

# SHEILA policy framework: informing institutional strategies and policy processes of learning analytics

Yi-Shan Tsai  
The University of Edinburgh  
Old College, South Bridge, Edinburgh  
EH8 9YL  
UK  
yi-shan.tsai@ed.ac.uk

Pedro Manuel Moreno-Marcos  
Universidad Carlos III de Madrid  
Avenida Universidad, 30, 28911 Le-  
ganés, Madrid  
Spain  
pemoreno@it.uc3m.es

Kairit Tammets  
Tallinn University  
Narva mnt 25, 10120 Tallinn  
Estonia  
kairit@tlu.ee

Kaire Kollom  
Tallinn University  
Narva mnt 25, 10120 Tallinn  
Estonia  
kairit@tlu.ee

Dragan Gašević  
The University of Edinburgh  
Old College, South Bridge, Edinburgh  
EH8 9YL  
UK  
Monash University  
Scenic Blvd, Clayton VIC 3800  
Australia  
dragan.gasevic@ed.ac.uk

## ABSTRACT

This paper introduces a learning analytics policy development framework developed by a cross-European research project team – SHEILA (Supporting Higher Education to Integrate Learning Analytics), based on interviews with 78 senior managers from 51 European higher education institutions across 16 countries. The framework was developed using the RAPID Outcome Mapping Approach (ROMA), which is designed to develop effective strategies and evidence-based policy in complex environments. This paper presents three case studies to illustrate the development process of the SHEILA policy framework, which can be used to inform strategic planning and policy processes in real world environments, particularly for large-scale implementation in higher education contexts.

## CCS CONCEPTS

• Security and privacy~Social aspects of security and privacy • Applied computing~Education

## KEYWORDS

Learning analytics, policy, higher education, strategy, ROMA model

## ACM Reference format:

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## 1 INTRODUCTION AND BACKGROUND

Higher Education Institutions (HEIs) are constantly collecting large amounts of data in the form of students' digital footprints during their studies. Although HEIs strive to increase the quality of teaching and learning by exploiting the collected data, there are often barriers that prevent data from being used systematically and effectively. For example, data quality, ownership and access, organisational culture, and expertise available to implement learning analytics (LA) are prevalent issues that need to be addressed before implementation [4]. According to Ferguson and others [10], although funding opportunities for LA research and activities have increased, there is still a lack of systematic and large-scale implementations of LA in higher education. The preliminary findings of a European project – SHEILA (Supporting Higher Education to Integrate Learning Analytics) have demonstrated that numerous HEIs in Europe are either observing the development of LA or have engaged with it practically without a defined strategy or monitoring framework to ensure the effectiveness and legitimacy of LA

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practices [30]. Drachsler and Greller identified uncertainties among institutions about legal boundaries and ethical limits regarding the use of personal data for LA, in addition to prevalent fear of negative consequences from the application of LA [8]. As a result, they proposed the DELICATE checklist to rebrand the privacy burden that the LA community carried with a quality label. Other famous models that exist to guide the adoption of LA can be found in Jisc's Code of Practice [5] and the Open University's "Policy on Ethical use of Student Data for Learning Analytics" [28]. However, these ethical and privacy guidelines may not always apply to every institution's own unique context. In light of the need for a sound policy that is tailored to meet individual institutions' unique contexts and ensures a responsible and effective use of student data for LA, the SHEILA project was launched with the goal to assist HEIs to develop institutional policies for LA. To do so, the project will produce a policy framework (addressed as the SHEILA policy framework hereafter) by engaging end users of LA directly to understand their perceptions, expectations and concerns, as Knight and others [15] have suggested that users are in the most accurate position to identify their own needs and to indicate how their practices can be supported and improved before solutions are designed and implemented. [20]. With data collected from the direct engagement with stakeholders, the project team has used the RAPID Outcome Mapping Approach (ROMA) to scope existing practices of LA among HEIs in Europe, and to make suggestions for policy development. Although the literature has suggested that ROMA model is an effective tool to support systematic adoption of learning analytics in HEIs [10, 17], there has been limited work that purposively involved different stakeholder groups to validate the feasibility of this tool for LA policy development. The contribution of our work is to bridge this gap, and extend the use of the ROMA model to address challenges recognised in the literature and raised by different stakeholder groups.

While the final product of the SHEILA policy framework will reflect the perspectives of various stakeholders, including institutional leaders and decision makers, teaching staff, students, and LA experts, this paper will focus on the first SHEILA policy framework, which was developed based on 64 interviews with senior managers from 51 European HEIs. Considering the scope of the paper, we will present three representative cases to illustrate the concept of the framework, as well as potential ways to use it for institutional strategic planning and policy formation for LA.

