EUNIS 2018 Congress

Tuesday 5 June – Friday 8 June 2018

Centre de Conférences, UPMC, Sorbonne Université, Paris

Proceedings
EUNIS AT A GLANCE

EUNIS is the European University Information Systems Organization. EUNIS brings together those who are responsible for the management, development and the policy for Information Technology in Higher Education in Europe.

In the beginning of the 90’s OECD started a study about the impact of Information Technology on Higher Education Institutions. It must be remembered that it was a time when the Internet did not exist and very few things were known in the different European countries about what was going on in other countries. As usual at OECD the study ended with a seminar where a number of IT managers in European universities participated. One of the outputs of this seminar was the decision, by some participants, to establish a European organization and the founding members meet in Paris, France, at UPMC (now Sorbonne Université) in May 1993. In the beginning EUNIS was just a series of informal meetings between leaders, in Western Europe, to exchange information. The first congress, held in Düsseldorf in 1995, was such a success that it was decided to enlarge the young organization to all Europe. EUNIS later, was registered as a non-profit organization in Paris in 1997.

The objective of EUNIS is to contribute to the development of high quality information systems. To achieve this, the aims of EUNIS are:

- encourage exchange, cooperation and debates between those responsible for information systems in higher education or research institutes/organizations within Europe;
- establish relationships with supervisory organizations in charge of information systems in higher education and in research institutes in each country as well as at European level.
The organizers

Amue (shared-services agency for universities and other higher education and research Institutions) provides higher education institutions with IT solutions, training and expertise in their various field of activity. It organizes cooperation among its members and supports their joint action to improve the quality of their management, monitoring and decision making:

- Development and optimization of co-constructed IT solutions (shared costs)
- Professionalization and skills development of higher education staff through training
- Cost reduction through central purchasing
- Accompanying performance improvement by providing expertise and regulatory watch.

Amue builds a collective approach with the experts of its 180 members, from the definition of the needs to the choice and the development of IT solutions, the construction of the training offer or procurement.

Our head office is located in the 5th arrondissement of Paris and our IT construction department is in Montpellier.

CSIESR is a professional association whose main objectives are: contribute to digital development for education, culture, and research; support the services of information and communication techniques and their staff to understand innovations, technological developments, methods and organizations; reinforce the recognition of the strategic role of information systems in institutions and support decision-makers in taking these aspects into account.

The Muséum is a research centre and draws on laboratory work and worldwide expeditions, a wide range of disciplines, outstanding collections and recognised expertise. Its mission is also to share knowledge, which it does through education and dissemination activities. With a clear objective – to make knowledge about the natural world accessible to everyone and to make as many people as possible aware of the importance of protecting our planet.

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The Organizing Committee is responsible for organizing the program, budget, contracts, PR, sponsors, registration process, accommodation, evaluation of the congress, the day to day congress operations and logistics.

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### Elite Award

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POL-on: The Information System of Science and Higher Education in Poland

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Keywords
information system, higher education and science, decision support system

1. ABSTRACT
The aim of this paper is to introduce the Information System of Science and Higher Education in Poland, POL-on. It is an integrated and centralised information system which supports the Ministry of Science and Higher Education, as well as other ministries and institutions related to science and higher education. The system acquires data from universities and research institutions, analyses these data, and supports the decision-making processes of governmental bodies such as funding, evaluating, controlling, monitoring, and informing. The POL-on system has been continuously developed since 2011. Nowadays, it is a mature and fully deployed system. However, there are still ongoing modifications and improvements that result from the user needs or the law changes. Moreover, POL-on is going to be the essential part of a new integrated system of services for science, which should increase interoperability of the whole information ecosystem with domestic or European institutions or entrepreneurs. As a result, it should increase innovativeness.

2. INTRODUCTION
In this study, we focus on architecture, business processes, and the environment of an information system of higher education and science, POL-on\(^1\) which has been relatively introduced in Poland recently (Protasiewicz et al. 2017). More specifically, the goals of the study are the following:

(i) to show underlying aims of the central information system of higher information system in Poland, and concurrently discuss its environmental factors and constraints;
(ii) to disseminate the project’s results and its impact on the scientific, educational and business environments;
(iii) to discuss the further development plans of the system and its possible impact in the European context.

The Information System of Science and Higher Education, POL-on is the integrated and centralized information system, which supports the Ministry of Science and Higher Education as well as other Ministries and institutions related to science and higher education. Its primary task is to create a global database of scientific institutions, universities, and Polish science. Collected information supports the decision-making processes. Moreover, some data stored in the system are publicly available. Although the system is designed only for Poland, cooperation with other countries may be established. The novelty of this system, as well as this paper, rely on the following aspects:

(i) it supports both higher education and science concurrently as their processes are interwoven;
(ii) it helps to introduce policies on the governmental level regarding financial aspects as well as scientific and educational issues;
(iii) it acts as a central repository of theses, publications, and various information which are utilized to assess research units.

\(^1\) https://polon.nauka.gov.pl (only in Polish)
3. SYSTEM OVERVIEW
The project was launched at the beginning of 2011 as a partnership project co-financed by the European Union under the European Social Fund. As a result, the system, POL-on has been developed under the leadership of the Ministry of Higher Education. Pol-on is one of the biggest functioning governmental systems in Poland in terms of the scope of acquired data. It influences the Polish science and education in the following ways:

(i) It reduces bureaucracy by supporting over 20 reporting obligations of universities and research institutes.
(ii) Since 2015, it has been monitoring graduates’ careers nationwide using the data system in conjunction with the insurance state register.
(iii) It supports the creation of financial policies by providing strategic data about the Polish science and higher education system.
(iv) It checks the employment quality in higher education, i.e. it automatically verifies multiple employment of researchers and science employees.
(v) It gives the possibility to check compliance with legal requirements of courses.
(vi) It automatically checks the possibility to grant financial aid to students.
(vii) It evaluates all national research units - assesses scientific values that help to establish relevant policies on fund spendings in the scientific field.
(viii) It shares data for public and free use.
(ix) It is going to check plagiarism and frauds by supporting verification of the correctness of students’ scholarships, as well as public funds spending.
(x) It is going to be used for the authentication of diplomas for international purposes.

4. CONCLUSIONS
In this study, we have presented goals, environment, and results of introducing the Information System of Science and Higher Education in Poland, POL-on. Moreover, we have discussed its development issues and possible further evolution.

The system acquires data related to almost all aspects of higher education and science in Poland. These data help the government to fund, evaluate, control, and monitor several management processes in this area. In addition, it supports information policies and shares data.

We have to underline that POL-on is not only a single database, but rather a whole information ecosystem composed of several modules or separate systems. In detail, it acquires data from about five hundred universities or research units. The system itself covers nearly forty modules, where each of them realises one or more business processes. In addition, there are six information systems which closely cooperate with POL-on. Finally, many governmental institutions make use of information processed by this ecosystem.

The results indicate that the system is extensively used both by academia and governmental institutions. Since it covers comprehensive information about science and higher education, it is the valuable tool supporting decision-making processes.

The project POL-on has been developed since 2011. Nowadays, it is the mature and fully deployed system; however, there are still ongoing modifications and improvements. The further developments may include integration with other Polish governmental systems as well as some European systems. As a result, it would not only be a tool for academia but it also should lead to better cooperation between entrepreneurs and researchers, which together with open data may increase innovativeness, and consequently wealthness.

5. REFERENCES
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50 Years of Change 1968-2018
The Evolving Journey of the Traditional Campus ID Card

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Keywords Campus Cards, eID Credentials, Interoperability, Student mobility, Mobile devices

1. INTRODUCTION

Campus Cards are now an essential part of student life in Higher Education Institutions (HEI’s). They serve as an official document to verify and authenticate the student’s status and provide access to a wide range of academic and non-academic services. Since the early days of the Campus Card, card technology has undergone rapid change. In recent years, successful one-card programs have been developed and implemented in HEI’s throughout Europe, with systems evolving from the traditional magnetic stripe to smart chip technology, biometrics and mobile devices.

This paper reviews some of the key milestones in the 50-year evolution of Campus Cards. It will also address future needs and requirements, with a focus on interoperability and the removal of barriers and obstacles that currently hinder the use of campus cards across borders. In addition, it also reviews the efforts of the European Campus Card Association (ECCA)¹ to identify and agree on a proposal for the development of a European Trusted Student eID Credential Framework.

2. BACKGROUND

The history of Campus Cards dates back to 1968, when Rochester Institute of Technology in the U.S. installed the first electronic card access system. Since the early days of campus cards, education and campus card requirements are now vastly different from what they were 50 years ago with technology being the major driving force. Campus Cards are now an essential part of student life in HEI’s by providing access to a wide range of both academic and non-academic services. Since the days of using a card with mechanically punched holes to grant access to dining hall facilities, card technology has undergone a rapid pace of change, which has evolved into intelligent and secure smart technologies that make campus life safer and provides the convenience of a single-card concept for all the campus community.

3. THE EARLY YEARS IN EUROPE

Europe has made great advances in the development of smart-chip technology and card systems in the last two decades; however, the United States (U.S.) remains at the forefront of the Campus Card market and there are many pragmatic reasons for this. In the U.S., there is a much greater need for financial aid distribution, meal plans, on-campus accommodation, vending, cashless payments and security. Moreover, the more profit-oriented auxiliary services sector in the U.S. universities and colleges view the Campus Card as an important tool for the delivery of services and the development of lucrative business opportunities for vendors. In contrast, in terms of business and revenue generation, European HEI’s generally do not view their Campus Card as an important device in this area. In addition, the multifunction Campus Card is a relatively new phenomenon in Europe,

¹ www.ecca.eu
originating with the introduction of a number of projects, which commenced in the mid 1990’s. Prior to this, the traditional ID card was generally used for ID and library access, utilising a barcode.

The real beginning of the multifunction Campus Card market in Europe commenced in 1995. After much promotion by European governments, a range of multi-functional smart-card projects were initiated throughout Europe. In the Netherlands a multi-functional smart-card pilot project commenced at three Dutch universities involving 20,000 students. Similarly, several other smart card systems were also implemented; these include the Autonomous University of Barcelona and the University of Cantabria in Spain, the University Catholic of Louvain in Belgium, Johannes Kepler University in Austria and Waterford Institute of Technology in Ireland. In the UK, between 1996 and 1999, NatWest and HSBC banks introduced a multi-purpose smart card incorporating a Mondex electronic purse in six UK universities.

Since the turn of the century, successful one-card programs have been developed and implemented in universities and colleges throughout Europe, with systems evolving from the traditional magnetic stripe to smart chip technology, biometrics and mobile devices. The structure of the Campus Card continues to evolve with the technology aimed at achieving better security and performance in terms of multi-function capability. MIFARE technologies are now extensively used in the Campus Card market in Europe, with over 80% of Campus Cards using this technology. The primary focus now is to ensure that systems are future-proofed, particularly in terms of changing technologies, together with safeguarding the backward compatibility of systems to the existing infrastructure. The dependencies and requirements of the Campus Card are now undergoing a transformational change, mainly due to the needs of high-level security, authentication and the convenience of trusted access to campus services.

4. CURRENT AND FUTURE STATE-OF-ART

The current state-of-the-art in Campus Card systems, which can be described as a ‘desert island’ paradigm, is illustrated in Figure 1. With this isolated, stand-alone scenario, no interoperability or connectivity exists between campuses. Figure 2 illustrates a desired future concept providing interoperability and connectivity, showing the “Future Vision” scenario with a secure eID credential that provides secure identification and authentication. This requirement is now an essential element in supporting the free-movement and mobility of students throughout Europe.
5. THE FUTURE

The introduction of secure electronic Identification (eID), the use of mobile devices and the need for interoperability and connectivity are changing the landscape of Campus Card systems. The absence of interoperability, security and authentication standards are some of the main obstacles that are currently preventing the student from using their eID from their home Education Institution to provide cross-border identification, authentication and access to services. In a survey commissioned by ECCA in 2016, which involved 181 HEI’s from 28 countries, the need for interoperability and standards was clearly identified, with over 72% of the HEI’s rating it as important. 

6. CONCLUSION

Campus Cards and mobile devices that provide secure identification and authentication are now an essential part of student life in HEI’s. Since the early days in Rochester Institute of Technology, when the card used a pattern of punched holes to grant access to dining hall facilities, card technology and systems have evolved from the use of the traditional magnetic stripe to smart chip technology, biometrics and mobile devices. These technologies now provide students with eID and access to a wide range of both academic and non-academic services. However, we now need to focus on the provision of a European Student eID Credential and systems that support the free movement of students and access to services across borders. The absence of interoperability and authentication standards are some of the main obstacles that are currently precluding the student from using their eID from their home Education Institution to provide cross-border identification and access to services.

ECCA has commenced a consultation process with the ultimate aim of identifying and agreeing on a proposal for the development of a European Student eID Credential Framework, which is compliant to eIDAS (EU Regulation No 910/2014 on electronic identification and trust services for electronic transactions in the European internal market). This process will obtain the views and opinions of the stakeholders on the requirements and benefits of a European Student eID credential.

Its main objective is to facilitate a process that supports the convergence of research outcomes and impacts from previous EU projects that focused on the development of concepts to improve student mobility, secure identification, interoperability of systems, and the electronic transfer of data between HEI’s.

7. REFERENCES


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2 http://ecca.eu/index.php/members-area/researchpaper

8. AUTHORS’ BIOGRAPHIES

Eugene McKenna is a founding member and first President of the European Campus Card Association. He currently serves on its Board and is Director of their Research & Innovation Division.

Eugene was one of the co-founders of the Campus Services structure, which was established in 1989 at Waterford Institute of Technology (WIT), Ireland. This unique and innovative operation combined both the academic and student services requirements of an Educational Institution into a cost-effective business operation that employed over 200 staff. As CEO of Campus Services, until 2014, Eugene was highly acknowledged for his vision, direction and innovative methods that resulted in a multi-million Euro development and operation that included student accommodation villages, clubs and societies, catering and retail outlets, sporting facilities, health services, Campus Card services, scholarship and athletic performance programmes.

Prior to this, he held the position of Senior Lecturer in Engineering Technology at WIT and was also actively involved in Research and Development. His success in the delivery of student services, research and innovation, together with his excellent leadership, coaching and motivation qualities has been recognised through numerous awards both at national and international level. He has been a keynote speaker at numerous card technology and student services conferences in the US, Canada, South Africa and Europe.
Challenges and Solutions for Integrating Student ID Systems into Existing HEI Infrastructure

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Keywords
Smartcards, Mifare, Electronic Services, Business Intelligence

A smartcard based student identification systems has become a requirement for most HEIs in Europe in the last decade, which have resulted in various projects with the goal to integrate a student ID system into the existing infrastructure. One of the main challenges of incorporating a system of this scale into the existing infrastructure is the connection of the new system to the existing student information system of the institution without the need of extensive modifications. This was one of the basic requirements for the development of the Campuscard System, as other commercially available card management solutions would not offer the possibility to incorporate an identical system into multiple highly different HEI environments.

The Campuscard system is an innovative, integrated card system for universities and colleges, which is introduced as joint project of six universities and colleges in Berlin. The system is designed to incorporate multiple card types, from student cards, which are being currently introduced at the six institutions, to employee and visitor cards, with multiple services included. The system is based on Mifare DESfire EV1 cards and is compliant with ISO/IEC 14443 (NXP Semiconductors N.V., 2010). This signifies that the security of the cards is on par with other comparable card based solutions. (Oswald & Paar, 2011)

The introduction of our card management system (KMS 2) into the existing framework at the HEIs was accomplished by creating a modular architecture, which can be easily tailored to the infrastructure requirements and the unique business processes of the institution.

Figure 1: Structure of the KMS 2 connection to the student information system
In addition, the possibility to connect the card management (KMS 2) to multiple different student information systems was solved by an innovative, business intelligence approach seen on figure 1. Different student databases can be linked to the system using a data transformation layer inserted between the two systems. We use the Talend ETL open studio for this data transformation, which has been used very successfully in other business intelligence projects. (Makchrzak, Jansen, & Kuchen, 2011)

This makes a standardisation of the communication to the KMS 2 possible so that the card management is unaffected by the configuration of the student information system. The ETL component is essentially a separate layer, which translates the information from the student information system to a standardised input for the KMS 2 and can be modified in accordance with the requirements of the student database. This makes it possible to integrate the KMS 2 to a vast number of different student information systems, including SAP CM and HIS SOS-GX. The problems stemming from highly different business process at various institutions which many commercial systems face can also be avoided using this approach. Even in very similar environments, HEIs can have very different student processes, which can be very hard to model to be usable by a student ID system. The business intelligence based ETL approach offers a relatively easy solution for this problem, as the modelling of the business processes can be done in the ETL layer without modifying the student information system or the KMS 2. This means that the card management can be relatively easily integrated into the existing infrastructure of the HEI.

The Campuscard makes it therefore possible for HEIs to introduce a novel approach to card systems by creating an innovative solution and infrastructure to not only solve the problem of issuing a high number of cards, but also for the first time, create system wide services for the students and employees with only minor modifications required on the core systems. (Molnar, 2016)


Author’s Biography

Dr. Tamas Molnar is the head of unit of the Service Centre Campuscard since 2015 and project manager for the Campus card system since 2011.

Education

Primary and Secondary Schooling - Some in Germany
2001 Completed with Final Examination

09/2001 - 07/2003 University of Technology Budapest - Studies: Electrical Engineering

09/2003 - 07/2008 Corvinus University Budapest - Studies: Business Information Systems
Focus: Electronic Government

2007 - 2008 University Potsdam, Exchange Student Informatics

2008 Degree Business Informatics (Grade: Good)
In cooperation of the University Potsdam and the Corvinus University Budapest

05/2009 - 04/2014 Humboldt-University Berlin - Ph.D. Program
Focus: Software Usability in Electronic Government Systems

2014 Ph.D. in Software Usability (Grade: Magna Cum Laude)

Work Experience

09/2005 - 01/2006 Teaching Assistant, Corvinus University, Chair of Theoretical Informatics, Focus: Oracle Database Systems

09/2006 - 10/2007 Project Team Member, Auda GmbH. Focus: Multimedia Systems in education

10/2007 - 03/2008 Work on the Usability Project of the State Chancellery Brandenburg

01/2009 - 10/2010 Consultant/Project Lead, Brandenburg State Forestry Institute Focus: IT-Security Projects

Since 01/2011 Project Manager, Humboldt-University Berlin Focus: Smartcard based identification systems

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eIDAS based Applications at University Management

Abstract

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Keywords

eID, eIDAS, electronic signature, legally binding, university management, TREATS, StudIES+.

1. Summary

Three use cases at university management were implemented as eID/eIDAS based web applications to support cross border usage & mobility (EU): MyCredentials, MyResearch & Development (MyRaD), MyFBAI. eID/eIDAS based authentication and authorization extensions were integrated in pre-existing eID-based applications (German national eID/identity card), funding/co-financing by EU CEF program 2015, project "TREATS - Trans-European Authentication Services", Action No. 2015-DE-IA-0065 [6]. An outlook to the new EU CEF 2017 funded project StudIES+ is given (Student's identification and electronic signature services), Action No. 2017-DE-IA-0022 [7].

2. Development of eID/eIDAS extensions for university apps (TREATS)

To support the mobility of students and research/researchers across campus boarders formerly eID & signature based applications & campus infrastructures were developed at the eCampus/Scampii project (co-funded by European Fund for Regional Development ERDF, EFRE FKZ: 11.03-08-03), based on the German national identity card (GeID) and qualified signatures (accord. German signature law GeSI) [4,5]. Based on this pre-existing work and experiences further eID/eIDAS based extensions were integrated to the eCampus/Scampii applications and infrastructures at the TREATS project (EU CEF 2015; eIDAS [2] based on STORK [3]), especially extending the local user identity in the campus management systems (LDAP) to a hybrid user identity (containing eID/eIDAS attributes, additionally). Therefore, these eID/eIDAS extended infrastructure & applications are using extended eID service interfaces with additional eID/eIDAS based attributes/parameters (the eIDAS minimum data set) - for registration & application login [1,6]. The eIDAS based extensions of the eID services infrastructure itself were done by other TREATS partners, e.g. Governikus (lead). To integrate user/client based up/downloads of (GeSI signed) application forms according to the use cases with legally binding on the one hand and to integrate these applications forms to the legacy IT environment on the other hand, the web applications frontends were enriched by application specific portal file systems (directories, see Figure 1), authorized by an administration and access control hierarchy.
3. Outlook StudIES+

The StudIES+ project will support student mobility use cases by the (combined) integration of eID/eIDAS, Erasmus Student eCard/derived IDs and eSignature/eIDAS on the one hand and by the integration of different stakeholders at cross border use cases, like HEI, HEI service organizations and businesses, on the other hand, also for third party use cases. Especially, the secure & legally binding document exchange will be supported by eProSecal & eNotar platform/services, e.g. for ePracticum/eInternship or for notarized (derived) IDs at HS Harz (extending "MyCredentials" to "YourCredentials", also integration of EMREX). Therefore, the StudIES+ partners Francotyp-Postalia (lead), Bundesdruckerei, six-form, FU Berlin and Hs Harz will cooperate with external partners [7].

Figure 1: Application page "MyCredentials (eIDAS)", logged in as student

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AUTHORS' BIOGRAPHIES

Prof. Dr. Ing. Hermann Strack, a full professor for network management and computer sciences since 2000, also the coordinator for Informatics / E-Administration study course, the speaker of the Competence Centre as well as the head of the Network Laboratory (netlab) and the ICT Innovation Laboratory - SecInfPro-Geo (Security, Infrastructure, Process Integration & Geographical Information Systems). Furthermore, he is a member of the Gesellschaft für Informatik (GI e.V.) and the Competence Center for Applied Security Technology (CAST e.V.). In 2007 Prof. Strack was a co-founder of the European rs3g-group in Rome - rome-student-systems-and-stand-ards-group (rs3g) - a group which moved to European University Informations Systems as an EUNIS task force in 2009. Prof. Strack has focused his research activities mainly on the conception, the development and the implementation of (mobile) systems in the areas of IT-Security and E-Government. Specifically, he focuses on the development of eID based applications with the identity card in Germany (eID/PA) and eID/eIDAS. [http://netlab.hs-harz.de/research/](http://netlab.hs-harz.de/research/)

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The network attached devices inventory as required by the Italian requirement of “Minimal measures for ICT security” and EU “General Data Protection Regulation”

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Keywords

1. SUMMARY
The paper deals with implementation and management of software tools used for the inventory of all authorized and unauthorized devices in the University. The inventory of all active resources, as well as of both all the systems connected to the network and of the devices themselves, is implemented automatically using the SpiceWorks platform. The networks scanned are those of the systems, of the active network devices and of the active equipment of the data center, which are located in various University buildings.

Our approach is an integrated approach, who provide us the ability to manage in unified mode different requirements provided by different laws and authority.

The work describes the analysis of the different requirements of Regulation (EU) 2016/679, as well as of the Standards ISO/IEC 27001:2013 and ISO/IEC 27002:2013, and also, the Italian legislation on ICT Minimum Measures for Public Administration (which is directly derived from the “CIS Critical Controls for Effective Cyber Defense” version 6 of the 2015).

Therefore, it describes how to integrate these requirements in the University’s Information Security Management System, to manage them, in a coherent and centralized way.

2. THE NETWORK ATTACHED DEVICES INVENTORY AND THE GDPR REQUIREMENTS
The Regulation (EU) 2016/679 asserts that “any information relating to an identified or identifiable natural person” (c.f. art. 4(1)) [1] is a personal data. This is a concept already present in the Directive 95/46/EC, but that now is expanded, including a wider concept of identifiable natural person. Both laws state that it is identifiable a natural person “who can be identified, directly or indirectly” (c.f. art. 4(1)) [1], but they differ in the moment of establishing in reference to which element is possible to make the identification. In fact, General Data Protection Regulation introduces additional identification elements compared to those introduced by Directive 95/46/EC, effectively expanding the scope of protection offered. Specifically, Regulation (EU) 2016/679 generalizes the concept of identification number referring to an “identifier” that can be of various types “such as a name, an identification number, location data, an online identifier” (c.f. art. 4(1)) [1]. In this way are included also the elements relating to the online environment, which are fully part of the everyday reality of every data subjects. Furthermore, the GDPR extends the characteristics of the concept of data subject’s identity, adding also elements related to the genetic identity.
The choice of defining personal data by referring to any information relating to an individual, identified or otherwise identifiable, is particularly important because in fact it makes it possible to include in this category many types of information. So, for e.g., they can be classified as personal data: the person's name, a mobile number, an e-mail address, the credit card details, the payment details, the history of the web browsing, images, videos, temperature, GPS coordinates, clinical analysis data (such as blood pressure, diabetes level), and so on.

Consistently with this approach, Recital 30 explicitly includes as a source of identification of individuals the association with “online identifiers provided by their devices, applications, tools and protocols, such as internet protocol addresses, cookie identifiers or other identifiers such as radio frequency identification tags” [1]. Furthermore, again in the same recital it is noted that the aforementioned identifiers “may leave traces which, in particular when combined with unique identifiers and other information received by the servers, may be used to create profiles of the natural persons and identify them” [1].

Furthermore, Recital 26 clarifies the meaning of the term “all the means reasonably likely to be used […] either by the controller or by another person to identify the natural person directly or indirectly” [1]. So now it is clear that “to ascertain whether means are reasonably likely to be used to identify the natural person, account should be taken of all objective factors, such as the costs of and the amount of time required for identification, taking into consideration the available technology at the time of the processing and technological developments” [1]. Therefore the indication of the legislator is to consider all the aspects related to the identification activity, as well as any related technological knowledge and, finally, to carry out a punctual assessment on a case-by-case basis.

Therefore, it clearly emerges that the possibility of identifying a natural person (maybe through an IP address) is a clear means of verifying whether the treatment in question is within the material or territorial scope of the GDPR.

About the territorial scope, the first paragraph of Article 3 states that the “Regulation applies to the processing of personal data in the context of the activities of an establishment of a controller or a processor in the Union, regardless of whether the processing takes place in the Union or not” [1].

On the other hand, about the material scope of Regulation (EU) 2016/679 “applies to the processing of personal data wholly or partly by automated means and to the processing other than by automated means of personal data which form part of a filing system or are intended to form part of a filing system” (c.f. art. 2(1)) [1]. Moreover, Recital 15 states that “the protection of natural persons should apply to the processing of personal data by automated means, as well as to manual processing, if the personal data are contained or are intended to be contained in a filing system” [1].

About the material or territorial scope of the GDPR, we want underline that the correct use of the data protection techniques (namely, anonymization and pseudonymisation) could cause a partial application of the GDPR’s requirements, or even a complete non-application of the Regulation (EU) 2016/679. In this paper, we will not linger about this topics, but for a detail analysis both of data protection techniques and of the data re-identification risks, we recommend the Ciclosi’s article named “Assessing Compliance with Data Anonymization Techniques with European Data Protection Regulation” [2].


An operational implementation of a network attached devices inventory system, both from a perspective both organizational and technical, can be also a mean to ensure the compliance with some ISO/IEC 27000’s family standard, namely 27001:2013 [3] and 27002:2013 [4].

The Annex A of the ISO/IEC 27001:2013 standard [3] lists 114 controls, divided into 14 main security controls categories and 35 principal categories of security. Inter alia, in the main security control named A.8 “Asset management”, there is the principal category named A.8.1 “Responsibility for assets”, which has the control objective of “to identify organizational assets and define appropriate protection responsibilities” [3]. This category is further divided into 4 controls, namely: inventory of assets (A.8.1.1), ownership of assets (A.8.1.2), acceptable use of assets (A.8.1.3) and return of assets (A.8.1.4).
In particular, the first two controls are the most interesting for the purposes of this document. In fact, they state that it is necessary both to identify and to draw up as well as to maintain an inventory of the asset associated with information and information processing facilities. Furthermore, these controls state also the need that assets contained in the inventory is owned by the organization.

Analogously, in the main security control named A.13 “Communications security”, there is the principal category named A.13.1 “Network security management”, which has the control objective of “to ensure the protection of information in networks and its supporting information processing facilities” [3]. This category is further divided into 3 controls, namely: network controls (A.13.1.1), security of network services (A.13.1.2) and segregation in networks (A.13.1.3).

In particular, the first control is the most interesting for the purposes of this document. In fact, it states that is necessary to manage and to control networks in order to protect information in systems and applications. Therefore, it is clear that the full knowledge of which devices are connected in the network is an important element to guarantee its security.

In the standard ISO/IEC 27002:2013 [4] are contained some additional information, such as an implementation guidance and other information, useful for an appropriate application of the control itself. Therefore, this standard is essential for a correct implementation of the ISO/IEC 27001:2013 one. For example, the ISO / IEC 27002: 2013 highlights the importance both that systems connection to the network are restricted, and that these are authenticated. In addition, it is also required that are recorded and detected all the actions relevant to information security by the means of an appropriate logging and monitoring system.

Therefore, comparing the content of the controls described in the ISO/IEC 27001:2013 standard and that of the AgID Base Security Controls, it is possible to discover a real similarity of the same. Unfortunately, we cannot reproduce here the results of this analysis due to copyright restrictions applied by ISO.

Despite this, we believe it is important to highlight a difference between what is stated in the ABSC controls (first family, as show in chapter 4) and those of the ISO/IEC 27002:2013 standard (specifically, the principal category named A.8.1). While all the assets owned by the organization should be present in an inventory defined accordingly with the ISO standard, in another one, defined accordingly with the AgID’s minimum ICT measures, must be contained all the assets connected to the network (regardless of whether they are active or not, and owned by organization or not). We have chosen to solve this dichotomy in such way. First, we have automatically populated the inventory with all the assets connected to the network, here we have added manually other information related to the, authorized and/or owned by the University, assets.

These aspects were taken into consideration during the definition of the University’s ISMS.

4. THE INTEGRATION WITH INFORMATION SECURITY MANAGEMENT SYSTEM

In order to guarantee the full integration of the network attached devices inventory with the already existing University’s Information Security Management System (ISMS) [5], a specific technical procedure has been issued. This deals with identifying the methods of implementation and managing of the inventory of all authorized and unauthorized university’s devices. Moreover, the same technical procedure also applies to all active resources, especially those of all systems connected to the network, and the network devices themselves, used by the University of Camerino.

This is a very complex document, even considering its integration with other documents of the Information security management system. In fact, there are references both to the log management as well as to the backup technical procedures.

This procedure was issued for the first time in December 2017 to implement the indications of the University of Camerino working group about the application of the Italian minimum security measures for ICT security [6]. This is a working group set up on 29 September 2017 in order to meet the requirements indicated in the Circular of the “Agenzia per l’Italia Digitale” no. 2 of 18 April 2017 [7]. These aspects are analyzed in detail in our paper, named “The risk analysis as a unified approach to satisfy GDPR, NIS Directive and ISO 27001 requirements” [8], presented at this same conference.

From an operative point of view, in this procedure are been included some controls of the AgID Basic Security Control’s (ABSC) first family. Which are a set of controls of the “Italian Cyber Security Framework” [9], who are also derived from the “CIS Critical Controls for Effective Cyber Defense”
In our opinion, the AgID’s circular is not very understandable in defining the difference between the concepts of “resources” and “active resources”. Luckily, the CODAU Working Group “Minimum ICT security measures for the PA” help us to understand this difference. According to the CODAU [11] (which has consulted with AgID in a specific technical table) the 1.1.1 control is relative to all the resources active on the network, while the one of point 1.4.1 is more restrictive, being relative to all the resources active on the network that have also been authorized.

The inventory must contain at least an IP address. This is an important point, because this information could become a personal data. In fact is possible that the IP address acts as an identifier that references, directly or indirectly, a data subject. Furthermore, “the inventory of active resources must be detailed according to the distance from [...] the most critical area for information security” [11].

5. DESCRIPTION OF THE NETWORK ATTACHED DEVICES INVENTORY SOLUTION

The inventory of all active resources, as well as all systems connected to the network and the devices themselves, is implemented automatically using the SpiceWorks platform. This is installed on a University’s Computer Center server, in Windows mode. Configuration and control panel are accessible on a SSL connection by connecting on port 9675 to the system’s IP address, through the necessary credentials.

The SpiceWorks system scans various University networks, including those dedicated to the management of network equipment, which are located in various university buildings.

It is not possible to directly connect to the network attached devices inventory system, by RDP and as privileged users (the administrator account). Instead, all the authorized administrators must to use their personal account to connect by RDP. Is possible to use a special privileged user in an RDP connection, only to perform specific system maintenance activities, which cannot be done differently. Rather, the normal activities of use of the system will have to occur via the web, through an HTTPS connection, as described previously.

The SpiceWorks system is been configured for to get the best filter information in order to guarantee a more immediate selection of events that need verification, but also in order to organize the assets
inventory. Moreover, these configurations allow us to create a reporting system to get a general overview of the situation and of its evolution over time. This was also achieved by creating particular custom dashboards, of which an example is shown in the Figure 1.

![Figure 1 - An example of the SpiceWorks custom dashboard](image)

Inventory scanning runs automatically one, every day at an established time. In addition, every hour the system monitors the status of the servers and the network. The University’s Computer Center staff manually integrates the data collected through the SpiceWorks inventory system, fulfilling them with any missing information, compared to current regulatory requirements.

![Figure 2 - The Spiceworks’ report section](image)

In particular, they integrate the resources inventory, of all the systems connected to the network and the network devices themselves, for which at least the IP address is registered, by adding (manually if not already present) the following data:
• name of the device (e.g. the host name or the NetBIOS name);
• system function;
• indication of a holder responsible for the resource;
• structure to which the resource is associated;
• indication of whether the device is portable and/or personal.

Moreover, whenever the University’s Computer Center implements new systems or network devices, its staff starts a manual activity aimed at updating the data contained in the inventory system.

In addition, the SpiceWorks system provides a large section of reports (c.f. Figure 2) that can be accessed to generate those that are of interest (c.f. Figure 3).

