorous and systematic assessment of the strategic decision implementation’s success.

In the fourth phase called Evaluation of the effects of strategic decision, several standard qualitative (econometric analysis, cost-benefit analysis, multi-criteria analysis, regression analysis etc.) and quantitative (stakeholder perspective, document analysis, internal consistency of the strategy and external effectiveness, benchmarking, in-depth case study, Delphi panel, etc.) methods can be implemented, but some innovative approaches such as Pearl’s structural causal models for the identification of the effects of strategic decision. Evaluation phase also encompasses feedback that informs policy makers and is used as an input for starting a new cycle of strategic planning. For the evaluation to be meaningful, the strategic goals must be SMART, meaning that the objectives are: Specific, Measurable Achievable, Relevant and Time Bound.

In the following sections the main stages of the outer cycle with emphasis on the e-learning implementation in HE are described.

3.1 Identification and Research of the Problem – e-Learning in HE

In general, the identification and research of the problem phase consists of three parts: (1) Analysis of supply and demand using situation analysis, (2) Determination of diffusion indicators and success, (3) Determination of readiness for innovations.

Situation analysis includes the analysis of present state, research of the problem and analysis of potential solutions. The methods which can be applied at this stage are: recording of the current situation, case study research and different types of qualitative analysis. These methods enable identification of key factors related to the identified strategic problems in HE and define the responsibility for solving those problems.

When modelling the diffusion of innovation, structural equation modelling (SEM) and social network analysis (SNA) can be used to identify: 1) key factors for assessment of organization’s readiness for a decision on the adoption of innovation in a particular social environment, and 2) key performance indicators for the measurement of diffusion of innovations’ performance in a specific example on e-learning

implementation. We emphasize here the theory of diffusion of innovations according to Rogers (Rogers, 2003), which is almost completely ignored within the existing research.

In this phase, the methodology for readiness assessment, for the purpose of strategic decision making, used to be applied. In the context of our case study of e-learning implementation in HE, the starting point is a methodology for e-readiness assessment based on CID methodology. CID methodology was developed by the Center for International Development at Harvard University (CID, 2006). It is a diagnostic instrument for the assessment of society's readiness to use ICT, and it was originally based on indicators in five categories: access, education, society, economy and policy. Upgrade of CID methodology is necessary in order to accommodate the problem's needs and to cover, at least, the following areas: Access to technology; Digital literacy and willingness to change of staff and students; Expectations from society and economy; Educational goals, policy and their funding. The co-authors of this paper conducted an extensive research on e-readiness and adapted the methodology in Kosovo from 2010 to 2011, and accordingly developed the strategy of e-learning for pre-tertiary education within the EU IT Pilot Project in the Field of Education in pre-tertiary education in Kosovo (Divjak, Begičević Redep, 2012).

Methodology for e-readiness assessment can be complemented by the use of qualitative analysis, in-depth interview with stakeholders, focus groups or panel discussion. This is very important for HEIs due to institutional autonomy and participation of staff and students in strategic DM. Therefore, raising awareness of new challenges and potential benefits is at the very core of strategic DM in HE. A HEI finishes the first phase with understanding the objectives or reasons why an organization wishes to establish e-learning education, and the support garners from the various institution stakeholders (Tucker, Gentry, 2009).

3.2 Design of Decision Making Methodology – e-Learning in HE

The development of methodology for strategic DM in HE covers three basic stages: 1) Choosing the most appropriate multi-criteria decision making methods (MCDM) related to the problem characteristics, 2) Improving methods for MCDM, and 3) Building models for decision making using MCDM.

The main hypothesis at this phase is that by adjusting and implementing the methodology of multi-criteria decision making analysis (MCDM), it is possible to improve the quality of strategic decisions in HE.

Decision making in HE has several perspectives and dimensions. The main perspectives are personal, institutional and public. Key factors that make decision making in HE more difficult are: complexity; weak structure and interdependence and decision making at multiple levels in the hierarchy (national, university, faculty/institute, department/division, personal level). The criteria by which it is possible to describe alternatives for making strategic decisions in HE have both qualitative and quantitative characteristics.