## 2 LITERATURE REVIEW

In spite of the potential to provide better information about student learning behaviour and progress, thereby improving the quality of educational offerings and optimising learning, LA has met a number of challenges that impede its adoption at an institutional level. The most frequently identified issues are (1) the demand on resources, (2) issues of ethics and privacy, and (3) stakeholder engagement and buy-in. These challenges need

to be tackled through strategic planning and a sound policy framework. In this section, we outline issues identified in the literature under the three themes and introduce the ROMA (RAPID Outcome Mapping Approach) model, on which the SHEILA policy framework is based.

### 2.1 Learning Analytics Challenges

*2.2.1 Demand on Resources.* The first main issue covers challenges associated with data and technological infrastructure, financial resources, and human resources. The implementation of LA typically involves complex computing and aggregating of large amounts of data, in addition to management challenges, such as the integration of research tools into existing learning environments [13]. These tasks can be difficult to perform with traditional data management technologies [14]. A survey carried out by EDUCAUSE to investigate analytics landscapes in US higher education revealed that data-quality concerns and system-integration difficulties were part of the major challenges to embedding the use of LA into institutions [3]. These findings suggest that there is a need for a financial investment in advancing institutional data infrastructure to enable LA. However, the same study by EDUCAUSE also found that LA remains an interest rather than a major priority at most institutions [3]. This finding highlights the challenge of obtaining sufficient financial support to develop a technological environment for LA or appointing analytics specialists in many HEIs if LA has to compete with other institutional priorities. For example, another EDUCAUSE report based on the same survey data pointed out that institutional analytics was twice as likely to be described as a major priority as was learning analytics, and 4 in 10 institutions reported little or no investment in learning analytics [32].

Another key dimension is human resources, which includes both the availability of staff time and expertise that is required to implement LA. In a complex educational system, the introduction of a subtle change can meet substantial resistance because of the perceived increase in workload for staff [17]. As LA makes use of data from various sources, institutions not only need data experts to obtain and analyse good quality data, but they also need the users (e.g., administrators, teaching staff, and students) to have basic data interpretation skills and the ability to reflect on data critically, in order that LA may have positive impact on informing decisions and changing behaviour [2, 19, 31]. This has been identified as a common gap between needs and solutions in institutional analytics capacity [18, 25].

*2.2.2 Issues of Ethics and Privacy.* The second main issue has been identified as a major obstacle to gain buy-in from stakeholders, especially when the collection and use of data seem to risk intruding privacy [23, 27]. Like all Big Data applications, LA relies on constant and ubiquitous collection of data from students. The wide range and types of data collected could induce discomfort among data subjects due to a sense of surveillance, leading to resistance to LA [19]. Moreover, while an-

onymity policies are commonly enforced in HEIs when personal data is used, it can be difficult to deliver customised interventions without retaining a certain degree of individual linkages [24]. Similarly, Greller and Drachsler acknowledged the dilemma between keeping data anonymous and exploiting the most value of data [12]. They also argued that fear induced by ethics and privacy issues can easily lead to misunderstandings and distrust in institutions [8].

Another key issue associated with ethics and privacy is informed consent [26]. Rubel and Jones question the extent to which students can make informed consent [24]. They point out that educational institutions may be transparent in their data practices, but the complexity of algorithms still makes analytics a 'black box' for many. Moreover, the inherent information asymmetries between data collectors and data subjects mean students tend to have limited knowledge about who can access their data, what they do with the data, and what consequences intrusions of privacy may be [8]. Similarly, Prinsloo and Slade are concerned about the best time to seek consent from students. They suggest that consent seeking should focus on downstream users rather than on the time of the initial collection of data, because the benefits of opting-in or out may not be apparent at the moment when a LA service is introduced [22]. The conflicts between maximising the efficiency and efficacy of LA and respecting data subjects' rights to control their own data can be challenging to institution adopting LA at a large scale.

**2.2.3 Stakeholder Engagement and Buy-in.** The third main issue has been highlighted in a systematic literature review where Tsai and Gašević pointed out that HEIs struggle to find common grounds among different stakeholders regarding the adoption of LA, due to discrepancies in existing experience and knowledge of data, therefore resulting in different understanding of possible benefits and outcomes of LA [29]. Moreover, according to Tsai and Gašević, only a handful of studies have tried to explore student perspectives regarding the use of their data for learning analytics or the impact on their learning journeys, despite the fact that LA champions for a learning environment that is learner-centred and learner-concerned [11]. The differences in perceptions of LA among stakeholders can lead to unequal buy-in if their needs are not met, further resulting in distrust in LA if concerns are not addressed. For example, Prinsloo and Slade specifically called for researchers to explore potential conflicts between students' concerns with their right to opt-out and the implications of personal-level interventions from HEIs [21].