![Figure 3 - The SpiceWorks’ «Inventory Summary» report](image)

The global function of university’s network attached devices inventory system is described in a ISMS’s technical procedure, which has been prepared in compliance with the following both laws (EU and Italians) and international standards:

- Directive of the President of the Council of Ministers August 1, 2015 [12];
- Legislative Decree of 7 March 2005, n. 82 (also known as CAD - Administration Code Digital) [13];
- CIS Critical Security Controls for Effective Cyber Defense - version 6.0 of October 2015 [10];
- La Sapienza - 2015 Italian Cyber Security Report of the CIS [9];
- ISO/IEC 27001:2013 [3];
- ISO/IEC 27002:2013 [4];
- Regulation (EU) 2016/679 [1];
- Legislative Decree no. 196 of 30 June 2003, Italian “Personal Data Protection Code” (English translate by Italian Authority for the protection of personal data) [14].

6. DATA ANALYSIS

The data collected by the inventory tool are analyzed manually, and exclusively by authorized personnel. If necessary, these data are integrated with the logs of the DHCP servers, but only in cases foreseen by the law and in compliance with Regulation (EU) 2016/679.

Similarly, if events or even security incidents have occurred, authorized personnel manually analyze the DHCP logs. This activity is carried out with the purpose of being able to correlate the data present in these logs with what is stored in the inventory management system. This activity is carried out in compliance with the laws concerning the protection of personal data (such as, the General Data Protection Regulation).

7. CONCLUSIONS

The use of an integrated approach to the management of information protection, on the subject of network attached devices inventory of university’s devices, represents a piece of a broader methodology adopted by the University of Camerino. This is a general and holistic vision, aimed at guaranteeing data protection and compliance with every requirement established by law and by
international standards, through their management within the university’s ISMS. This choice has allowed the University of Camerino, among other things, both to increase the continuous improvement of its system and to satisfy the accountability principle, enunciated by Regulation (EU) 2016/679.

8. REFERENCES


9. AUTHORS’ BIOGRAPHIES

Francesco Ciclosi is a twenty years experience analyst and trainer, responsible for designing distributed systems services. He is graduated in computer science and has achieved several professional certifications such as: Cisco CCNA, Microsoft MCSE, MCT, MCSA, MCTS and VMware VCA-DCV. He’s the author of many articles about computer security and of the books “Bitcoin. Genesis and functioning of a cryptocurrency”, “Implement the paradigm with SDN protocol OpenFlow switch” and “S.A.T.A. traveling to the System of Access to Administrative Transparency”. He has worked with many government agencies, private companies and universities, in the framework of national projects, such as the Italian electronic identity card project. Currently he’s working at Camerino University as Information Security Management System manager and cloud computing, server virtualization and storage platform administrator. He’s also working as “Computer Science” contract professor at Macerata University. He has previously worked at “Asur” CEO office, at Nestor, the experimental safety laboratory of Tor Vergata University in Rome and at Siemens Informatica “Security Data Networks”. Further information is available at https://www.linkedin.com/in/francesco-ciclosi-a0668062.

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EUNIS 2018: The Norwegian Diploma Registry
- enabling secure digital sharing of educational results

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Keywords
Transfer of educational results, Secure digital transfer, Interoperability.

SUMMARY
The Diploma registry is a digital interoperability solution in Norway, used by 40 higher educational institutions (HEI’s). By using the Diploma Registry, students and former students can retrieve their results and share them with potential employers, educational institutions and other relevant recipients. The Diploma Registry ensures that the shared information is valid. It makes it easier for applicants to present their educational results and at the same time facilitates the reception of results for educational institutions or potential employers. The use of the Diploma Registry is free of charge.

EXTENDED ABSTRACT
A statement of the problem
Application and hiring processes normally requires submission of transcript of records and diplomas. For many years this documentation has only existed on paper. Unfortunately, we know that some applicants counterfeit their transcript of records and diplomas when applying to study or applying for jobs. Educational institutions and employers, as recipients of transcripts of records and diplomas, spend a lot of time and money assessing the validity of the documents they receive. In addition to this educational institutions often tell us that they use a lot of time administrating and producing transcript of records and diplomas and that this also requires large quantities of paper.

Background information
In 2011, the University of Oslo was commissioned by the Norwegian Ministry of Education and Research to write a statement of requirements for a digital diploma registry. A working group was established and the statement of requirements was handed over to the ministry in January 2013. The development of the product started in 2015, and the first version of the Diploma Registry was launched January 2017.

About the Diploma Registry
The essence of the Diploma Registry is that only the person who has achieved the educational results can see his/her results. A recipient can only see a person’s results if access has been given to him/her. This is in line with the new General Data Protection Regulation (GDPR) from the European Parliament, the Council of the European Union and the European Commission.

Typically, many employers use recruitment systems when hiring. The primary way to share results with the Diploma Registry is to transfer them to a recruitment system connected to the Diploma Registry. The sharing process starts in the recruitment system and by following a link to the Diploma Registry one can retrieve all their results directly from the educational institution databases. Before sending the results to the recruitment system, one can choose which results to transfer.

As an alternative to transferring results, access to view the results in the Diploma Registry can be given. Access is given through a link generated by the Diploma Registry, which is sent to the designated recipient by email. A unique code is sent along with the link. The recipient must enter the code to access the results. The sender can choose the validity period of the link and at any time deactivate the link.
Legal basis

The legal basis of the Diploma Registry is found in the Regulation of the National Diploma Registry (Forskrift om Nasjonal vitnemåls- og karakterportal). The regulation states that the Diploma Registry contains ID-numbers from students and former students, and identification information about the HEI’s connected to the registry. A person’s results will only be retrieved to the Diploma Registry, from an educational institutions database, when the person logs into the Diploma registry. The service is GDPR compliant; the students themselves are in control of the data exchange.

International aspects

Secure digital sharing of educational results across borders has been an international issue in recent years and the Erasmus+ project EMREX was established in 2015. Through the EMREX pilot project, students have transferred results between educational institutions in Norway, Sweden, Denmark, Finland, Poland, the Netherlands and Italy. The Diploma Registry is the Norwegian service used in the EMREX project. The network is continuously being developed and new countries, such as the USA, Australia and China, are potential future partners. Both the Diploma Registry and EMREX are mentioned in the European Commission’s report «Study to support the revision of the diploma supplement and analyse the feasibility of its digitalisation at European level».

Technical

The Diploma Registry is a stand-alone service that does not contain results to begin with. Only after a person has logged in, their data will be retrieved from different sources in charge of the result information (like universities and colleges). All communication with data sources is done using web services, based on the ELMO format. The service is compliant with EMREX and all data extracted from the service are digitally signed. The ELMO XML format is the basis for the exchange of result information. ELMO is based on the CEN standard EN 15981-2011 EuroLMAI. EuroLMAI is a data model describing assessments, primarily Diplomas, Diploma Supplements and Transcripts of Records for higher education. The format used in the Diploma Registry is a profile of ELMO developed as part of the EMREX project (ICT Services for Education and Research, 2016).

Major conclusions

Every time a person is applying for admission or changing jobs, resources are used to produce, send, receive, register and verify transcript of records and diplomas. With the Diploma Registry all these processes becomes unnecessary. Using the Diploma Registry the recipient avoids giving admission to or hiring people with a false diploma. The Diploma Registry has already contributed to revealing fraud, and it was awarded an OSPA (The Outstanding Security Performance Awards) for “Best new security product” in Norway in 2017.

REFERENCES


Marte Holhjem holds a Master of Philosophy in Organisation, Leadership and Work. She is currently working as a Head Engineer at ICT Services for Education and Research in Norway. Holhjem works with project management within software development and is the product owner of the Diploma Registry.
1. SUMMARY
EU General Data Protection Regulation (EU-GDPR) applies from 25 May 2018. This paper describes how Hämé University of Applied Sciences has used enterprise architecture for GDPR personal data inventory.

2. BACKGROUND
Hämé University of Applied Sciences is located in Finland, Hämeenlinna. The number of staff at HAMK is about 600 and the number of students is about 7000. HAMK has worked with enterprise architecture for several years. When HAMK started GDPR preparations, it was clear that enterprise architecture principles and tools would be applied. One reason for the solution was that Data Protection Officer (DPO) is also an enterprise architect.

During the same time, HAMK implemented new information system for enterprise architecture management. It gave new possibilities to document personal data.

3. Personal data inventory
GDPR is all about personal data. At first we decided that we have three main groups of personal data:

1. Student data
2. Staff data
3. External (other) personal data

All these groups have different processes and different master data systems. Also, all of these groups have many personal data categories, for example: student contact information, external person contact information, student study information, staff tax information, staff payroll information and staff contact information.

Risk based approach is one element of GDPR. In order to make risk analysis, we decided to have new data classification:

- No personal data
- Special personal data
- Personal data
- Only username (this is specially for information systems)

We use this classification for personal data categories and information systems.

4. The results
As a result, we will be able to list for example following information:

- Information systems which have special personal data about students
- Processes which are using certain personal data, for example personal data needed when recruiting new staff.
In addition, data visualization is possible. Enterprise architecture management system can create visualizations (figure 1) automatically after relationships between different elements is defined. The system we are using is Arter ARC which is commercial cloud service. Every staff member has access to the system. About 10 people can create and update the models.

![Figure 1: Example of data visualization.](image)

Informing individual (data subject) is important aspect of GDPR. We use privacy notices for that. The basis for privacy notices is the data that describes what kind of information is registered. The same data is also used for records of processing activities. All the data is stored into the enterprise architecture system.

5. FUTURE DEVELOPMENT

When writing this article we still have a lot of work to do. We have identified most of the personal data categories and master systems. However, we have not yet connected those to processes. Records of processing activities are almost finished.

6. AUTHORS’ BIOGRAPHIES

Offering a service hosted in the US in compliance with the European general data protection regulation

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...Keywords
education, e-learning, mooc, data privacy, general data protection regulation

1. SUMMARY
In the context of the digitization of teaching, universities are increasingly interested in new flexible teaching formats. One of the current trends are Massive Open Online Courses (MOOCs). RWTH Aachen University has been a partner of the MOOC platform edX for two years. The courses provided there are available free of charge and independent of time and place.

In selected MOOCs, students of the RWTH Aachen can earn ECTS credits if they take an on-site examination at the RWTH Aachen University at the end of the course. Until now, it was necessary for students to register regularly on edX. This has the disadvantage that user data is stored on edX servers in the USA, which leads to problems with data protection. For this reason, RWTH Aachen University and edX have developed a solution in which only anonymous data is transmitted to edX.

2. MOTIVATION
In general, MOOCs offer students access to a wide range of content that can be used anywhere and at any time. For universities, they provide the opportunity to address previously inaccessible audiences, gather information on the effectiveness and efficiency of learning content and present themselves as a modern university worldwide. In order to achieve these goals, it is important to offer your own MOOCs on a widespread university platform such as edX.

The new European general data protection regulation poses considerable challenges. The handling of personal data has been revised and is clearly structured. In principle, personal data is only allowed to be transmitted to countries outside of the EU with the user’s voluntary authorization. With the coming into force of the general data protection regulation in mid-2018, this would otherwise violate applicable law.

Students who do not authorize the disclosure of their personal data cannot access the learning content offered on edX and therefore have a disadvantage. From the point of view of data protection, such authorization is no longer voluntary and is therefore not recognized.

In order to meet the requirements of European data protection, RWTH Aachen University and edX have initiated a project whose results are transferable to all European universities. The aim of the project is to provide a technical solution that allows students to participate in edX courses without passing on any personal data of the users.
3. SOLUTION

The login to edX is realized via Shibboleth authentication, the university acts as identity provider and edX as service provider. This ensures that neither the user's password nor the local user ID is transmitted to edX.

edX also requires a valid email address to send notifications to students. This e-mail address must have the domain @rwth, so that edX can assign the users of the corresponding university. Unfortunately, RWTH's e-mail addresses have the pattern firstname.surename@rwth-aachen.de and is thus not suitable for data protection reasons. In order to solve this problem, an anonymous e-mail alias is set up automatically for the students of RWTH Aachen University and connected to the students @RWTH e-mail account and is then delivered to the edx platform via Shibboleth.

The necessary edX aliases are generated in the e-learning infrastructure, then passed on to identity management via a web service, assigned to the corresponding identities and attached to their e-mail accounts. Once the alias is known in Identity Management, students can register with edX. The aliases are checked daily, if a person loses his or her status as a student, the associated alias is deleted via a web service in Identity Management. It is then no longer possible to register with edX via Shibboleth.

During his first visit to edX, the user goes through a registration workflow. In the native setup he is asked to provide various information about himself. But this query of this information is prevented by the fact that the corresponding data fields are preset via Shibboleth in the adjusted workflow. Attributes with the fixed default value “anonymous” are configured in the Identity Provider for all fields, which are then mapped to the corresponding data fields.

This means that a user only has to accept the terms of service when he first visits the platform without giving any personal information. Nevertheless, he can add the corresponding personal data to his profile at any time, as this cannot be switched off in edX. The RWTH Aachen University advises the user to refrain from submitting any personal data.

For the technical implementation, four new attributes are defined in the Shibboleth Identity Provider of the RWTH Aachen University: edx_anonymous, edx_username and edx_email and edx_residence.

The attribute edx_anonymous is assigned the static value "anonymous" in the Shibboleth Identity Provider and is mapped to all profile fields on pages of edX. The edx_email attribute is filled with the generated e-mail alias and edx_username is assigned the part before the @ of the e-mail alias. The edx_residence attribute is statically assigned the value "Germany". This means that all required attributes and their values can be delivered to edX to ensure full service access without violation of data protection regulation.

4. Lessons learned and future ideas

The described solution has been evaluated in a pilot course in the winter term 17/18. The students reported no problems accessing their course on edX. Also, the lecturers did not report any problems regarding the connection to edX.

For the summer term 2018 it is planned that two further courses with about 1000 students each will use the solution. The next technical step will be the utilization of the API offered by edX. This allows some of the steps that were carried out manually in the pilot phase to be automated.

5. AUTHORS' BIOGRAPHIES

Dipl.-Inform. Bernd Decker has been deputy head of the IT process support department at the IT Center of RWTH Aachen University since 2011. He graduated from RWTH Aachen University with a degree in computer science. From 2006 to 2009, he worked as a software developer in the IT Center and has been head of the development team since 2009. His work focuses on IT solutions for processes in the area of e-learning, e-services and campus management systems.
Marius Politze, M.Sc. is research associate at the IT Center RWTH Aachen University since 2012. His research is focused on service oriented architectures supporting university processes. He received his M.Sc. cum laude in Artificial Intelligence from Maastricht University in 2012. In 2011, he finished his B.Sc. studies in Scientific Programming at FH Aachen University of Applied Sciences. From 2008 until 2011, he worked at IT Center as a software developer and later as a teacher for scripting and programming languages.

Sarah Grzemski, M.A. studied Economic Geography, Economics and Geography. She received her Master’s degree from RWTH Aachen University in 2002. Until 2007, she worked as a research assistant in the Department of Economic Geography of Services. Her main research focus were employees in call and service centers. Since 2007 she has been working for the IT Center of RWTH Aachen University. Initially, she worked for the division of Process IT Support. In 2010 she was made division head of the IT-ServiceDesk. She was appointed to the position of chief communication officer in October 2017 and is responsible for the internal and external communication of the IT Center.
Distribution and Usage of Digital IDs at the University of Münster

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Keywords
secure email, S/MIME, X.509, digital id, digital certificate, digital signature, encryption, GDPR, digital transformation, eID

1. ABSTRACT
X.509 is a standard for digital IDs that has existed for about 30 years and has since been integrated in commonly used software. It allows digital signing of office documents (e.g. Word or PDF) and emails as well as encrypting them. Digital IDs are often used in combination with smartcards or eTokens for Windows logins or for logins to web applications via browser. All German higher education institutions are connected to the German National Research and Education Network (DFN), which also provides central services such as a Public Key Infrastructure (PKI). With the WWUCA, the University of Münster has a certification authority that issues X.509 certificates on behalf of DFN-PKI. Distribution and usage of digital IDs are currently promoted on a large scale at Münster University. They allow signing and encryption of sensitive information and provide a basis for future processes of digital transformation. As regards IT security, digital IDs and S/MIME signatures help to fight against spam and phishing emails. Similar activities take place at the University of Dortmund and the University of Dresden. This paper gives a short introduction into X.509 certificates, their usage and our increased efforts to distribute them. We want to encourage other universities to use digital IDs, give hints and suggest tools for the rollout.

2. INTRODUCTION
Email communication is far from dead, despite the rising popularity of messengers such as WhatsApp, Signal, or Telegram. In fact, the amount of emails sent per day is still expected to rise over the next years (The Radicati Group, 2017). The standardized way emails work, their easy accessibility and their global distribution make them the main communication channel in organizations and the preferred method for business communication. It has to be reliable and secure to allow workflows in the course of digitalization. However, current email implementations do not meet these requirements. Emails can be forged very easily and are not qualified to deliver sensitive information. In consequence, phishing and CEO fraud threaten organizations. Statutory provisions require encryption of sensitive information. There are several attempts to make messengers ready for business communication (e.g. Slack). While those messengers are likely to be used more and more within organizations, at least communication with customers, students and other company users will presumably continue to be by email for quite some time. Nearly everybody has an email address but not all people use the same messenger.

Unfortunately, the advantages of emails are also the reasons why they are such a popular medium for cyber-attacks, e.g. through phishing or distribution of malware. In 2016, emails caused two-thirds of all malware infections (Barkly, 2017) and with the current worm-like developments of ransomware (Goodin, 2017), even one infection can cause havoc in a business environment and in the worst-case lead to a high amount of irreversible damage. Phishing is one of the major entry points for cyber criminals into secure systems (IT Weapons, 2017). It is no surprise that phishing emails constantly get more elaborate. They contain less spelling errors, use deceptively real designs and real user information from information leaks. The high fluctuation and internationalization of university personnel lead to a broad attack surface through people who may not detect errors in
form or spelling of emails. With a lot of potential targets and lucrative scientific research information, universities are under constant attack.

Broad usage and awareness of digital signatures help to protect employees and students from phishing and spam attacks. Furthermore, it lays the foundation for encryption. This is important regarding the European General Data Protection Regulation (GDPR) that requires encryption of sensitive data. This paper presents current efforts at Münster University to secure email communication by means of S/MIME, addresses problems we encountered with poor knowledge and low popularity of digital certificates for emails, and presents attempts to overcome them.

3. PROBLEMS

Usage of digital IDs is a complex topic and needs training and support. Once a private key is compromised, malicious emails could be signed, too. Backups of data and encryption keys are even more important to protect encrypted data. The underlying trust model depends on reliable and trustworthy certification authorities. In the near past, several scandals with CAs led to the withdrawal of their certificates in browsers, for example DigiNotar (Nightingale, 2011) (ENISA, 2011) and StartCom (Wilson, 2016).

Most participants of our training courses have never heard about digital certificates or do not know what they are used for, even though everyone uses them, e.g. when browsing websites over HTTPS. Because other popular communication tools such as messengers offer end-to-end encryption and security without any additional user interaction, people do not see any need to secure their email communication either.

Regardless of the current attempts to promote the usage of digital certificates at Münster University, only few university members, mostly from IT-related departments, use them to date. One reason for this is, that many people do not want to become active themselves, despite their seemingly growing security concerns (Bitkom, 2017). Users blindly trust in IT systems and services and rely on security measures established by their IT department. They do not see any difference between transport encryption (via SSL/TLS) and end-to-end encryption which results in a false sense of security. Users are still a main weak point when it comes to IT security. Educating users and especially motivating them to deal with these topics is a very important ongoing task, but hard to accomplish.

When it comes to using S/MIME, unexperienced users often have trouble due to inconsistencies between different email applications. Different companies use different synonyms and file formats for digital certificates and applications need individual steps to install them. This makes the usage of digital IDs and S/MIME unnecessarily complicated. A tool to aid in the setup of client software such as “Volksverschlüsselung” can help to improve user acceptance and reduce efforts at help desks.

4. FUTURE WORK

The University of Münster is currently in the process of passing regulations to enforce the digital signing of official emails. These primarily focus on official newsletters and information from the central administration unit. However, these regulations also encourage university members to sign all business emails. The broad distribution and knowledge of digital certificates can be valuable in the digital transformation of administrative workflows. Therefore, the university administration wants to implement usage of digital certificates in the near future. These could also help in student mobility projects like “Erasmus Without Paper” (Mincer-Daszkiewicz, 2017) or “European Student Card” (Jean-Paul Roumegas & Frédérick Bigrat, 2017).

Digital certificates could be issued during the recruitment process for new employees. During “certification days”, the application process and usage could be demonstrated. The process of rolling out new certificates for large user groups is a challenge regarding user verification and assistance with installing certificates.

5. AUTHORS’ BIOGRAPHIES

Thorsten Küfer is information security officer at the IT center of the University of Münster, Germany. He graduated at Münster University in 2004 and holds a diploma in mathematics and
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Excellency and knowledge sharing in IT the management of the social action services - The case of the EGO-SAS project

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Keywords
Trust, resource sharing, best practices, ICT infrastructures, Erp, Information systems, mobility, cloud, opensource.

1. ABSTRACT

The recent economic and sociodemographic changes and increasing national and international competition among universities created a number of challenges in higher education (HE), such as the difficulty in attracting new students as well as research funding’s, where also the HE Social Services (SAS) should be prepared. The present project arises within the scope of the UNorte.pt consortium due to the knowledge-sharing initiatives developed between the University of Porto Social Services (SASUP), University of Minho Social Services (SASUM) and University of Trás-os-Montes and Alto Douro Social Services (SASUTAD) in order to respond to the identified challenges and to generate new ideas that can lead to innovation aiming to provide better services to students.

Also, the final goal of the project is to provide a good practice approach within SAS aiming to a national dissemination and implementation.

The present paper intents to present the technical implemented IT infrastructure to support all the information systems and applications, through the use of a hyperconverged infrastructure implementation and by the use of hybrid cloud services, mixing open source private cloud implementations with public cloud services.

2. The project, scope and future work

The recent economic and sociodemographic changes and increased national and international competition among universities, created a number of challenges in higher education (HE), such as the difficulty in attracting new students as well as funding where the HE Social Services (SAS) should be prepared.

The SAS model in Portugal was based on a logic of providing basic services with a little added value, thus being misaligned with the needs and preferences of the students, as well of their universities that are seeking to differentiate themselves and gain a competitive advantage, not only by regarding innovative teaching methods and excellence in research, but also with the support services that they provide to their academic community.

Students are now looking for attractive, quality services, in contrast to a simplistic and unappealing image that SAS where passing over time, for example in their canteens. For universities, these services can be strategic for attracting new national and international students, and with the sharp aging of the population and a decline in the number of young people, competition between universities will increase in the coming years.
The present project arises within the scope of the UNorte.pt consortium due to the knowledge-sharing initiatives developed between University of Porto Social Services (SASUP), University of Minho Social Services (SASUM) and University of Trás-os-Montes and Alto Douro Social Services (SASUTAD), in order to respond to the identified challenges and to generate ideas that allow innovation within the SAS, aiming to provide better services to students.

The carried analysis gave rise to a consortium project - "Excellence in the Operational Management of Social Action Services of Higher Education in Portugal - EGO - SAS", that aims the implementation of modern management practices, efficiency in the use of physical and human resources through the dematerialization and automation of processes, and the implementation of decision support information systems covering the main areas of intervention of the SAS.

The focus of the project, and areas of actuation, are divided in 2 main pillars:

- Support areas: Logistics, Marketing and Sales, Maintenance, Quality, Human Resources, Management Control and Security.

The aim of the project is to standardize the procedures between the three SASs and prepare them for future use of existing synergies, eliminating the duplication of tasks and increasing their bargaining power with suppliers. An example of this is integrated management of menus and nutritional control. Also, it will allow access to a single database with nutritional information and possibilities to coordinate a schedule of menus enabling, as part of a drafting of tender documents, to increase their bargaining power and to make transfers of stock in case of break situations. Thus, this project does only not aim to modernize the SAS and compile the practices of electronic commerce, but also to prepare them to future synergies in the management of services.

The project is divided into 7 intervention areas composed of initiatives that tries to meet the challenges encountered by promoters and diagnoses. These 7 areas are organized as follows:

- SAS Collaborative and Interoperable Platform;
- Logistics;
- Quality;
- Security;
- Management of queries;
- Maintenance management;
- Management of sports facilities.

In the SASUTAD case all of the IT processes and infrastructures are supported by a private cloud implementation based on an OpenStack solution and hyperconverged systems.

A hyperconverged system allows the integrated technologies to be managed as a single system through a common toolset joining under a single point of management computation and storage. Also, better performance is achieved in the cases where database access is essential to the systems. Other cases of the use of hyperconvergence is the where the use Virtual Desktop Environments (VDI) are applied.

The current paper intents to present the overall architecture, the private cloud implementation and the implemented hyperconverged infrastructure.

Also, it intends to demonstrate the services and systems already in production in the infrastructure.

Note: This EGO-SAS project is co-financed by the European Regional Development Fund (ERDF) through COMPETE 2020 - Competitiveness and Internationalization Operational Program (POCI).
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4. AUTHORS’ BIOGRAPHIES

Elsa Justino – Has a PhD in Social Work. The professional experience includes the positions held in the service commission as Vice-President of the Student Support Fund, Deputy Director General of the General Directorate of Higher Education and Head of the Office of the Secretary of State for Employment and Vocational Training. She is currently Administrator of the University of Trás-os-Montes and Alto Douro and of the Social Action Services. In the field of higher education he has regularly participated in studies, communications and scientific articles on students, social action and higher education

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EUNIS 2018:

Taking it further - Widening and Deeping the clouds

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Keywords
Cloud, services, infrastructure, iaas

1. Summary
The European Higher Education Institutions can now use a pan-European offer with a range of attractive Infrastructure as a Service (IaaS) cloud computing solutions without any tendering themselves. These solutions cover computing resources, networking, storage, backup and disaster recovery, as well as professional services.

The IaaS Cloud Framework is based on the first digital single market for cloud services, established by European networking association GÉANT.

10 000 research and education institutions across Europe have now been enabled to procure services that are tailor-made, safe and easy to use, from a range of vendors. These IaaS platforms offer highly scalable resources that can be adjusted on-demand and are ideal for academic research characterised by workloads that are temporary, experimental or subject to unexpected change.

2. TEXT
Widening and Deeping the clouds
The European collaboration has covered in-house development using OpenStack and OwnCloud, as well as a range of commodity cloud offerings within collaboration tools, file storage, web and video conferencing. In 2017, a Pan-European tender for IaaS services resulted in agreements with 23 vendors, among which one can find leading global cloud vendors like Amazon Web Services (AWS), Microsoft Azure and a range of other infrastructure providers. Scientists, lecturers and students all benefit from implementing these services. In collaboration every institution will benefit from the joint efforts and aggregated demand. Scientists, lecturers and students can login using their institutional account. The ready-to-use agreements comply with EU data protection law. Billing and purchasing models were designed to match financial structures in research and education institutions. Discounted prices are available for all institutions, large and small. Some institutions have achieved cost savings of up to 30% after moving to the framework contracts. No wonder that commodity cloud services are thus being widely accepted into the Research and Education community.
Using this strong foundation, the collaborating partners are looking into the future of cloud services, working with Public and Private cloud providers and developers, to understand the future landscape for advanced cloud services - moving beyond commodity cloud facilities.

The big picture and the real-life examples
The presentation will give an overview of the results of the European cloud collaboration so far. In addition, it will highlight the benefits for European research and education institutions. GÉANT will present a number of use cases about how education institutions are using the cloud services in the GÉANT cloud portfolio to bring real benefits to their users.

3. AUTHORS’ BIOGRAPHIES

Lars Fuglevaag is Department head of communications at the newly established Norwegian agency for ICT in education and research. He has previously worked as Head of Communications at UNINETT, the Norwegian research and education network, since 2008, Lars has more than 30 years’ experience within marketing and communications in both the public and private sector. He has substantial international experience through the Nordic collaboration NORDUnet, as well as the GÉANT task forces for marketing and communications and management of service portfolios. Lars is currently an active participant in the GÉANT project clouds activity, and is also a member of the Program Committee for the TNC18 Networking Conference.

Karl Meyer has spent the past 20 years working within the Internet industry in both technical and sales and marketing roles, and was Director of Channel Marketing Strategy for WorldCom EMEA. His roles included design and build of ISP services across the Middle East and Southern Europe including Turkey and Jordan and the development of the first European Cloud Service offering with Messagelabs. Karl has an MBA for the Open University with an emphasis on International Enterprise Development and Knowledge Management. In addition, Karl is a teaching fellow at Cambridge Marketing College.

Andres Steijaert is activity leader for the cloud activity in the pan-European GÉANT project. At the Dutch NREN SURFnet, as a member of the SURF-taskforce Cloud, Andres coordinates the efforts from the higher education institutes to jointly benefit from cloud services. Andres initiated and directed the cloud brokerage and vendor management activities at SURF. Previously he worked as program manager on the development of the SURFconext collaboration infrastructure, a middleware framework which interconnects cloud vendors and higher education organizations in the Netherlands. Andr Andres is a frequent presenter, nationally and internationally on cloud computing and one of the speakers in the Masterclass Cloud, part of the Executive Education track at the Nyenrode Business University in the Netherlands.

Maria Ristko is Project Manager at the Estonian Education and Research Network, as well as task leader for communications and dissemination in the GÉANT cloud activity. Maria has extensive experience from project management, dissemination and communications within research and higher education, both from the Estonian NREN, as well as various international task forces, special interest groups and projects.
DNS-RPZ - defending against malware - The UTAD case

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Keywords
Trust, resource sharing, best practices, ICT infrastructures, Security, Firewall, Mobility, Cloud Computing, Open source.

1. ABSTRACT

There has been growing interest in the use of DNS RPZ (domain name system response policy zones) as a mechanism to defend against malware on the web. This paper intends to present the technical implementation of DNS RPZ in UTAD, aligned with a national pilot promoted by the Portuguese NREN CERT (CERT.RCTS) and the Polytechnic Institute of Castelo Branco. Also, the paper intends to demonstrate its applications (including malware and phishing), share the experience of its deployment in the university instead of other layer 7 based filtering systems, by providing a step-by-step process for configuring DNS RPZ in BIND, as well of other services for logging and manual manipulation of the RPZ.

2. SCOPE AND RESULTS

Over the past few years, organizations have witnessed an increasing attacks by malware, ransomware, spam, phishing and other attacks internet based. Domain Name Service Response Policy Zones (DNS RPZ) is a method that allows a name server administrator to overlay custom information on top of the global DNS to provide alternate responses to queries. DNS RPZ to essentially stop malware-infected hosts from reaching their command and control (C&C) servers by blocking DNS resolution to known malicious hosts and sites. This effectively turns a recursive DNS server into a DNS firewall making also this method usually called with another generic name as “DNS firewall”. The present project arises within of the University of Trás-os-Montes and Alto Douro ICT modernization and strive for a more aware and secure institution. In this manner UTAD is now member of the National CSIRT Network and is actively working in the adoption of Open source solutions for the application in the domains of cybersecurity and cloud computing inside the institution.

The prime motivation for this implementation in UTAD was to protect users from badness on the Internet related to known-malicious global identifiers such as host names, domain names, IP addresses, or name servers. Malware sites tend to keep using the same identifiers until they are taken away from them. Unfortunately, the Internet security industry’s ability to take down criminal infrastructure at domain registries, hosting providers or ISPs is not timely enough to be effective. Using RPZ, a network or DNS
administrator can implement their own protection policies based on reputation feeds from security service providers on a near-real-time basis.

The current paper intends to share the experience of its deployment in the university, to provide a step-by-step process for configuring DNS RPZ in BIND, as well of other services for logging and manual manipulation of the RPZ. Also it intends will be show the need for user education and response to 'false positives'

**Note:** The “VDI&VOIP Consolidation project” is co-financed by the European Regional Development Fund (ERDF) through COMPETE 2020 - Competitiveness and Internationalization Operational Program (POCI).

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### 4. AUTHORS’ BIOGRAPHIES

António Costa – Is an ICT specialist at (UTAD), Vila Real, Portugal, and is responsible for the coordination the areas of core infrastructure and communications, computer security areas, datacentre, VoIP and communications networks. He collaborates in teaching on different degrees of computer courses, as well as in research, extension and development projects. Holds a degree in Electrical Engineering (specialization in Electronics, Instrumentation and Computation) and a post-graduate degree in engineering. Currently, he is in the final research stage to complete the PhD in Computer Sciences. He made several made courses or specializations which includes the Upper Course Director for Public Administration; Diploma of specialization of the Information Society for Public Administration, SIP Masterclasses, OpenStack, Security and Data protection specialization.

Alberto Vasconcelos - Senior network/Linux/security integrator/consultant working in UTAD with more than 20 years of experience. His specialties are Linux architectures/server security/database admin coupled with associated support services/automation and monitoring with a heavy use of open source software, and a strong inclination to mix network concepts with open source-based Unix technology.

Helder Fernandes has worked at FCT-FCCN's RCTS CERT since January 2015 as a security analyst, in charge of security incident handling, malware analysis and software development. Before, he has worked as a senior IT technician and information security consultant at other companies, namely IDW (outsourcing at Caixa Geral de Depósitos) and CLC - Companhia de Logistica de Combustiveis. He is a Certified Ethical Hacker and holds a degree in Electronics, Telecommunications and Computer Engineering from Instituto Superior de Engenharia in Lisbon since 2010.
Carlos Friaças has a Computer Science degree from University of Lisbon and has been involved since 2002 in several EC projects: 6NET, 6DISS, 6DEPLOY, 6DEPLOY-2, FEDERICA, GN2, GN3, GN3+ and GN4-1. These projects included delivering trainings and lectures around Europe, South America and portuguese speaking countries in Africa. He has worked on the Portuguese Research & Education Network IP backbone management, while also managing IP addressing for FCCN and RCTS. He was also the technical manager for the Portuguese Internet Exchange (GigaPix, where portuguese networks meet) between 2001 and 2016. Carlos has joined RCTS CERT as its coordinator in late 2015. This role implies supervising security incidents handling, the portuguese Safer Internet Center's Helpline & Hotline, and representing FCT at the INHOPE Association. In early 2017 he was also elected as the General Assembly's Chairman at the portuguese National CSIRT Network.

