

# Learning analytics implementation in higher education institutions: Enterprise risk management approach

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**Abstract.** *Higher education institutions (HEIs) that are implementing learning analytics (LA) are faced with many open questions related to strategic, operational, ethical, pedagogical and privacy issues. LA implementation in HEI requires strategic decision-making, but since LA is a relatively new and interdisciplinary field, the process of reaching quality strategic decisions may be somewhat difficult due to lack of clearly defined decision-making criteria. In this paper we present enterprise risk management (ERM) approach to LA implementation in HEI. We transpose COSO (2017) risk management framework on the case of LA implementation in HEI. The purpose of the paper is to present how risk management approach may be beneficial for HEI in setting clear aims related to LA implementation, defining strategy and measuring achievement of the set goals. The process is expected to lead to enhanced value for stakeholders related to LA implementation in HEI.*

**Keywords.** Learning analytics, higher education institutions, enterprise risk management, COSO (2017) framework

## 1 Introduction

The roles of higher education institutions (HEIs) have traditionally been defined through three core activities: research, education and service to the society (Oosterlinck, 2004). The societal change and technological progress led to the expansion of these traditional roles. Hayter and Cahoy (2016) draw from the existing literature that HEIs' roles also include contribution to the economic development and commercialization through incubators, science parks and spin-offs, as well as contribution to the societal sustainability. This is in line with Guerrero et al. (2016) who perceive HEIs as focal points in the development of three types of capital: human, knowledge and entrepreneurial.

Although digitalization, driven by external processes (policy) and internal processes (leadership

and staff development), was already present in some HEIs (Tømte et al., 2019), the COVID-19 pandemics led to the widespread adoption of digitalisation in HEIs. One of the aspects related to digitalisation is the employment of learning analytics (LA). Interest in LA is growing both in researchers' and practitioners' community, but having on mind that this field is new and interdisciplinary, it requires cooperation among different experts in HEI that are included in its implementation.

Some of the most common issues related to LA implementation are related to strategic, operational, ethical, pedagogical and privacy issues. HEI's management is thus faced with the necessity to make many strategic decisions related to LA implementation, as well as its usage and continuous improvement, once LA is implemented. One of the main issues decision-makers in organizations are faced with are risks related to the introduction of a new processes. Thus, HEI's management is faced with the challenge how to approach risks connected to LA implementation, usage and improvement.

The main aim of this paper is to approach LA implementation in HEIs from enterprise risk management (ERM) perspective. We follow the guidelines provided by the standardized risk management framework COSO (2017), but we translate them in the context of LA implementation in HEIs. Having on mind that ERM benefits organizations in terms of enhanced value, derived from adequate risk management process for all the stakeholders, we argue that ERM approach to LA implementation in HEIs may be beneficial for all the involved parties and lead to improved strategic decision-making.

Although common in business practice, ERM approach is not widely discussed in the scientific literature in the context of HEI decision-making. Lundqvist (2015) argues that ERM adoption at the universities in the United States of America began at year 2002 and that ERM approach is very useful in managing all the risks universities are exposed to and reaching strategic decisions. On the other hand, there is no literature corpus related to exploration of ERM in

HEI outside of the USA geographical context. This presents impetus for our paper. Since LA implementation is a strategic process that requires significant resources from the HEIs point of view, we aim to present a conceptual paper how ERM may be used in the process of LA implementation in HEIs. The base for using this concept are its widespread usage in large companies, public companies and not-for-profit companies (AICPA, 2021).

The paper consists of five parts. Following the introductory notes, we present a short overview of LA in HEIs. Third section of the paper is related to ERM and COSO (2017) overview. In fourth section we present how COSO (2017) may be translated in HEIs' context on the case of LA implementation. Finally, we provide conclusion remarks and references.

## 2 Learning analytics in higher education institutions

HEIs around the globe are undergoing the process of digital transformation, accelerated by the COVID-19 pandemics. One of prominent areas of HEIs' digital transformation is related to LA implementation. LA may be defined as *“measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and environments in which it occurs”* (SOLAR, 2011).