A direct impact of unequal engagement with teaching professionals is the weak pedagogical grounding of LA technologies and implementation design. For example, Ali and others pointed out that LA tools still needed to move from spotting students at risk to providing pedagogically informed suggestions [1], and Macfadyen and Dawson suggested that institu-

tions should balance solving technical challenges and developing pedagogical plans [16]. Similarly, Ferguson and colleagues highlighted that much work on LA has concentrated on the supply side, and considerably less on the demand side, for example connecting LA with education in ways that can truly support the everyday learning, teaching and assessment work [9]. Failing to consider the pedagogical context in which data is generated and interpreted will affect teaching staff's perceptions of the usefulness of LA, thereby impeding broader buy-in and scalable actions of LA [25].

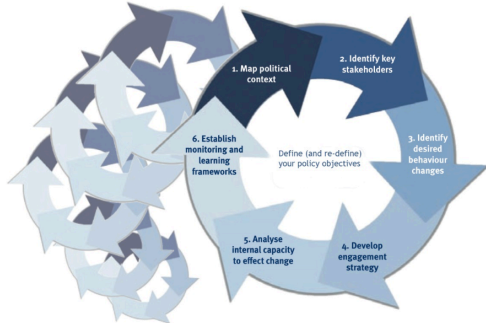
The phenomenon of unequal engagement with stakeholders is also reflected by the absence of clear leadership to define directions for LA adoption among many HEIs [13], which is considered a key factor associated with the maturity of LA practices at an institutional level [6, 18, 25]. In particular, the involvement of institutional leaders is crucial to the development of strategies and policies for LA, which could help mitigate the challenges identified so far. As new practices in a complex educational system potentially disrupt traditional management and organisational structures, and therefore likely to meet resistance [17], it has been suggested that institutions should start LA implementation by defining a strategic plan [2, 7, 10]. Moreover, studies have identified that existing policies related to technical standards for interoperability do not fully apply to LA practices [9], and tailored LA policies for individual institutions will be needed in order to properly consider individual institutional contexts in every phase of adoption [29]. Without dedicated input from high-level decision makers [7], it can be difficult to press for the development of LA specific strategies and policies that meet the needs of individual institutions and the members therein.

In response to the need for a strategic framework and policy to adopt LA systematically, the SHEILA project used the RAPID Outcome Mapping Approach (ROMA) to produce a policy development framework. The ROMA model was adopted as a foundation for the development of the SHEILA policy framework due to the original purpose of ROMA to support evidence-based policy development and change through active engagement with relevant stakeholders. The model has already been suggested for systemic adoption of LA in HEIs [10, 17]. The following subsection introduces the concept of the ROMA model.

## **2.2. The ROMA Model in Learning Analytics Contexts**

The ROMA model was designed by the ODI (Overseas Development Institute) to inform policy processes in the field of international development using research evidence [33]. The model begins by defining an overarching policy objective, which is followed by six steps designed to provide policy makers with context-based information: 1) map political context, 2) identify key stakeholders, 3) identify desired behaviour changes, 4) develop engagement strategy, 5) analyse internal capacity to effect change, and 6) establish monitoring and learning frameworks.

Unlike traditional linear tools and approaches, ROMA is designed to be used iteratively to inform strategic choices and meet unexpected changes (or challenges) in a complex setting. This model has been adapted to guide the planning and implementation of LA at an institutional level [10, 17] (Figure 1).



**Figure 1: The RAPID Outcome Mapping Approach [10]**

Ferguson and colleagues provided two case studies of LA practice from the UK and Australia to demonstrate how theoretical frameworks could be operated in the real world and, in particular, how ROMA could be used for the planning and implementation of LA in higher education contexts to maximise the success and impact of LA. Our work builds on the approach adopted by Ferguson and others [10] to map out the state of LA adoption among HEIs in Europe using ROMA, and further provides suggestions to guide policy development. The following section accounts for the abovementioned methods adopted to develop the SHEILA policy framework, followed by three case studies that have contributed to this policy framework.