Implementing Virtual Desktop Infrastructures at the University - the UTAD case

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Keywords
Trust, resource sharing, VDI, best practices, ICT infrastructures, Erp, ICT infrastructure, Mobility, Cloud Computing, Open source.

1. ABSTRACT

Virtual Desktop Infrastructure or VDI, is a technology that basically separates the desktop environment and associated application software from the physical client device that is used to access it. These infrastructures, if provided via cloud computing technologies, similar to that provided using a software as a service model are also commonly denominated as “Desktop-as-a-Service” (DaaS), which provides a higher level of automation and real multi-tenancy reducing the cost of the technology. The implementation of cloud virtual desktop environments in the institution brought an enhancement not only on the support service level agreements and costs rationalizations, but also in the performance of the running applications, and for the manageability of the teaching laboratorial environments.

The current paper intends to present the technical implemented VDI Cloud DaaS infrastructure, a in total of 190 terminals aiming to have almost 400 terminals until the end of june, through the use of two technological implementations. One, Open Source based for the teaching labs and other proprietary based for the administrative and services deployment, both supported in cloud-based model. Also a benchmark of these two aproaches is intended to be presented.

2. SCOPE AND RESULTS

The present project arises within of the University of Trás-os-Montes and Alto Douro ICT modernization and cloud adoption. Virtual Desktop Infrastructure or VDI, is a technology that basically separates the desktop environment and associated application software from the physical client device that is used to access it. VDI used in conjunction with application virtualization and user profile management systems, also called as "user virtualization," can provide a comprehensive desktop environment management system. These infrastructures, if provided via cloud computing technologies, similar to that provided using a software as a service model are also commonly denominated as “Desktop-as-a-Service” (DaaS), which provides a higher level of automation and real multi-tenancy reducing the cost of the technology. The DaaS infrastructure takes full responsibility for hosting and maintaining the compute, storage, and access infrastructure, as well as applications and application software.

The implementation of cloud virtual desktop environments in the institution brought an enhancement not only on the support service level agreements and costs rationalizations,
but also in the performance of the running applications, and for the manageability of the teaching laboratorial environments.

Also, the implementation permitted the university to provide a software as a service (SaaS) solution for internal research software permitting mobility and device independent running applications. The overall solution is running with 190 VDI dedicated terminals for the administrative purposes and is being deployed to several computer labs aiming to have nearly 200 more refurbished terminals until the end of June.

The current paper intends to present the technical implemented VDI Cloud DaaS infrastructure that support all the administrative infrastructures, some computer training labs, public access information points through the use of two technological implementations. One, Open Source based for the teaching labs and other proprietary based for the administrative and services deployment, both supported in cloud-based model.

The paper also intends to provide the benchmarks of these implementations and to provide a best practice document for future implementations.

**Note:** The “VDI&VOIP Consolidation project” is co-financed by the European Regional Development Fund (ERDF) through COMPETE 2020 - Competitiveness and Internationalization Operational Program (POCI).

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António Costa – Is an ICT specialist at (UTAD), Vila Real, Portugal, and is responsible for the coordination the areas of core infrastructure and communications, computer security areas, datacentre, VoIP and communications networks. He collaborates in teaching on different degrees of computer courses, as well as in research, extension and development projects. Holds a degree in Electrical Engineering (specialization in Electronics, Instrumentation and Computation) and a post-graduate degree in engineering area. Currently, he is in the final research stage to complete the PhD in Computer Sciences. He made several made courses or specializations which includes the Upper Course Director for Public Administration; Diploma of specialization of the Information Society for Public Administration, SIP Masterclasses, OpenStack and Data protection Security specialization.

Manuel Marques - Is an ICT specialist at (UTAD), Vila Real, Portugal, with responsibilities in the VDI implementation and administrations.

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Elsa Justino – Has a PhD in Social Work. The professional experience includes the positions held in the service commission as Vice-President of the Student Support Fund, Deputy Director General of the General Directorate of Higher Education and Head of the Office of the Secretary of State for Employment and Vocational Training. She is currently Administrator of the University of Trás-os-Montes and Alto Douro and of the Social Action Services. In the field of higher education he has regularly participated in studies, communications and scientific articles on students, social action and higher education.
A national SOC (Security Operation Center) for all institutions in Sweden

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Introduction

This paper discusses the challenges of establishing a national SOC (Security Operation Center) for all institutions in Sweden. The background is of course the increasing IT-security threats against institutions and the chore for an institution to cope with different kind of attacks. The GDPR discussion has also raised attention of a need to strengthen institutional countermeasures against misuse and intrusion. Can a decentralized SOC help local IRT-functions (Incident Response Teams) to improve reactive and proactive initiatives?

What is a SOC?

A SOC is, as described in Wikipedia, “A SOC is related to the people, processes and technologies that provide situational awareness through the detection, containment, and remediation of IT threats.” A SOC for Swedish institutions must have a relation to the CERT for Higher Education, the CERT-SE and other security agencies. Our goal for the SOC is to be able to help institutions dealing with major attacks, at least two attacks at the same time. The SOC should work with proactive tasks, as information, education, penetration tests, SIEM tools and a “Red-Blue Team”-approach.

Why a collaborative SOC?

It is almost impossible for a single institution to establish a robust SOC. It costs money, need skilled staff and tools. If institutions can share a SOC, it might be easier to attract talent to a qualified SOC that would meet so many different challenges that occurs in an open environment of an institution. The business case for an institution is to increase IT security levels and not increasing the budget as it might has to do without the collaboration with peers. A SOC is a liason body for institutional IRT and the glue for collaborative IT security actions.

What is happening now?
The organization of all CIO´s in higher education in Sweden (ITCF), together with SUNET, the national IP provider for higher education, has described a mission for an investigator to explore if a national SOC is a passable for institutions. The presentation will go deeper into why and how to establish a national SOC for institutions of higher education in Sweden.

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The author is CIO for Umeå university since 2009. He has a degree in Computer Science and Business, University of Umeå, 1978. After university studies, employed as System Analyst and Designer for business information systems. Returned to Umeå university for doctoral studies and teaching in Informatics with special focus in System Design and System Development. He has been a Project Manager for several national projects. He has been Head of the Ladok Division at the University of Umea, a large unit specialized in system development and maintenance. He has been a board member of EUNIS and worked as an expert for the European Commission. Latest EUNIS publications includes:


EUNIS 2018: Certification and maturing an incident response team

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Keywords
Incident, Response, Team, Certification, Security, Maturity

Summary
This paper describes the process to certify a Computer Security Incident Response Team (CSIRT). How to use the SIM3 model, the obstacles and the most important question: Why do we need to do this?

Introduction
What are the challenges of certificating a CSIRT team that has been active and well established for many years. What model can we use for measuring the maturity level of a CSIRT and how is it done.

Certifying your CSIRT
With an increasing number of cyber-attacks towards educational institutions as well as the industry, we stand a large risk of being cut off from the internet because of hack attacks by intruders, either planting malicious code into our systems or overloading our internet connected web systems with a massive overload attack. Our most important systems for our daily work demands internet access and must be stable and available. One key role is an effective and well trained organization that prevents incidents by being proactive and also handles incidents in an effective manner when they occur.

Such team is a Computer Security Incident Response Team (CSIRT), which is responsible for providing necessary services to resolve computer security incidents for a given constituency. Generally, this includes prevention, detection and remediation of cyber incidents.

The CSIRT team works relies a lot on trust - both within its own constituency but also within the CSIRT community. One link of the trust chain is to show that you are a mature CSIRT and that you comply with the best practices of the community. One of the most important ways to show your maturity is to certify yourself. There are several models to certify a CSIRT.

We have used the ISO27035 standard and community-based standard SIM3 (Security Incident Management Maturity Model) which is recommended by organizations like Trusted Introducer, ENISA and FIRST. The SIM3 model rates the areas of: organization, human, tools and processes. You need to have a minimum score for each individual parameter.

The SIM3-model was developed and adopted by the CSIRT community in 2009. So far, 24 teams are certified in Europe out of a community of ~525 members. Following SIM3 will give you a very cost effective, but still professional, reoccurring review and certification of your incident handling processes.
One reason to certify your team is to show your level of maturity. Many previous models leading to certification builds on self-assessment, which do help you to build your processes. A certification on the other hand, comes with an independent reviewer that will make you rate your team and its processes.

A certification is also an important component while developing partnership with other organizations. The whole CSIRT community is built upon trust and many times on peers. A certification will assure that the whole team shares the same values and strengths.

The certification process was more time consuming that we had anticipated, and raised a couple of unforeseen obstacles. Since we have been a well-established team for so many years, we thought that this would be a fast and straight-forward process to walk through. The reality showed that even though you think that you have everything in place and good control, there is still need for improvement. The SIM3 model is a good tool to establish a strong and acknowledged IT security body within an institution.
Author’s biography

The author is working leading the UmU IRT Team, which is the Computer Security Incidence Response Team for Umeå university. She is also part of the SUNET Cert Team wich is the CSIRT organization for the Swedish academic network. She has a degree in Informatics from the Umeå university since 1989 and have been employed att the university ever since. With a background in teaching, programming, system development and system administration she has been working with computer security since 1995.

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The risk analysis as a unified approach to satisfy GDPR, NIS Directive and ISO 27001 requirements

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Keywords

1. ABSTRACT

The recent changes in the Italian and European regulatory framework to the benefit of the creation of a real European Security Framework represent a challenge for public administrations that, being subjected to multiple requests from different sources, risk focusing on detail, losing the more general and long-range vision of the so-called “security” process. And implementing all the most suitable actions to guarantee cyber security is now inevitable in a hyperhistorical society completely dependent on the specific information content and ICT in general.

The University of Camerino, which has always been attentive to the processes of security and protection of personal data, has for years adopted a holistic vision of cyber-security issues that has allowed it to manage the change in progress, including a redesign of the services provided by the University. More recently (2012) this approach has enabled the organisation to achieve ISO/IEC 27001:2013 certification.

Today, the University intends to relaunch the process of change management by proposing an innovative approach with which the security requirements deriving from the various regulatory requirements are managed in an unambiguous way by integrating them into the ISMS and in the renewed process of analysis and risk management at its base. In addition, the University also provides to increase the strategic importance of ISMS by bringing it to direct approval of its governance.

2. THE NEW ITALIAN AND EUROPEAN REGULATORY FRAMEWORK ON CYBERSECURITY

In recent years, the Italian institutional architecture for cybernetic security has been the subject of numerous interventions, also in order to take into account the indications received from the European legislator. At the moment it is outlined by the Decree of the President of the Council of Ministers of 17 February 2017 [1] setting out the new guidelines for national cyber protection and cyber security. The overall framework of the current cyber security system is completed by two strategic documents: the “National strategic framework for the security of cyberspace” (December 2013) [2] and the “National plan for cyber protection and cyber security” (2017) [3].

The first is a long-term document containing several elements:
- defining the roles and tasks of the various players;
- an indication of the profiles and evolutionary trends of threats and vulnerabilities associated with systems and networks of interest;
- identifying tools and procedures to increase the capacity of the country's system to prevent or respond to cyberspace events.

The second is a short term document, used to define the objectives and lines of action to be implemented in order to implement the national strategic framework.

These elements find a clear practical application also in the international context if we consider that in July 2016, the NATO Summit in Warsaw recognised cyberspace as an operational domain in which
the allies must defend themselves in the most effective way. In this context, a fact-finding investigation into security and defence of cyberspace is currently being carried out at the IV Commission for Defence of the Chamber of Deputies of the Italian Republic.

On the European front, there have also been significant changes to the regulatory framework, essentially detailed in the Directive (EU) 2016/1148 of the European Parliament and of the Council of 6 July 2016 concerning measures for a high common level of security of network and information systems across the Union (NIS Directive) [4], and also in Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) [5]. Finally, further changes to the European regulatory framework will take place in future when Proposal for a Regulation of the European Parliament and of the Council on ENISA, the “EU Cybersecurity Agency”, and repealing Regulation (EU) 526/2013, and on Information and Communication Technology cybersecurity certification (“Cybersecurity Act”) [6] comes forward; in any case, given that this is a future scenario for the purposes of our discussion, we will simply point out this last change in the legislative framework.

Especially the Directive (EU) 2016/1148 lays down measures with a view to achieving a high common level of security of network and information systems within the Union so as to improve the functioning of the internal market; finally, this is the first general measure adopted by the European Union in terms of cyber security.

The Directive requires that individual Member States adopt a series of initiatives aimed, among other things, at improving cyber security on the one hand and increasing their level of cooperation in preventing cyber threats and responding to cyber attacks on the other. The idea is to foster the development of a security culture in all Member States of the Union, paying particular attention to those sectors based on information and communication technologies which are vital to their economy and societies. Moreover, in a scenario characterized by HyperHistory [7], the current evolutionary stage of the most advanced societies, vulnerability to cyber attacks represents the real weakness of society. In fact, since this passage from history to HyperHistory is characterized by the changing role of information technologies, which, following a growing trust that modern societies place in them, finally become indispensable for the survival of these societies. This makes it clear that the possible positive outcome of a digital attack will be able to completely bring an advanced hypertorical society to its knees, but not an emerging historical one.

Moreover, always in a hyper-historical phase, the traditional States are flanked by other transnational agents (such as bulletin boards, large corporations, markets and even supranational organisations) which must therefore be involved in the definition of security processes, in line with what has already been outlined by the Directive (EU) 2016/1148.

As far as the Italian scenario is concerned, the indications of the above-mentioned Directive (EU) 2016/1148 have already been partially implemented by the national legislator, which is gradually updating the national legislation. In this regard, in addition to what has already been indicated, the recent amendment in force since 28 January 2018 to the so-called “Code of the Digital Administration” [8], in which, among other things, it is envisaged that the technical regulations on information security will now be issued by means of guidelines issued by the Italian Digital Agency, a more flexible and dynamic tool capable of responding promptly to requests regarding security and cyber security.

On the other hand, the Regulation (EU) 2016/679 about “rules relating to the protection of natural persons with regard to the processing of personal data and rules relating to the free movement of personal data” [5], is already in force since 25 May 2016 in all the Member States of the European Union, even if it will only be applied from 25 May 2018, and it also “protects fundamental rights and freedoms of natural persons and in particular their right to the protection of personal data” [5]. So the Regulation (EU) 2016/679 introduces a major change in the perspective in which the protection of natural persons is placed, as without modifying rights and duties of data subject and controller, changes the regulatory approach from “formal and reactive” to “substantial and pro-active” [9], in this way, “the processing and protection of personal data evolves to acquire its relevance within the organisational and management processes” [9].
3. THE MINIMUM ICT MEASURES FOR PUBLIC ADMINISTRATION

The Agenzia per l’Italia Digitale has drafted (26 April 2016) the minimum ICT Security Measures for public administrations [10] with the aim of “promptly providing the public administration with a normative reference and enabling it to undertake a progressive process of verification and adaptation in terms of IT security” [10]. This document, issued in implementation of the Directive of the President of the Council of Ministers of 1 August 2015, constitutes “an urgent anticipation of the complete regulation currently being issued, in order to provide public administrations with reference criteria for establishing whether the level of protection offered by an infrastructure meets operational needs, also identifying the appropriate measures for its adaptation” [10]. This reference to urgent anticipation was made in the expectation of an imminent regulatory intervention to amend the “Digital Administration Code”, which was then carried out at the end of 2017 and which has already been discussed in chapter 2. Therefore, at the moment the Agenzia per l’Italia Digitale is granted the right to adopt the guidelines containing the technical and address rules [8]. In this context, the AgID Circular No. 2 of 18 April 2017 [11] requires a multitude of parties (including public administrations, but also public service operators and publicly controlled companies) to adopt the minimum ICT measures in question by 31 December 2017.

In drafting the minimum ICT measures for PA, AgID has defined its own security controls by resuming the “CIS Critical Security Controls for Effective Cyber Defense” [12] in version 6.0 of October 2015. The CCSC are a group of controls commonly known as SANS 20, chosen by the Agenzia per l’Italia Digitale for their diffusion in the public and private sectors.

The controls defined by AgID, which take the name of “AgID Basic Security Controls” (ABSC), are the result of a simplified choice compared to the original CCSC with the aim of adapting them as much as possible to the specific context of the Italian public administration. Overall, there are only eight ABSCs that have been chosen to be implemented compared to 20 in the CCSC. These are the first five, which are commonly considered to be those essential to ensure a minimum level of protection in most cases, plus three other controls not so much focused on preventing and combating cyber attacks, but on contrasting accidental security events, such as those due to natural events or technical breakdowns.

The eight controls defined by AgID are as follows:

- ABSC 1 (CSC 1): Inventory of authorized and unauthorized devices;
- ABSC 2 (CSC 2): Inventory of authorized and unauthorized software;
- ABSC 3 (CSC 3): Protect hardware and software configurations on mobile devices, laptops, workstations and servers;
- ABSC 4 (CSC 4): Continuous assessment and correction of vulnerability;
- ABSC 5 (CSC 5): Appropriate use of administrator privileges;
- ABSC 8 (CSC 8): Defence against malware;
- ABSC 10 (CSC 10): Security copies;
- ABSC 13 (CSC 13): Data protection.

Each ABSC control is made up of a finer family of detailed measurements that can be implemented individually, each of which, in turn, decomposed into elementary measures that can be taken again independently. So an ABSC control is identifiable by <x, y, z> which expresses in an orderly way the levels and hierarchical sublevels in which the control is placed. In Table 1 is visible an excerpt from the ABSC13 family “Data Protection” controls.

<table>
<thead>
<tr>
<th>ABSC_ID#</th>
<th>Description</th>
<th>FNSC</th>
<th>Min.</th>
<th>Std.</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carry out an analysis of the data to identify those with particular</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>confidentiality requirements (relevant data) and in particular those</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>to which cryptographic protection must be applied</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Use encryption systems for portable devices and systems that contain</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>relevant information</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Use automatic tools on the perimeter of the network to block, limit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>or monitor in a timely manner, the traffic leaving your network, the</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>use of unauthorized cryptography or access to sites that allow the exchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>and the potential exfiltration of information</td>
<td></td>
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</tbody>
</table>

Table 1 - An excerpt from the ABSC13 family “Data Protection” controls
In addition, the ABSC are also subdivided into three macro categories that correspond to the particular level of security achievable following the complete implementation of all the controls corresponding to the particular level in question. Specifically the levels are as follows:

- **Minimum**, this is the basic level of safety under which no organisation can go down;
- **Normal**, this is an average level of security that represents a fair compromise between the preventive effectiveness of the measures chosen and their implementation costs;
- **Ideal**, this is a particularly high level of safety, even when handling critical information or providing critical services.

The minimum ICT security measures are characterized by the choice of a concrete and realistic approach that takes into account the variegated level of complexity of public administrations, going to contextualize the application of the various controls based on the type of services provided and the level of complexity of the structure in question. Therefore, each Administration can divide its domain into several subdomains that must then be clustered so as to divide them into groups in which to apply the security measures in a homogeneous way.

### 3.1. The contextualization of the minimum ICT measures in the academic world

The academic world provides a particular challenge for the application of minimum ICT measures considering that on the one hand universities often do not directly manage all the resources that can be networked and, on the other hand, access to the network is subject to a user-centred approval process and not on the device. In this regard, AgID, questioned by the Working Group of the “Conference of Directors General of University Administrations” (CODAU) “Minimum ICT Measures for Pas” on 13 June 2017, clarified that “the perimeter to be considered for the definition of the scope of interest and the evaluation of the corresponding minimum measures is not defined in absolute terms; an analysis of the specific reality in question is necessary, considering its peculiarities and the reference context in which it is inserted in order to identify a partition[...] systems and network” [13]. Moreover the contact person of the Agenzia per l'Italia Digitale has further developed the concept by clarifying that “in such stratification the central part («core») constitutes the area of maximum criticality, for which it must be absolutely guaranteed the respect of all the necessary safety measures to prevent its compromise” [13].

Another peculiarity of the academic world is related to the complex organizational structure of the Universities, which makes it difficult to identify immediately who is responsible for the implementation of minimum measures. Also in this context, the Agenzia per l’Italia Digitale has been clarifying stating that: “given the organizational structure of the Universities, in them there are typically structures endowed with ample autonomy, which also extends to the definition, implementation and provision of services” [13], so “the responsibility for the application of minimum measures lies, for such structures, with the Head of the structure” [13]. Moreover, according to the AgID, in specific and detailed cases such a mechanism of articulation of responsibilities could determine the direct responsibility of individual users, if the use of devices and workstations is under their complete control and responsibility.

Therefore, in the academic field, the proposed model is that of a pyramid of responsibility in which the minimum ICT measures for PA are indeed applied globally to the Administration, but in such a way as to leave the possibility that for its specific subdomains different sets of controls are used by the person in charge of the specific subdomain.

### 4. THE ISO 27001:2013 STANDARD

We will not analyse here the details of the operation of the ISO/IEC 27001:2013 [14], as they have already been presented in our paper “University ICT Security Certification” [15] presented at EUNIS Congress 2016 “Crossroads where the past meets the future”. Rather we will try to understand what it means for an organisation to achieve ISO 27001:2013 certification.

First of all in our opinion it’s not true that the compliance with the standard ISO/IEC 27001 guarantees the safety of the organization, because generally the compliance with the standard doesn’t say nothing about the real level of information’s security.

Furthermore the standard ISO/IEC 27001 is not a metric of the level or quality of security but gives us some guidance about the correct manner to manage the information security process.
Finally the ISO 27001 scope is to certify the quality of the information security management process, but is not to certify the quality of the solutions, of the technologies or of the configurations. In fact this standard follows the same approach used by the ISO 9000 family (industrial processes’ quality certification) where the focus is not on the tool’s quality but on the tool’s management process quality.

The new version of the standard ISO/IEC 27001:2013 [14] introduces some changes to the risk management process. Particularly is necessary to implement a process of security risk treatment in which both the governor of the University and his management structure are involved. This activity requires the following steps to be taken:

1. define all controls needed to implement the right risk treatment;
2. compare the same controls with those defined in the Annex A of the ISO/IEC 27001:2013 standard, in order to verify the presence of the mandatory controls;
3. if necessary, arrange the Statement of Applicability (SoA);
4. prepare a risk treatment global plan;
5. obtain the risk owner’s endorsement about the risk treatment plan and about the residual risk.

This last step represents a key point, as it obliges the University to consider the risk management process not as a merely technological aspect, but as a strategic element of the organization’s governance.

Therefore, according to this approach, it is not possible to implement a risk treatment strategy regardless of the approval of the so-called risk’s owners, those subjects that would suffer damage if the risk analyzed were to materialize.

Therefore the direct or indirect involvement (also through the acquisition of the opinion of the representatives of particular categories, such as the students), depending on the case, of all the stakeholders of the organization becomes an indispensable requirement to define a process of risk treatment compliance with the standard ISO/IEC 27001:2013.

5. THE ISO 27001:2013 CERTIFICATION OF THE UNIVERSITY OF CAMERINO

The University of Camerino, on behalf of the Centro Servizi Informatici e Sistemi Informativi (CINFO) has started since 2012 a certification process with the aim of responding to the demands of the external environment, its own stackeholders and the legislator, trying to govern the typical change of a HyperHistorical society dependent on information and ICT, abandoning an old model based on the mere technological updating in favour of a new paradigm focused on management [15].

This approach has enabled the University to achieve ISO/IEC 27001:2005 certification [16] already in december 2012, and then conform to the new version of the ISO/IEC 27001:2013 [14] in september 2015. Subsequently, the University successfully supported all periodic maintenance audits up to the most recent one held in december 2017 when was presented our unified approach to risk analysis and management (decribed in chapter 9) at the base of the integration between information security management system and ICT minimum measures (described in chapter 8) and which represents the first step towards the modification of the scope of application (described in chapter 10) in order to integrate the requirements of the Regulation (EU) 2016/679 into the ISMS.

More generally, the implementation of a methodological approach focused on the management of the safety process has allowed the University to realize an actual change of route “that has led to designing (or redesigning, in many instances) the systems for distributed services provided by the University” [15]. Moreover “special attention was devoted to security issues considered in a holistic manner and not just from a technology point of view anymore” [15].


The Regulation (EU) 2016/679 [5] representing a real evolution in European legislation on the protection of personal data. Particularly the principal chages are related to:

- the clearer rules on disclosure and consent;
- the definition of limits to automated processing of personal data;
- the foundation for the exercise of new rights;
- the establishment of strict criteria for the transfer of data outside the EU;
- the establishment of strict criteria for cases of violation of personal data (data breach);
- the designation of the data protection officer;
- the obligation of maintain a record of processing activities;
- the obligation to carry out an assessment of the impact of the envisaged processing operations on the protection of personal data;
- the data protection by design and by default principles;
- the accountability principle.

These major changes, especially the new accountability principle and the choice to identify the most appropriate security measures “taking into account the state of the art, the costs of implementation and the nature, scope, context and purposes of processing as well as the risk of varying likelihood and severity for the rights and freedoms of natural persons” [5], and finally “implement appropriate technical and organisational measures to ensure a level of security appropriate to the risk” [5], can be particularly difficult in a complex reality such as university.

For these reasons, the Conference of the General Managers of University Administrations (CODAU) recently issued version 1.1 (November 2017) of its “Guidelines on privacy and protection of personal data in universities”, as a result of the work carried out by its Working Group “Privacy and GDPR Guidelines” [9].

The purpose of this document is to “provide guidance and recommendations regarding the processing operations carried out with personal data in universities and the protection of such data”. The approach adopted, which is predominantly practical, has made it possible to identify concrete answers to a series of common problems typical of the activities carried out by the Universities. In particular, the Working Group has carried out a widespread activity of mapping the most important treatments in the university field, taking care to differentiate among them those with institutional character from those with instrumental and/or transversal character. At the same time, the processing of personal data, which are commonly present in the course of the research projects, was also analysed.

The University of Camerino has chosen to use this mapping of the main treatments present in the university as a basis for the compilation of its register of treatments, as provided for by Regulation (EU) 2016/679, as well as for the review of the scope of application (SoA) of the Unicam’s information security management system and also for the execution of an assessment of the impact of the envisaged processing operations on the protection of personal data carried out by the controller.

With regard to the review of the scope of application (SoA) see chapter 10, while with regard to the execution of the DPIA, this is seen as a subset of a broader risk analysis and management process outlined in chapter 9.

At the operational level, the CODAU document identifies 33 types of treatments divided into the following macro-families:

1. main processing concerning students;
2. main processing concerning employees and/or collaborators;
3. transversal processing or connected to transversal activities;
4. processing of personal data in the context of the provision of federated services;
5. tracking of non-primary information.

If the types of treatments that belong to the first three groups are obvious, the discourse is completely different for the last two groups.

The fourth group includes the processing aimed at providing the Eduroam service [17] (that is the secure, world-wide roaming access service developed for the international research and education community), the IDEM service [18] (this is the federated identity service of GARR, the ultra-broadband network dedicated to the Italian research and education community, which is part of eduGAIN [19], a service interconnects identity federations around the world, simplifying access to content, services and resources for the global research and education community), and also the SPID service [20] (which is the Public Identity System Digital of the Italian Republic, or rather is the solution that allows a subject to access all the online services of the Public Administration with a single Digital Identity). Particularly the processing of personal data related to SPID service analysis is very interesting because it is compliance with the Regulation (EU) n. 910/2014 of the European Parliament and of The Council of 23 July 2014 “on electronic identification and trust services for electronic transactions in the internal market and repealing Directive 1999/93/EC” (eIDAS) [21], that lays down both “the
conditions under which Member States recognise electronic identification means of natural and legal persons” [21], than “the rules for trust services” [21]. It also “establishes a legal framework for electronic signatures, electronic seals, electronic time stamps, electronic documents, electronic registered delivery services and certificate services for website authentication” [21].

The fifth category includes both the tracking data generated by network devices and infrastructural composites as well as the session and application tracking data of user activities.

In addition, a specific section of the document provides guidelines that can be used for processing of personal data for statistical or research purposes.

7. THE UNICAM WORKING GROUP FOR MINIMUM ICT MEASURES

In order to meet the requirements indicated in the Circular of the Agenzia per l’Italia Digitale no. 2 of 18 April 2017 [11], with which all Public Administrations (and therefore also the University) are required to adopt the minimum measures for ICT security by 31 December 2017 [10], on 29 September 2017 the University of Camerino set up a special working group for the application of minimum security measures. This group had the explicit task of carrying out the technical activities in order to propose to the General Management of the University and subsequently to implement the necessary adaptation measures, as well as to produce the relevant documentation, where applicable and necessary.

Already since the formation of the group, the University’s willingness to implement real integration between the information security management system and the ICT minimum measures has clearly emerged, given that it was decided to entrust the coordination of the working group to the head of ISMS, who has been in charge since 2012, among other things, of risk analysis and risk management activities.

The unicam working group for minimum ict measures met several times in the fourth quarter of the year 2017, first in a more restricted configuration composed of the “Group Coordinator and ISMS Manager”, the person in charge of the “Network, Telephony and Help Desk Sector”, the head of the “Operating Systems and Hardware Sector”, as well as the “Manager of the Processing Infrastructure to support the activities of the Athenaeum Library System” and only then in the complete composition. This operational choice was justified by the very tight deadlines that required the working group to complete the activities assigned to it in just three months.

Specifically, the activity of the so-called small group (with 4 managers) consisted in the identification of the interventions to be implemented, which were then explained to the working group in its full composition at the meeting of 31 October 2017. Also on that date, the overall timing of the individual activities was defined, together with the personnel involved in each of them. This information was then elaborated in the following days by the coordinator of the working group that prepared the final project GANTT (See Figure 1 for an excerpt of the diagram), then shared with all the components.

On the one hand, the implementation of all the technical-organisational solutions identified and, on the other hand, the definition of the document “Module for the implementation of minimum ICT
measures”, which was digitally signed and marked in time by both the General Manager and the Rector of the University (according to the provisions of [11]).

This document, which is kept on file at the University of Camerino and ready to be presented to the CERT-PA in the event of a computer accident together with the report of the incident itself, is reported in the following chapter 8.

8. THE INTEGRATION BETWEEN INFORMATION SECURITY MANAGEMENT SYSTEM AND ICT MINIMUM MEASURES

The integration between the Unicam Information Security Management System and the AgID ICT Minimum measures was implemented by filling out the implementation form of the "Minimum ICT Security Measures for Public Administrations" of the University of Camerino in order to transform it into a sort of index that refers to the various documents of the ISMS (see Table 2). In this sense, in the field of “implementation modalities” of each ABSC control, it was decided not to describe in detail how the University chose to implement the requirements of the control, but to briefly mention it by making a reference to the particular document of the ISMS that contains the required information. Among other things, operating in this way, since the implementation module is a double signature document of the General Manager and the Rector, the Information Security Management System has in fact been transformed from this one into a strategic system of University.

<table>
<thead>
<tr>
<th>ABSC_ID#</th>
<th>Description</th>
<th>Implementation modalities</th>
<th>Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>13  8  1</td>
<td>Block traffic to and from url present in a blacklist.</td>
<td>The University blocks all traffic directed to URLs included in a special blacklist. The detail of this implementation is described in the SGSI document called “PT - 102 - URL Filtering”.</td>
<td>M</td>
</tr>
</tbody>
</table>

Table 2 - Example of completing the implementation of the “ICT minimum security measures”

Operationally, the University of Camerino has chosen not to limit itself to the implementation of minimum controls going further, implementing all standard ones (except one), as well as three high ones (and this is consistent with what would be expected from an ISO 27001:2013 certified organization). A total of 44 ABSC minimum type, 43 standard and 3 high type ABSC controls were implemented.

In addition, this implementation required the modification of 11 technical procedures, as well as the addition of 7 technical procedures, for a total of about 54% of the relevant PT type ISMS documents.

In detail, the technical procedures involved are as follows:

- **URL filtering** [new], containing the methods of managing the URL filtering service in use at the University (ABSC families 8 and 13);
- **University Wireless Service** [new], containing the methods of implementation and management of the University Wireless Service;
- **Software Inventory** [new], containing the methods of identifying the authorized software required for each type of system in use at the University, in order to identify what is allowed or not (ABSC family 2);
- **Devices Inventory** [new], containing the methods for implementing and managing an inventory of all authorized and unauthorized devices present in the University (ABSC family 1);
- **Inventory of administrative users** [new], containing the methods of implementation and management of an inventory of all the administrative users present in the University (ABSC family 5);
- **Allocation of administrator privileges** [new], containing the procedures for identifying human resources with a working relationship with the University of Camerino, to which to assign administrative privileges (family ASCA 5);
- **Managing installation images** [new], containing the methods of management of the installation images of the systems in use at the University in order to ensure their protection, integrity and availability to all authorized users only (ABSC family 3);
- **Management of administrative credentials**, containing the rules to be respected for the correct management of non-personal administrative credentials, the IT systems in use (ABSC family 5);
- **Vulnerability Assessment**, containing how the process called Vulnerability Assessment and Mitigation (ABSC family 4) is executed, managed and maintained;
- **Log Management**, containing the methods of collection, archiving, accessibility, maintaining the availability of integrity and confidentiality, verification and storage times of log information generated by the systems (ABSC family 8);
- **Communication tools**, which regulates the use of the various communication tools in order to ensure the security of information communications (ABSC family 8);
- **Credential management**, containing the methods for managing access credentials in Athenaeum systems and applications (ABSC family 5);
- **Screen and Desktop**, regulating the way in which workplaces and personnel processors are to be managed (ABSC family 8);
- **Backup**, containing how the administrative data backup process is performed, managed and maintained (ABSC family 10);
- **Protection against self-executable code**, containing the ways in which you can protect yourself from self-executable code through the use of Athenaeum's anti-malware platform (ABSC family 8);
- **Protection of operating systems**, including how to protect operating systems (ABSC families 3, 4 and 13);
- **Networks protection**, including network traffic routing, separation and filtering policies;
- **Networks separation**, containing the methods of separation of the networks present within the University.