The strategic relevance of LA in education has been recognized and accentuated by UNESCO (2021), OECD (2021) and European Commission (2018; 2021). According to OECD (2021), LA provides opportunities for improvements in educational organizations' strategic management. While EU Commission (2018) is dedicated to improving education by data analysis and prediction, the same governing body emphasizes the need to develop ethical guidelines on data usage in teaching and learning (EU Commission, 2021). UNESCO (2021) prioritizes the need to strengthen the capacity of big data usage in education, develop standards and ethical guidelines related to technology implementation in education and provide evidence how technology impacts teaching and learning processes.

Schumacher and Ifenthaler (2018) argue that HEIs implement LA to increase their understanding of how students learn and support them in the process. Namely, LA enables personalized learning environment that may enhance students' learning. But it is not only students who benefit LA implementation. LA provides benefits for other HEI stakeholders as well. These stakeholders may be divided in four levels: mega-level (governance), macro-level (institutional level), meso-level (curricular level or teacher level) and micro-level (learner) (Ifenthaler and Widanapathirana, 2014; in: Schumacher and Ifenthaler, 2018). In the context of our paper, this

means that each stakeholder group has its own interest in pursuing LA implementation, thus resulting in higher risk exposures through the process. This view is supported by Shum and Luckin (2019) who state that when using LA and artificial intelligence for educational purposes, *“we need the educators to be talking with developers and builders, and the joint narrative must speak to public policy”*.

According to Joksimović, Kovanović and Dawson (2019), LA roles include predictive analytics, social learning analytics, discourse analytics and learning design. Main focus of using LA for predictive purpose is understanding and optimising learning. Some examples include identification of students at risk of dropout, predicting students' academic performance and retention rates (Joksimović, Kovanović and Dawson, 2019). According to Ifenthaler and Widanapathirana (2014) benefits of LA for learners include understanding learning habits, analysing learning outcomes, tracking learner's progress towards set aims, comparing learning paths, receiving automated interventions, supporting collaboration, taking assessments that include just-in-time feedback, optimizing learning paths, increasing students' engagement and success rate. The social LA role is dedicated to understanding how students create social relationships with their peers and teachers. Discourse LA explores students' communication, i.e. it focuses on *“using textual discourse data for supporting student learning”* (Joksimović, Kovanović and Dawson, 2019). In relation to learning design, early predictive learning models did not consider specific learning contexts, while newest research tendencies go in direction of exploring how LA can be used in various learning settings to improve learning design and enhance learning (Joksimović, Kovanović and Dawson, 2019).

Guzmán-Valenzuela et al. (2021) argue that main challenges for LA arise from:

I) *non-participation of students and teachers in active LA development*: While it would be expected that students and teachers are involved in the process of LA implementation and discussion about its effects, there is evidence from the field that LA implementation, data gathering and analysis are under control of a centralised unit, without clear connection to students and teachers. This challenge implies lack of organizational culture related to LA implementation, thus leading to the risk of possible misunderstandings and underusage of LA potential.

II) *students' learning process*: Main risk identified in this field is related to the fact that LA may be used as a source of information on students' success and prediction of possible learning problems. Although valuable in its core, this LA role may lead to the exact opposite of its intention, i.e. labelling students with problems and leading to self-fulfilling prophecy regarding the expected success rates. We may perceive this challenge as a pedagogical and ethical risk related to LA implementation.

III) *LA' impact on students' outcome achievements*: there is a lack of evidence on true LA impact on students' learning achievements. In the concurrent literature there is evidence that LA benefits researchers and administrators, but the effects on teachers and students are not well documented. This means that there is a risk that LA aims are not fully defined, understood or possibly adequately measured, thus leading to potential misunderstandings and overestimated benefits of LA.

IV) *methodologies of LA data interpretation*: there is a need that protocols are developed how LA data can be used within HEI's different timeframes and contexts.