### 3 METHODOLOGY

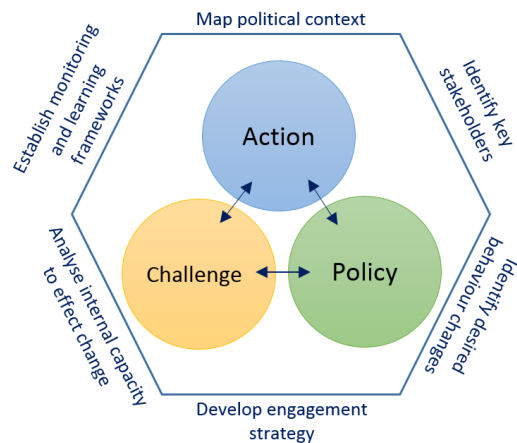
The SHEILA policy framework will be based on evidence from a wide range of data including an institutional survey administered to universities in Europe to understand the state of adoption of LA (n=46), a Group Concept Mapping activity that sought opinions from LA experts on essential features of a LA policy (n=30), 64 institutional interviews with mostly senior managers (e.g., provosts, rector, deans, principals, vice principals, and vice/ pro-vice chancellor) from 51 higher education institutions across 16 countries in Europe, and local consultations with teaching staff and students at four European higher education institutions using a survey method and a focus group method. The SHEILA policy framework will be developed in phases based on the findings from the abovementioned data.

This paper will focus on the output of the first phase development. The first SHEILA policy framework was developed based on the results of an analysis of 64 institutional interviews that took place between August 2016 and February 2017. Each of these interviews lasted for 30 to 60 minutes. The number of participants in each interview ranged from 1 to 3, and some participants from the same institution attended the interviews separately. This resulted in a total number of 78 participants

from 51 institutions. Ten interview questions were developed to investigate 1) institutional plans for LA, 2) motivations for LA, 3) adopted strategy, 4) strategy development processes, 5) readiness preparations, 6) success and evaluation, 7) success enablers, 8) challenges, 9) ethical and privacy considerations, and 10) the interviewee's views of essential elements in a LA policy.

We used the ROMA model as a tool to analyse each institutional case by mapping out their LA related activities and challenges to the six key dimensions of ROMA. During this process, we identified a strong connection between the six ROMA dimensions. That is, the same challenge may be identified in multiple dimensions, and an action may be informed by consideration of multiple dimensions at the same time. While the ROMA model should be applied iteratively, there does not seem to be a definite order between the dimensions. Therefore, we decided to treat them as 'dimensions' rather than 'steps' as initially suggested by Young and Mendizabal [33], so as to acknowledge the fluidity between the six dimensions.

We synthesised the mapping results of the 51 cases and created a comprehensive table of all actions and challenges identified in the interviews. This process resulted in a list of 42 action points and 59 challenges across the six ROMA dimensions. Based on this result and the interviewees' responses to Question 10, we generated 47 policy questions to address the key actions and challenges. Thus, the SHEILA policy framework consists of a comprehensive list of adoption actions, relevant challenges and policy prompts, framed in the six ROMA dimensions. Figure 2 explains the concept and structure of the SHEILA policy framework.



**Figure 2: The SHEILA policy framework structure**

We grouped the action points, challenges, and policy questions by common themes including capabilities, culture, ethics & privacy, evaluation, financial & human resources, infrastructure, internal & external support, management, methodology, purpose, and stakeholder engagement. These themes helped us

to identify the main focus of action in each ROMA dimension and prevalent issues to address.

The following sections discuss the mapping results of three cases that are different from each other by institutional size, location, goals, and approaches to LA. While the data presented below only makes up part of our policy framework, our intention is to use them to illustrate the development process of the SHEILA policy framework, and to demonstrate how the SHEILA policy framework could be used to guide the development of institutional policies and strategic planning for LA.

## 4 RESULTS

In this section, we present the action points undertaken by the three selected institutions and the challenges that they faced, followed by a list of questions to reflect on when developing a LA policy in similar contexts. Each of the statements is associated with a theme. Section 4.1 presents the profiles of the three cases, including their approaches to LA. Section 4.2 presents the mapping results of the three cases using the ROMA model.

### 4.1 Three cases

Institution A is based in the UK and has more than 30,000 students enrolled. At the time of the interview, institution A had one central university sponsored LA project and a number of small projects initiated by individual teaching staff. In terms of the institutional uptake, institution A took an experimental approach to LA. That is, LA was adopted not as a tool to solve identified problems, but as a tool to explore new possibilities and innovations to enhance existing practice. Institution A's goal was to use LA to enhance curriculum design and student experience.

Institution B is based in Estonia and has more than 10,000 students enrolled. This institution had a few course-level LA projects previously, and was preparing an institutional LA project at the time of the interview. Institution B took a problem-based approach to LA, which is perceived as a potential solution to deal with student dropouts. The goal was to understand students' learning progress and provide interventions when needed.