Consistently, 6 new operating instructions have been added (Release of University credentials, Installation of the collector for network devices and operating systems, Proper use of software, File integrity check, G Suite security settings) aimed at proceduralising the contents of the technical procedures, for a total of about 46% of the ISMS documents of type IO concerned.

Particularly, the aspects concerned the devices's inventory, are detailed in our paper, named “The network attached devices inventory as required by the Italian requirement of «Minimal measures for ICT security» and EU «General Data Protection Regulation»” [22], presented at this same conference.

With regard to system documents, no new documents were introduced but the following have been updated:
- **Asset tree**, the purpose of which is to provide a summary of the various asset tree associated with each of the business processes currently present at the University;
- **Context and scope of the Information Security Management System**, in which the context and scope of the University ISMS is defined;
- **Perimeter of the Information Security Management System**, which defines the perimeter of the University ISMS, including its scope, limits and possible exclusions

Specifically these updates have made it possible to identify business processes by incorporating the list of treatments contained in the CODAU document described at the chapter 6.

In addition, the new level assumed by ISMS as an University system has made it necessary to modify the operating procedure that decrypts the types of eligible documents, in order to provide for a new type of document, “The Athenaeum Regulations”.

9. UNICAM’S UNIFIED APPROACH TO RISK ANALYSIS AND MANAGEMENT

The University chose to adopt the explicit indications of the European legislator regarding the adoption of an approach based on risk analysis. In fact, such a reference is present in the Directive (EU) 2016/1148 (NIS Directive), Regulation (EU) 2016/679 (GDPR), Regulation (EU) n. 910/2014 (eIDAS) and Directive (EU) 2016/680 (Criminal Offences and penalties). So the set of these normative texts constitutes a sort of European Security Framework focused on the security measures that shall be “appropriate” (as reported in all the previously cited regulatory texts), and that must “to ensure a level of security appropriate to the risk” (as reported in the GDPR, in the NIS Directive and in the Criminal Offenses and Penalties Directive) as well as “to manage the risks posed to the security of the trust services” (as reported in the eIDAS Regulation).

In spite of this, it should be pointed out that the type of risk referred to in the General Data Protection Regulation is different from that normally referred to in other areas, such as that linked to the ISO/IEC
In fact, the risk referred to in Articles 32 and 35 of Regulation (EU) 2016/679 is not an operational risk with impacts that are assessed from the perspective of the possible consequences for the data controller or controller, but rather a risk related to the rights and freedoms of natural persons. Therefore, in this case the impacts will have to be assessed from the perspective of the risks associated with these rights and freedoms. Similarly the impact assessment should focus on treatments rather than business processes.

Therefore, if you want to achieve a unified approach in which DPIA is included within the risk analysis and risk management process of an ISMS conforming to ISO/IEC 27001:2013 [14], it might be useful to assume a representation of the existing treatments within the business processes.

The University of Camerino has chosen to revise the certification scope by implementing the list of treatments indicated in the document CODAU: “Guidelines on privacy and protection of personal data in the university field” - version 1.1 of November 2017 [9], thus building a list of assets consistent with this new scope (see chapter 10). This updated list of assets that includes the business processes coinciding with the treatments in place at the University will be used as an input to a revised process of analysis and risk management that in its implementation will also include the indications of Regulation (EU) 2016/679 regarding the execution of DPIA. The results of this analysis will be reported in the system document “Risk assessment”, which will be reviewed in the second quarter of 2018.

10. THE MODIFICATION OF THE SCOPE OF APPLICATION

Initially in September 2012, at the beginning of the process that led the Informatics Services and Information Systems Centre of the University of Camerino to obtain certification of compliance with the ISO/IEC 27001 we had carried out a first study and investigation in order to define the perimeter of the information security management system and also the field of application (SoA), as well as his limits and exclusions. The outcome enabled us to define the following certification scope: “Supply of connectivity, email, web portal, telephone, hosting and management services to the University and to customers that ay request them”.

<table>
<thead>
<tr>
<th>Macro family of CODAU processing</th>
<th>Type of CODAU processing</th>
<th>Unicam Business Process</th>
<th>Unicam services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main processing concerning students</td>
<td>Services to possible students</td>
<td>Orientation services</td>
<td>Service available at the URL orientamento.unicam.it</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre-registration services</td>
<td>Service for conducting admission tests to degree programs</td>
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<tr>
<td></td>
<td></td>
<td>Career management services</td>
<td>Esse3 service by CINECA</td>
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<tr>
<td></td>
<td></td>
<td>Tutoring services</td>
<td>Service available at the URL tutorato.unicam.it</td>
</tr>
</tbody>
</table>

Table 3 - Extract from the list of University business processes built from the CODAU’s list

Subsequently, since March 2017, the University has expanded its list of assets by redesigning its business processes (PB) taking into account the indications provided by the CODAU [9]. On an operational level, the Athenaeum's choice was to define for each type of treatment identified in the CODAU document [9] a specific Athenaeum business process (see Table 3) to which specific University services will correspond. These services will then be managed in the usual way by creating and valuing specific assets (see Figure 2) using the software tool PILAR [23] that implements the methodology of Magerit [24]. The PILAR software tool will then produce the list of assets in use.

This approach will then allow the University to make a real change in the certification scope of the University's Information Security Management System. In fact, considering the imminence of the regulatory deadline regarding the implementation of the minimum ICT measures of December 2017, as well as its coincidence with the external maintenance audit carried out by the certifying body in December 2017, the University chose to “limit” its decision to include the minimum ICT measures within the scope of ISMS (as described in the chapter 8). Therefore, considering also that the application of Regulation (EU) 2016/679 is set for 25 may 2018, it has been decided to start from January 2018, the extension of the certification scope of ISMS in order to complete and complete, also, the implementation of a new and coherent process of analysis and risk management before the full
application of the General Data Protection Regulation. So, the University intends to present the completion of these activities to the certifying body in December 2018 when renewing the certification according to ISO/IEC 27001:2013.

11. CONCLUSIONS

The decision to integrate the minimum ICT security measures for the PA first and then, subsequently, the obligations relating to the appropriate security requirements (as indicated by European legislation), within the Information Security Management System of the University’s IT Services and Systems Centre (CINFO) has allowed us to achieve two fundamental objectives.

First of all, the strategy of ISMS has increased in that through the integration with the minimum ICT Measures for the PA (document, this, signed twice by the Director General and the Rector) the approval of what is present in the management system has been brought to the top of the University, no longer remaining under the exclusive competence of the Technical Manager of CINFO. In addition, the scope of the measures contained in the ISMS has also been expanded, since they can now be considered as measures no longer confined to a single organisation structure (the CINFO) but extended to the whole University, as approved by its governance. Among other things, this paradigm shift has also been manifested in the insertion of a new type of documents (the Athenaeum Regulations) within the ISMS.

Moreover, as a second element, the choice to adopt a unified approach that uses the methodology of risk analysis and management as a single university process to improve the global protection of the organization, its processes and services, is allowing us to acquire a greater knowledge of the “University of Camerino system”, as well as to highlight the correlations between the various elements (not necessarily technological) that characterize it and that, if compromised, could cause damage to the risk owners. In any case, it should be kept in mind that this last step is still in the process of being completed and therefore we consider we can obtain objective evidence at the end of the first half of 2018 to support the forecasts made.

12. REFERENCES


13. AUTHORS’ BIOGRAPHIES

Francesco Ciclosi is a twenty years experience analyst and trainer, responsible for designing distributed systems services. He is graduated in computer science and has achieved several professional certifications. He’s the author of many articles and books about computer security. He has worked with many government agencies, private companies and universities, in the framework of national projects, such as the Italian electronic identity card project. Currently he’s working at Camerino University as ISMS manager. He’s also working as “Computer Science” contract professor at Macerata University. He has previously worked at “Asur” CEO office, at Nestor, the experimental safety laboratory of Tor Vergata University in Rome and at Siemens Informatica “Security Data Networks”. Further information is available at https://www.linkedin.com/in/francesco-ciclosi-a0668062.

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Creating a Sustainable Open Source Based Research Data Infrastructure for North Rhine-Westphalia - with a View to the National RDI Perspective and the EOSC

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Keywords Research data management, European open science cloud, IT infrastructure, ceph, openstack, repository, open science, reproducible research.

1. Summary
The IT service facilities of the five universities Bielefeld, Bonn, Münster, Paderborn, and Siegen in the German state of North-Rhine Westphalia (NRW) form a consortium to jointly develop a synergetic and sustainable, cost-efficient research data infrastructure using standardized hardware components and free open-source software. The operational management is to be made efficient by inter-university cooperation - this operating group was already established in advance. In addition to the storage of research data (Ceph), an integrated platform for virtual machines and containers (OpenStack), which enables very fast access to the extensive data sets for processing and analysis, is of central importance based on the collected user requirements. This platform is based on the ideas of the European Open Science Cloud (3) and represents a development for the participating universities towards the National Research Data Infrastructure planned for Germany (1).

2. Extended Abstract
Digitization in research and, in particular, the massive increase in the volume of digital primary research data are currently the focus of discussion not only at national but also at European level. The EU grouped its strategies for promoting digital infrastructures around the concept of the European Open Science Cloud (EOSC). In the EU call EINFRA-12-2017, the main elements of this infrastructure are structured as follows:

(1) Data and Distributed Computing e-infrastructures for Open Science
(2) Secure and agile data and distributed computing e-infrastructure
(3) Access and preservation platforms for scientific information

In particular, in the context of EOSC, reference is always made to existing or emerging infrastructures in the EU Member States as fundamental elements. The German initiative for the National Research Data Infrastructure (NFDI) can be understood as such an element (1). Following the currently available papers on NFDI, the aim is to establish sustainable, interoperable research data services through multiple thematically focussed consortia organized on a Germany-wide scale. The timeframe for this is 15-20 years (depending on the source).

However, we form a regional consortium, focussed on immediately addressing the identified short-term needs for research data infrastructure (both for storage, processing and analysis of large-volume research data) in numerous disciplines at the participating universities with a cooperative, sustainable and transferable approach. For certain disciplines, it may be quite possible to develop this infrastructure to suit institutions beyond those connected in this consortium over the next 5-10 years.

The concept we are pursuing is based on the movement, which is currently strongly represented in the US Life Science environment, for the establishment of "data commons". The vision of these Data
Commons is summarized as follows (4): Infrastructure where data can live as a searchable, discoverable, computable, reusable resource. The concrete mission is articulated as follows: To aid researchers in creating, managing, curating, publishing, discovering, and reusing data throughout the data life cycle. This is in line with the FAIR (Findable, Accessible, Interoperable, Reusable) principles (5), which are also central to the EOSC concept.

Examples for the adoption of the Data Commons concept are found for example in biomedical research, genomics, or environmental monitoring (6, 7, 8). For the "long tail of science", NSF has established Jetstream (9) as a "national research and education cloud". The underlying concepts of Jetstream (federated system at several universities, use of open source software - especially OpenStack and Ceph) are closely related to the concept presented in the project described here.

The purpose of this project is to create a future-proof, cost-effective and synergistic research data infrastructure for the five participating universities that will provide both an environment for data manipulation and analysis (using OpenStack as a powerful private cloud platform for virtual computing environments that are self-contained service can be provisioned) as well as for long-term preservation (Ceph Open Source Software Defined Storage). The use of widely established open source products, which are a de facto standard, in line with a multidisciplinary operational concept, which bundles the competence and performance of numerous people, make this infrastructure future proof (in the worst case, the necessary adjustments to the Source code can be done inhouse). The exclusive use of free community versions of the software also minimizes the costs. Instead of costly service offers, the joint university-wide operating team ensures the support. This paves the way for the establishment of a sustainable infrastructure for research data, which can be operated in the long term and flexibly expanded by its modular structure consisting of standard components (both software and hardware) - and this in the long-term on an affordable financial scale.

In the state of North Rhine-Westphalia, the universities have formed three consortia that address the respective infrastructure requirements for research data management with joint large-device applications - whereby different technical approaches, focal points and functional areas are pursued (depending on past experience and established environments of the respective consortium members).

This project focussing on a Ceph and OpenStack based infrastructure is one of these. Its technical and operational concepts are now stable, mature, and verified in some quite extensive pilot environments after lengthy discussion processes and preliminary work in the consortium. The hyper-converged solution approach for a combined Ceph / OpenStack cluster per site is very flexible, highly scalable, cost-efficient - and elegant. We start by exemplifying the demand for an efficient (storage) infrastructure for research data by the development of the data volume of the University of Münster in the last 10 years.

A paradigm shift to a new concept of intrinsically resilient storage systems that can guarantee long-term data availability even without backup and time-consuming file system migrations is necessary and sometimes already in progress. In particular, the storage in an object storage system such as Ceph, which allows a considerably simpler migration to new hardware platforms (by means of a smooth migration by gradually adding new storage servers and removing obsolete ones), appears as a working way of ensuring long-term data availability. The key ideas in building this research data infrastructure are the following principles:

- Use of low-cost standard hardware (without manufacturer-specific properties)
- Use of free open source software
- Use of community versions without fee-based mandatory maintenance contracts

This will ensure the sustainability of this infrastructure both in terms of affordability and operability (without the risk of software and hardware obsolescence). Good experience with VMware ESX clusters with vSAN storage has established the practicality and benefits of a hyper-converged system architecture and the performance of SSD cache accelerated object storage.

In accordance with the data commons concept, feedback for user demands shows that not only storage alone is needed in a research data infrastructure, but also host platforms for virtual machines for data manipulation and analysis.
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4. AUTHORS’ BIOGRAPHIES

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EXTENDED ABSTRACT
The digital classroom roadshow

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Keywords
Blended learning, digital learning activities, learning design, learning spaces.

7. SUMMARY
Higher education is making increasing use of digital tools and resources to support learning and teaching to the extent that blended learning (a combination of face-to-face activities and use of digital tools and resources) is increasingly the norm in many universities (See Ferrell & Smith 2018). However, this increased use of digital technologies is often used to support both self-study and collaborative work off-campus. In many cases we have been slower to change the design of our typical classrooms and lecture theatres to make the most of the opportunities afforded by more technology rich spaces (see SCHOMS et al 2016).

In 2015, Jisc - the organisation providing digital solutions for UK education and research - supported the Digital Classroom Roadshow that provided a new type of hands-on engagement for universities and colleges exploring new active learning spaces (see Peberdy 2017). The roadshows proved a great success and have been repeated many times since.

Each roadshow lasts for 4 weeks in the same venue and provides the host university with a fully configured wireless collaborative environment that is used for many workshops, conversations and meetings as stakeholders from across the campus explore creating new active learning environments. Unlike exhibitions and conferences on new learning spaces, the roadshow is an authentic new learning space that facilitates full connectivity and participation.

This year we will be bringing the roadshow to EUNIS 2018 and, aside from this introductory presentation, there will be many opportunities throughout the week to try out the digital classroom environment for yourselves. We will be providing a 24 seat, fully functional, collaborative learning space. After a basic introduction, you will be able to book the space for a trial session with your own colleagues.

8. ABOUT THE PAPER
In the paper that accompanies the presentation we talk about the following topics:

- trends in the development of learning spaces in higher education
- the motivation for creating a digital classroom roadshow
- the benefits of the roadshow approach
- some of the outcomes of the roadshows to date

9. ABOUT THE DIGITAL CLASSROOM ROADSHOW
Unlike exhibitions and conferences on new learning spaces, the roadshow is an authentic new learning space that facilitates full connectivity and participation.

A typical installation looks like this one hosted at the University of Westminster during January 2018.
The facilities in the digital classroom roadshow typically include:

- a range of table shapes so that participants can see what works for different types of group size and activity
- tables with full connectivity integrated into them and surfaces equally suitable for analogue activities
- demonstration of foldable and wheelchair accessible tables
- wheeled chairs to facilitate group work
- display screens at each table
- front of house interactive screen
- projection equipment
- demonstration visualiser
- front of house lectern with technology required to manage the classroom
- demonstration writing surfaces
- integration technology to facilitate wireless BYOD connectivity
- demonstration polling and collaboration tools

The facilities come from a number of different suppliers and are carefully selected for ease of setup, user-friendliness and realistic cost.

Visitors to the roadshow have the opportunity to experience a fully functional active learning environment with fully interoperable technology and bring your own device (BYOD) capability that can help you to:

- Come up with new ideas about what future learning spaces might look like.
- Discover how students can be engaged more fully in their learning including by involving students in demonstration teaching sessions.
- Consider existing digital skills and what developments are needed to make the most of the opportunities on offer.
- Arrive at better informed decisions on future learning space requirements, pedagogical developments, and strategies around student engagement and success.

All of this valuable insight is delivered through active learning because the participants are finding out for themselves.
Duncan Peberdy is an independent consultant specialising in the development of active learning spaces for education, and full-participation environments for corporate collaboration. He has experience gained working for international technology and specialist technical furniture companies. Alongside the digital classroom/sticky campus roadshow, Duncan has been working on the development of a ‘chalk replacement system’ that will provide STEM subjects with a meaningful digital alternative to analogue writing walls.

Gill Ferrell has teaching and research experience and has held senior management positions in university administrative functions as well as directing a UK support service enhancing the use of ICT in further and higher education. She acts as a consultant to universities and national agencies in the UK and Europe and has been an invited speaker at many national and international events. Current interests include: data and information management, technology enhanced learning, assessment and feedback, learning analytics and learning space design. [http://uk.linkedin.com/in/gillferrell](http://uk.linkedin.com/in/gillferrell)

Ruth Drysdale is a senior co-design manager at Jisc in the learning, teaching and student experience team. Her area of responsibility covers enterprise solutions including ICT systems that support students across the digital journey throughout higher education. Her work covers the emergence of digital credentials for wider and lifelong achievement. Prior to joining Jisc in 2009 she has worked in commercial organisations (including on CRM systems) and been an IT manager in higher education leading on major projects designed to impact on the student experience.
EUNIS 2018: EXPERIENCES OF CROSS-INSTITUTIONAL DIGITAL EXAMS IN FINNISH HIGHER EDUCATION INSTITUTES

Marjut Anderson¹, Sami Hautakangas², Liisa Kallio³

Keywords: digital exam, HEI, cross-institutional, exam premises, assessment, electronic assessment

1. Summary

The HEIs in Finland have more than 10 years of experience in large-scale use of electronic examinations. It is a common practice that students are able to book the times for exams flexibly according to their personal schedule and to spread the use of exam rooms throughout the academic year. Currently the Finnish HEIs (EXAM consortium of 27 Finnish universities and universities of applied science) are taking one step further in advancing the flexibility of studies for the students. The new version of EXAM service supports an arrangement, where a student can take an exam of the “home institution” using the nearest HEI’s exam facilities. The pilots for the joint use start spring 2018 and in this paper we will present the first results and the experiences of the institutions involved.

2. EXAM concept for online exams in Finnish Higher Education Institutes

The role of exams in Finnish higher education is not confined to final exams of arranged courses. It is a common practice to use exams to assess students’ learning achieved by independent study or prior learning. The model for electronic exams has enabled students to book the times for exams flexibly according to their personal schedule and to spread the use of exam rooms throughout the academic year. With this concept the HEIs have already digitalized a considerable amount of their exams.

The EXAM concept consists of the exam software (EXAM), customized workstations and network environment, camera-controlled exam rooms and the process to supervise the students. Compared with other online exams e.g. home based exams, these exams done in special premises can be controlled and the users are easily identified. Because students can freely choose their examination time and date and are not taking the exam at the same time, the capacity issues are not a problem.

The new version of Exam service supports an arrangement, where a student can take an exam of the “home institution” using the nearest HEI’s exam facilities. In Finland it is possible to get considerable benefits from this concept, because of the long distances. Especially those online courses or programmes relying greatly on distance learning that use electronic exams can give a better service for students. When the HEIs are networking their exam facilities for shared use, the students from all parts of Finland can participate in the studies.

3. Flexibility for the students with cross-institutional exams

The planning of cross-institutional examination started by identifying sharable resources within the already proven concept of EXAM. The identified resources include exam facilities, exams, questions and evaluations.

The joint use of exam rooms was decided to be the first use case which means a model where a student can reserve a spot from the premises of another university and do the exam there. The concept and technical implementation has to enable the student to see the EXAM room information of another university, to make a reservation, to be able to access the exam room and actually do the exam and finally the answers are returned back to the home university. Also, admin support and report services
are needed to handle the cross-institutional examination process. In addition to technical implementation also important non-technical aspects were identified.

The implementation relies on a proxy server which means that the information flows go only through the XM server from a local EXAM instance to another one. This way there is no need to build and open access between the local EXAMs.

4. Pilot project experiences

The pilots for the joint use start this spring and in this paper we will present the first results and the experiences of the institutions involved. Geographically the pilots are spread across the country from West coast to Eastern Finland and from the Southern part to Northern Finland.

First technical tests of the joint use of EXAM were done in the end of 2017 to ensure that the chosen technical architecture, implementation and basic data flows work. An important aspect of the testing was also to confirm that the user identification works as planned. It was noticed during the testing that there might be different ways of how the universities use HAKA attributes which may cause problems in some implementations.

Also other development needs were identified. The institutions have to formulate together agreements on the use of other institution’s facilities (sharing costs, quota of shared computers) and also outline common features for accessibility for the actual exam rooms but also to the service itself. This includes detailed instructions on a public website for the students on how to find your way, how to access the exam room, is it accessible with a wheelchair, is there a passkey or code to enter and where can it be collected. Since not all facilities can be totally barrier free the institutions have to come up with a common understanding of what is accessible in the terms of exam rooms.

In each institution the EXAM rooms are monitored with access control and recording security cameras. When registering for an exam to another institution’s exam room, the student has to comply with the access control and the use of camera monitoring. It also has to be stated who are the contact persons in each institution in case of suspicion of fraud.

A uniform workstation set-up has to be decided as well to enable taking different types of exams in all participating institutions. At the moment the institutions have individually decided on the set-up of their workstations: some use a very basic set-up with just a browser to access the exam software, Pdf reader or Notepad to open attachments while some institutions allow also the use of e.g. Office tools, calculator, mathematical software etc.

5. Future steps

Next use cases to be studied in the near future would be the joint exam and evaluation process between two or more universities. This would mean that two or more teachers from different universities could create and evaluate a joint exam and students from different universities do it.

Other actions planned to widen cross-institutional examination are to proceed over educational levels to provide cross-institutional examination opportunities to high schools, primary schools and also vocational schools. First thing to overcome is the identification system when HEIs use HAKA EduPerson schema (federated sign-in). Another action taken in the end of 2017, was that EXAM source code was licensed under EUPL 1.1 -license which provides opportunities to new user groups and wider development network.
AUTHORS’ BIOGRAPHIES

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Supporting understanding of students’ learning via visual self-assessment

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Keywords
Learning analytics, information visualization, concept maps, self-assessment, academic emotions, information networks

1. Summary
Understanding students’ learning is crucial to the development of teaching. The most common systematic approach to understanding students’ learning has been summative course feedback, gathered after each course. However, students do not seem to be motivated to give this summative feedback after courses, with answer rates as low as 30 percent at Aalto University. Based on our observations, this is partly due to the timing and quality of current methods: students do not themselves benefit from any possible developments to the course. We soon realised that we merely need to develop a more dynamic culture of giving feedback during a course and started a project called Dynamic Course and Programme Level Feedback. We use a concept mapping tool to collect data from students during a course. This data is then visualised as dashboards that serve as feedback for teachers and enable adaptive teaching.

2. EXTENDED ABSTRACT
The emerging field of learning analytics attempts to improve students’ learning by collecting, analysing and reporting data about learners and their contexts (Siemens 2013). Different kinds of visualisations, such as learning analytics dashboards (Verbert et al. 2013), are central in learning analytics, aiming to support students’ self-regulated learning (e.g. Panadero 2017). Concept maps and other types of node-link knowledge mapping tools form another widely used category of tools for supporting the learning process and the evaluation of learning. These different formats can be used in complementary ways to enhance motivation, attention, understanding and recall (Eppler 2006).

In this paper, we demonstrate how concept maps can be used to visualise learning both on the course and curriculum level. Instead of having students create a concept map, we build concept map templates in advance, based on curriculum structures (see also Willcox & Huang 2017). The structure is four levels deep: 1) Degree programme (e.g. MSc Education on Ship Design), 2) Field (e.g. Safety-based Ship Design), 3) Course (e.g. MEC-E2003 Passenger Ships) and 4) Course topics (e.g. History of cruise ship design).

The concept map template files are given to students, after which they update their concept maps weekly and conduct cognitive-emotional self-assessment; see simplified example in Figure 1. By cognitive-emotional self-assessment, we refer to students’ judgements of learning (Nelson & Dunlosky 1991) on the topics defined by the teacher, their topic emotions (Boekaerts & Pekrun 2015) toward...
the topics and their identified cross-links (Novak & Cañas 2008) between different topics. Students can also create new topics and comment on their learning processes or course arrangements in the concept map. The updated concept map files are then returned as assignments in our Learning Management System (LMS). Typically, one concept map includes tens of courses, several hundreds of concepts and tens of cross-links.

![Figure 1] Simplified example of concept map. Selections are made with clickable icons: judgement of learning (0, 25%, 50%, 75%, 100%), emotion (happy, neutral, sad, angry). Cross-links are marked by drawing relationships and naming them (FEM analysis).

The input from all students is also assembled and visualised as learning analytics dashboards for students and teachers, resulting in a dynamic feedback tool. To visualise the data of hundreds of concept maps in a meaningful way, data from concept maps must first be extracted and aggregated. We prepared a Python script to extract essential data from concept map files (XML) into CSV-files to enable feeding them to a business intelligence software. As a result we get visual dashboards (see Figure 2) that help a teacher to adapt his teaching based on student self-assessment data.

![Figure 2] Example of an analytics dashboard built with self-evaluation data from concept maps.

As a part of the Aalto Online Learning pilot project (Kauppinen & Malmi 2017), our method has to date been piloted and in use on eight university courses to date, resulting in about 400 concept map files. To study the effects of concept mapping and dashboards, we interviewed students and teachers and made observations from students’ concept map files. A key insight from the student interviews was that the visualisations help students put their personal opinions and experiences into a larger perspective. On the teachers’ side, self-assessment data has turned out to be sufficient feedback for adaptive teaching, i.e. to better serve the student group in question.

In our future work, we will develop this methodology further and integrate it with the IT infrastructure of our university. As of year 2018 we are also starting a new scientific research project to further investigate the effects of the presented methodology.
REFERENCES


3. AUTHORS’ BIOGRAPHIES

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Heikki Remes is a professor of marine technology and a vice director of the Master’s Programme in Mechanical Engineering at Aalto University. Prof. Remes has 15 years of teaching experience. He has educated six Doctors of Science and supervised roughly 40 master’s and 20 bachelor’s theses. Prof. Remes has participated in the development of two new master’s programmes as well as the marine technology curriculum. He is a member of Teaching Competence Assessment Group of the Aalto University School of Engineering. He has received a teaching award for the development of the Shipbuilder’s Learning Portfolio. He has published roughly 100 scientific journal and conference papers.

Tomi J. Kauppinen is a project leader and docent at the Aalto University School of Science in Finland. He holds a habilitation (2014) in geoinformatics from the University of Muenster (WWU) in Germany and a title of docent (2014) and a Ph.D. (2010) in media technology from Aalto University. From April 2014 to September 2014, he was appointed as the Cognitive Systems Substitute Professor at the University of Bremen in Germany and, since 2015, he is a Privatdozent at WWU. He has been active in the areas of information networks, for instance by developing information visualisation approaches, opening and sharing data and creating semantic recommendation and exploration tools with artificial intelligence (AI) and knowledge representation techniques. A central theme in his work and teaching is data science and information visualisation applied to spatiotemporal phenomena and supporting the understanding of related cognitive processes. He has published or edited 100 papers/books and organised several international tutorials and workshops on information visualisation, linked data, spatial thinking and learning. He is currently project leader of the Aalto University wide strategic development project, Aalto Online Learning AIOLE.
EUNIS 2018: How are students’ expectations and experiences of their digital environment changing? Find out about the Jisc Student Tracker research

1st Author Ruth Drysdale

Keywords Student Experience, Digital Technology, Student Feedback, Analysis

1. Summary

Since 2016, Jisc has been carrying out research with UK and International Universities and colleges about what current students’ expectations and experiences are of technology. The presentation will evidence how institutions are gathering students’ views on their digital experiences. The research listens to students views on technology and how this is being utilised in their places of study. You will discover how Jisc supports organisations in making use of this data to help develop their understanding of students’ expectations of the digital environment. Universities and colleges are increasingly working in partnership with their students on the development of their digital environment. As a result, students experience a digitally enabled learning experience which better meets their needs and offers them the digital skills they require for the workplace. But do we really know how students are using technology and how are their expectations changing? This presentation will provide delegates with an overview of innovative approaches colleges and universities are using to gather their students’ views on digital and how they are they are using the data collected to inform the development of their digitally enhanced learning and teaching provision.

2. Extended Abstract

The tracker is a short survey to gather students’ expectations and experiences of technology, based on a concise set of questions which have been intensively trialled with higher and further education students for readability and ease of response. The tracker has been a key outcome of Jisc’s [digital student](https://www.jisc.ac.uk/solutions/digitalstudent) work to date. It builds on resources such as the [Jisc/NUS digital student experience benchmarking tool (pdf)](https://www.jisc.ac.uk/solutions/digitalstudent), and Jisc’s [guide to enhancing the digital student experience: a strategic approach](https://www.jisc.ac.uk/solutions/digitalstudent). The questions cover issues that are important to learners and/or to staff with a focus on the learning experience. The 2017 and 2018 surveys include questions on access to digital devices, course-related digital activities, institutional level digital provision and support, and learner skills. The tracker is delivered in [BOS](https://www.bos.ac.uk) - an online survey service specially developed for the UK education sector. Institutions using the tracker received guidance on implementation in BOS, had real-time access to their own data, could benchmark their data against their sector data, and access further guidance on how to understand and respond to the findings.

The student digital experience tracker survey enables universities, colleges and skills providers to:

» Gather evidence from students (and online learners) about their digital experience and benchmark their data against other institutions, over time
» Make better informed decisions about the digital environment
» Target resources for improving digital provision
» Plan other research, data gathering and student engagement around digital issues
» Demonstrate quality enhancement and student engagement to external bodies and to students themselves
» Runs annually from October - March each year

Findings;

University learners are more likely to use personal devices for learning than other groups

Accessing learning on the move is more common among University learners

Role of digital technology is most valued for the convenience and flexibility it affords;

- I can fit learning into my life more easily 73%
- I am more independent in my learning 71%
- I can understand things better 59%
• I feel more connected with my lecturers 44%
• I feel more connected with other learners 40%

A number of case studies showcase how different institutions are using the results of the tracker to inform decision making and engage learners in the process.

University of Northampton:
- Student’s Union (SU) was a key partner in tracker project, both in gathering data, and in analysis and follow-up
- Initial survey was followed up by focus groups with students to explore issues in more depth
- Actions agreed by a working groups including SU representatives and teams reported progress to the student body via this group
- This allowed Northampton University to respond to tracker findings in ways that have student support and embed accountability

University of Nottingham Nimbo, China campus:
- Resistance seen from students in previous years with providing personal information and opinions online. Some would only submit via paper
- The structures for staff and students to have a strong voice in their learning experience or IT provision are still developing
- In 2017, an email campaign to alleviate fears, embedding the survey in Moodle and use of word cloud posters of initial results alongside QR codes were used to engage students in project
- Resulted in high engagement

With over 22,000 participants from 74 organisations in the UK and 10 international universities, it is the first time the digital experience has been looked at in this detail and at this scale. This report shares the findings from the analysis of the data collected from the 74 UK organisations. It is a useful snapshot of the state of technology-enhanced learning in UK post-compulsory education - and so we hope the findings will be useful to policymakers and education researchers - as well as educational leaders looking to improve their own provision.

The tracker is a survey tool that enables organisations to explore how students use and feel about the digital tools, environment and support they provide. It offers institutions valuable insight into how students are experiencing digitally enhanced learning and provides an opportunity for them to engage with students with regards to issues such as the design of their curriculum and the digital environment.

**Conclusion**

Firstly, students are generally positive about the use of digital technologies in their learning. However, some providers still need to do more to get the basics right - including guaranteeing decent wifi provision across campuses and continuing access to desktop computers, which many students still rely upon. The use of digital activities within courses is not as prevalent as we might expect. This suggests that the full benefits of technology to support learning are yet to be realised, with technology more commonly used for convenience rather to support more effective pedagogy.

Finally, the results raise questions about the level of digital skills awareness within both the higher and further education sectors. 80% of HE learners and 63% of FE feel that digital skills will be important in their chosen career, but only 50% agree that their course prepares them well for the digital workplace, raising questions about the provision and/or signposting of services to student which support the development of digital skills and capabilities. Through working with students, we can create learning environments which fully harness the power of digital and provide the best possible preparation for the world outside the classroom.
Ruth Drysdale

Ruth Drysdale is a Senior Codesign Manager in the Jisc Digital Futures directorate. Ruth currently manages various projects about surveys and linking qualitative and quantitative data to produce insights into improving the student experience. Ruth also works on various student mobility initiatives such as HEAR, International Credit Transfer, digitising qualifications with Open Badges.

Ruth has worked for Jisc since 2009 and during her time at Jisc has led large transformation projects on implementing technology to improve course information and work based learning.

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1 https://www.jisc.ac.uk/rd/projects/digital-student
2 http://repository.jisc.ac.uk/6140/1/Jisc_NUS_student_experience_benchmarking_tool.pdf
3 https://www.jisc.ac.uk/guides/enhancing-the-digital-student-experience
4 www.onlinesurveys.ac.uk
5 https://www.jisc.ac.uk/rd/projects/student-digital-experience-tracker
6 http://repository.jisc.ac.uk/6662/1/Jiscdigitalstudenttracker2017.pdf
1. Summary

For three years now Fontys University together with Parantion has run the Quantified Student Initiative. This year, in January, we held a conference for 250 man in which we presented the results for year 3. In this session we will give you the highlights. Quantified Student is a program with a lot of projects that all share the same challenge: can we collect data about students and study behavior and feed this data back to the student so the student can reflect on its behavior and enhance study success and pleasure? We have a lot of examples (apps, dashboards, and so on) showing that this is possible.