V) *privacy issues* present one of major concerns in relation to LA implementation because it may be perceived as a source of permanent observation and limitation of students' freedom. Thus, collection, management, storage and data usage present potentially risky situation from the perspective of the institution that manages LA connected data.

According to EDUCASE (2016), major challenges related to LA inclusion in educational practice is connected to data-quality, difficulties with system integration, lack of support from key leadership of the institution and possible resistance of organisational staff to LA implementation.

Among the existing research related to LA implementation we point out Ferguson et al. (2014), who present how a structured approach Rapid Outcome Mapping Approach, may be used in order to overcome barriers that exist to LA implementation. This model includes definition of a clear set of policy objectives, mapping the context of LA implementation, identification of key stakeholders, identification of LA purposes, development of implementation strategy, analysis of capacities and development of human resources and development of a monitoring and learning system. The model clearly defines main steps that are very useful prior to LA implementation and tracking of implementation, i.e. it is focused on answering strategic questions that precede LA implementation. What is missing in this model is a more detailed connection how these strategic issues will be translated into HEI practice.

On the other hand, according to Sheikh et al. (2022), despite of LA' popularity, many HEIs have failed in the achievement of their previously defined strategic goals through LA support. According to these authors LA research is predominantly focused on tactical issues, i.e. how to implement LA on operational level, while the effects of LA on HEI's value are unclear, thus providing rationale for research how LA implementation can be used in order to achieve strategic goals of HEI. Since primary aim of ERM is to increase the likelihood that strategic objectives are realized and stakeholders' value enhanced (Dvorski Lacković et al., 2021), ERM approach is in its core focused on complying risk management activities with achievement of strategic goals of the organization. Thus, we find an argument

that using ERM approach to LA implementation may be beneficial for aligning risk management with strategic aims set for LA implementation.

We may conclude that although LA implementation is an emerging and interdisciplinary field (Blackmon and Moore, 2020; Phillips and Ozogul, 2020; Divjak, 2021) that raised interest among researchers and practitioners, it is in its infancy (Viberg et al., 2018) and requires thorough research that will clarify LA' interaction with different strategic, operational, ethical, pedagogical and privacy aspects. This implicitly means that there are many risks related to LA implementation. These risks have been tackled only partially and until now there are no all-encompassing solutions that would include strategic, operational and oversight aspects of LA implementation at the same time. Thus, in continuation of this paper we approach LA implementation and usage from enterprise risk management perspective.

### 3 Enterprise Risk Management

Enterprise Risk Management (ERM) is a strategic approach to managing risks in companies. It is based on the premise that all the risks organization is exposed to should be managed holistically. This requires the centralization of risk managers role, regular identification and assessment of all the risks organization is exposed to, assessment of interconnection of different risk types, communication on risks throughout the organization and using risk management process insights for strategic decision-making. The purpose of using this approach is increasing the value for organization's stakeholders. The corporate sector practices ERM by managing strategic, operational and oversight aspects of risks management (Dvorski Lacković et al., 2021).

When implementing ERM, organizations have the freedom to use a tailor-made approach that suits their resources. Standardized frameworks COSO (2017) and ISO 31000 (2018) may offer guidance on the path of ERM implementation by providing an all-encompassing and structured approach to ERM process. The application of ERM approach on the universities is quite common in the United States of America (Lundquist, 2015), but we are not aware of its application on HEIs outside of this geographical context.

The main aim of this paper is to apply ERM on a specific process in HEIs – LA implementation. In order to reach our aim, we will use COSO (2017) standardized framework. It will serve as a basis point in exploring how LA implementation in HEIs may be supported through a standardized structured approach that manages risks holistically.