Institution C is based in Spain and has more than 30,000 students enrolled. At the time of the interview, institution C did not have any institutional LA project, although there were small-scale projects carried out by individual researchers. The main goal of these projects was to explore data collected from current and past courses to identify opportunities for teaching innovations.

### 4.2 Six ROMA dimensions

An analysis of the three cases using the ROMA model shows that the most common themes of challenges identified in Dimension 2 (stakeholders) are ethics and privacy related issues, while those in Dimension 3 (desired changes), 4 (engagement strategy), and 6 (monitoring framework) are methodology related. Dimension 5 (capacity for changes) examined the internal capacity of the institutions, resulting in a longer list of challenges being identified compared to the other dimensions. The common challenges in this dimension are related to culture, capability, and infrastructure. In contrast, the mapping of Dimension 1 (political context) did not identify shared themes among the comparatively shorter list of challenges. The following subsections are organised according to the six ROMA dimensions. Each section begins with a critical reflection on the state of adoption of LA among the three cases, followed by three tables providing further information on corresponding actions, challenges, and policy prompts respectively. These tables also present a selective part of the SHEILA policy framework, as illustrated in Figure 2.

#### 4.2.1 Dimension 1 – Map political context

The mapping of Dimension 1 revealed institutional drivers and needs for LA. Both Case A and B faced external pressure to perform quality evaluation, which usually forms part of the key performance indicators (KPI) in HEIs (Table 1). Therefore, it is particularly important for these institutions to reflect on the reasons for adopting LA – whether it is for the benefits of the institution or for learners and teachers (Table 3). While LA activities in Case C were still at a grass-root level, the same policy questions would be useful to reflect on when planning a strategic movement towards institution-level adoption. That is, align individual-level research activities with the wider university strategy, so as to gain support from senior managers/ decision makers. The need to gain support from key leadership to enable systematic adoption of LA has also been confirmed by the identified challenges (Table 2)

**Table 1: Map political contexts - actions**

Case	Action	Theme
A	The internal driver was to use data to inform teaching and learning related decisions, and an external driver was to provide data for audits (e.g. National Student Survey).	Purpose
	Given the size of the university, it was decided that a pilot study was needed to find the best way to extract and integrate data.	Methodology
B	The internal driver was to increase teaching quality and learning motivations. The external driver was to provide data for state-level quality evaluations, which had previously highlighted the problem of student dropouts.	Purpose

C	A key driver was to gain better understanding of course related activities so as to improve the curriculum design.	Purpose
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**Table 2: Map political contexts - challenges**

Case	Challenges	Theme
A	No challenges were identified.	N/A
B	There is no central guidance from the government regarding the use of student data in university feedback systems.	Management
C	Decentralised leadership made it difficult to take a centralised approach to LA.	Methodology

**Table 3: Map political contexts - policy prompts**

Policy – questions to reflect on	Theme
What are the reasons for introducing LA to students and staff?	Purpose
How do institutional objectives align with personal benefits for teaching staff and students?	

4.2.2 Dimension 2 – Identify key stakeholders

The mapping of Dimension 2 showed that the adoption of LA in the three cases involved a wide range of stakeholders, both internally and externally (Table 4). A key implication for policy is to consider the responsibilities and rights of everyone involved, in addition to the impact on them (Table 6). Case B, in particular, faced an ethical dilemma about how to make opt-out options available while addressing institutional challenges that involve every member of the institution (Table 5). While there is no easy solution for this challenge, defining the circumstances of enforcing opt-out/ -in options, anonymity, and limited access to data in a policy can effectively minimise conflicts. In contrast, Case C was concerned about data re-identification, which would need to be addressed by evaluation action in Dimension 6 (see Section 4.2.6). An implication of this challenge for policy is to define rules about sharing data with researchers and external parties.

**Table 4: Identify key stakeholders - actions**

Case	Action	Theme
A	The primary internal stakeholders included students, teaching staff, senior managers and a working group made of representatives from various units. The external stakeholder was a LA service provider that offered a warehouse and analytics expertise.	Stakeholder engagement
B	The primary internal stakeholders included students, teaching staff, IT officers, senior managers, and the department of academic studies.	Stakeholder

	The need to involve external stakeholders, such as LA experts and data scientists, was identified.	engagement
C	The main stakeholders were researchers and IT officers. However, there was indirect engagement with external researchers through the engagement of LA literature and conferences.	Stakeholder engagement

**Table 5: Identify key stakeholders - challenges**

Case	Challenges	Theme
A	It was difficult to define ownership and responsibilities among professional groups within the university.	Management
B	The provision of opt-out options conflicts with the goal to tackle institutional challenges that involve all institutional members.	Ethics & Privacy
C	Anonymised data could potentially be re-identified when matched with other pieces of data.	Ethics & Privacy