2. Extended abstract

Three years ago we started the quantified student initiative. Based on the Quantified Self Movement the initiative started with a simple question: Can we built a runkeeper app for studying?

Can we collect data from students and study behavior and feed the data back to the students. Will this help them reflect on their own behavior? Will this make the better students? Will this enhance study success? Or study pleasure?

We started a program with all kinds of projects and also decided on a few design principles that were very important for the complete program:

1. All projects have to be done by students, professors, IT - staff and companies;
2. All projects are an integral part of the educational process, meaning students get graded and/or earn credits;
3. Privacy and security are key;
4. We do not do academic discussions. We start and see what happens;
5. All project should be designed by the concept: No Big Brother, Big Mother! Meaning the data belongs to the student;
6. All products are open and we share all data, code, documentation and so on.

In 2015 and 2016 we did all kinds of interesting projects:
1. We built all kinds of apps measuring student behavior and feeding the information back to the student (think about attendance, sleep, movement, and so on)
2. We built all kinds of dashboards doing the same;
3. We created labs in which students could have a check-up and leave with a study advice;
4. We tried to find out when students concentration drops and advice them to take a break (using biometrics);
5. And so on...

In 2017 we did a lot of new things which will be highlighted in the presentation. We will, in detail, discuss the following:

**Use of WIFI - data to predict on-campus behavior**

At Fontys University we have a very large wireless network. 3000 access points are providing connectivity for 70,000 user accounts. Sometimes we have over 35,000 concurrent connections in 27 different buildings. This data provides valuable insight. This is very important because in the Netherlands most students do NOT live on campus and we believe in a relation between on campus presence and learning. This data becomes especially interesting when combined with other data like temperature in the building, weather and things like study success.

We created a GDPR-compliant infrastructure that collects the data and we trained the system using algorithms. This infrastructure creates dashboards that are very useful for:

- **Building administrators.** They can easily see things like:
  - Number of people in a building, floor, zone any given time. This helps them plan accordingly and decide about opening times of the buildings;
  - Relation between number of people in the buildings and things like Co2 and temperature of the building. Cooling a building modestly is good for the environment but what is the result on on campus time?
  - The effects of building enhancements, lounge areas and stuff like that. Does investments in buildings result in more on-campus time?
  - Predictions of number of people in the building especially when combined with weather;
  - Planning of services like cleaning and catering based on the data. For example, when you know it is going to rain, you also know what will be the impact on the presence of students and you can plan accordingly;

- **Educational Designers.** They can easily see things like:
  - How many students are still coming to the campus compared to the number of students that are enrolled;
  - The effect of new educational measures. Do they result in more on campus time?
  - What is the average on campus time of a student. How does this correlate with study success?
Making Quantified Student Part of The Fontys Student App

In 2017 we started a project which will conclude in 2018 in which we are making components of the Quantified Student thinking part of the general Fontys Student App. In the general app we provide students with news updates, schedule, grades and events. But soon, there will be more.

- If they give consent, students can see their on campus time and compare that to other students. This way they can reflect on their behavior and they can share the data, if they want with their study counselor. The data is NOT automatically provide to the study counselor;
- If they give consent, students can see their smartphone behavior (number of checks and screen time) compared to their schedule and other students. How many times are you checking your phone during class? This way, again, they can reflect on their behavior and they can share the data, if they want with their study counselor. The data is NOT automatically provide to the study counselor;

All kind of new experiments

In 2017 (and still going in 2018) we launched all kind of new Quantified Student Experiments.

1. We built new apps that concentrated on stuff like:
   a. How does noise level influence your study experience?
   b. Can we measure your focus?
   c. Can we measure your alcohol use?
   d. And so on;
2. We launched a new project called Programmatic Assessment in which we record all activities from medical students, so students are no longer graded but really monitored on what they have learned and how they have improved;
3. We conducted studies in the relation between sleep and studying and movement and studying.

We have our own website: www.quantifiedstudent.nl where we blog about everything we do. In 2018 we would love to expand the community and work with other universities in Quantified Student projects. That is why we think it is important to tell our story at the EUNIS - conference.

3. AUTHORS’ BIOGRAPHIES

Rens van der Vorst works for Fontys University. He is member of the management team of IT - services, he works as a technophilosopher and teaches New Technology. He also is head of innovation at Fontys. Rens van der Vorst is a columnist and writer of the book Smartphones are the new Smoking (in Dutch: appen is het nieuwe roken). Rens is 47 years old, is married and has two children.

Roel Smabers is CEO of Parantion and has a degree in sociology. Roel is author of a number of books and is very committed to developing software that helps the student community. The role of Roel in the Quantified Student Community is strictly non - commercial. Quantified Student is a non-profit organization. Roel is 53 years old, is married and has two children.
Advancing the NGDLE- One Step at a Time

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Keywords
NGDLE, LMS, Learning Management, Learning Analytics, Personalization

1. ABSTRACT

In 2014, EDUCAUSE held workshops where stakeholders were asked to discuss the future of the learning management system and understand what is working today and what must evolve to reach its full potential to support future advances in technology-enabled learning. The result of those meetings was a white paper named The Next Generation Digital Learning Environment: A Report on the Research. The paper identified five dimensions to be addressed as we move forward, these are:

- Interoperability and Integration - the ability to integrate tools and exchange content and learning data will enable everything else.
- Personalization - allowing students and faculty to customize and configure the learning environment and the ability to easily use adaptive learning techniques to support individualized learning.
- Analytics, Advising, and Learning Assessment - the NGDLE should be integrated into other systems supporting student success and provide students and advisors information to improve decision making and time to degree.
- Collaboration - the NGDLE should move beyond a course-centric view of information and learning and easily integrate public and private resources into the course; and
- Accessibility and Universal Design - we need tools that use universal design principles to build accessibility into what we do at the start, not as an afterthought.

Through the work of groups such as EDUCAUSE and IMSglobal, along with many individual efforts at universities around the world, we are seeing real progress being made in many of the five dimensions listed above. This paper will describe the work of IMSglobal and how the author’s institution, University of Maryland, Baltimore County is using this to guide its efforts in laying a foundation for the NGDLE.

The NGDLE is a vision for a learning ecosystem not a detailed technical specification. As such, the NGDLE will evolve over time as technology matures and the research in teaching & learning identifies effective practices. This paper focuses on what the author believes to be three essential elements for success:

1. The role of standards in building a learning ecosystem, the most important standards to follow, and why standards are essential for interoperability and integration;
2. The importance of learning analytics in advancing effective practices in course design and pedagogy, student graduation and retention, and personalization of learning; and
3. The importance of universal design principles to think more broadly about accessibility of learning resources and to move beyond a course-centric view of learning.

Finally, the author will discuss what campuses should be doing now to position their institution to take advantage of the work that has been done to date or is in progress.

Historical Context of the Learning Management System (LMS)
While this article focuses on web-based access, in particular the evolution of the learning management system (LMS), it is important to acknowledge that there is a long history of efforts to leverage ICT for education. A brief review identifies the University of Louisville using radio in 1948 for broadcasting distance education classes and in the late 1950's the University of Houston using public TV to broadcast college courses. With the broader introduction of computers in society, in 1960, the University of Illinois released the PLATO (Programmed Logic for Automatic Teaching Operations) system running on the Illiac I computer. Starting in the later part of the 1970’s, we see the beginning use of the personal computer. My first use of a personal computer in college was in 1980 using Visicalc with an Apple II computer. In 1981, the IBM PC was released and until 1994, self-paced education utilized a personal computer of some form. In 1987, NKI Distance Education of Norway began offering online courses through the EKKO conferencing system that have been evolved with technology. In 1995, with the launch of Windows 95 and Internet Explorer, it became much easier for computers running Microsoft Windows to access the World Wide Web and this began the shift to using the WWW as a platform for course delivery.

It is easy to think that something used so ubiquitously as the LMS, or the WWW, has been around for a very long time; however, the origins of the web-based LMS trace back just over twenty years ago to some initial work by Murray Goldberg at the University of British Columbia. In 1995, Goldberg was researching the effectiveness of using the WWW for teaching operating systems and published a paper in the ACM SIGCSE proceedings. From this work, Murray Goldberg created and released the WebCT LMS for general use, the first LMS publicly available. I downloaded this software in late 1997 and set this up on my campus as our first LMS at UMBC. WebCT provided an easy way for faculty to put their syllabi and notes online. Prior to WebCT, most faculty were using html and were often frustrated with how difficult it was to update their course website, while students were frustrated that more faculty weren’t putting course materials online.

By 2000, a number of commercial LMS systems were now available and the period of 2000 to 2010 was as much about vendor mergers and the move of institutions to online courses. For the United States, in 2000 the National Center for Education Statistics (NCES) reported that 10 percent of students were using distance education, of which 6 percent were using the Internet. In 2014, 28 percent report taking at least one course online and 14 percent take all their courses online. This growth in online enrollment has made the LMS one of the most important educational tools, at least in terms of return on investment.

In 2013, Malcolm Brown, Rob Abel, and I wrote an article for EDUCAUSE Review titled, A New Architecture for Learning. This article laid out a vision for connected learning and personalization that was later integrated into the NGDLE document. At the same time this article highlighted a challenge to the central university IT - that in our efforts to establish a stable LMS environment we were limiting the opportunities for academic innovation. The article went on to highlight of looking at the LMS in the context of the other systems we have in place to support learning and the necessity of developing standards to support the plugNplay of systems. This work was highlighted below in Figure 1. The key elements we identified in our functional diagram was that it would be impossible to separate learning environments, learning tools/content from enterprise systems such as our ERP and from other systems being developed to support advising and assessment. Without working holistically across vendors and systems we would be stymied to live in walled gardens, only able to interchange data with systems that vendors had developed formal partnerships with. The belief was this walled garden would stifle innovation and lessen the impact of new entries in the marketplace.
The article identified four critical requirements for learning innovation to be enabled, these were:

- Digital content and applications must be easily (ideally within a few minutes versus months) and seamlessly integrated into any platform that supports a set of vendor-neutral open standards and, importantly, are not trapped inside a single platform;
- User, course and context information must be synchronized among selected applications so that manual transfer of information and multiple logins to different applications are not required – thus making set-up and use of new software much easier for all concerned;
- Data that describes usage, activities and outcomes must flow from learning content/apps to the enterprise system of record, learning platforms and analytics platforms; and
- Systems, services, and tools will be virtualized and increasingly move towards the elastic computing model that enables sharing scenarios across systems or other federations of users.

Many of these same requirements carried over to the NGDLE report.
Defining the NGDLE

In 2014, EDUCAUSE held workshops where stakeholders were asked to discuss the future of the learning management system and understand what is working today and what must evolve to reach its full potential to support future advances in technology-enabled learning. The result of those meetings was a white paper named *The Next Generation Digital Learning Environment: A Report on the Research*[1]. The paper identified five dimensions to be addressed as we move forward, these are:

- Interoperability and Integration - the ability to integrate tools and exchange content and learning data will enable everything else.
- Personalization - allowing students and faculty to customize and configure the learning environment and the ability to easily use adaptive learning techniques to support individualized learning.
- Analytics, Advising, and Learning Assessment - the NGDLE should be integrated into other systems supporting student success and provide students and advisors information to improve decision making and time to degree.
- Collaboration - the NGDLE should move beyond a course-centric view of information and learning and easily integrate public and private resources into the course; and
- Accessibility and Universal Design - we need tools that use universal design principles to build accessibility into what we do at the start, not as an afterthought.

Through the work of groups such as EDUCAUSE and IMSglobal, along with many individual efforts at universities around the world, we are seeing real progress being made in many of the five dimensions listed above. This paper will describe the work of IMSglobal and how the author’s institution, University of Maryland, Baltimore County is using this to guide its efforts in laying a foundation for the NGDLE.

The NGDLE is a vision for a learning ecosystem not a detailed technical specification. Our hope is that the NGDLE will evolve over time as technology advances. Ideally, the community should never fully implement all aspects of the NGDLE. When that happens, it indicates that innovation has stopped taking place and we are unwilling to extend energy to advance the state of the art.

Advancing the NGDLE at your Institution

In the prior section I identified my three essential elements for success of the NGDLE, listed below:

1. The role of standards in building a learning ecosystem, the most important standards to follow, and why standards are essential for interoperability and integration;
2. The importance of learning analytics in advancing effective practices in course design and pedagogy, student graduation and retention, and personalization of learning; and
3. The importance of universal design principles to think more broadly about accessibility of learning resources and to move beyond a course-centric view of learning.

I will explain why I choose these three elements and expand on what I believe is important for institutions to be doing in this space.

The Role of Standards

I am privileged to serve on the IMSglobal Board of Directors. As such, I believe strongly in the importance of the educational community and vendors working together to agree on standards. The IMSglobal model for standards development is much more lightweight than ISO or ANSI models for
Another difference is that IMSglobal is only interested in standards that institutions feel are necessary to advance the cause of digital teaching and learning.

IMSglobal is focused on five elements of the educational technology space:

- **Integrated and effective digital curriculum** - how do we integrate electronic textbooks and other digital curriculum seamlessly into our digital learning environment. The important standards here are the common cartridge format and the LTI advantage format. With these standards in place by vendors the effort to integrate third party content is significantly reduced.

- **A plug & play ecosystem of learning platforms, apps, and tools** - how do we insure that a tool or a content application can work across multiple LMS system and how do we ensure that data generated from these tools can be consumed by other applications? The important standards answering these questions are LTI advantage, Caliper Analytics, and Open Badges 2.0 standards.

- **Integrated and actionable E-assessment** - in adaptive learning the most important aspect of course design is the assessment engine that asks questions and moves the student forward. As we add in data from e-textbooks and specialized tools such as Aleks for math, we need to provide transparency and adaptability across platforms to understand how students are doing. The important standards here are QTI for questions, LTI Advantage for interoperability, and Caliper for data analytics.

- **Integrated digital credentialing, badges, and competency-based education** - one of the goals of the NGDLE is personalization of learning. How do we identify, assess, and notate skills that the student has acquired through her formal and informal learning at the university. The important standards here are the open badges 2.0 standard and the LTI Advantage standard.

- **Real-time, cross-application educational data and analytics** - No one fully understands the learning process of individual students. Without more data that can connect a variety of learning activities - from reading the textbook, watching a flipped course video, doing homework, and working in a group we can never hope to understand how to most effectively personalize learning. The most important standards here are LTI advantage and Caliper analytics.

These five elements are important because they identify a high-level learning effort and then identify the underlying standards designed to support that goal. I don’t believe there are many universities that don’t care about at least one of these five elements as part of their digital learning strategy. The four standards that are common across these activities are LTI advantage, Caliper Analytics, Open Badges, and QTI. These four standards form the basis of four of the five NGDLE dimensions noted above:

- **Interoperability and Integration** - the ability to integrate tools and exchange content and learning data will enable everything else - LTI advantage, QTI, and Caliper Analytics;

- **Personalization** - allowing students and faculty to customize and configure the learning environment and the ability to easily use adaptive learning techniques to support individualized learning - Open Badges and LTI advantage;

- **Analytics, Advising, and Learning Assessment** - the NGDLE should be integrated into other systems supporting student success and provide students and advisors information to improve decision making and time to degree - LTI advantage, Open Badges, and Caliper Analytics; and

- **Collaboration** - the NGDLE should move beyond a course-centric view of information and learning and easily integrate public and private resources into the course - QTI, Open Badges, and Caliper Analytics.

The other element not mentioned above is:

- **Accessibility and Universal Design** - we need tools that use universal design principles to build accessibility into what we do at the start, not as an afterthought - there is a IMS draft
standard built with the support of Georgia Tech University named Access for All. This standard would allow users to set up a profile for accessibility and have that profile shared with all applications that the user interacts with. This effort is still a draft standard and needs the support of the U.S. Department of Education to move forward. Once this standard does move forward a user should be able to create a profile of their preferred options and have that shared with all LTI-enabled applications.

These examples of standards and functional applications are not meant to say the goals of the NGDLE are solved, rather they are to show that our community is making significant progress towards solving these issues and with our collective efforts we can define solutions that work across vendors and institutions.

Institutions can advance their efforts in the NGDLE by understanding these standards, and where appropriate, should begin requiring these standards when they procure educational technology products.

**Importance of Learning Analytics**

My institution, UMBC, worked with Blackboard to develop the Blackboard Learning Analytics module. We did this because understanding how faculty used the LMS was critical to identifying thought leaders and developing support models for innovative pedagogy. In addition, UMBC is one of the campuses working with Civitas Learning to improve student success. Through the work of the data science team at Civitas Learning, we know that activity in the LMS is an important indicator in student success\(^\text{16}\). In fact, for online course LMS activity is probably one of the most important for persistence to the next semester. For UMBC, which has a very limited online presence, we still see online activity as one of the most important risk variables to monitor for at-risk students.

Beyond the basic question of whether students are engaged and actively participating in the course, learning analytics are essential to broader questions of the effectiveness of pedagogical innovations. UMBC is fortunate that we have a thought leader such as John Fritz. Through John’s efforts UMBC has worked to advance student empowerment through presentation of course-based learning analytics and worked to build a platform that provided faculty with robust data on the different aspects of course design\(^\text{17}\). These studies have shown that we are only scratching the surface of interesting research questions to ask regarding course design and student interaction.

Moving forward, UMBC has a number of projects underway to advance learning analytics. The first is a project between our LMS vendor, Blackboard, and Vital Source, to integrate electronic textbook analytics into the risk calculation associated with Blackboard Predict and passing a course. The second is to set up a data lake in Amazon Web Services to store analytics data from the LMS, e-Textbook, and other sources to understand the learning environment in a course. We believe by creating a robust analytics environment we can better support pedagogical innovation by faculty.

For institutions just starting out with an interest in learning analytics, I recommend identifying a project where learning analytics could add insight and where you are making significant use of educational technology. Good examples of projects would be projects focused on student retention or persistence, especially in online courses. By their nature, these projects make heavy use of educational technology tools and can have a high return on investment if data can improve persistence. All LMS vendors, including Moodle, as well as the major content publishers now have options for acquiring and utilizing learning analytics data.
The Importance of Universal Design Principles

For UMBC, 55% of our students are intending to major in STEM. What is most important is being able to support both support those students and help to identify the best STEM major for a student. For example, students have very little understanding of the differences between Computer Engineering, Computer Science, and Information Systems. Our goal is to provide students with advising and scheduling information that will allow them to make the appropriate selections based upon their background and interests.

Another opportunity to support universal design principles is to leverage the open badges standard for personalized learning. For example, we know that students who actively participate in the CyberDawgs cybersecurity club develop a much deeper understanding of cyber defense principles that students that don’t participate. Through Open Badges we can discriminate between those student that are active participants and those that aren’t.

At UMBC, we are one of the early adopters in working towards to the Open Badges standard. Our goal is to focus on the most important extracurricular activities identified by the institution and give an easy and effective way for units to note who has done these extracurricular activities. The data from this effort is loaded into our data warehouse and then integrated with our student success data we provide to Civitas to improve our persistence and retention models.

For institutions just starting out in this area we recommend watching the IMSglobal webinar on the Open Badges standard. This webinar discusses the important standards and metadata to consider and provides ideas for how to get started with Open Badges.

Conclusions and Next Steps

There will never be a single LMS defined as the NGDLE. As such, it is a mistake for institutions to wait for their LMS to be certified as NGDLE compliant. Instead, institutions should focus on building out their own capabilities in three distinct areas:

- Reviewing or participating in the IMS standards development process. All IMS materials that have been finalized are open to the public. For institutions that want to engage with IMS and influence the process the cost to join IMS is quite small;
- Working to integrate data across different tools is essential to providing an overarching view of how technology is, and isn’t, supporting the learning process. Requiring all vendor products to support Caliper analytics is the first step; and
- Articulating learning goals and performance criteria for the successful adoption of skills is essential to highlighting that learning occurs outside the classroom.

While these three elements appear easy to define they showcase the importance on in-class and out-of-class interaction among students and instructional personnel.

Our long-term hope is that we can store this data and build models that help us identify students we can incent to pursue college.
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Agreed John Suess

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Jack Suess has is one of a small number of individuals to serve on the Boards of Internet2, EDUCAUSE, and IMSglobal. He is focused on two overarching efforts, building community and leveraging technology to advance higher ed. His areas of interest are identity management, cybersecurity, data analytics, and user experience.

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EUNIS 2018: The last LMS: Can UCPH do without a Learning Management System?

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Title
The last LMS: Can UCPH do without a Learning Management System?

Keywords
LMS, IT-landscape, platform, learning technologies, federation, LTI, administrative support, future trends

1. SUMMARY
This extended abstract describes how the learning management system (LMS) at University of Copenhagen (UCPH) since 2006 has evolved from being a complete wall-to-wall application covering every aspect of teaching and learning activities including vital parts of study administration until merely a hub or platform for connecting students, teachers with external services and functionality. The extended abstract describes therefore how the role of the LMS has changed, and how far away the completely LMS-free university actually is.

2. ABSTRACT
Introduction
This extended abstract describes the transmission of the role of the LMS at UCPH. By looking back we have observed that 1/ the original built-in functions in the application are not qualitative advanced enough to fulfill the teacher's needs and 2/ different processes have been moved out of the LMS are instead handled by other systems or services. This development seems to respond to the user's demand for IT-services that reflects the it-services used outside the institution.

Background on UCPH and Absalon
Founded in 1479, UCPH is the oldest university in Denmark. It is located in four campus areas in central Copenhagen. The university has around 40,000 students and around 10,000 members of staff. It divides into six faculties and around 100 departments and research centers.

The LMS at UCPH is called Absalon. The name Absalon is a reference to a former Danish Archbishop and is used irrespective of which particular LMS is used. The name works as a way of 'branding' e-learning at UCPH. From 2006-2016 the system behind or inside Absalon was Itslearning, since 2016 and forward the ‘engine’ inside Absalon is Canvas.

When Absalon was rolled-out to the entire university back in 2006 it actually replaced more than 15 different LMS systems across the faculties and institutes. Some were commercial, some ‘homemade’ and some were not even LMS systems but just used as such. The variety and autonomy of this field was part of a general story about a very divided and fragmented university with almost no joint identity and very few joint services across the university. UCPH did not have something as simple as a common phone register for all employees.

In that context, Absalon had a mission besides supporting teaching and learning. It also should add momentum to the dawning ambition of creating a more joint university with a free and easy
transmission of students, teachers, experiences, and knowledge between the faculties and institutes.

Absalon was also given a central position in the study-administrative IT-landscape deeply integrated with the SIS-system, the planning/scheduling system, and authentication and identity management. The idea was to release the teachers for all administrative tasks in terms of creating and handling courserooms, students, access rights etc. The teachers should concentrate on developing their teaching not solving administrative tasks. That should be the carrot for using the LMS.

It worked. But since then the world of IT outside the university has rocketed away. From the students and teachers perspective, it is all about having the best tools and services available no matter if they are provided by the university or not (Caviglia). The users demand tools and services that work in a modern, global network- and OER-oriented context (Svensson) where the university is not fenced in from the global village by rigid IT-setups.

It is challenging for a university at the same time embrace whatever technology that students and employees bring along and by that give them the freedom they want - and at the same time keep track on students progress, payment, grades etc. Not to mention managing licenses for software and resources. And finally, for a publicly funded university is it absolutely necessary to keep an exact track of the production in order to receive the fundings to run the entire university.

The answer to that challenge has been:

1/ Moving business-critical services like Course registration, Exam and Grading out of the LMS.
2/ To use the LMS as a hub for learning tools using LTI standard

Moving Course registration, Exam, Grading out

When a student signs up for a course at UCHP its done via the Student Information System. Prior to that the administrative staff has created and published the course and class via the SIS. Data about courses, classes, and student registrations will be transferred to the UCPH scheduling system (Syllabus+). In this system, we plan and schedule teaching activities as well as exam-activities as well as allocate resources like teachers, censorship, facilities, and rooms. Finally, based on data about courses, groups, students, and teachers allocated to the scheduling system then courserooms will be created and populated in the LMS.

Data and resources related to Exam are transferred to the Exam-system that handles the entire workflow from creating the exam to handling and grading the assignment. Grades and results are transferred back to SIS, where both the administration and the actual student can see the grades.

As mentioned earlier, this entire setup was made to liberate the teacher from any administrative task regarding the LMS.

LMS as a hub for learning tools

Interoperability is a key feature in the latest generation of LMS’. LTI is the standard for getting external services to operate within the context of an LMS. Meaning users can be authenticated from the LMS to external service as well as eg. results and data can flow from the external tool into the LMS.

This high level of easy interoperability creates a situation where the built-in features in the LMS more and more often are replaced with tools developed by specialized and dedicated software vendors. The obvious tools are Office365, peer feedback system, Media platform/repository, math formula editor, annotation platform, survey tool, conferencing tool and plagiarism check tool. Not
all of them are actually replacing built-in features in Absalon right now. It’s fair to say eg. that the assignment module in Absalon is very used for course assignments throughout the course. Those assignments do not trigger a grade in the SIS. Bit by bit Absalon looks more and more like an intranet for learning and teaching tools.

More challenges ahead

How far from the LMS-free university are UCPH actually? Not very far actually when it comes to the technical setup. UCPH has a federation authentication to all UCPH systems and services, meaning that UCPH-users can log in to all systems from the same login page, and with the same credentials. This means that we actually don’t need and the LMS to authenticate the access to the external tools and services.

Alongside UCPH has established a data warehouse to collect, process and transfer data from not only the LMS but also from other UCPH-systems. The success of eg Learning Analytics lies in the data warehouse thinking, more than just looking into the separate system.

To conclude: UCPH have been forced to rethink the role of the LMS in the entire learning environment. Where it used to be in the center, it might now be on the course to outplay itself and be replaced by a more open environment that corresponds much better with the world of IT outside the institution. They last and the very open question is of course whether or not UCPH as an organization will be ready to take that step.

3. REFERENCES


4. AUTHORS’ BIOGRAPHIES

Peter Aagerup Jensen, MA Communication and Modern History, Special Advisor

Peter Aagerup Jensen works in Education Services in the Central Administration at the University of Copenhagen. He has been a key figure in e-learning initiatives at the University of Copenhagen since 2005. Since 2009 he has been the Operational Systems Owner of the University of Copenhagen’s learning management system. He is trained as a project manager and an organizational consultant.
EUNIS 2018:
Proof for badges
Providing use cases for a badge infrastructure in the Netherlands

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Keywords
Open Badges, Edubadges, Micro-credentialing, education, proof of concept, best practice, Blockchain.

1. Summary
SURFnet, the Dutch National Research and Educational Network (NREN), is running a Proof of Concept (PoC) Open Badge Infrastructure. Institutions in Higher Education (HE) can experiment with this infrastructure and assign (open) digital badges to students.

In this presentation we will focus and elaborate on this Open Badge PoC and the use cases of the participating institutions. We share SURFnet’s lessons learned, as well as those of the institutions. Also, we would like to hear about possible similar initiatives or experiences, and learn if there is a common interest in building a pan-European Open Badge infrastructure.

2. ABOUT THE EXTENDED ABSTRACT
A badge is a digital icon that indicates the knowledge or skills a person has acquired in a particular field. A badge contains metadata with links to information on acquired knowledge or skills as well as the underlying evidence and details of the issuer of the badge. Employers, educational institutions, professional organisations and other stakeholders can verify the claim online. They can therefore be sure that the claim made by the badgeholder (a student or professional who is undertaking further learning) is genuine. The student owns the badge and decides how and where on the web he wants to display it. By using an open framework, students can collect and display their badges in a ‘backpack’ (similar to an e-portfolio). They can then make their badges available to third parties.

Badges pave the way for a potentially radical change in education: the introduction of micro-credentials. At present, students who follow accredited higher education programmes obtain only a single formal confirmation of the knowledge and skills that they have acquired during the course of their studies, i.e. a Bachelor’s or Master’s degree. With micro-credentials, however, educational institutions break their programmes down into smaller units to which they link an assessment/recognition. They can offer these individual units not only to their own students, but also to other new target groups such as professionals and other lifelong learners.
What is the potential of badges and micro-credentials for higher education? By using badges and micro-credentials, higher education can reach new target groups, particularly professionals. People in this target group often do not want to follow an entire degree programme, but only specific parts of it. They then want to be able to demonstrate that they have completed this additional learning.

For employers, badges help clarify the courses a person has completed: badges make the individual skills more transparent. Badges and micro-credentialing can also solve the barrier in student mobility by the recognition of credits, experience and qualifications between institutions. Finally, micro-credentials and badges help align formal and non-formal learning.

Since 2016 SURFnet has been investigating the subject of open badges and micro-credentialing and is discussing it with different stakeholders such as institutions, teachers, students, employers and government. SURFnet published a whitepaper on open badges and microcredentialing at the end of 2016. In 2017 SURFnet built a Proof of Concept (PoC) badge infrastructure which institutions can use for issuing badges. 10 institutions in Higher Education put their use case in practice during this PoC. Together we are exploring and evaluating badging processes. Furthermore, we are discussing and implementing additional metadata needed to align open badges with European common practices of exchanging data on accomplishments and skills of students. Last but not least, one of the deliverables of the PoC will be if, and in what way, blockchain technology could be of use within a badge infrastructure. For example, blockchain technology might be a solution to store badge assertions in such a way that even if the issuer of a badge were to disappear the proof of the badge assertion would always remain available to the badgeholder.

The use of open badges in Dutch Higher Education looks promising. It could enable micro credentialing and more flexibility and choice for students. Furthermore, it might align education better to the needs of employers. The current PoC activities are the first steps towards a potential future national open badges infrastructure that SURFnet aims to offer as a service to the Dutch Higher Education institutions.

3. AUTHORS’ BIOGRAPHIES

Alexander Blanc is Senior Product Manager at SURFnet and Project Lead of the Open Badge project. He studied Communication Science at the University of Amsterdam. In 2004 Alexander joined SURFnet to become Product Manager of its online video services. From 2010 on Alexander was involved in many different projects and services concerning SURFnet’s Collaboration Infrastructure, Security, Privacy & Trust, and Educational Services. The past three years Alexander took part in several of the projects within the ‘Education innovation with IT’ programme.

Frans Ward is a Senior Technical Product Manager at SURFnet and has been responsible for innovation projects in the area of Trust and Identity, Service Delivery and Educational Services. For the past two years his focus was mainly on Open Badges and Micro-credentialing, the Open Educational API and Open Educational Resources; projects that are part of the SURF Innovation programme ‘Education Innovation with IT’. Frans studied Business Information Technology at Rotterdam University. After working at the Erasmus University IT department for more than 12 years he joined SURFnet in 1999.

Jenny de Werk is an experienced program and project manager. She has fulfilled these roles in both international and national organizations and in both the commercial as non-profit sectors. She enjoys working on the edge of company processes, ICT and people and balancing these elements. Since 2013, Jenny has been working as a project manager at SURFnet. She has been responsible for various projects. Key responsibility within this role is ensuring broad dissemination of knowledge between Dutch higher education institutions. Jenny studied economics and languages at the Rotterdam University of Applied Sciences.
Ronald Ham is an information architect for SURFnet. He obtained a master’s degree in information management at Tilburg University. From his practice he provides SURFnet with knowledge on educational standards, information and software architecture. Ronald joined the badging project in 2016.
Active Learning in Innovative Learning Spaces: An Action Study

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SUMMARY
New innovative learning spaces at the largest university in Norway, the Norwegian University of Science and Technology (NTNU), challenge traditional teaching approaches and the long-standing lecture pedagogy in tertiary education. New and more flexible learning spaces facilitate for more student-active learning by opening for major role changes for both the teacher and the student. Using new technological solutions, the traditional and often one-sided focus on lecturing is being replaced by or absorbed into interaction and dialogue between groups of students and teachers and students. This extended abstract presents TettPÅ [Close On], a priority NTNU learning project that uses interactive action research to facilitate in-house collaboration, between departments and campuses, where new learning and teaching methods are used in new innovative learning spaces.

Keywords: Innovative learning spaces, active learning, interactive action research
1. ACTIVE LEARNING IN INNOVATIVE LEARNING SPACES

More than is currently the case, the Norwegian Ministry of Education expects that the academic environments in tertiary education will use forms of teaching and learning where the students have an active role, and that they will use digital aids and new technology where this is appropriate and possible. This expectation has been stated clearly in the report to the Storting (Parliament) “Culture for quality” (Report to the Storting no. 16. (2016-2017)) which was published in 2017. One of the clearest responses from NTNU with respect to this expectation is the development and pilot testing of new innovative learning spaces.

NTNU currently has a number of innovative learning spaces that are designed for more varied teaching methods and for implementing and pilot testing new technology. The aim of these spaces is to open for more student activity and greater collaboration, and to make it possible to vary between different learning activities. One of these areas is R2 (see Figure 1). This is a large split-level auditorium. It has been redesigned from a traditional amphitheatre into a flexible interactive learning space. Traditional rows of desks have been replaced by four (five) levels, with a total of 28 group stations. Each station has a large screen that students can connect their own devices to. Each group station also has a whiteboard, a speaker and a microphone. From the lectern the teacher determines the content that is to be distributed on the screens. With these functionalities the space facilitates for varying forms of teaching and learning where it is easy to switch between lecturing and group work. In other words: it is easy to change between passive and active student roles.

Figure 1: R2. Innovative learning space at NTNU.

The NTNU prominent teaching and learning project TettPÅ works actively on the development, use and evaluation of several of these learning spaces. The first case studies have
pointed out important benefits, such as closer teacher-student contact, more student activity, a change from the traditional presenter/lecturer teacher role to a collaboration partner role, enhanced group dynamics due to the shared screen and presentation surface, and greater variation in the teaching and learning activities.