COSO (2017) is a set of principles that may be used in organizations of different sizes and sectors. It consists of five components: (1) governance and culture, (2) strategy and objective-setting, (3)

performance, (4) review and revision and (5) information, communication and reporting (Figure I). COSO (2017) components consist of a total of 20 principles. Namely, *Governance and Culture* component encompasses: a) board risk oversight, b) establishment of operating structures, c) definition of desired culture, d) demonstration of commitment to core values and e) attraction, development and retention of capable individuals. *Strategy and Objective-setting* component includes: a) analysis of business context, b) definition of risk appetite, c) evaluation of alternative strategies and d) formulation of business objectives. Under the component *Performance* following principles are encouraged: a) risk identification, b) assessment of risk severity, c) risk prioritization, d) implementation of risk responses and e) development of portfolio view. Component

*Review and Revision* includes: a) Assessment of substantial changes, b) reviews of risk and performance, c) continuous improvement in risk management. Finally, *Information, Communication and Reporting* component encompasses: a) leveraging information and communication technology, b) communicating risk information and c) reporting on risk, culture and performance.

The main characteristics of COSO (2017) are related to the fact that importance of strategy is clearly accentuated in all the phases of ERM process, strategic and operational risk are integrated and holistically assessed in order to measure performance and achieve strategic aims, and iterative approach to risk management is practiced, thus leading to continuous monitoring of the strategic aims (Pierce and Goldstein, 2018).



Figure I. COSO visual. Source: COSO (2017)

## 4 ERM approach to LA implementation in HEIs

In this section we explore how COSO (2017) may be used in order to enhance LA implementation in HEIs. As argued in the previous Section, COSO (2017) framework consists of five main components and 20 principles divided onto these components. In order to analyse how COSO (2017) framework may be transposed on the process of LA implementation in HEI, in this section we go through detail of every COSO (2017) component and underlying principles in terms of specific HEIs' context and the process of LA implementation.

### 4.1 Governance and Culture

The first COSO (2017) principle *Governance and Culture* is strongly related to organization's mission, vision and core values. This means that HEIs should define or re-examine its mission, vision and core

values in general and analyse how LA implementation fits into these realities. According to Keefe (2020), mission in HEI may be regarded as "the lens through which the organization views relationship with students, educators, academia and other stakeholders, including local and global community". More precisely, HEI should analyse its relation to all of its key stakeholders in the context of LA implementation. Some questions of concern related to LA implementation in relation to HEI's mission include: What is the purpose of LA implementation in relation to our students/teachers/other staff/local community/other key stakeholders? What are the benefits we aim to achieve by using LA in the learning process for each of the stakeholders? What is the value we wish to deliver to our key stakeholders?

HEI's vision should clearly define how the institution will achieve its mission, i.e. it should state desired future and strategic plan how to achieve it (MacLeod, 2016, in: Keefe, 2020). In the context of LA implementation, a vision should be a statement of where the institution sees itself in the context of

LA in the upcoming period and main manners how it aims to achieve it. For instance, what are our main aims related to LA in the next five years? How do we plan to achieve these aims?

The definition of HEI's mission and vision is the responsibility of the HEI's Management. This requires an adequate level of Management's oversight of all the risks HEI is exposed to and establishment of clear operating procedures in order to manage these risks. Specifically, in the context of LA implementation, HEI should have clear written procedures related to both strategic and operational aspects of LA. In order for the desired outcomes of LA implementation are achieved, the HEI Management should aim to define the desired culture that supports and promotes the desired behaviours related to LA, but also demonstrate the commitment to these values through written policies and behavioural guidelines. The organizational values are beliefs about socially or personally desirable end states or actions that are explicitly or implicitly shared by members of organization (Schwartz, 1992, in: Mueller and Straatmann, 2014).

In HEIs, it is crucial that each employee is introduced to HEI's values so that LA practitioners are well-aware of how LA connects to values of their institution. By knowing values related to LA, each employee is encouraged to practice acceptable and ethical behaviour, thus complying with the set aims and enhancing the process of LA implementation. As discussed in the second section of this paper, LA implementation carries a certain amount of concern related to the ethics and privacy (Guzmán-Valenzuela et al., 2021), thus it is highly recommendable that detailed mapping is conducted how LA implementation may contribute to practicing desirable behaviour.