**Table 6: Identify key stakeholders - policy prompts**

Policy – questions to reflect on	Theme
Who is the policy for?	Stakeholder engagement
How will responsibilities be defined for each stakeholder?	
Whose data will be collected?	Methodology
How will consent be obtained? Is there an option to opt-out of (or opt into) any data collection and analysis? Who can access the data? How will anonymity policies be applied to the processing and presentation of data? Will data be shared with researchers? Will data be shared with external parties? Is it justifiable?	Data management

4.2.3 Dimension 3 – Identify desired behaviour changes

The mapping of Dimension 3 showed that the expected changes for Case B were particularly 'institution-focused', while those identified in Case C were teacher-focused (Table 7). Although Case A expected to see behaviour changes among all three levels of stakeholders, there was a concern that expectations may not be met (Table 8). A similar concern about returns on investment was observed in Case B where LA was also driven centrally by the institution. Therefore, it is important that the policy not only guides decision makers to focus on changes that meaningfully reflect the goals set out for LA (Table 9), but also a range of indicators that can truly reflect these changes in a

specific institution's context. The latter could be defined as success indicators, as suggested later in Dimension 6 (see Section 4.2.6).

**Table 7: Identify desired behaviour changes - actions**

Case	Action	Theme
A	Academic staff will better understand students' learning problems and offer support accordingly. Students will be able to reflect on how they learn, and make learning plans accordingly. The institution will be able to make better decisions to support learning and teaching based on an overview of learning and teaching effectiveness.	Purpose
B	Student dropout rates will decrease. Students will be provided with regular reports about their learning progress. The institution will make better decisions to enhance teaching quality and keep students motivated.	Purpose
C	Academic staff will better understand student learning behavior, thereby improving the way they teach. The institution will improve the quality of their educational services.	Purpose

**Table 8: Identify desired behaviour changes - challenges**

Case	Challenges	Theme
A	An experimental approach is susceptible to a sense of uncertainty about the return on investment.	Methodology
B	It is unclear if a problem-based approach guarantees a solution.	Methodology
C	No challenges were identified.	

**Table 9: Identify desired behaviour changes - policy prompts**

Policy - questions to reflect on	Theme
What changes will LA bring to the current situation? Why are these changes important to us?	Purpose
Who will benefit from learning analytics? How will the purpose of learning analytics be communicated to primary users?	Stakeholder engagement

4.2.4 Dimension 4 – Develop engagement strategy

The mapping of Dimension 4 showed that engagement data was considered primary data for LA in the three cases (Table 10). The implication for policy is to define the range of data being collected and encourage 'meaningful selection' of data, so that LA will not be driven by data, but by learning or teaching goals (Table 12). It is also crucial to include students and teachers in the interpretation of data so as to contextualise data and increase the validity of analytics. The challenges that Case A and C focused on suggest the importance of including these key stakeholders in efforts to improve the efficacy of LA (Table 11) A common strategy shared by all three cases is to set up a working group to drive LA. It is important that the policy states the responsibilities of the working group, particularly their role in ensuring that LA will be used responsibly within the institution. For example, the working group at Case B will need to make sure that relevant data protection regulations have been consulted, as it is not evident in the reported actions.

**Table 10: Develop engagement strategy - actions**

Case	Action	Theme
A	The initial engagement with LA was guided by Jisc's Code of Practice for Learning Analytics. There were preparations to develop an institutional policy to provide a framework for the use of LA in the local context.	Ethics & privacy
	Two LA specialists and a working group were set up to facilitate a pilot project with a LA service provider, engage with research activities, and develop institutional strategies.	Human resources
	The initial preparations included a review of existing LA cases. The sources of data used in the pilot project included interactions in virtual learning environments, Student Record Systems, and course marks. Sixty-five online MSc courses were involved.	Methodology
B	A diverse working group was set up to drive LA activities.	Human resources
	The working group will initiate communications among different stakeholders.	Stakeholder engagement
	The initial preparations included a review of existing LA cases and visits to other European universities to learn from best practices. The data sources included engagement data in LMS (Learning Management System) and	Methodology

	data held in SIS (Student Information System).	
C	There were consultations on the Spanish LOPD (Organic Law on Protection of Personal Data).	Ethics & Privacy
	There was a plan to set up a working group to promote LA among teaching staff and develop ethical guidelines.	Human resources
	Social interaction data was extracted from discussion forums in the LMS.	Methodology