_TettPÅ_ aims to improve the teaching quality at NTNU, and this means to facilitate for changes in practice. Empirical findings about teaching and assessment tell us, however, that it is challenging to change teaching methods in tertiary education (Evans, 2013). There is a large gap between empirical solutions and real practice (Donovan, Rust & Price, 2016; Sadler, 2016). We also know that students are often dissatisfied with key elements in relation to teaching quality, such as effective feedback, dialogue and interaction (Boud & Molloy, 2013). Lastly, an important lesson to be learned from the school-research literature, which often has a view of both teaching and learning that is more incisive than discussions in tertiary education, is the importance of collaboration between teachers to facilitate educational change (Black & McCormick, 2010).

Bearing all this in mind, _TettPÅ_ examines how collaboration between teaching staff on the use of new innovative learning spaces may be analysed, understood and developed using relevant theory and empirical findings. The aim is to facilitate for change in the teaching and learning, to have more satisfied students and to improve teaching quality.
REFERENCE


The first author, Gabrielle Hansen, is a PhD fellow at the Faculty of Information Technology and Electrical Engineering at the Norwegian University of Science and Technology, NTNU. She is currently completing a doctoral project, while working as university lecturer and scientific leader of the NTNU Top Education project TettPÅ.

She has a Master's degree in Social Psychology (2008) from NTNU, where she has been employed since 2009. She first worked as a pedagogical researcher in the field of technology and teaching, then as a PhD fellow, studying formative assessment and motivation, and as a university lecturer and scientific leader of the NTNU Top Education project, TettPÅ. She is currently researching the use of new innovative learning spaces, response technology and the value of colleague collaboration to facilitate changes in teaching and learning in tertiary education.

Journal publications:


Parts of books/reports:


Learning Spaces around the world: an international comparative approach

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Keywords
Learning Spaces Centers Commons international

1. INTRODUCTION AND CONTEXT

During the last decade, the innovative physical Learning Spaces, usually shortened to « Learning Spaces » have continuously increased as a hot topic, especially in the Higher Education world (Oblinger, 2006). These spaces consist of a mix of innovative spatial organization, layout, furnishing and ICT equipment, and seek to support - and sometimes induce - innovative teaching and learning practices, such as active learning, flipped classrooms, collaborative work and project based learning (Byers, T., Imms, W. & Hartnell-Young, E., 2014).

After a first rush mostly based on Active Learning Classrooms designed for formal teaching and learning activities, the Learning Spaces trends now tend to move to larger and integrated spaces such as Learning Commons and Learning Centers, more focused on informal practices, and that are often considered to represent the future of university libraries, as they usually are located inside them or replace them.

Considering the internationalization of this Learning Spaces phenomenon, and the relevance to compare experiences and share the best practices, an international comparative study has been formally launched in October 2016 by Paris Île-de-France Digital University (France) and Kyoto University (Japan).

2. STUDY’S RANGE & FRAMEWORK

In February 2018, the study involves more than 120 institutions, spread on 4 continents, and representing more than 140 Learning Spaces of different types. Contacts and interviews have been conducted with 450 university stakeholders, practitioners, users and contractors. Within all the territories (USA, Canada, European Union, Japan, Singapore, Australia, New Zealand), a specific focus has been made on Japan, considering the specificities of this country especially in terms of Higher Education system, and societal approach to architecture and digital tools uses.

The study relies on a framework of ten criteria, that seek to cover the whole range of matters to deal with in a Learning Spaces project: strategic, material and technical, operational and pedagogical. Hereafter the list of those ten criteria: Terminology, Layout and Furnishing, Integrated IT/ICT, BYOD compliancy, Location on the campus, Governance, Design & Evaluation tools, Community interactions, New Services, Teaching & Learning practices.

Besides the factual comparison itself, the study seeks to identify, in an intercultural approach, the internal and external dynamics that lead Learning Spaces projects, to highlight their conditions of success, and more globally to qualify the nature of the transformation they induce on the campuses. Therefore, the methodology includes quantitative but also qualitative approaches, especially involving interviews, focus groups and observations in real time or using time-lapse video recordings.

3. PRESENTATION PLAN

This communication will expose the key features of the different kinds of formal and informal Learning Spaces (Active Learning Classrooms, Learning Commons, Learning Centers). It will then move to an overview of their international major trends regarding different main aspects.
First, the technological one, with the BYOD that became as a basic in the current Spaces design, but also through the fundamental question of the relevant amount of embedded technology to integrate, that shows significant variation between the territories, some quite surprising considering their respective cultural approach.

It will then address the obvious matter of the spatial organization and the main layout schemes, by considering the flexible and the fixed ones, and by introducing the concept of zoning, that appears to be fundamental in the informal and integrated spaces such as Learning Commons and Learning Centers.

The new services typically offered in those very spaces will also be presented: laptop & tablet lending system and charging stations, specialized workstations, IT support counters, teaching assistance, group working areas, printing labs and fab labs, visualization rooms, presentation areas, A/V production studios, and relaxing areas. We will show how these services are designed to fit not only to academic purposes but also to the students basic requests for their informal activities.

Finally, the communication will expose the main challenges that the Learning Spaces have to deal with in their rise, to move from an experimental situation to a generalized one. We’ll present the different kinds of competition they’re facing: internal between facilities of a same institution, and external with out of the campus actors as potential third place for the students. We will also discuss the fundamental problem of the physical capacity of these spaces, as well as the Faculty Development matter for the ones oriented to formal learning activities. We will close the session with an overview of the assessment matter, showing a pressure of the quantitative approach that needs to be overcome.

4. REFERENCES


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5. BIO

John Augeri is co-founder and deputy director of Paris Ile-de-France Digital University. His core topics are innovative physical Learning Spaces, Faculty Development and BYOD. Since 2016, John is managing an international research project entitled « International comparative study of innovative physical Learning Spaces policies, design principles and outcomes on teaching & learning practices and on campuses transformation », already involving 120 institutions on 4 continents. John regularly acts as expert/advisor and as guest lecturer in 50 institutions in Europe, Japan, USA, Australia and Singapore. During the last 18 months, he gave 35 talks in national and international symposiums and conferences about the international situation of Learning Spaces (including at EDUCAUSE annual conference 2017), and has been invited twice as visiting researcher in Japan on the same topic. He’s also member of the board of advisors of large scale existing and upcoming Learning Spaces around the world, and core member of major international Learning Spaces related workgroups (i.e. EDUCAUSE Learning Space constituent group, Learning Space Rating System group, FLEXspace repository...).
Using digital ideation technologies to support and enhance active learning

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Keywords
Active learning, ideation, pedagogy, learning spaces, collaboration, Nureva Span, Avocor

1. SUMMARY
Named as a top strategic technology by Educause in 2017 (Grajek), Active Learning, which had previously been considered more of a technique for school level education, has gained wide adoption in university education. Through two key strategic programmes, Programme for Improving Student Outcomes (PISO) and One Campus | One Community (OCOC), London Metropolitan University have developed Active Learning Suites (ALS) with a positive effect on student achievement and are now delivering digital ideation technologies to support productive, effective and innovative idea generation. This paper discusses the journey taken and the technology used to deliver these new pedagogies.

1. INTRODUCING AND DEVELOPING ACTIVE LEARNING IN CLASSROOMS
In 2014 London Metropolitan University installed its first Active Learning Suite within the Guildhall Faculty of Business and Law. The installation of six collaboration tables was a pilot of new technology and part of a Technology Enabled Learning and Teaching strategy. The Business and Law disciplines, traditionally having a larger amount of relatively didactic, “chalk-and-talk” style of teaching, were targeted with the aim of increasing engagement, improving student outcomes and ultimately contributing to graduate employment and workplace readiness. Academic staff champions led workshops with colleagues sharing learning and teaching methods. The new room was popular and successful as evidenced by higher pass rates on modules taught in these spaces. This room served as a template for several more rooms to be deployed over the next couple of years.

In 2017, as a part of the continuous development of learning and teaching spaces within the University, two pilot classrooms were deployed to assess room layouts, furniture and technology to continue the transition to more active learning and teaching styles that were not possible in the collaboration spaces already created. Avocor F-8410 84” interactive displays were installed in preference to traditional projection. In addition to better brightness and contrast, the use of large multitouch screens brought a physicality to lecturer presentation and let students come forward to the front of the class and engage with material on the display. However, following repeated requests for whiteboards and flipcharts, it was clear that there was still something lacking within the pilot spaces. Avocor Eclipse software was used to provide a digital whiteboard however something was needed to utilise the power of the hardware and support the brainstorming and ideation activities typified by the sticky note sessions and pin ups observed. Following visits to BETT and ISE it was decided to try Nureva Span software - a Software as a Service (SaaS) product which creates virtual canvases for students and lecturers to access simultaneously from the multitouch screen or via any device or platform. The software allows Quick Share - the ability for participants, local and remote, to contribute sticky notes or pictures to the canvas and Screen Share - sharing their local screen with all contributors to the canvas without the need for any client software.
When the University started the development of a new Learning and Teaching block at the end of 2017 a light and airy top floor room was identified as a great location for the creation of a new type of active learning setting building on the lessons learnt in the pilot spaces. Ideation, the creative process of generating, developing and communicating new ideas (Jonson) is a critical skill in almost every discipline and the process is best engaged in an active manner. It was determined by the Technology Enabled Learning and Teaching Group (TELTG) that the creation of a space that facilitated digital ideation would be beneficial.

2. TECHNOLOGY

2.1. Hardware

The University has created a flagship ideation space within its new Learning and Teaching block. The focus of the space is a 12 metres wide Nureva Wall created using a WhisperTek™ surface and 4 Nureva WM210 projectors. This enormous canvas can be increased with just under 8 metres of additional space by linking 4 Avocor F-8410 84” interactive displays which are in the room and can also be used independently on the same canvas, different canvases or as standard Windows PCs for normal classroom use.

2.2. Software

Nureva Span, which enables the ideation space and is available to staff and students across the university, is a Software as a Service (SaaS) subscription-based product allowing the University to increase or decrease its investment and does not have any server infrastructure requirements. The HTML5 application is available across all platforms and devices with a rich full client with some additional functionality for computers powering the hardware wall. The software offers sticky notes, text, sketches, flipchart, several predefined templates - some of which auto colour code notes when they are dropped on them (PEST, SWOT etc). Canvases can be exported in PDF or Excel which separates metadata from the canvas into its own worksheet. Canvases exist in a digital portfolio which can be shared between users.

3. REFERENCES


4. AUTHORS’ BIOGRAPHIES

Oliver Holmes is interim Director of Information Technology and Services at London Metropolitan University. A linguistics graduate from University College London, Oliver has over 18 years’ experience delivering IT Services in Higher Education. His principle interests are IT Service Management and Learning and Teaching technology. He is a gadget lover and smart home enthusiast and enjoys merging enterprise IT with the innovation in the consumer technology market. https://www.linkedin.com/in/ollyholmes/

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e-Assessment: Ensuring Equality of Treatment in a BYOD-Setting

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Keywords
Computer based examinations, e-Assessment, Digital Examinations, BYOD, Equality of Treatment

1. SUMMARY

When dealing with paper-based exams, it seems to be widely accepted that factors like varying writing speeds do not have to be treated with special consideration. Other aspects limiting a student’s ability to participate successfully in an exam, e.g. medical reasons, like psychological implications or an injured arm, are sometimes compensated by granting additional time. In the context of e-Assessment, additional limiting factors appear, e.g. the computing power of a device, and more concerns regarding equality of treatment arise. This is especially a problem when e-Assessment is carried out in a Bring Your Own Device (BYOD) setting. Therefore, it is not easy to assemble an exam in such a way, that no student is discriminated in their ability to solve the exam by the choice of tasks. This paper presents an approach to tackle this issue with a quality-assured pool of assignments that contains meta information based on which the differences between different students’ devices can be treated in a way that equality of treatment for the whole exam is preserved.

2. ABSTRACT

In addition to being an ethically important policy, Equality of Treatment for students during an examination can be required by laws or regulations. In Germany, for example, Article 3 of the Basic Law of the Federal Republic of Germany demands that “[n]o person shall be favoured or disfavoured because of sex, parentage, race, language, homeland and origin, faith, or religious or political opinions [and n]o person shall be disfavoured because of disability” (Tomuschat & Currie, 2014). Since this is a basic right for every citizen of Germany, the same holds for examinations, despite the Basic Law not dealing with examinations in particular. For paper-based examinations exists a modus operandi, which is generally accepted to ensure EoT (Forgó, Grupe, & Pfeiffenbring, 2016). Having a close look, however, reveals that equality, in a literal sense of the word, cannot be ensured in general, not even for paper-based examinations. This inability to ensure EoT regards environmental conditions and personal abilities of the students. For e-Assessment, however, another potential source of inequality is introduced: the device that is used during the assessment.

To overcome this issue, this paper presents an approach towards generating exams for e-Assessment in a BYOD setting, while maintaining Equality of Treatment. The approach is based on established randomized multiple choice tests (McLeod, Zhang, & Yu, 2003) and extends this concept for a wider range of scenarios, while maintaining “fairness” and comparability. Differences and influencing factors of assessments are discussed and an attempt is made to define what “fairness” and “equality” mean in this context. To derive these definitions, the established taxonomy of Bloom in the Revision of Anderson and Krathwohl (Anderson & Krathwohl, 2013) is used as a pedagogical underpinning. From these definitions, criteria and methods to meet and check them are derived. This results in the presented method of defining minimum capabilities for each task and filtering the assignment pool on a per-student basis. Furthermore, a metric is introduced that allows validating how much a generated exam deviates from the objectives defined by the examiner.
Potential problems and appropriate solutions of the presented approach are discussed. These problems include the theoretical possibility of being unable to generate an exam for a given set of constraints. One of the solutions, not only for this problem, is a well-populated assignment pool with a broad range of assignments. Having a well-suited assignment pool is crucial for many aspects of the described procedure, as this is the foundation from which every resulting exam is assembled.

3. REFERENCES


4. AUTHORS’ BIOGRAPHIES

Bastian Küppers, M.Sc. is research associate at the IT Center RWTH Aachen University. His research is focused on e-Learning and e-Assessment technologies. He received his M.Sc. cum laude in Artificial Intelligence from Maastricht University in 2012. In 2010, he finished his B.Sc. studies in Scientific Programming at FH Aachen University of Applied Sciences. Since 2010 he works at IT Center as a software developer and later as a teacher for parallel programming, robotics and other topics in computer science.

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Prof. Dr.-Ing. Ulrik Schroeder received his Diploma degree as well as his PhD in Computer Science from Technische Universität (TU) Darmstadt. Since 2002 he heads the Learning Technologies Research Group in the computer science department at RWTH Aachen University. His research interests include assessment and intelligent feedback with a focus on learning processes, Web 2.0 applications and social software in education, mobile Internet and learning, gender mainstreaming in education, and Computer Science didactics.

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RISK MITIGATION IN THE AGE OF LEARNING ANALYTICS

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Keywords
Risk, Mitigation, Matrix, Learning Analytics, Frameworks, Top Ten Failure Patterns

1. SUMMARY

The European Commission is convinced that within the next decade big data will have a remarkable impact on monitoring education, on learning processes and the IT infrastructures that support teachers and students (Berendt et al., 2017). This impact implies an expectation of rapid growth in Learning Analytics (LA) adoption worldwide. Practitioners already have made great strides in standardising, benchmarking and scaling LA infrastructure, what current examples, like Analytics4Action (Rienties et al., 2016), PAR framework (Ice et al., 2012) and the JISC National Infrastructure (Sclater, Berg & Webb, 2016) also demonstrate.

Despite rapid growth, the deployment of LA is still fragmented and there are still limited evidence of success available (Ferguson et al., 2016). This fragmentation decreases the visibility of results and experiences and amplifies possibilities for duplication in effort. For example, Schwendimann et al., (2017) examined an initial set of 364 papers on LA dashboards and concluded that most studies are exploratory and proof-of-concept. Fragmentation and the bias of researchers to publish only successful studies (Clow et al., 2017) increases the likelihood that we do not take into account lessons learned from failure and thus duplicate our efforts around mitigating actions. We should be highly motivated to decrease failure as it costs, the prime example being the Inbloom disaster, which impacted on many tens of thousands of students. The 120 million dollar project was shut down due to the concerns of parents that Inbloom shared their children's data without consent with third parties (Inbloom shuts down, 2014).

Therefore, in this paper we investigate how can we systematically limit the risks associated with the deployment of Learning Analytics?

The debate around failure in LA has already begun with the Failothon workshops (which are organised at the LAK conferences (Clow et al., 2017))., but this discourse needs more structure. The stated aim of these failothons is to discuss individual experiences of failure and explore how the field of LA can improve, particularly regarding the creation and use of evidence.

JISC in the UK supports organisations in their adoption of the JISC infrastructure. As part of their strategy, consultants review risks and mitigative actions and through this means help organisations prioritise their efforts. However, currently, no commonality between those institutions risks have yet to be widely published. We need to curate across the whole of the LA landscape to increase the awareness, quality and details thus decreasing duplication and the deployment of sub-optimal local solutions.

In order to structure this debate, we review the currently available frameworks that support the deployment of large scale LA infrastructure and define a strategy of curation of a global risk mitigation matrix (risks vs mitigative actions). We then example the practice with a top list of common failure patterns based on the work of JISC and the existing literature on this issue. We show how a risk mitigation matrix can be attached to any deployment framework improving both the framework and the quality of the matrix. Finally, based on data hackathons (Cooper et al., 2017), to kick off curation, we suggest a series of interconnected workshops to facilitate the take up this methodology.
2. ACKNOWLEDGEMENT

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5. AUTHORS’ BIOGRAPHIES

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EXTENDED ABSTRACT Honey I shrunk the data: data-informed blended learning design

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Keywords
Blended learning, curriculum design, digital learning activities, learning analytics, learning design.

12. SUMMARY
Blended learning (a combination of face-to-face activities and use of digital tools and resources) is increasingly common in higher education. However, it is not always evident that people fully understand the benefits of including digital in the learning mix or, indeed, how to tell if the approaches they use are actually working.

In some cases institutions are setting 'quotas' for moving learning online without really thinking through what kind of learning is best supported in this manner. Conversely, there are some institutions that pride themselves on face-to-face learning and do not see how a blended approach can improve on this.

The authors of this paper are currently undertaking research intended to help academics, and those supporting the development of academic programmes, to improve how they design and evaluate blended learning. This paper outlines the approach and the supporting conference presentation will outline the results of pilot work and evaluation to date.

We are developing a technique to help ensure that blended learning designs are purposeful. We seek to make explicit the pedagogic intent in a learning design and then go on to explore how data can enable us to understand whether learner behaviour is corresponding to our expectations or not.

We chose the title to make the point that, with a carefully crafted learning design, small data 'hooks' can be every bit as useful as Big Data.

13. ABOUT THE FULL PAPER
Higher education institutions are making increasing use of digital tools and resources to support learning. Blended learning (a combination of face-to-face activities and use of digital tools and resources) is now the normal approach in many universities.

The shift to blended learning does however involve considerable investment in many cases both in terms of financial investment in the tools themselves and the human resources needed to develop staff skills and develop learning resources. Ever since we started using technology to support learning and teaching, senior managers have asked for tangible evidence that technology enhanced learning actually works.

What we are attempting to do with this approach is to provide a method to design digital learning activities with specific pedagogic intent and then collect the supporting data to see whether student behaviour actually corresponds to what we think we have designed.

This is a proactive approach to learning analytics. Rather than sifting through a mass of data looking for patterns, we are designing in such a way that the data to tell us exactly what we need to know is readily available. We will show how the insertion of digital activities, with a clear pedagogic
purpose, into the learning design has the power to support real-time interventions that can make a
difference to learner outcomes.

This approach will serve to demonstrate that the digital footprint of these activities makes it
considerably easier to measure success than with traditional analogue activities. For example, how
do you tell if a student who takes a book out of the library has actually read it and, if so, how do you
know they have actually learned anything from it?

The dual benefits of this work should therefore be:

- improved learning design and
- demonstrating the value of digital learning activities

The full paper discusses the approach and the accompanying presentation at the EUNIS 2018
Congress will discuss the outcomes of piloting the approach across the UK in February and March
2018.

14. TOPICS COVERED IN THE FULL PAPER

14.1. Good design practice and learning design tools

We review the way in which approaches to learning design have changed over the last 10 years. We
review tools used to support learning design in the UK over the last 10 years and draw conclusions
about what has been proven to work best for academic staff development in an HE context.

We review the main tools in current use with particular emphasis on the ABC approach which has
been used throughout Europe and translated into a number of European languages.

14.2. Moving to blended learning

We talk about introducing digital tools and learning activities with specific pedagogic intent and
provide guidance on good practice in designing blended learning.

14.3. Learning design and learning analytics

We look at the variety of current approaches to and uses of learning analytics and conclude that
much of this work is far removed from day-to-day academic practice.

We suggest that designs that make explicit their pedagogic intent make it easier to use data to
identify whether or not the intended approach is working. We talk about how to identify data 'hooks'
to help you monitor progress and take action, based on what the data tells you, at a point where you
can still make a difference to student outcomes.

We aim to show that with a carefully crafted learning design, small data can be every bit as useful
as Big Data.

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Using Today’s feedback to inform Tomorrow: Contextualizing Student Feedback in Semantically Interoperable Vocabulary

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Keywords
Learning experience management, student feedback, student evaluation of teaching, learning analytics, text analytics

1. Summary

Listening to feedback from students is becoming an important accountability measure for accreditation organizations in Higher Education, and more and more institutions are listening to student feedback to go further to improve the quality of teaching and learning. Students’ responses to course evaluation surveys provide information on students’ perception of their engagement, learning experience, learning outcomes, and the instructor’s course activities, and thus can be used to guide changes in the instructor’s teaching, help refine courses and improve curriculum and programs. This talk will present practices in how student feedback data is used to glean actionable insights for data-driven continuous improvement in teaching and learning. In particular, this talk presents a dictionary-based learning analytics approach to tackling the challenge of analyzing students’ qualitative feedback on their learning experience and improvement suggestions in context and in a consistent manner across departments and instructors.

2. THE EXTENDED ABSTRACT

Problem: How to make sense out of student feedback to improve the quality of teaching and learning?

Background: Listening to feedback from students is becoming an important accountability measure for accreditation organizations in Higher Education, and more and more institutions are listening to student feedback to go further to improve the quality of teaching and learning. Students’ responses to course evaluation surveys provide information on students’ perception of their engagement, learning experience, learning outcomes, and the instructor’s course activities, and thus can be used to guide changes in the instructor’s teaching, help refine courses and improve curriculum and programs. As educators in Higher-Education institutions are facing increasingly diverse student population - international students, students from different social-economic backgrounds, returning veterans, working adults, however, a key question is to how to make sense out of student feedback to improve the quality of teaching and learning. This is compounded by the phenomenon that when Higher-Education institutions migrate course evaluations from paper to online, students tend to submit 4 to 7 times as many words.

Conclusions: This presentation describes practices in how student feedback data is used to glean actionable insights for data-driven continuous improvement in teaching and learning. In particular, it presents a dictionary-based learning analytics approach to tackling the challenge of analyzing students’ qualitative feedback on their learning experience and improvement suggestions in context. A teaching and learning dictionary was developed by mining over 1.8 million student comments to define vocabularies to apply in text analytics of student feedback. The dictionary-based approach to analyzing student comments provide school administrators, teaching & learning professionals, and
instructors with a way to analyze student feedback a consistent manner across departments and instructors, availing insights on teaching practices, which can in turn be used to inform actions to lead to improved student learning and teaching effectiveness.

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Learning Scorecard Dashboards: visualizing student learning experience

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Keywords
Learning analytics, learning dashboards, gamification, information visualization

1. Summary

This paper presents the design of dashboards for the Learning Scorecard, a platform designed for improving the student experience in a Higher Education course using gamification and Business Intelligence (BI) techniques. LS is a Learning Analytics application, that has been used in Data Warehouse and BI courses in a University setting since 2016. The LS platform has two independent views: student view and faculty (or course coordinator) view. In the LS faculty view, dashboards were designed according to the best practices of information visualization for decision support, whereas in the student view the visualization of the learning experience is immersed in gamification elements. This paper focuses only on student dashboards, which are driven by engagement and motivation of students to improve their collaboration and learning experience. A central design decision for the LS implementation, was the recognition that the way students want to track their progress and their learning experience in a course is fundamentally different that the way teachers need to monitor student progress. The presented learning dashboards use gamification mechanisms to enable the visualization of self-assessment results giving a clear indication of the learning progress of students in a course.

2. Visualizing student learning using dashboards

Learning Analytics (LA) is a recent research field, in which Business Intelligence (BI) and Analytics techniques are applied to learners and their contexts, with the purpose of acquiring a greater insight about the entire learning process. Information visualization is an important technique explored by several LA applications (Freitas et al. 2017, Verbert et al. 2013, 2014). Visualizations enabling the tracking of student learning activities are often called learning dashboards or student dashboards. These visualizations have the potential to improve student performance by providing a direct feedback. Providing students with an analytical environment with right-time data about their performance, as well as benchmarking capabilities regarding their peers, has demonstrated to increase student engagement (Verbert et al. 2014, Barata et al. 2013). Therefore, well-designed dashboards can be a powerful tool to improve self-assessment of students, and consequently increase their motivation and engagement to attain course’s goals and achieve better final grades. The main challenge of dashboard design in this context is the identification of meaningful and unambiguous learning indicators to monitor student performance.

This paper focuses on the design of dashboards for the Learning Scorecard platform to enable the visualization of self-assessment results giving a clear indication of the learning progress of students in a course. The Learning Scorecard (LS) is a tool designed to monitor and manage the learning experience of students in a course (Cardoso et al. 2017, 2016).
The LS platform has two independent views: student view and faculty (or course coordinator) view. The student view uses several gamification mechanisms to engage students with the course’s activities, including quests, leaderboards, badges, trophies, and avatars. The student view dashboards were designed according to gamification practices (Freitas et al. 2017) instead of more traditional Business Intelligence and decision-making principles. The student view and their learning dashboards were also inspired by sports and healthcare mobile applications, in which users want to track their progress and socialize with other users. This was a central design decision, recognizing that the way students want to track their progress and their learning experience in a course is fundamentally different that the way teachers need to monitor student progress. So, in the LS faculty view, dashboards were designed according to the best practices of information visualization for decision support (Wexler et al. 2017, Few 2006), whereas in the student view the visualization of the learning experience is immersed in gamification elements. In this paper, we discuss the design options for the visualizations of the student view.

3. Conclusions

The Learning Scorecard platform is a research project developed at the ISCTE - Instituto Universitário de Lisboa that is being used since 2016, in Data Warehouse and Business Intelligence courses. Current learning dashboards for the student view incorporate several gamification visualizations to assess individual student performance in a course. Future works intends to take advantage of historical data to determine student profiles, based on their learning behavior patterns. These profiles can be used to inform students of successful learning paths and provide personalized guidance and recommendations to attain better results (learning experience and performance).

The LS also has a faculty view, with dashboards designed according to BI best practices for decision support. However, these visualizations were not the focus of this paper. Given the detailed set of data collected in the student view and possible analytical capabilities (e.g., data mining and machine learning), faculty dashboards are information rich providing a multi-dimensional view of student learning data. Fun and engagement are no longer the drivers for this design, but effective and in-time support for decision making.

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INTEGRATING MOODLE LEARNING PLATFORMS WITH ACADEMIC MANAGEMENT SYSTEMS FOR TEACHERS

Jordi Cuní

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Abstract

Teachers are using e-learning platforms in their day-to-day activities. These e-learning environments such as Moodle1 and Sakai are not linked to the SiS2 system, so when the teachers use them they have two different environments where the information is not connected. Actions like grading exams, class lists and so on have to be done at the e-learning platform and then updated to the SiS system.

After the enrolment process, the list of students with a group assigned has to be updated in the e-learning platform. Here, the difficulties appear when a SiS group in the e-learning environment is split into n-smaller groups where all of them stand alone in the e-learning platform but are attached to one single SiS group. The opposite could also happen with two or more SiS groups in a unique e-learning group. These changes can be done during the academic course and all the materials, grades,… have to be keep updated in both environments.

SIGMA has been working to eliminate this barrier providing a number of services in the Moodle virtual platform that enable academic management systems and virtual campuses to work together. The aim of the project is to add the necessary plugins to the e-learning platform automating the relations between groups in both sides and offering a set of SiS typical functionalities such as, class lists, partial grades, links to the academic files ….

SIGMA currently offers to the universities of the consortium two environments in SaaS, efficiently maximizing the information in the academic management system allowing teachers and students to make the most of it.

This integration ensures the automatic creation of Moodle courses from the groups defined in the syllabus and teacher’s assignments, so all the courses are available in Moodle after the university enrolment period.

We created a number of utilities in the teacher’s Moodle workspace that allow them to interact with the academic management application directly from Moodle without opening a new session in SIGMA SIS. The complete lists of integrations up to date are:

- Check the class lists
- Check student records
- Enter final grades in SIGMA SIS
- Transfer and calculation of grades
- Management of alphabetic grades
- Check grades template
- Manage records
- Transfer of records to SIGMA SIS
- Reviews of exam dates
- Closing records
- List of records

In addition, we have developed a component that allows the teacher to pass the final grades recorded in Moodle directly to SIGMA SIS, linking the daily assessment tool with the academic administration tool.

Keywords: Sigma, SaaS, Moodle, life-long learning, SIGMAAIE
SIGMA AIE³ is a non-profit organization established in 1996 by a group of 8 top level Spanish Public Universities to optimize their management with information technologies (IT), providing the best solutions for academic and research management. SIGMA represents 20% of the university students in Spain. The organization’s goal has evolved to the continuous technological modernization of university management through the development of IT solutions. As a result, the clerical processes have been automated and their effectiveness guaranteed.

Technology and innovation are the backbone of the services and solutions provided, based on a highly open source development and deployment platform for J2EE5 certified application servers compliant on a multi-tier and high performance proven open architecture. Internationalization is also one of SIGMA’s top priorities. For years, SIGMA has established relationships with other European universities consortiums. Lately, SIGMA has open new strategic areas of interest such as SaaS, BI, eLearning and Mobile.

- SIGMA SIS (Student Information System)
- SIGMA CRIS (Current Research Information System)

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[2] SiS Student information System SIGMA ACADEMIC

AUTHORS’ BIOGRAPHY

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Chief Information Officer

Jordi was born in 1976 in Barcelona Spain. He holds a Computer Science degree at Universitat Oberta de Catalunya (2006 - 2012) and a Computer and Software Engineer at Universitat Autònoma de Barcelona (1997 - 2000).

He works at SIGMA since 2000, being the current Manager of the Architecture and Software quality assurance Areas. He leads team of 7 developers in those areas.

His role mainly focuses on the maintenance and development of the (own) Sigma framework to increase the productivity, define the methodology among the different areas and establish the software development tools for the rest of the company. Last but not least, his area also takes part on the technical and performance customer support helping our clients with the migration projects of their back-end resources.

Previously, he had been project manager developing SIGMA’s educational planning area for 5 years. His main efforts focused on the development of software solutions, resource planning, stock management of static and mobile resources and offline and on-line surveys.
EUNIS 2018: EXTRA\textsuperscript{sup} project toolkit and Open Badges to foster student mobility

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Keywords

International mobility, open badges, informal recognition, formal recognition, extracurricular skills, hidden competences, endorsement, quality, learning pathways, society of trust, informal proof, hints of achievement, traces, employability.

1. ABSTRACT

As identification, assessment and recognition of skills (versus academic knowledge) are still a complex issue in many higher education institutions (HEIs) in Europe, in France, since January 2017, a recent law has allowed students in HEIs to ask for recognition of the skills they have acquired through their extracurricular activities.

HEIs are therefore being confronted to the occurrence of skills acquired through informal learning in their formal education system, of informal and non-formal recognition processes in informal or non-formal activities of their students... without much clue on how to deal with them or guarantee the quality of the recognition and evaluation.

To respond to the requirement of the law, the French ministry for higher education, research and innovation has launched, with stakeholders, a national project (called EXTRA\textsuperscript{sup}) funded by the Erasmus+ European Agency on the issue of recognition and quality assurance of the competences acquired by students in extracurricular activities. This ongoing project aims at producing a methodological toolkit for the HEIs, the teaching staff and the students willing to take steps towards the recognition and validation of the learning outcomes and competences developed by students in the framework of citizenship activities or personal involvement within their training programs. The toolkit is currently being written and will be released on April 23, 2018.

The project was based on a national survey of HEIs that indicated that international mobility was an experience where students develop a set of skills valued by the socio-economic world and that were worth recognising /valorising as they were too often “hidden competences”.

According to Unesco, 992 000 European students have undergone a mobility experience in 2015—a 12% increase since 2012. European students represent about one fourth of the total international mobility pool; Germany is the first country of origin for those students, followed by France and Italy. France is also the European country with the highest increase in student outgoing mobility in Europe between 2010 and 2015 (+37 %).

Within that context, our contribution will attempt to address the following questions:

What is at stake in the recognition of competences acquired through informal or non-formal learning in formal HE systems? Why is it needed to reflect on the recognition of skills developed through extracurricular activities? What is EXTRA\textsuperscript{sup} project telling us about the situation in Europe (based on a national survey, 3 stakeholders working groups and a study of 5 European countries)?

\textsuperscript{1} http://www.u-ldevinci.fr/wp-content/uploads/2017/12/Brochure_EXTRAsupEN_vdef.pdf
How are those stakes shared by research on the topic of competences in the European Higher Education Area context?

**How could Open Badges unbridge informality in a formal higher education system?** Based on the joint work of the French Erasmus+ Agency for Education and Training and the Confederal University Leonardo da Vinci, we will explain how open badges are developed in France as a way to recognise and guarantee quality of the skills acquired through international mobility by students. The topic of international mobility has been chosen as it raises many of the difficulties of recognition of informal learning: students are away; the skills acquired are diverse and not necessarily only related to mobility; employability is at stake; interoperability is crucial.

The objective of the presentation will be, therefore, to share the reflections produced by EXTRA sup project and Erasmus+ Agency research production and to raise several issues on the concrete use of open badges in France mainly but not only, related to mobility issues, notably the endorsement aspect. To do so, the Confederal University Leonardo da Vinci and the French Erasmus+ Agency will present together.