Considering the characteristics we described, it is desirable that the methods for the analysis of decisions in HE have the following features: support for multiple criteria decision making, support for structuring of decision problems, support for modelling dependencies between the elements of decision making, the intensities of the criteria have to be expressed in qualitative and quantitative scales, support for group decision making, performing sensitivity analysis and risk analysis, as well as cost-benefit analysis. Existing methods for multi-criteria decision making only partially meet these requirements. Therefore, it was necessary to improve the methods for decision analysis in order to fit strategic decision making in HE. The starting points were methods for multi-criteria decision making: AHP and (Saaty, 2001). AHP provides a hierarchical structuring of decision making problems, and ANP models provide interdependencies of the problem via network. The AHP and ANP can be used to create a BOCR (Benefits, Opportunities, Costs, Risks) decision making models for group decision making on problems in HE. Other methods available are PROMETHEE, ELECTRE, and the ideal point-based multi-criteria decision methods and they can be used if they are more appropriate for solving a specific problem in HE. Due to the importance of cost-benefit analysis for decisions making in HE, the multi-criteria variant of cost-benefit analysis can be useful. If risks are identified in making strategic decisions in HE, it is important to have a risk management strategy. Activities in risk management can be prioritized by hybrid methodology. Monte Carlo simulation can be used for the analysis of financial risks. Risks associated with prioritization can be analysed by sensitivity analysis.

In the stage of building a model for decision making using MCDM, models that incorporate methods from previous stage are built. In stages 2) and 3), the qualitative analysis, survey, factor analysis and clustering (to determine participants in the process of group decision making) can be applied.

3.3 Implementation and Monitoring of Strategic Decision – e-Learning in HE

In the phase of implementing a strategic decision, individual or group decision making must be conducted and the made decision implemented. We propose the decision making methodology designed for strategic decision making in HE is based on the MCDM methods. In that context we have already mentioned AHP and ANP BOCR methods as the methods used for building the decision making models. However, other MCDM methods can be used according to the analysis in the previous phase.

The AHP/ANP BOCR models helps groups to structure decision into objectives and alternatives, prioritise objectives and alternatives, and justify decisions using sensitivity analysis. It is important to choose the participants in group decision making with specific knowledge; this makes them competent to assess and give judgments in the process of group decision making on some strategic issues. Results of group decision making are the objective's relative significance and priorities of the alternatives, gained by judgment synthesis of participants included in decision making process. Sensitivity Analysis offers a stable solution, but it also enables the change of input figures as well as observing consequences on priorities of the alternatives. Sensitivity Analysis is used to investigate the sensitivity of the alternatives to changes in the priorities of the objectives. In the process of group decision making based on the developed models, the alternatives are prioritized and the best alternative is implemented. Parallel to the implementation, it is crucial to have monitoring of strategic decision.

The implementation of strategic decisions, along with strategic goals, requires the adoption of related action plan which includes: activities, responsibilities, deadlines, costs, indicators and prerequisites for implementation. In general, the methodology is based on the following methods and models: 1) BSC Balanced Scorecard: in order to define indicators i.e. KPIs (Key Performance Indicators) to monitor the implementation of strategic decision; 2) Enterprise Architecture for BPM (Business Process Management) for modelling and management of activities; 3) CMMI (Capability Maturity Model Integration) to assess the level, of process capability and maturity of organizations for the implementation of strategic decisions.

In order to build a model for assessment of the maturity of an organization for implementation and monitoring of strategic decisions in HE, CMMI model can be used. Accordingly, the relevant criteria for assessment of capability levels for the process of implementation and monitoring of strategic decision in HE must be defined. Process capability levels are the basis for determining a maturity level of the organization, which is an indicator of its readiness to implement the strategic decision.