Once HEI's top management achieved a consensus on its mission, vision and core values in relation to LA, it posed a fertile ground on which it can develop sound ERM governance and culture. This first step enables HEI to practice the principles stated by COSO (2017). If HEI's management analysed what LA implementation means in relation to its mission, vision and core values, it has a clear oversight of LA implementation. Further on, this means that HEI established the general structure how LA will be implemented and how it supports HEI's commitment to what matters – its core values. Also, HEI's management defines the desired organizational culture and analyses how LA supports this culture. It is a step that may be specifically related to ethical and pedagogical issues of LA. Main question for HEI's management in this step is: How will we develop such an organizational culture that promotes the ethical use of LA and supports the pedagogical outcomes? For instance, a debate has been raised in the United Kingdom related to the problem of an algorithmic bias in grading the students during the COVID-19

pandemic (Smith, 2020). Such issues pose ethical risk for students who are under impact of such practices, but also reputational risk for educational institutions that practice biased grading approach.

Finally, the step that is of crucial importance is that HEI's management identifies capable individuals in different fields, as LA implementation requires an interdisciplinary approach, and motivates them to work on LA implementation. It is exactly these individuals and their interdisciplinarity that may contribute to successful LA implementation that is in line with HEI's strategy, but that also supports pedagogical and ethical issues.

## 4.2 Strategy and Objective-setting

The second COSO (2017) principle *Strategy and Objective-setting* relates to the development of a specific LA strategy. The first step for HEI to develop a high-quality LA strategy is based in the analysis of the business context. This means analysing HEI's macro-environment, namely all the demographic, geographical, political, economic, technological and social factors that impact HEI's processes, by tackling how these factors interwind with LA. It is important that business context analysis encompasses both external and internal factors that are specific for LA in HEI. These factors may be analysed by using SWOT matrix in order to identify the strengths and weaknesses coming out of HEI, as well as opportunities and threats arising from HEI's surrounding.

In business settings, the usual step following the business context analysis is risk appetite definition. A thoroughly conducted analysis enhances the process of formulating specific business objectives related to LA implementation and defining risk appetite, i.e. answering the question: What is the amount of risk connected to LA implementation that HEI is willing to take over? Risk appetite represents the amount of risk an organization is willing to take over in order to achieve a certain result. In relation to LA this would mean answering the question which risks and in which amount the HEI is willing to take over in order to implement LA. For instance, a simple example may be that HEI may define that it is willing to bear a certain additional financial amount (cost) of LA implementation in order to manage privacy risks related to LA implementation, such as data leakage.

Once the risk appetite is defined, possible alternative strategies may be evaluated and analysed to see how they match business aims achievement. For example, HEI may want to formulate alternative solutions to data leakage protection and analyse the optimal solution. Based on the analysed scenarios, HEI may formulate its clear business objectives that match its mission and vision in terms of LA implementation. Based on clear formulation of

business aims, HEI may plan its resources necessary for LA implementation and match the exact amount of resources to a specified aim, but also aggregating all the necessary resources and manage them holistically, not partially.

Further on, a consistent and clear definition of business aims enables performance tracking and measurement. In the context of LA implementation this means that HEI may have a clear picture what is expected of LA implementation and define the metrics to measure the performance of LA, thus answering to impetus that methodologies of LA data interpretation are missing in current research (Guzmán-Valenzuela et al., 2021).

### 4.3 Performance

The third COSO (2017) principle *Performance* is oriented on risks associated to LA. It is based on the risk identification. This means that HEI should make a list of all the risks that may occur in the process of LA implementation, usage and improvement. An initial point for making a risk list is a literature analysis: conducting a search through the scientific databases to identify research that was focused on LA associated risks. Further on, experts may be consulted for a further risk list complementation. What is very important in this step is that not only risks associated to LA implementation are considered, but that various risks that may occur in the advanced stages of LA usage in HEI, are considered.

Once the risk list is set, risk assessment is expected to take place in HEI. One of the main problems related to risk assessments is who should be responsible for conducting it. In business practice, an employee in charge for risk management conducts risk assessment based on inputs received from various employees. It would be recommendable that HEI's management appoints an employee in charge for risk management. Also, HEI's management should consider very carefully and target the employees that have the most knowledge in various technical, pedagogical and ethical issues related to LA and consult them to provide an adequate input for risk assessment.