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3. AUTHORS’ BIOGRAPHIES

Since February 2017, Mrs. Caroline BELAN-MENAGIER is in charge of international relations and lifelong learning strategies for Confederal University Leonardo da Vinci—a French consortium composed of Poitiers and Limoges universities and Isae-ENSMA engineering school. From 2015 to 2017, she was, at the French Ministry for Higher Education, Research and Innovation, the Head of the Department for European Research and Higher Education Area Strategies. Between 2009 and 2015, Ms BELAN-MENAGIER was the French representative in the European “Helsinki Group on gender in Research & Innovation” and was the Vice Chair of the policy-driven European network, COST genderSTE, a network of 33 counties on gender in science, technology and the environment (@genderSTE).

When she was a Teaching and Research Temporary Attaché (between 2000 and 2009), she gave many papers on American religion (notably Puritanism and the Devil in American movies) and directed an on-line publication, « Defining Americanization » Nb 19 - in March 2008. She has completed a Master’s Degree in American civilization in 1996 and was an Erasmus student at Goldsmith’s College, University of London (UK) in 1995 and at the University of Oklahoma, Oklahoma State (US) in 1994.

Nadia Gonthier works at the French Erasmus+ Agency for Education and Training where she has been in charge of editorial coordination of the scientific peer-reviewed Journal of International Mobility since 2014. Between 2011 and 2014, she held several positions in the French Erasmus+ Agency and was particularly in charge of promoting Erasmus programme to higher education stakeholders.

Nadia Gonthier received her Master’s Degree in Cultural Projects Engineering in 2009 from Bordeaux Montaigne University. She was a teaching assistant at Highams Park School, London (UK), in 2007/08. After her graduation and until 2013, she was particularly active in voluntary activities, she created a cultural organisation and set up an arts festival.
SHORT VIRTUAL INTERNATIONAL PROGRAM: STUDENTS’ VIRTUAL EXCHANGE
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Keywords
Virtual Exchange, EVE, S-VIP, LERU, accreditation, ECTS, online teaching, distance learning, SPOC, MOOC, online education, virtual mobility, e-learning

SUMMARY
With this proposal we want to present an ambitious international project, the Short Virtual International Program (S-VIP), which has an important innovation dimension.

The significant evolution of the online and/or blended education offers now new possibilities to all universities at European level. Our project aims to propose a new format for the Students’ mobility and for the Erasmus program to our students. By analogy with the Erasmus exchange for on-campus training, S-VIP offers a virtual exchange via online teaching. Students taking online training will obtain accreditation for a limited number of ECTS. We started our program with a pilot project within a consortium of European universities, the European Virtual Exchange (EVE)1. In our project we also develop a close collaboration with Leiden and Milan Universities.

1. AN INNOVATING DIMENSION PROJECT
Sorbonne University today boasts an important experience in online teaching with its ODL department and the creation of a large number of online courses for its students. Since 2015, our university has been developing SPOCs (Small Private Online Courses) [1] for its first year of studies at the Bachelor of Science and Technology and for the Master’s degree. At the same time, there has been several MOOCS (Massive Open Online Course) opening on science and humanities.

The Virtual International program aims to highlight two themes, namely virtual exchanges [2] and accreditation. The Sorbonne University started its experiment by joining EVE, a pilot project associating other European universities and providing experience in linking online teaching as well as allowing the virtual mobility for their students and the sharing of credits within the other universities [3]. In parallel, we develop a partnership with several LERU universities for the creation of a LERU virtual exchange program in the near future.

2. VIRTUAL EXCHANGE PROGRAM THROUGH ONLINE EDUCATION
Students will have the opportunity to experience an innovative exchange for some elective courses, obtaining in parallel the corresponding ECTS for each course. The possible number of validated ECTS remains limited.

The Sorbonne University is able to offer a complete ecosystem of online courses. A significant number of SPOCs, complete and hybrid, are already available on physics mathematics, chemistry, electronics and mechanics and others are underway at the bachelor’s (thermodynamics, and quantic physics) and master’s level (Functional analysis 1&2).

In order to renew teaching resources and course design, this pedagogical framework was designed as equivalent to the one that is available on campus, proposing the same number of ECTS [4]. SPOCs bring together many multimedia resources -conventional, technological or digital- to implement the chosen teaching strategies (a better understanding of scientific concepts, a reduction in dropout rates and cohesion among students). Each course contains written materials, such as conference notes and manuals, as well as knowledge clips explaining some of the theoretical or methodological aspects of the course[5]. Several activities such as forums, the creation of a glossary, wikis are proposed as well as quizzes and exercises allowing the students to carry out a formative self-evaluation. The student is also accompanied by tutoring with organized virtual classes. Besides SPOCs our university proposes courses in a MOOCs format (Concurrent programming, IOS programming) that follow the on-campus teaching in terms of length and programmed period [6]. Teaching teams offer tutoring to on-campus students and exchange with them via the available tools (forum, chat, emails, simultaneous online meeting tools creating virtual classes).

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1 Eve project is a pilot study articulating MOOCS for credits. Seven universities are part of the consortium. Ecole Polytechnique Fédérale de Lausanne CH; TU Delft, NL; Université catholique de Louvain, BE, Leiden University, NL; Universidade Carlos III de Madrid, ES ; DE; Sorbonne University, Paris, FR, Wageningen University, NL
Online education presents a great advantage for the students because they can benefit from the flexibility and independence distance learning can offer them, following the courses according to their rhythm but in a synchronous manner with the on campus students for the handiworks and the final exams. By choosing electives from a growing and diverse collection of online courses proposed from leading European universities, students enrich their portfolio and develop different soft skills. They get to know diverse learning experiences, work online using multiple format contents, meet different types of learning activities proposed from the partner universities. They also have opportunities for maximizing their learning and skills through important and enhancing intercultural exchanges [7]. Furthermore, the students have great opportunities to interact and practice in a foreign language. Working in such environment facilitates the improvement of the multilingual competencies of their own field of studies.

2.2 INSTITUTIONS PERSPECTIVE

The elective courses prepared by each partner will be proposed to the Partners’ students following the principle of Erasmus programs. Each partner will be able to choose between the suggested catalogue of courses from every institution of the consortium and promote the selected courses to their students. Likewise, Sorbonne University will add few elective courses to its proposals.

For the institutions, this project can contribute to a concrete effort of increasing the students’ mobility program. The Host University (the creator of the course) will be responsible for tutoring online the student during the course (semester), preparing the exams subject and the assessments. The Home University (were the student is) will be responsible for the proctoring. Sorbonne université will propose per each partner university 10 places for its students. The obtained credits at the host institution will be transferred to the home institution and translated to its own grading reference. Each university will enlarge its experience of online electives responding to the needs of the students. It is a new form of collaboration between the members of the consortium. Furthermore this common project allows the promotion of the world-class academic expertise fields of each university increasing its visibility. It also permits the reinforcement of the global offer of online education with MOOCs and SPOCs mutually enriched by the know-how domains and cultural diversity of each other.

3. CONCLUSION

Short Virtual Internationalisation Program is the outcome of a long evolution of the online education and the will of different European institutions to collaborate and build a common innovating pedagogical project. Virtual exchange program inspired a number of world class universities to get engaged in a consortium and propose selected courses to their partners. S-VIP is a complete project of virtual exchange via online education using SPOCs and MOOCs. Courses on digital format solidly integrated at the pedagogical offer of each university allow the acquisition of accreditation for a limited amount of ECTS. This program motivated the teaching teams of the courses mentioned above to work actively for the preparation of high quality educational resources. The prepared teaching material will be proposed for the on-campus and online courses participating at the global project to renew the teaching and learning offer of our university. Students will equally appreciate the advantages of the online teaching and the possibility of credit transfer besides the broader choice of electives proposed by world-class experts. They will also have the opportunity to develop an international network, extremely important in a further professional career.

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[2] For previous virtual university strategies see the article of M.Pursula, M. Warsta & I.Laaksonen, Virtual university - a vehicle for development, cooperation and internationalisation in teaching and learning
Author’s biography

Vassiliki Michou

Since 2015, I am Research engineer (Ph.D.) at Sorbonne University. I work as a project manager, instructional designer and trainer at the department of pedagogical innovation. I managed the Idex SUPER FEL’1 project that realised 11 SPOCs. Today I manage the Idex SUPER projects: SVIP project (topic of the article), the IMAP project (creation of an interdisciplinary master level course combining sciences and humanities) and the project Play@SU: building a platform for serious games for Bachelor’s degree aiming at using an active and innovative education. I participate at the project PRADHA (Liscinum, Unisciel) as well as at the MarMOOC Erasmus+ capacities reinforcement project for Moroccan universities project. I offer trainings on instructional design and learning clips and I participate at the LERU workshops on this last subject. Currently I co-coordinate the implementation of pedagogical trainings at Sorbonne University.

Chloé Gaziello

I am an instructional designer for 2 years. After a master’s degree in distance learning, I worked on a bibliographic research project with Sorbonne-Nouvelle University. We realised short online courses to help student handle research, bibliographic database and copyright. Then, I spent 6 months guiding expert teachers with ITC for Education. I am actually working at Sorbonne University on the Short Virtual Internalisation Program. I support professors with the transformation of their face to face courses into online courses.

Sabine Bottin-Rousseau

Since 2000 I have been an Associate Professor in physics at the Institut des NanoSciences de Paris. Since 2016, I am Director of Open and Distance Learning (FOAD) (800 students. I joined the FEL’1 project in 2015 when I became deputy director of the FOAD. This project aimed at the realization of 9 SPOC. In 2017 and 2018, I obtained funding for two projects: The SVIP project, AAP Idex SUPER, (topic of this article). The project PRADHA, AAP Liscinum, Unisciel: is continuing the development of digital resources. I also run a pilot project for online exams, within the framework of a broader Erasmus + OP4RE project, for the FIED. On the research side in Physics, I am the PI of the ANPHASES project (ANR-M-era.net, 2014-2018), Franco- German research project on anisotropy of eutectic solidification interface. Since 2006, I have been involved in the TRANSPARENT ALLOY project: Multi-user ESA Instrument for the International Space Station.
MANAGING a MOOC on a public health subject: Experience feedbacks at Sorbonne Université

The example of the MOOC « Prise en charge de la personne obese »

Keywords
MOOC, needs analysis, deliverables, financial and human resources, communication plan, higher education, obesity, feasibility study.

1. Introduction

In January 2018, UPMC and Paris Sorbonne Sorbonne Université merged to become Sorbonne Université divided into three faculties: Medicine, Sciences, and humanities. The center for pedagogical support and experimentation, CAPSULE, belongs to the Faculty of Sciences. It has the potential to enhance, support and evaluate learning and teaching. It also has human resources such as instructional designers, a video production and IT team. Although the political and strategic view of the Faculty of Sciences is more oriented on the creation and design of SPOCs, some MOOCs are initiated based on teachers personal motivation.

The faculty of medicine has its own video production team and a graphic artist, but no instructional designers.

In order to support those initiatives and help teachers to implement a methodology on the designing process of MOOCs, crossed innovative experiences are encouraged between the three faculties which among them the exchange of skills, particularly thus of instructional designing.

The ex UPMC (formerly the faculty of sciences and the faculty of medicine) counts four MOOCs: two concerning subjects on public health ‘La prise en charge de la personne obese,’ by Jean-Michel Oppert and Judith Aron and “la maladie d’Alzheimer: tout ce que vous avez toujours voulu savoir” by Joel Belmin. The other two deal with programming “Programmation sur IOS” by Fabrice Cordon and mathematics “Les équations différentielles; de Newton à nos jours” by Cedric Vilanni.

This paper will present the experience on how managing a MOOC on public health subject with the particular example of the MOOC on obesity.

2. METHODS

This MOOC is the first one in France dealing with “the care of the obese person”. Obesity is a serious disease requiring a long way process of treatments and thus for life. A person affected by obesity needs the care of a multi-disciplinary team of doctors (Nutritionists, psychologists, surgeons, dieticians, nurses, sports coach, and patients associations)

Nowadays, obesity is not recognized as a disease and thus not reimburse by the health care system. It was important that this MOOC emphasize on a disease that affects 600 million of adults worldwide.

One of the main motivation of the teachers come from the ambition to inform the population on the constant growth of this disease and then integrating this project in association with the patients their families and give tools to doctors to treat those patients and give them the right information.

The main goal was to inform report and communicate around this disease and built a community of committed doctors. Because the public of this MOOC is mainly doctors, it was obvious that they will be no verified certification to deliver to thus who attended the MOOC.

The MOOC “Prise en charge de la personne obese “is the first MOOC produced by a Sorbonne Université team consisting of an instructional designer, a graphic artist, two videographers and two nutritionists. The MOOC was designed on the edX platform (the paid version of edX whose team is based in the US).
The MOOC is divided into 5 weeks. A week is made of 4 to 7 sections. Each section is a video of 5 to 10 minutes. Videos are illustrated with tremendous graphics created from scratch by the graphics artist of the team.

The doctors define each objectives and pedagogical activities thanks to a synopsis. The main idea was to keep in mind that they need to tell a story, the story of a patient: from the first contact with the doctor to the ultimate surgery. However, the most important is how the medical team will take care of the patients all along his life. Two graphics come all along the MOOC as the key milestone of this training: “the weight curve” and “the pyramids”.

In a pedagogical project, this particular phase of building the scenario is called “designing/ analysing” (this phase is described on the ADDIE model (Analyze, Design, Develop, Implement, and Evaluate).

Some of the videos shooting took place in the hospital in a real life situation and with a patient in order to emphasize on the different aspects of the multi-displinary care of the obese person (medical equipment, over size beds, doors, chairs weight balances …). Again, according to the ADDIE Model, this second phase is part of the “development” or “production” of the MOOC.

Six months has to be dedicated to those two previous phases. Most of the time, teachers, doctors are not prepared to spend that amount of time and at that time they realise how difficult could be to build a MOOC.

Advertising the MOOC is a part that comes at the six last months of the project. This is one of the hardest but at the same time exciting part of the MOOC. We choose to hold a press conference in front of experts and journalists and to use social media to relay the launch of the MOOC with the help of well-known you tubers.

Managing a MOOC with doctors is very particular. Many legal aspects have to be cleared before. Time is also the sinews of war because doctors are most and foremost practionners in hospital and they have a limited time to dedicate to the project.

Throughout the project, the difficult part was to keep deadlines clear in mind and to be aware that they can be adjusted at any time. Also, the financial costs of human resources (Sorbonne team, doctors, third part services), costs of materials, communication agency costs have to be anticipated.

A gant diagram can help to define the success and difficulties that the team can face during the MOOC. To prevent such difficulties, the importance of the use of clear deliverables (synopsis / storyboards), of a clear system of videos post-production validation, of a communication agency services, of transcript society have to be explained and followed by all the members of the team.

For the evaluation part of the MOOC, 1774 participants were registered in total.

The platform can provide figures that include the total of active learners, those who watched the videos, those who tried quizzes, those who participate to the forums. Those graphs give a percentage per week.

A questionnaire was given to the learners at the end of the MOOC to evaluate their experience with the MOOC. We will be able to give you a summary and analyse of their feedbacks later on during the oral presentation, as the MOOC will close on the march the 18th.

3. CONCLUSION
The MOOC was launch on January 24th as planned a year ago. The team faced some difficulties especially running out of time. It asks the questions of doing a MOOC when you hold a medical activity that give you no time to spend on a long project like a MOOC. The doctors were not prepared to face this amount of work. They realize that creating a MOOC is not just transforming your power points on some videos. It needs to re-think on their pedagogy, their way of teaching.

Doctors will launch the MOOC a second time on the year 2018. Feedbacks from discussion forums tell us that learners are mainly professionals and the questions asked are medically orientated. A data
scientist is working on the different traces of the MOOC. A similar MOOC in English is also considering as an option in order to affect a worldwide population.

REFERENCES

Only a change is constant - student digital experience in the academic on-line English language courses at the University of Warsaw

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Keywords
e-learning, Higher Education, e-course, foreign languages, on-line teaching, life-long learning, evaluation, survey

ABSTRACT

The implementation of the innovative and modern didactics is an important goal in any university development strategies. One of the forms of reaching this objective is the inclusion of the ICT into the didactic process. The Centre for Open and Multimedia Education UW has been implementing it with the support of the extensive application of e-learning EFL methodology. As a part of this process the on-line foreign language courses have been introduced to the students’ curriculum, parallel to the stationary courses, which leads towards obtaining qualifications following flexible learning paths. Progressively, multi-level e-courses together with on-line placement tests have been created. They are currently used by over 5 500 users every academic year.

The paper covers a short description of the nature of the online English language courses as offered to students nowadays. Most of all, however, it focuses on the analysis of the outcomes of the end-of-semester student survey, reporting on their digital experience and the reception of the changes introduced in the chosen task formats in the online English language courses. It may possibly suggest solutions for future online foreign language teaching educational contexts.

Summary

The University of Warsaw academic community has been provided with the ICT supported courses on the e-learning educational platform “Kampus” maintained by the Centre for Open and Multimedia Education of the University of Warsaw. It allows students to experience various forms of studying and introduces them to the life-long learning process. Among the initiatives, an online foreign language teaching (mostly for English) has been developed for over a decade now.

In 2017, 5 500 students took part in over 200 online language courses (and the number of e-course participants exceeded 45 000 since the e-courses launch), run by over 40 e-teachers of the UW Centre for Foreign Language Teaching and the Centre for Foreign Language Teacher Training and European Education.

All students are obliged to take a Certification Exam in a chosen foreign language at the B2 level. In the case of B1-C1 English (but also German, Russian, French, Czech, Croatian), every semester they can choose the language course form: traditional face-to-face or blended, with an on-line component - this paper focuses on. The on-line component perfectly meets the expectations for online English language teaching, including various teaching materials: audio, video, graphics, and text files in one environment, together with a variety of knowledge testing ways (Clark, Mayer, 2016).

As for today, the structure of a (blended) e-course consists of two modules (at B1 and B2) covering 60 teaching hours out of which 45 hours (75%) are taught on-line and 15 hours (25%) - in a classroom.
Each module consists of 10 thematic chapters, interactive exercises on listening comprehension, reading comprehension, writing, as well as language sub-systems: grammar, vocabulary, functions and pronunciation. The C1 course is built according to a slightly different scheme.

The e-course evaluation questionnaires, completed by students after every semester, have shown, however, that the level of satisfaction with the speaking component is much lower in comparison to the other skills practice opportunities, such as: listening, grammar, writing, reading, vocabulary. Thus, in response to that, an initiative to improve the speaking component was undertaken as a pilot. The tasks allowing students to enclose audio files in the forum entries instead of providing a written response were the new option that was introduced (from the beginning of summer semester 2017). At the same time the e-teachers were guided on how to deal with the feedback for the recorded entries from students. They have also had some freedom of choice on how many tasks of the recording they wanted to apply in their e-course (the maximum number was 10), if any.

The updated evaluation forms were designed in order to check how the change introduced met the expectations of students and also to find out what should be modified on the basis of the replies within questionnaires obtained from students.

The survey has shown that 65% of teachers adopted the new task format out of which 55% left it optional as an alternative to the written form. Apparently, only 38% of students who had had a choice of the task format decided to send the recorded speech. For most of the students, the written form of the task occurred easier to manage.

Looking at the results of the survey, several conclusions have been made regarding the impact of introducing a new form of recording speech exercises. There are two crucial factors that should be taken into account which influenced the students’ attitude, that is: the level of English language competence and the level of ICT skills. Both of them, in the case of low competences, were indirectly indicated in the survey as main obstacles in fulfilling the task in a recorded form.

It is significant that the students of the higher level e-course (particularly at C1) perceived the recording speech task as an advantage and added value in the area of self-assessment. When listening to their own speech recording, they were already able to make some self-assessments, correct themselves, and finally record an improved version of their spoken response. At that level of advancement the speaking self-awareness was far higher in comparison to the lower level speakers (B1), who were unsure of own speaking/pronouncing skills. Many of them point out to not being able to correct themselves, even after listening to their own recording. That caused the completion of the task in the written form, which turned out to be more secure and easier, and gave a chance for a better mark.

The different levels of ICT skills have been also noted among the students. The lower, the more problematic the making of the recording was, together with attaching the audio file to the forum. The lack of an interlocutor, limitation of the speaking and the size of the file have also occurred as stressful factors. All these made students more eager to choose a written form of the task.

Interestingly, even if students haven’t used the recording opportunity (or such an option was not available), they still consider it as a precious one for their learning, and indicate that approximately half of these tasks should be assessed in such a form.

In other words, the number of recording tasks should be thought over (preferably as half of all that kind of tasks) in order to assure the fair evaluation of all e-course participants.

Interestingly, out of 51 evaluation forms obtained in winter semester of 2017/2018, a 76% of students expressed satisfaction with the speaking component (that is already higher than the results in the previous semesters eg. of 2015/16). One of the explanations might be the fact that e-teachers being informed on the lower level of satisfaction from the speaking component, felt motivated to pay more attention to student’s pronunciation and speaking skills. They might have changed the method of giving feedback focusing more on the individual approach to student and making it more thorough.

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In respect to the findings of the survey the coherent amendments to the e-courses are to be introduced together with the updated evaluation forms in order to check how the change meets the expectations of students.

A student-oriented approach helps learners to identify gaps in their knowledge that needed to be revised with greater care (Allen, 2016). Therefore a particular attention should be paid on giving feedback to an individual learner as well as sharing the feedback with the students group if appropriate. Apart from that, some additional efforts should be made to ensure the best and most efficient ways of providing opportunities for the development of students’ ICT competence (eg. an e-course on on-line studying).

The student-oriented ELT methodology is to be continuously taken into consideration while preparing online courses, along with the new educational and technological tools being developed.

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AUTHORS’ BIOGRAPHIES

Anna Pacholak, MSc, works in the Center for Open and Multimedia Education, University of Warsaw. She has been engaged in various educational projects involving e-learning such as Doctorates for Mazovia (e-course: Basics of knowledge commercialization), Ministry of Regional Development e-courses on projects’ evaluation, Audiovisual and Media Education Programme (PEAM), Warsaw School of Data Analysis. Her main scope of interest is open access education, e-learning involvement in teaching and learning, motivation aspects in learning process, new technologies for education. She is the member of the Editorial Board of the EduAction open access online journal and the European Journal of Higher Education IT; EDUCAUSE Annual Conference reviewer.

Monika Galbarczyk, MA, academic ELT methodology teacher and teacher trainer at the University of Warsaw since 1994 (The University College of English Language Teacher Education; The Centre for Foreign Language Teaching); author/co-author and editor of ELT coursebooks for primary and
secondary education in Poland. Currently works for the Centre for Open and Multimedia Education, the University of Warsaw: in charge of online foreign language courses; also deals with online course design, testing and evaluation. Interests: effective communication in a foreign language, self-awareness and self-monitoring in language learning, language differences as a source of development of communicative competence; blended learning, new technologies in e-learning.
Enriching video content for educational uses with Paella Player.

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Keywords
E-learning, video

1. Summary
Video content is being ubiquitous in education, both in the form of recorded lectures or small clips. However, most of the video players available don’t provide interactive features or the ability to play rich media content. Paella player fill that gap by providing a feature rich open source player with interactive support, currently used by tens of Universities including some major names.

2. About the Extended Abstract
Video, in the form of recorded full length lectures or educational small clips is a commol tool in the teacher tool chest. A lot of universities around the world record a significant number of their lectures so they can be published online to the students. Additionally, MOOC platforms, like edX or Coursera are mainly based around video content.

However, not all videos are equal. As Guo (Guo et al, 2014) shows, students engage differently with lecture and tutorial videos. and that that even high-quality pre-recorded classroom lectures might not make for engaging online videos.

From this viewpoint, lecture recording by itself lacks engagement and is only useful for reviewing. A study from (Zhang et al, 2006) showed that the value of video for learning effectiveness was contingent upon the provision of interactivity. Students in the e-learning environment that provided interactive video achieved significantly better learning performance and a higher level of learner satisfaction than those in other settings. However, students who used the e-learning environment that provided non-interactive video did not improve either.

On other side of the board, sharing educational video distribution over the Internet is a widespread practice. And together with the increase in the use of educational videos there is also an increase in the features that may come with these videos.

Interactivity in educational videos is a relatively new trend with the level and types of interactivity to be in constant evolution. This is evident from the appearance of new tools and online platforms for creating and hosting interactive videos, like Zaption or EdPuzzle2, of able to include in MOOC courses, like Coursera. These platforms support a different set of features (e.g., in-video quizzes, time based discussions, branching videos etc.) and aim at making the video learning process a a more interactive experience. However, may offer only a limited set of features for free and are tied to a particular website and are not open source so they don’t allow further development or customization.

Paella Player is an open source video player designed both to play and to enrich lectures and other educational content. It can be used as a standalone video player in the environment of a web server or a LMS, or within the Opencast ecosystem for lecture recordings (Ketterl et al, 2013). As today, Paella is used by tens of Universities in the world, including some major names, like Harvard University and ETH Zürich, and it is also the official video player for the Opencast community.
3. FEATURES OF PAELLA PLAYER FOR ENRICHING VIDEO CONTENT

The Paella Engage Player is the UPV contribution to the Opencast ecosystem. It is a HTML5 multistream video player capable of playing multiple audio & video streams synchronously and supporting a number of user plugins.

Usage of paella evolves around the concept of media package. A media package is a collection of related media & educational resources, like videos, audios, captions, quizzes, slides and additional material, that can be viewed as an atomic unit. The task of the video player is orchestrating the playing of those contents in a meaningful way for the end user.

By using Paella students can view both the lecture hall and the teacher's screen, get info about the lecture (slides, OCR, series videos, footprints) and interact with the lecture (views, comments). Teachers can also soft edit the lecture to set the start and end point or make breaks in the recording.

Paella also support embedding quizzes from external sites, so teachers can design learning activities with interaction so students can get the most of the lecture.

Recent features include also software video tracking, in which the video window follows the teacher so students can focus on what he or she is printing in the blackboard while at the same time they can look at another point by disabling that feature.

Figure 1. Paella player showing dual stream synchronous video and some interactive tools

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Comparative analysis of the use of video lectures and web 2.0 applications in a hybrid university course environment: a case study

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Keywords
E-learning, hybrid learning, web 2.0 tools, video lecturing.

1. SUMMARY

Use of online video and audio lecturing is an effective means to deliver asynchronous teaching resources to students in a hybrid academic learning environment. The lecture that was delivered by the teacher in the classroom can be recorded and placed on a video sharing network like YouTube and/or in a learning management system (LMS) to be available to students for later viewing and preparation for assessment. Also, the audio recording of a lecture can be easily created with the PowerPoint Slide Show recording functionality or by using screen capture or screen recording software like Camtasia and also placed in the course LMS to be used by students for learning. In most previous studies the students’ evaluation of such video or audio lecturing resources has indicated their potential contribution to learning, even though their adoption by the students was moderated by their learning styles and preferences.

A better insight into the value of video and audio lecturing can be provided by an empirical investigation in form of a comparative analysis of the use of video and audio lectures and other types of online learning technologies. Therefore, in our paper we compare the students’ perceptions of several aspects of video and audio lecturing and the value of their use for learning with their perceptions of the use of other technologies suitable for online teaching and learning: Diigo social bookmarking and notes-taking tool, Mendeley tool for organization of research documents, Google Documents, Google Slides, Google Forms, YotForm web survey tool, online mind mapping tools (Mindomo / Mindmeister / Bubbl.us), online block-diagram tools (Gliffy / Creately), Netvibes mashup tool, user interface mockup or wireframe tool (MockFlow / Mockingbird), and online presentations (Prezi / Emaze). The results of our comparative analysis of students’ evaluations of various types of tools that can be used for teaching and learning tasks indicated that video and audio recordings of lectures were among the highest ranked tools regarding the average evaluation of interestingness, usefulness, potential for knowledge acquisition, better understanding of course content and its long term retention.

Our research was a pilot study in form of a comparative analysis of the effects of various technologies for learning that were applied in a Computer-Mediated Communication (CMC) course within a graduate Software Engineering and Information Systems university study. During this hybrid university course the students (N=61) used various technologies like learning management system, e-portfolio, social bookmarking and notes-taking tool, tool for organization of research documents, Google Drive applications, web survey tool, mind mapping tools, block-diagram tools, mashup tool, user interface mockup or wireframe tool, and online presentations. Before the final exam the students were also provided with video and audio recordings of some lectures that had been delivered during the semester.
An anonymous survey was performed after the final exam regarding students’ evaluations of interestingness, usefulness, potential for knowledge acquisition, better understanding of course content and its long term retention in relation to the use of video and audio lectures, as well the use of aforementioned web 2.0 tools. The main findings of our study were as follows:

(a) Video recordings of lectures and audio recordings of lectures with slides received similar and above-the-average ratings regarding the evaluation of interestingness, usefulness, potential for knowledge acquisition, better understanding of course content, and long-term content retention.

(b) In most cases, the video recordings of lectures and audio recordings of lectures with slides received higher average ratings than most of the web 2.0 technologies that were used for teaching/learning activities in the Computer-Mediated Communication course.

(c) When compared to traditional forms of learning with a printed textbook, most of the web 2.0 technologies in general received only an either slightly higher or slightly lower average rating than traditional forms of learning; i.e. they manifested no superiority to the use of a printed textbook as means of learning regarding the specific context and their respective learning activity in the Computer-Mediated Communication course.

(d) When compared to traditional forms of learning with a printed textbook, video recordings of lectures and audio recordings of lectures with slides received similar and above-the-average ratings regarding better understanding of the course material and longer retention of course content.

2. AUTHORS’ BIOGRAPHIES

Goran Bubaš works as Full Professor at the University of Zagreb, Faculty of Organization and Informatics in Varaždin, Croatia. He teaches courses in Computer-Mediated Communication, Business Communication, Managerial Communication and Leadership. He has published papers on e-learning, computer-mediated communication, interpersonal communication, e-government etc. He was a team member and a project leader when he won the EUNIS Dørup E-learning Award in 2008 and 2011.

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Andreja Kovačić holds a bachelor’s degree in the English and Spanish language and literature from the University of Zagreb. She has worked as a lecturer of English for Information Technology and Business English at the University of Zagreb, Faculty of Organization and Informatics. Her research interests lie in the connection between various psychological variables and CALL, online teaching of grammar and writing instruction in the hybrid English for Specific Purposes context. She has authored and co-authored around two dozen professional and scientific papers and several book chapters. She was a project leader when she won the EUNIS Dørup E-learning Award in 2008.
The effect of implementing web 2.0 tools on the development of grammar competence in a hybrid English as a foreign language setting

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Keywords
Web 2.0, wiki, form-focused approach, grammar, English as a foreign language, experimental study.

1. SUMMARY

Although the effects of the integration of web 2.0 tools for the development of writing skills in teaching English as a foreign language (EFL) have been documented in literature, an integrated use of wikis and other asynchronous web 2.0 tools for the improvement of grammar competence in a hybrid EFL setting remains fairly unexplored. This paper investigates the potential of implementing various web 2.0 tools for the development of students’ grammar skills in a tertiary English as a Foreign Language course. We present the results of an experimental study conducted among first-year undergraduate students engaged in collaborative form-focused activities in a hybrid EFL course. In these collaborative online activities the students’ written language production in a wiki was accompanied by multimedia artefacts representing particular EFL grammar concepts which the students created using web 2.0 tools. The described activities represent an innovative fusion of elements from EFL pedagogy, computer-assisted language learning (CALL) and multiliteracies education. Since the data analysis of grammar competence tests did not yield a significant statistical difference between the grammar competence level measured after the completion of the online grammar activities in the experimental and the control group, it can be concluded that the use of a wiki and other web 2.0 tools in performing online grammar activities in this particular hybrid course did not have a noticeably greater impact on grammar competence development in terms of the acquisition of the specific grammar structures selected for this study and in comparison to the use of a more traditional technology (e.g. MS Word) for the completion of an equivalent learning task.

2. AUTHORS’ BIOGRAPHIES

Andreja Kovačić holds a bachelor’s degree in the English and Spanish language and literature from the University of Zagreb. She has worked as a lecturer of English for Information Technology and Business English at the University of Zagreb, Faculty of Organization and Informatics. Her research interests lie in the connection between various psychological variables and CALL, online teaching of grammar and writing instruction in the hybrid English for Specific Purposes context. She has authored and co-authored around two dozen professional and scientific papers and several book chapters. She was a project leader when she won the EUNIS Dørup E-learning Award in 2008.

Goran Bubaš works as Full Professor at the University of Zagreb, Faculty of Organization and Informatics in Varaždin, Croatia. He teaches courses in Computer Mediated Communication, Business Communication, Managerial Communication and Leadership. He has published papers on e-learning, computer-mediated communication, interpersonal communication, e-government etc. He was a member and leader of project teams which won the EUNIS Dørup E-learning Award in 2008 and 2011.
BENCHEIT - Benchmarking Higher Education IT

An Update on the Work of the EUNIS BencHEIT Task Force

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Keywords
benchmarking, BencHEIT, CIO, IT management, costs

1. Summary

BencHEIT is a free of charge yearly survey with the aim of establishing a comprehensive knowledge of how cost efficiently IT works in European universities, and universities of applied sciences. The BencHEIT Task Force gathers the data and generates an analysis for the CIOs to use in comparing the organization’s IT costs and volumes to their peer’s numbers. It also provides them with tools to start more detailed discussions how to improve the performance of institute’s IT services. Analysis gives some perspective to common development within the higher education IT.

Data is collected in three dimensions:

1. Organizational level: centralized IT, other centralized units, distributed units e.g. faculties and research centers. This way participating organization can see how (de)centralized their IT is in comparison to others.
2. Account level: financial data is divided in hardware, software, staff, facilities, outsourcing and other costs.
3. Services: all costs and also some of the volume data is collected within different IT services e.g. infrastructure, workstations, business applications.

The initiative was started as a country-wide Finnish project, but in the year 2012 it was opened to all European HEIs that were interested. The number of participants has increased every year since the project started in its current form in 2012. In the last round there were 57 participants from 12 countries. This year, participants from 15 countries have applied to participate in the survey.