Additionally, the success of the implementation and monitoring of strategic decisions in HE can be assessed by using KPIs (related to BSC and BPM) and econometric methods (ROI, productivity, efficiency, profitability, etc.), This must be done with significant adaptation to the environment in order to interpret what notions of productivity, efficiency and specially profitability mean in HE. These indicators are related to three important project-oriented objectives: time, quality and cost.

3.4 Evaluation of the Effects of Strategic Decision – e-Learning in HE

The evaluation of the effects of a strategic decision in HE is very rarely researched or even performed on systematic basis in HEIs. However, the results of such evaluation should have a major impact on the following cycle of strategic planning. Therefore, the methods for strategy evaluation must be carefully selected and applied, and the evaluation results must be announced and used as lessons learned. In the phase of evaluation, different quantitative, qualitative and mixed methods can be used. The quantitative methods that can be used are econometric analysis, cost-benefit analysis, multi-criteria analysis and regression analysis. The qualitative methods that can be used for the evaluation of the effects of strategic decision are stakeholder perspective, document analysis, internal consistency of the strategy and external effectiveness, benchmarking, in-depth case study and Delphi panel. In our methodology we also suggest using some innovative approaches, such as Pearl's structural causal models to identify the effects of strategic decision.

Pearl's structural causal models can be used for the identification of strategic decision effects. J. Pearl's interpretation of causality enables quantitative modelling of causal concepts in dynamic systems. After the groundbreaking work in Bayesian networks and probabilistic reasoning, Pearl has been developing his structural causal models (SCMs) for the last 20 years. Using SCMs, we replace informal causal utterances with probabilistic queries. For example, we can say something about "why the system behaves in certain way" (explanation) or "how would the system behave under external actions" (prediction).

The research on this paper topics continues in the scope of the project “Development of a methodological framework for strategic decision making in higher education – a case of open and distance learning implementation” (HigherDecision) supported by Croatian Science Foundation and planned for the period 2015-2019. Primary goal of HigherDecision project is to develop a complete methodology for strategic DM and the monitoring of its implementation in HE. Two basic components of the project are: 1. Development of methodological framework for strategic DM and monitoring of its implementation; 2. Application, adjustment and evaluation of methodology on the example of decision implementation on e-learning (ODL).

4. CONCLUSION

HEIs today are facing many challenges, but also vast opportunities for change. The core question is how to use the opportunities despite restrictions in funding, international competition and internal resistance to change in order to better fulfil their fundamental mission. One of the biggest opportunities is the implementation of educational technologies that can serve many institutional goals, such as enhancing quality of teaching and learning, strengthening outreach and also raising profits. However, the process of strategic DM is even more complex in HEIs than in other organizations due to the nature of HE system and its role in the development of society, economy as well as in students’ personal development. In order to systemize and improve the process we proposed the methodology called strategic decision making cycle that includes four phases. We also proposed the listed methods that can be used in each phase, as well as some specifics of decision making in HE and especially when e-learning is concerned. A summary is given in Table 1.

Table 1. Summary of strategic decision making cycle in HE

Phase of the cycle	Approaches	Specifics of HE and e-learning	Methods
Identification and research of the problem	Needs and situation analysis Readiness assessment Diffusion of innovation	Stakeholders’ involvement E-readiness Consciousness raising	Situation analysis Case study research Different types of qualitative analysis Structural Equation Modelling (SEM) Social Network Analysis (SNA) Upgraded CID methodology for e-readiness assessment
Development of methodology for DM	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 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
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)
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 Innovative approaches - Pearl’s structural causal models

Finally, many open questions still remain and therefore the need for further research. In the phase of problem definition and exploration different stakeholders must be involved in order to contribute to development of goals and alternative solution. Different stakeholders have diversified goals and expectation of HE. However, if group decision making is facilitated in effective and efficient manner, solution can be reached and implemented. Nevertheless, implementation monitoring and evaluation are neither a common practice in HEI nor a well-researched area. Finally, the proposed research could have a reach beyond HE.

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