The risk assessment should be conducted based on two parameters: the probability that specific risk will occur and impact that it may have on HEI. It is important to mention that the corporate sector usually assesses impact that risk carries for the company in the financial terms. Having on mind particularities of HEIs, not only financial impact should be considered, but HEI should analyse the impact of LA associated risks according to different estimated parameters. These parameters should be comparable so that HEI's management can prioritize the assessed risks.

For each risk that has been identified and assessed, a specific risk response should be formulated. Risk response should answer the question how identified risk will be treated, a time framework should be set for specific measures that will be undertaken and each risk should be connected to a specific risk owner, i.e. the person in charge to implement identified risk response.

This approach enables HEI's management oversight over LA related risks and how they are being handled. A very important point to consider when analysing risks and defining responses, is connected to developing a portfolio view. This means that each identified risk is assessed in relation to the other risks that may occur and it is carefully analysed whether there is a spill-over of certain risk among different HEI's organizational units.

### 4.4 Review and Revision

The fourth COSO (2017) principle is *Review and Revision*. It is connected to the post-implementation and performance impact review. Namely, each substantial change that occurs related to LA process should be carefully assessed from the risk management perspective.

Further on, prior identified risks should be monitored through responsibilities and time framework set while implementing risk responses. Also, the impact of these risks on performance should be the subject of a continuous review. In case there is a possibility to improve LA in relation to the risk managerial aspects, they should be pursued.

### 4.5 Information, Communication and Reporting

The fifth COSO (2017) principle, *Information, Communication and Reporting*, encompasses principles that are oriented on using ICT in the process of risk management. In our case this would mean leveraging all the possibilities ICT offers in extracting information about LA implementation and its usage once it is present in the company. It also implies communicating information about risk.

In HEI a clear path should be defined and preferably described within internal procedures about risk communication, i.e. who is in charge for communicating regular and outstanding information about LA related risks and in what manner (orally, written) and to whom. Finally, reports on risk should be a common practice and HEI's management should receive regular reports about LA related risks from the person in charge for reporting.

Since LA implementation in HEIs is a quite interdisciplinary field, it requires cooperation of different stakeholders. Thus, a person in charge for coordination and systematization of the received

information on risks and reporting should be assigned. Altogether, the described COSO (2017) principles lead to enhanced value, meaning that in the analysed context HEI and all of its stakeholders should receive more value from the process of LA implementation.

## **5 Conclusion**

In this paper we argue that there are many open issues when it comes to LA implementation in HEIs, both on the strategic and operational level. In order for HEIs' decision-makers to reach adequate decisions related to LA implementation and usage, a structured approach is required. We propose that LA implementation in HEIs is supported by using ERM approach. The main expected outcome of this approach is delivering more value to all LA stakeholders.

We use a standardized risk management framework COSO (2017) as a base to translate different risk management aspects on LA implementation in HEIs. The main motivation for this paper is that HEIs implementing LA use this all-encompassing approach in order to identify, set and achieve its strategic aims related to LA implementation.

Main impetus for this paper stems from the fact that HEIs are exposed to growing number of risks. LA implementation in its core carries various risk factors that may expose HEI to more risky profile. Generally, the research related to ERM in HEI is not widespread outside of the USA practice. Since ERM proved its usefulness in both profitable and non-for-profit business sector, we transpose its principles to the process of LA implementation in HEI.

This paper is primarily conceptual in nature. Both ERM and COSO (2017) framework are validated and widely used in practice. But we are aware that using already validated approaches in new settings requires additional validation. Main limitation of our paper is related to the fact that the presented concept should be empirically tested. Therefore, we propose that the future research deepens the topic by exploring LA experts' opinions on risks HEIs face in the process of implementation. Also, concrete case studies with evidence how HEIs benefit from using the suggested approach in the process of LA implementation, are highly welcome.

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