**Table 11: Develop engagement strategy - challenges**

Case	Challenges	Theme
A	Over rely on data and fail to consider the experience and knowledge of instructor/ tutors about students.	Methodology
B	While there was funding support from the government to develop student feedback systems among Estonian universities, there was no state-level coordination to initiate collaboration among universities that have received the grant.	Management
C	Focus on identifying students at risk and overlook the pedagogical design of curriculum or learning support	Methodology

**Table 12: Develop engagement strategy - policy prompts**

Policy – questions to reflect on	Theme
What are the objectives for LA?	Purpose
What kinds of data will be collected to achieve these objectives? What is the scope of data collection? How will the results of analytics be interpreted within the context? Will teaching staff or students be involved in the process? Who will oversee ethical conducts related to learning analytics?	Methodology

#### 4.2.5 Dimension 5 – Analyse internal capacity to effect change

The mapping of Dimension 5 showed that the evaluation of internal capacity focused on financial, infrastructure, and human capacity (Table 13). A common challenge shared by the three cases was in gaining wide support from the teaching staff among whom analytical literacy and time availability were main issues to deal with (Table 14). The implication for policy is to ensure the availability of communication channels and support resources among different stakeholders (Table 15). While all cases identified the challenge of accessing certain 'useful' data, Cases A and B recognised that ethical conduct

needs an enabling infrastructure. Thus, it is crucial that the policy provides guidelines to keep the infrastructure updated with regard to current data protection requirements.

**Table 13: Analyse internal capacity to effect change - actions**

Case	Action	Theme
A	A risk evaluation was performed to analyse internal capacity.	Methodology
B	There was government funding for the development of feedback systems to support students.	Financial resources
C	There was an evaluation of the availability and usefulness of data from the LMS. Interest was expressed in cross-institution collaboration on LA research projects to enhance the integration of LA.	Infrastructure

**Table 14: Analyse internal capacity to effect change - challenges**

Case	Challenges	Theme
A	2018 GDPR (European General Data Protection Regulation) will bring changes to the way the university dealt with student data.	Methodology
	The existing data infrastructure could not deal with individual opt-outs. There was no single permission to use student data across the institution. Some useful data remains inaccessible, e.g. the usage record of the digital library was kept by publishers.	Infrastructure
	If Institution A failed to manage one student's request to be excluded properly, the unhappiness of one student might spread to others and start an institution-wide objection. The buy-in from teaching staff was polarised.	Culture
B	The culture of using data to inform decision-making was immature. Although compulsory training was planned for teaching and support staff, it was not clear how to foster ownership of LA among staff. The benefit of using LA to support decision-making was clear to senior managers but not to teaching staff.	Culture
	The existing infrastructure is not mature enough to process data from the LMS or to cope with privacy requirements, such as allowing individual opt-outs.	Infrastructure



	Data that is potentially useful for achieving the goals of LA may not be accessible due to privacy issues.	
	There was a skills gap in analytics and LA project design, which posed questions regarding the validity of the current approach to LA.	Capabilities
C	The skills required to understand and interpret visualised data needed to be installed among teaching staff.	Capabilities
	Worries about the time demands in incorporating LA into teaching outweighed the perceived benefits of LA, and reduced the motivation to attend relevant training.	Culture
	Certain data outside the LMS is hard to acquire, such as social interactions in a physical classroom.	Infrastructure

**Table 15: Analyse internal capacity to effect change - policy prompts**

Policy – questions to reflect on	Theme
How will data integrity be achieved?	Methodology
How will the data be stored and disposed?	Data management
How often will the efficiency and security of existing data infrastructure be evaluated?	
Are there related policies in the institutional/ national/ international level that the LA policy sits alongside/ above/ below?	Policy management
What communication channels or feedback mechanisms will be in place?	Stakeholder engagement
What training will be deployed? Will it be compulsory?	

4.2.6 Dimension 6 – Establish monitoring and learning frameworks

The mapping of Dimension 6 showed that none of the three institutions had developed success criteria or defined monitoring procedures, perhaps due to the early stages of adoption. However, the challenges that confronted them indicate the urgency and importance to define success measures for LA in their contexts, particularly with the grounding of learning and teaching theories (Table 16). More importantly, the policy needs to raise awareness about inadvertent consequences that may result from analytics, and suggest procedure to monitor and deal with these risks (Table 17).

**Table 16: Establish monitoring and learning frameworks - challenges**

Case	Challenges	Theme
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A	There was a fear of failing to meet expectations, resulting in a bad name for LA.	Methodology
B	It remains questionable whether student dropout rate is the best success indicator for the institutional LA project.	Methodology
C	The captured data of time spent online may not truly reflect learning. The design and implementation of LA may fail to consider pedagogical theories.	Methodology

**Table 17: Establish monitoring and learning frameworks - policy prompts**

Policy – questions to reflect on	Theme
How will success be measured? What are success indicators?	Evaluation
What are the mechanisms that deal with inadvertent consequences?	
Who will carry out the evaluation of impact?	
How often will the policy be reviewed and updated?	Policy management
Who will be responsible for the policy?	

**5 DISCUSSION**

The associated themes that have emerged in the mapping results show a different focus for each ROMA dimension. Dimension 1 (mapping political context) focuses on identifying the ‘purpose’ for adopting LA in a specific context so as to drive actions in the other dimensions. Dimension 2 (identify key stakeholders) is driven by the recognition that the implementation of LA in a social environment involves collective efforts from different stakeholders. Dimension 3 (identify desired behaviour changes) sets objectives, which reflect back to the ‘purpose’ of adopting LA. Dimension 4 (develop engagement strategy) defines approaches to achieving the objectives by addressing aspects that could otherwise become challenges, as identified in the literature: resources, ethics & privacy, and stakeholder engagement and buy-in (see Section 2.1). Dimension 5 (analyse internal capacity to effect change) focuses on assessing the availability of existing resources (e.g., data and funding) and identifying challenges (risks). Dimension 6 (establish monitoring and learning frameworks) is currently absent in all three cases.

This mapping process illustrates how the ROMA model can be used to examine existing LA practices and refine strategies. For example, the mapping results show that all three cases still need to consider what it means to be successful with LA and what success looks like (Dimension 6), so as to better inform actions related to other dimensions. The actions taken by the three cases also contributed to the action elements in the SHEILA policy framework (Figure 2), which could be used to initiate strategic planning for early adopters.

In terms of challenges that confronted the three cases, the mapping of Dimension 5 identified key themes around culture, capability, and infrastructure. This result coincides with two of the three key LA challenges identified in the literature – demand on resources and stakeholder engagement and buy-in as introduced in Section 2.1. As a result, the policy questions focus on management issues around data integrity and security, and channels for stakeholder training and communication within the institution. The other key challenge – ethics and privacy – was particularly highlighted in the mapping of Dimension 2. This reaffirms the importance and urgency of addressing ethics and privacy issues that could otherwise impede buy-in from stakeholders. To this end, the policy questions particularly focus on management issues around privacy, such as consent-seeking, data access, anonymity principles, and data sharing.

While a policy does not necessarily provide direct solutions to the identified challenges, the questions in the SHEILA policy framework intend to prompt answers that could serve as suitable code of practice to mitigate the challenges. For example, answers to the policy question – “how will anonymity policies be applied to the processing and presentation of data” (see Table 6) may not provide solutions to the data re-identification challenge identified by Case C (see Table 5), as it may not be foreseen before different data sets are integrated. However, a policy could suggest that a review and test process for such risks be carried out by data specialists before data is made available to a wider population of stakeholders. This may further inform actions of Dimension 4 and 5, as the availability of data could be determined by the associated risks of privacy and consequently affect engagement strategy.

As identified in the literature, stakeholder engagement and buy-in has a direct impact on the scalability and sustainability of LA, which need to be supported by strategic planning, led by institutional leaders, and informed by pedagogical knowledge possessed by teaching professionals. This issue is reflected in the mapping results of challenges associated with Dimension 1, 3 and 4, where ‘methodology’ and ‘management’ are key issues. As a result, the policy questions focus on defining the purpose of implementing LA and considering the value of LA to all relevant stakeholders and the specific context of the institution. Based on the identified purpose, the methodology adopted to achieve the chosen goal should also be stated in a policy, as suggested in Dimension 4.

## 6 CONCLUSION

We have presented three institutions’ approaches to LA and challenges that confronted them in this paper. Using the ROMA model, we analysed actions carried out by these institutions. We extended and adapted the use of ROMA further by including challenges under the six dimensions. Thereafter, we developed a set of questions to be addressed when formulating policy. This mapping process demonstrated the evidence-based approach that we adopted to develop the SHEILA policy framework, which contributes three types of information valuable

for a systematic adoption of LA – actions, challenges, and policy. The framework could be used to guide the development of institutional policies and strategic planning for learning analytics, to evaluate institutional readiness for LA and to benchmark best practices.

This paper has presented a selective part of the first SHEILA policy framework through three chosen cases. The list of policy prompts presented in this paper were selected to reflect the three particular cases. The framework was developed based on a series of interviews with predominantly senior managers in HEIs. Therefore, it particularly reflects the perspectives of this group of stakeholders. Our future work aims to incorporate findings from other on-going research activities, which explore views from other key stakeholders such as teachers and students, regarding the adoption of LA.

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