For the past six years, the Task Force has hosted workshops together with EUNIS. Last December in Lisbon we had about 40 participants talking about different ongoing IT benchmarking projects in Europe. This year the workshop will be in Zurich on the 27th of November.

BencHEIT is one of the EUNIS official task forces. This presentation aims to be both a short summary of what the BencHEIT aims and benefits are, but also to give a glimpse of what new results have been obtained during the latest benchmarking round during January-April 2018.
In our presentation we will present the project and its process. As the analysis will be ready in late May 2018, the EUNIS Congress is the first occasion to reveal some of the results and key findings from the last round. We will also show historical development of a few indicators during last five years of benchmarking process. The participants who have taken part in the survey previous years will see their previous numbers already when filling in the survey.

The BencHEIT survey analysis provides its participants an option to compare themselves with their peer institutions and with their sector’s latest development. When filling in the survey, you can also choose the currency you want to report your costs in. The currency can also be converted when looking at the results of other participants and comparing them to your own.

2. AUTHORS’ BIOGRAPHIES

Teemu Seesto has M.Sc. in economics from Turku School of Economics. He has been a teacher of information systems science for twenty years. Seesto was the CIO of Turku School of Economics during 2006-2010. He is currently the IT general secretary of FUCIO, the Network of Finnish universities’ CIOs. Teemu is a member of the BencHEIT steering group.

Suvi Valsta is an IT Specialist at the University of Helsinki and the project manager of BencHEIT. She holds an MA degree from the University of Helsinki. Suvi is the key contact person to most of the institutions that participate in the BencHEIT work.

Ilkka Siissalo is the CIO of University of Helsinki, EUNIS Vice President and chairman of the BencHEIT steering group. Ilkka holds an M.Sc degree in biochemical sciences as well as a bachelor level degree in marketing. Ilkka has acted as the IT leader in various research related institutions both within the private sector and academia for over 25 years.
IT governance: Constellations of IT decision shares and their consequences on IT in higher education institutions

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Keywords
IT Governance, German Higher Education Institutions, CIO Survey, Constellation Model

1. Introduction
Institutions in higher education are often described as systems with loosely tied decision makers [We76], resulting in ambiguity often described as a “garbage can model” [COM72, MO86]. This results in a system made up of autonomic subsystems, a system of systems (SoS) [SBG09]. To control this, clear and trusted processes of decision-making are needed: a governance. The introduction of IT governance and the placement of CIOs at German institutions of higher education have been recommended for many years [Dfg16]. Unfortunately, many institutions still need to establish effective IT governance [Wi17]. In particular, the decentralized nature of decision making in German universities [Wi16] collides with central control as suggested by most IT governance models.

However, who is involved in the decision-making processes very often depends on local conditions and the organizational culture and tradition. This aggravates the evaluation of the implemented models and the statistical comparison of their effectiveness.

The current study on German CIO- and governance-structures addressed these questions:

1. Are any factors correlated with who gets to decide to what extent? Is there a systematic difference in the institution, if different roles take part in the decision-making?
2. Does the analysis allow us to specify models for IT governance which are working regardless of strong personalities?

To determine the reduced set of relevant factors two principal component analyses (PCAs) and two factor analyses (FAs) were conducted. Finally, a reference model with typical constellations as alliances between the decision makers was derived.

2. Methodology
Web-based questionnaires were sent to representatives of all institutions of higher education in Germany, asking about basic statistics, the implemented governance model, and estimates of the functioning of IT using sliders. For the CIO study 2017 in Germany, 32 representatives of higher education institutions participated. They categorised their governance model and gave estimates of IT-relevant topics. After a plausibility probe 28 data sets were used for further analyses.

Following Weill and Ross we distinguish five domains of decision-making: IT strategy, IT architecture, IT infrastructure, IT applications, and priority and budget [WR4]. The suggested archetypes for decision makers can be matched with the persons involved in the decision-making process in an institution for higher education: the executive committee, vice president, head of administration, CIO, head of the IT service centre, heads of other administrative departments, IT board, and deans of departments [LW14, HWHL16].

The number of decision makers per domain defines their share in this domain. Added up, the shares over all domains identify the importance of each decision maker. The share of one decision maker is calculated as: $S_{\text{Maker}} = \text{Sum of all } D_{\text{Domains}} \left( \frac{\text{Participation}_{\text{Maker}, \text{Domain}}}{\text{Number of Decision Makers}_{\text{Domain}}} \right)$. 

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These shares were combined with two selections of different variables. The first set contained questions around aspects of size, cost, stability, de-/centralisation, projects, and goals. The second set contained variables connected to service management, cost distribution, ratio of third party funding, and the focus of the institution on research or teaching and learning. For both sets, five factors were identified as suitable for the FAs based on the parallel method in the Scree plot. All factor loadings were Varimax rotated and are discussed if the absolute value is > 0.4.

3. Summary of Results

To summarize each factor with one sentence, we derive the following (sometimes overly pointed) statements: The components of the GCI are confirmed. Institutions with high shares of decision-making for the head of administration and the head of the IT service centre maintain several IT departments and expect more rising costs than others. Centralised IT services trigger expectations for stability, but the head of IT services loses influence on decision-making. Process orientation and information security is driven by a higher decision making share for the head of administration. Executives’ decisions go along with high expectations for creative solutions, but neglect project management for organisational changes. The VPs’ decision shares do not focus on the communication of IT service costs or cost awareness. The CIOs’ workload benefits service orientation and value of IT, which contradicts the classical offer-oriented data center-driven services. Having a powerful head of IT services goes well with a focus on research, but displays a lack of documentation for the decentralised IT services. Decisions by the executive committee are a way to secure funding for IT, which in turn does not result in a high workload for IT governance. Decentralized IT services are more expensive in the past and future, even without centralised IT budgets.

4. Typical Constellations

The factors in which several shares of decision-making appear in parallel allow us to understand the governance models already implemented in the addressed institutions (see Figure 1). The respective factors label the connections between co-varying decision shares. Alliances (vertical red connections) can be observed for co-varying factors with the same factor loading. Opposing decision shares are observed along the horizontal blue connections (contra-varying factors).

Figure 1: Opposing/- (horizontal) or supporting/+ (vertical) decision shares as derived from the two FAs.

5. Summary

Overall, these results confirm the use of modern management methods by well-known IT frameworks like Cobit, ISO38500, ITIL and others. This means that institutions of higher education, even though their internal proceedings seem often rather complex, can in fact be led with the support of these concepts. IT governance, in the meaning of managing a system of systems (SoS), can dissolve the discrepancy between central regulation and decentralized autonomy, if this governance really leads and is not mixed up with mere micro-management. Decision-making power with validation for the entire institution has to be tied purposefully to roles; in an ideal case, this will result in improvement in service management and financial stability for IT.
6. References


7. Authors’ Biographies

Dr. Markus von der Heyde received his PhD in Computer Sciences from the University of Bielefeld for his work at the Max Planck Institute for Biological Cybernetics Tübingen in 2000. His approach is to adopt biological principles into distributed computer applications in order to enhance stability and robustness. Since 2004 he has worked within ZKI on topics such as information security, service management, strategy and governance. From 2003 to 2011 he was ICT director of Bauhaus University in Weimar. Since 2011 he has been a management consultant specializing in IT topics in higher education. In cooperation with various partners he has conducted the German CIO studies since 2014. He supports ZKI, GI, EUNIS and EDUCAUSE, and serves as a program committee member as well as a proposal reviewer for conferences and the scientific community. See more details on https://www.researchgate.net/profile/Markus_Von_Der_Heyde3.

Prof. Dr. Andreas Breiter is Professor of Information Management and Education Technologies at the University of Bremen and Scientific Director of the Institute for Information Management Bremen GmbH (iifb). His main areas of expertise are IT Management, IT Service Management and IT Controlling, Information Management in Education, E-Learning platforms, and Mediatization. He is also a member of working group 3.7 (IT in Educational Management) of the International Federation of Information Processing (IFIP), and a member of the Association for Computing Machinery (ACM). See further details on https://www.researchgate.net/profile/Andreas_Breiter.
Dr. Jörg Hofmann received his PhD in 2013 from the University of Bremen. Based on a case study he prepared solutions for grading and examination management which is shared between two or more universities. The objective was to develop a reference model to structure the complex processes and to provide solutions for grading and examination management.

Since 2005 he has worked on topics such as inter-university information systems, campus management, interoperability, standardization, IT service management, privacy and strategy.
Governance framework for digital transformation in higher education

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Keywords
Digital transformation, Higher Education IT, IT capabilities, IT governance.

1. SUMMARY
In most business sectors, the role of information technology is rapidly changing from a supporting function into a strategic asset, and higher education is no exception. Information technology can be used almost anywhere in an organisation and, consequently, a common approach for addressing digital transformation is to structure it as a collection of business capabilities across the board. This way, the organisation can adopt digital concepts without the bias of single digital programme or a narrowly managed digital slice of the business.

While business capabilities can provide structure and clarity to the implementation projects, there is an element that hasn't been addressed sufficiently: IT governance and decision-making in the digital world. Complex sectors, such as higher education, cannot continue with traditional IT governance practices if they want to reach the full potential available through digital transformation.

In this paper, we propose a governance framework to address the underlying complexities of the digital world. The idea is to group digital capabilities into four clusters with sufficiently similar governance requirements. The technical cluster combines the IT infrastructure and similar new capabilities under a governance style that is close to existing IT practices. The mainstream digital cluster consists of capabilities that form the organisation's official digital agenda, and the governance model is often driven by business growth and differentiation. The evolving digital cluster represents non-mainstream capabilities with the potential of moving into the core business, and the governance style is often similar to project or programme governance. Finally, the opportunistic cluster represents the first stage of the digital innovation pipeline and is a critical element for those organisations that are using digital transformation for their competitive advantage.

We present the governance framework through examples from the higher education sector. While the model has been designed with this sector in mind, it can also be used in other similar complex and multifaceted organisations independent of the underlying business.

2. GOVERNANCE FRAMEWORK FOR DIGITAL TRANSFORMATION
To support the complex nature of digital transformation, we propose a governance framework founded on digital capabilities. Capabilities are grouped into four clusters based on their similarities on governance requirements. To measure this, we use two dimensions: the amount of external focus as opposed to internal focus, and the degree of transformation as opposed to business-as-usual. Figure 1 illustrates the approach.

The first group, the technical cluster, is created around traditional IT capabilities. The aim for this cluster is to operate and develop the digital infrastructure, and the usual driver for these capabilities is to look for value for money. In addition to traditional IT infrastructure, this cluster often contains digital enablers that are best managed through a similar approach. For example, the cyber security capability is usually part of the technical cluster even if its visibility has grown significantly due to the increased digital exposure of the organisation.

The second group, the mainstream digital cluster, combines capabilities that aim at implementing the organisation’s official digital agenda, often derived from the main strategy. The primary value
driver is either business growth or differentiation. This cluster is typically populated by several obvious digital initiatives and related capabilities, such as supporting automation and self-service in administrative processes or enabling the use of common cloud services like Office 365.

Figure 1. Four capability clusters for digital transformation.

The third group, the *evolving digital cluster*, is used for turning non-mainstream prospects into core business. This cluster is an essential part of a transforming organisation using technology as a source of growth and change. The value of these capabilities is usually found in innovation and differentiation - the value-for-money aspect is often missing, at least initially. The most popular approach is to address these capabilities through a project organisation. Once mature enough, some of them may enter the mainstream digital cluster, but others might stay in this cluster and remain in use only for a small part of the organisation.

The fourth group, the *opportunistic cluster*, consists of capabilities that need more exploration before they find a proper place in the big picture. In a developing organisation with a continuous inflow of new capabilities, this cluster represents the first stage of the innovation pipeline. The value for these capabilities is often in the growth of the organisational knowledge, and many of them are relatively short-lived. The important thing is to be able to identify and develop those capabilities that may bring value beyond the initial exploratory phase.

3. REFERENCES


4. AUTHOR’S BIOGRAPHY

Pekka Kähkipuro is Chief Information Officer at Brunel University London since 2016. He is heading the Information Services Directorate responsible for ICT, Media, and Library services. Prior to joining Brunel, Pekka was Director of IT at Aalto University in Finland in 2010-2016 and, before that, he held various senior roles in the private sector including Nokia. He was EUNIS board member in 2011-2015 and the President in 2015. Pekka obtained his Ph.D. in computer science from the University of Helsinki in 2000.
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Title

Enabling the structures of Digital Pedagogy

Key Words


Abstract

How can University IT leaders working to enable the structures of digital pedagogy and digital service transformations, provide boundary spanning institutional leadership while at the same not stifle creative and innovative approaches to new technology?

Can a University IT strategy be constructed that sets out an innovative approach to the digital but still endorses the nature of digital technology as applied within a University setting and also fully recognise the transformative and the disruptive nature of new learning paradigms.

Session Description

The University IT leader sits at the periphery of the activity of academic staff but has a great deal of influence in how University wide systems can be adapted and utilised by academic staff, students and support staff. It is key that careful consideration of all users within the scale and scope of any IT or digital strategy is genuinely given by those leading the organisation.

It is also clear that strategies need high-speed adoption, clarity and agility to adapt with the times. The session will explore various strategies that have been used at the University of the Arts London to break down barriers, increase participation and discourse while still maintaining the underlying ethos of education, creativity and freedom of expression.

Session Participant Engagement Strategies

A greater insight into the strategic decision making process and to highlight the need for significant change in the way in IT professionals are approaching the core function of the University. The session will be both presentation and active engagement.

My proposed presentation will explore various strategies that we have used to move from being a traditional and static University IT Department to a University wide function involved in almost all digital based activities across the University. There is an on-going reshaping of the role of the CIO and IT Director in Higher Education, it’s no longer the case to be able to manage a complex IT enterprise. I strongly believe that it has become key to understand the University within the wider context of learning and teaching, social, economic and political values.

University IT services have to go where the pedagogy leads, this may well be uncomfortable but it is an essential element of the current pace of change in learning and social practice. Understanding pedagogic principles for a University CIO is an essential as understanding a WAN.

Change is apparent within University IT in Higher Education, some CIO’s and University IT Directors have embraced this change while others have stayed firmly within strict traditional parameters of activity. Leadership that spans all University areas of activity is now an essential pre-requisite for a CIO.

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As the core University IT service become ever more reliable and resilient then the function of the IT Department comes into question. Instead of becoming a Department where innovation and enablement is normal the IT department could become nothing more than an autonomous monitoring function.

I see my role as enabling the use of Digital Technology throughout the University, this of course extends into Learning & Teaching. It is vital to move beyond the narrow structures and processes that encumber IT in a University setting and be a key enabler of all digital activities and service transactions across the University. This in turn requires a mind-set change and a new generation of CIO’s who are fully engaged with the primary function of a University and see their role as highly informed across all aspects of the learning organization.

Author Biography

Jim Nottingham is the Chief Information Officer at the University of the Arts London. Ual consists of 6 world class Colleges of Art & Design, the Colleges include; Camberwell College of Arts, Central St Martins, Chelsea College of Arts, London College of Communications, London College of Fashion and Wimbledon College of Arts. The Colleges currently occupy 19 sites across London. UAL has over twenty thousand full-time students and over twenty-five thousand part-time students.

Jim holds a BA degree from Loughborough University and an MFA from Louisiana State University. Jim is a Charted IT Professional and is a member of the Gartner CIO Academy and the Entrepreneurial University Leadership Programme. Jim has over 30 years of experience of working in Higher Education in many different roles including teaching.
Digitalization of Higher Education
from an Academic’s Point of View

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Keywords
Digitalization, Qualitative Study, Higher Education, Teaching

1. SUMMARY
It appears to be just a matter of time until the digital transformation fundamentally changes university life. University IT centers will face challenges in all fields of activity and beyond. On the one hand, infrastructures and services have to be adapted to fulfill new demands expressed by different stakeholders, including researchers, lecturers, students, and administrative staff. On the other hand, stakeholders have to be informed about existing possibilities opened up by digital tools. Both aspects necessitate an examination of the stakeholders’ perspectives on digitalization in higher education. In this study, focus group interviews with lecturers were conducted to gather information on the status quo of digitalization in teaching and identify room for optimization at Münster University. The lecturers’ experiences and suggestions demonstrate that an improvement of the IT infrastructure and equipment is only secondary. Instead, a centralization of information and expertise in the field of digital teaching is required. Academics wish for a “center for digitalization” which they can contact for information and practical advice on existing IT services, for counseling on digital teaching concepts, and for support in the implementation of new digitalization ideas.

2. BACKGROUND
Most scientific studies that broach the issue of digitalization in higher education place emphasis on the situation and opinion of students: their needs, expectations, experiences, usage behavior, preconditions, etc. (Conole, Laat, Dillon, & Darby, 2008; Dahlstrom, 2015; Henderson, Selwyn, & Aston, 2015; Selwyn, 2016; Wilms et al., 2017). But as Cope and Ward (2002) point out, not just the students’ but also the lecturers’ perspective is important. A digital transformation in teaching would affect their everyday work and job requirements dramatically. Therefore, this explorative study aims to give first insights into the academics’ perspective on the digitalization of higher education, focusing on the following research question: From the lecturer’s point of view, to what extent is teaching in higher education already digitized and which improvements are needed? In combination with our previous study (Thoring, Rudolph, & Vogl, 2017) which centers students it also serves as a starting point to describe a full picture of different expectations, needs, concerns and obstacles as to the digitalization of teaching and learning.

3. RESEARCH DESIGN
For our first study in 2017 (Thoring et al., 2017), we conducted focus group interviews with students. As the method had proved successful and comparable results were desired, we only made minor adjustments for this follow-up study and adapted the existing interview guideline to the situation of lecturers. The survey included two 1.5-hour guided focus group interviews which took place in December 2017. The conversations were recorded and transcribed. Subsequently, the data were cleansed and structured. Significant statements were extracted and clustered into subject areas.
4. FINDINGS

Status Quo of Digitalization. There is a general uncertainty about what exactly a digitalization of teaching means and most participants see themselves as pioneers who have entered largely uncharted waters. The majority of their colleagues, however, is more reluctant or even opposed to digitalization, because of nescience, insecurity, ignorance or simply a lack of time. The participants agree that the digitalization affects all aspects of teaching, including lectures, material distributions, assessments, course evaluations, and administrative tasks. Lectures with PowerPoint presentations are still standard, but video content, audience response systems and digital devices have been adopted by many lecturers as well. When it comes to lecture materials, PDFs are an established format for lecture notes and literature which are distributed either via the university’s e-learning platform or via the department’s website. E-assessment is of little importance in most disciplines, while course evaluations are mostly digitized. Administrative tasks are performed very reluctantly, because most bureaucratic processes are only partially digitized. Overall, the status quo of digitalization is described as heterogeneous, depending on the particular task area, on the one hand, and on the department, the chair and the lecturer, on the other.

User Experiences with University IT Services. Discussing relevant university IT systems and services, the participants primarily mention the e-learning platform Learnweb and the exam registration system QISPOS. Rather new offers such as the cloud storage service sciebo and the audience response system ZIVinteraktiv are discussed as well. The participants are satisfied with the Learnweb which they primarily use to distribute lecture notes and literature. QISPOS, on the other hand, is criticized in many ways and cited as an example for complicated administration tools and laborious bureaucratic processes. The university cloud-service sciebo has been adopted by the majority of the participants and generates a high level of satisfaction. As regards audience response systems, various applications have been tried by the participants, but the university's app, ZIVinteraktiv, is widely unknown and perceived as limited in its functionalities. In summary, the discussion revealed that the users’ experiences are ambivalent. To improve the current situation, they would highly welcome an elimination of parallel structures and media disruptions as well as a reduction of bureaucracy.

Improvement Opportunities. A digitized university is not equivalent to a virtual university but definitely implicates significant changes in teaching, according to the participants. These changes should be reflected in the university’s strategy and structure in form of incentives and a central point of contact, information and practical support. These expectations already go beyond the students’ picture of a digitized university which is rather pragmatic (Thoring et al., 2017): Students do not ask for a fundamental change of teaching and studying, but prioritize an integration and standardization of existing IT services.

5. CONCLUSION

Lecturers describe the status quo of digitalization at Münster University as very heterogeneous, depending not only on the department, the chair and the individual lecturer, but also on the task area - an observation which is generally in line with the students’ experiences (Thoring et al., 2017). However, students have a rather conservative opinion as to a digital university and understand digitalization primarily as the digital provision of lecture notes, the digital organization of their studies, and online interaction possibilities (Thoring et al., 2017). Since these basics already exist, their discussion of improvement opportunities centered on the optimization and technical integration of existing IT services. They do not expect a digital revolution of teaching and studying but a smooth digital evolution. Due to their comparatively progressive attitude, the questioned academics, on the other hand, discussed strategical and structural changes that would facilitate a digitalization of teaching and enable new teaching formats. Their vision is much closer to a reformation of university teaching. In consequence, they do not primarily request an improvement of the IT infrastructure and equipment, but a clear direction of the university and a centralization of information, knowledge and expertise in the field of digital teaching. A “center for digitalization” could bring together relevant players, including IT professionals and didactics experts. Nonetheless, a digitalization of teaching is not seen per se as the future of teaching, but rather as a means to an end. To academics the basic question is: What is the best way to teach our students in the future?
6. REFERENCES

7. AUTHORS’ BIOGRAPHIES
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Building Data Science Capabilities into University Data Warehouse to Predict Graduation

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Keywords
educational data science, institutional analytics, business intelligence, data warehouse, predictive analytics, graduation, time-to-degree, GDPR

1. Summary

The discipline of data science emerged to combine statistical methods with computing. At Aalto University, Finland, we have taken first steps to bring educational data science as a part of daily operations of Management Information Services. This required changes in IT environment: we enhanced data warehouse infrastructure with a data science lab, where we can read predictive model training data from data warehouse database and use the created predictive models in database queries. We then conducted a data science pilot with an objective to predict students’ graduation probability and time-to-degree with student registry data. Further ethical and legal considerations are needed before using predictions in daily operations of the university.

2. BACKGROUND

To use the growing amounts of data in higher education, we need IT infrastructure that supports different kinds of analytical activities. Usually the IT infrastructure consists of a data warehouse and business intelligence tools. Methods in business intelligence are usually simple operations, such as cross tabulation, sums, averages and percentages.

More advanced methods (statistical modeling and machine learning) have not traditionally been a part of business intelligence. The term data science has been used instead, meaning combination of domain knowledge, statistics and computer science (Figure 1). Piety, Hickey and Bishop (2014) suggest using Educational Data Science as a general term when dealing with questions of using analytical methods with educational data. Other concepts considering analytics in higher education setting are Institutional Research and Institutional Analytics (see e.g. Saupe 1990).

Figure 1. The Data Science Venn Diagram (Conway 2010)
3. DATA SCIENCE LAB AS A PART OF THE DATA WAREHOUSE

We suggest, that in an IT infrastructure optimized for institutional analytics and educational data science, there should be

- access to organizations own data (e.g. data warehouse)
- access to internet to get data from public sources
- several data processing, analysis and visualization tools to choose from
- a programming environment (e.g. R and Python)
- enough computing resources to do heavy calculations
- a process to integrate data science projects’ results into existing data infrastructure (e.g. write predictive models into data warehouse)
- a process to ensure that data privacy is not violated

We created such infrastructure at Aalto University by enhancing Data Warehouse with a Data Science Lab (Figure 2).

![Diagram of Data Science-enabled Data Warehouse Infrastructure at Aalto University]

Figure 2. Data Science-enabled Data Warehouse Infrastructure at Aalto University.

4. PREDICTING GRADUATION

As a pilot project for the data science lab, we predicted Aalto University students’ graduation probability and time-to-degree in semesters using logistic and linear regression. 19.5 % of students’ graduations were predicted correctly when rounded to full semesters. On precision of +/- 1 semesters and +/- 2 semesters, the percentages were 54.9 % and 78.9 %, respectively. Accuracy could probably be increased by adding more predictor variables and using more advanced data science methods. Further ethical and legal considerations especially regarding EU GDPR and student consent (see e.g. Sclater 2017) are needed before using the predictive models in daily operations.

5. REFERENCES


6. AUTHORS’ BIOGRAPHIES

Joonas Pesonen received his Master’s degree from University of Helsinki in 2013, majoring in mathematics with minors in education, psychology and computer science. During 2012-2017 he worked at CSC - IT Center for Science, building Finnish national education data infrastructure in close cooperation with Ministry of Education and National Agency for Education. In 2017 he co-founded Rapida Ltd, a company specializing in educational data science. His personal key competency areas are learning analytics, data visualization, data architecture and mathematical modeling.

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From idea to practice. The realisation of quality management in cross-institutional support structures

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Keywords
Quality management, digitalisation, support and service, collaboration, transformation, communication, professionalization

1. Summary
The European Bologna process and the digital transformation in worldwide teaching have prompted RWTH Aachen University to implement a new campus management system (CMS) and a new modernised e-learning system (LMS). The interaction of these two systems covers the entire student lifecycle process. The CMS represents planning, administration, organisation, and e-learning for supporting the essential teaching procedure. Thus, these two systems are of fundamental importance for the digitization of teaching. This leads to essential changes in support, service and communication processes and structures. Such a far-reaching system transformation with massive changes in the administration and teaching processes of a university must inevitably lead to major changes in support, service and communication processes.

2. Motivation
Starting from winter term 2018/19 or summer semester 2019 both systems have to be used by all students (~44,500) and most of the RWTH Aachen University staff (~9,200).

In a pilot phase students and lecturers of two pilot degree programs are already organising their studies and teaching via the new CMS. In addition, a number of university administration departments are also using the system for exam administration and modelling of exam regulations of these two pilot degree programs. In the subsequent phase, which started in January 2018, both (prospective) students and employees are using the new system for managing applications and fees.

The e-learning project is divided into three phases. In the first test phase, a new standard LMS for 14 courses will be offered to selected pilot users. In the next phase, pilot users of about 25-30 courses will get to know an already adapted LMS. In the final 2nd pilot phase, a complete faculty with ~145 courses is planned to present the almost completely designed and adapted LMS. Some CMS pilot degree lecturers are also using the pilot version of a new LMS.

A strategic goal of the university management is to increase the competitiveness of the university by promptly implementing both systems as it will simplify the complex student lifecycle process and make teaching more attractive.

In addition to the technical challenges arising from the introduction of a new system and platform, there are numerous organisational and procedural changes. Different ways of working, varying departmental structures and individual process understandings of those involved make establishing a standard for processes, communication and documentation challenging. Quality-assured support and service for users of the system is thus difficult to implement.

It is crucial to meet the user’s needs by setting up integrated support and service structures. The application and support of these two new systems will lead to significant differences and strategic challenges in the development and establishment of new modernised support and service structures.
3. Background Story

As a central IT service provider of RWTH Aachen University, IT Center employees are also involved as project members in university-wide projects and are responsible for the technical implementation. Due to established service management structures and many years of experience in 1st level support, the IT-ServiceDesk is increasingly being integrated into these projects. In 2016 the IT-ServiceDesk obtained ISO 9001:2015 certification. This affirmed the 2016 decision for the IT-ServiceDesk to take over 1st level support of the university-wide research data management as single point of contact for RWTH staff.

Based on the experiences of the project “Eduroam Devicemanager” with the Research Centre Jülich, processes and competences evolved which enable the IT-ServiceDesk to support cross-institutional projects in the context of 1st level support in a quality-assured way, both in terms of work organisation and in dealing with other working cultures.

This is the context in which the IT Center management decided to include the IT-ServiceDesk in the strategically important and university-wide projects "Introduction of a new campus management system" and "Introduction of Moodle as a new e-learning platform".

Both projects affect approximately the same number of users and are comparable in complexity and strategic importance for RWTH Aachen University. This is substantiated by the fact that both project groups are composed of numerous members coming from different areas of the university.

Based on the very similar project constellations described above, the following comprehensive questions arise:

- Can these two projects really be compared?
- What influence do the actors in the different working environments and cultures have?
- Can standardized processes be developed that can be transferred to other inter-institutional projects in the future, e.g. national high-performance computing?
- Or does it have to be accepted that the differences between institutions, structures and people are so fundamental that the desire for standardized processes can possibly not be implemented, or only in parts?

The focus of this presentation is based on a comparison of the two projects with special regard to the development and implementation of cross-institutional support structures. The different organisational structures, working environments, employee cultures and the influence of different educational levels of the collaborators will be discussed. Furthermore, an attempt is made to provide possible answers to the questions listed above.

4. Authors’ Biographies

Sarah Grzemski M.A. studied Economic Geography, Economics and Geography. She received her Master’s degree from RWTH Aachen University in 2002. Until 2007, she worked as a research assistant in the Department of Economic Geography of Services. Her main research focus were employees in call and service centers. Since 2007 she has been working for the IT Center of RWTH Aachen University. Initially, she worked for the division of Process IT Support. In 2010 she became division head of the IT-ServiceDesk. She was appointed to the position of chief communication officer in October 2017 and is responsible for the internal and external communication of the IT Center.

Ingo Hengstebeck M.A. studied Technical Communication. He received his Master’s degree from RWTH Aachen University in 2009. Until 2009, he worked as an employee at the IT Center. Since 2014 he has been the deputy division head of the IT-ServiceDesk. His work is focused on quality management, process management, and communication in the field of user support.
GEER - Global Edtech Evaluation Repository

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Keywords
Edtech, Evaluation, Collaboration

1. ABSTRACT

In a world where Edtech solutions are flooding our world and enterprises and universities alike needs to be agile, the strain on organisations working with technology enhanced learning is ever increasing. To cope with this, many universities have created processes of evaluating and implementing Edtech tools.

Many institutions world-wide have more or less ambitious programmes to evaluate and pilot tools at their universities. On occasion the methods of assessment are shared. To support a greater level of sharing, GEER is introduced.

GEER wishes to be an organic concept. This means that, rather than finding and deciding the optimal process, this will evolve through input from institutions all over the world. GEER focuses on collaboration. It is is a community building affair and its success is directly linked to strength and reach of the network of institutions.

2. The GEER Project

The project, initiated by Johan Bergström Umeå University in Sweden and Anastasia Morrone Indiana University in 2016, proposes an alignment on selection and assessment processes as well as output. By creating a community of institutions that share their efforts and outputs we can achieve a circle of trust in which the output and methods can be published. With a high level of trust, we can then scale this globally. A repository of previous and current Edtech tool assessments can be distributed to other organisations.

GEER has been presented and discussed at several international conferences. Based on these discussions a few clear questions that anyone looking to do an evaluation project at their institution would ask themselves.

The ambition is to aggregate and make use of good practices around the world. There are a lot of good initiatives out there and this an attempt to leverage these.

The proposed content that could be shared are:

- Has anyone evaluated tools of type X?
- Has anyone evaluated tool Y?
- How was evaluation Z conducted?
• Process
• Instruments
• Output
• Assessment

To get a hold of this content and structure it accordingly, a platform that is easy to on-board and contribute to is required.

3. The Product

The tool should first and foremost be used as guidance rather than a definitive instrument. Two basic uses were identified.

• As help when you must make your own evaluation on the same type of tools
• Understanding what other institutions thought about a specific tool.

There are concrete hurdles that needs to be solved:

• The challenge of finding ways to assemble and categorize content to be able to filter a search output.
• It is important to use an easy model for content creation. We want to get as much content as possible without deterring people to do so. To achieve this, we should try to use as few input variables as possible.

The suggested variables at this point:

<table>
<thead>
<tr>
<th>Context</th>
<th>What university, date, contact info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goals/challenges</td>
<td>what has been evaluated, what was the goal of the evaluation.</td>
</tr>
<tr>
<td>Instruments</td>
<td>Rubric/criteria, Survey tools, who was targeted (staff, faculty, students, etc)</td>
</tr>
<tr>
<td>Results and decisions</td>
<td>What did the eval amount to? What was the end decision?</td>
</tr>
<tr>
<td>Lessons learned</td>
<td>Any comments that could be made. Different approaches, what went wrong, good etc.</td>
</tr>
</tbody>
</table>

To assess the validity of these variables we need to build a community of institutions and individuals and test them on as many institutions as possible.

4. The Benefits

The premise of the initiative is based on the need for universities to make swift, sound and evidence-based decisions on what Edtech to use and choose. One of the initial ambitions has been to find a way to let institutions run the evaluation process with the same level of quality output. This last part is perhaps the most important aspect. By sharing instruments and processes, enhancing and redistributing them the overall value for students and teachers should be achieved.
To an institution already having extensive processes, instruments etc, the knowledge that your content and tools are being used is hopefully of its own value, however if an institution actually uses them, comments or even enhances them but tweaking the tools something is given back.

To an institution without any tools in place, the benefits are quite obvious. Consuming good practices from different peers globally would potentially kick-start evaluation practices.

Edtech providers are also benefited from this. There is a possibility to collaborate with companies. A repository like this could provide insights that would otherwise be hard to come by.

5. Current state

5.1. Mock-up

The project have been trying to explore different means of interaction with a possible solution. A mock-up of what a tool could look like has been made and presented at different events.

Fig 1, Search page
Fig 2, Browse by Tool, Type of tool or Institution

Fig 3, Evaluation details
5.2. Data collection
The biggest challenge to overcome to be successful is to be able to collect, structure data that can be shared. An unorganized set of information will not be of any use to institutions. This coming fall a more focused work will be done to assemble content from around the world and more importantly try to categorize the information into a searchable form.

6. Call to action
As with any collaborative project the quality is based on the network of individuals, both the size but also the willingness to contribute. There should be enough information out there to get this initiative flying, but to do that we need to grow the community.
7. AUTHORS’ BIOGRAPHIES

Johan Bergström, Msc Computer Science, is working as an International Business developer for ICT Services and System Development (ITS) - Umeå University. Johan was the congress organiser of the 20th annual EUNIS congress in 2014. Johan is a co-founder of the GEER Project. https://www.linkedin.com/in/johanbergstrom

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Chris Willis, B.A. in Psychology. Master’s in Public Administration and an M.A. in Survey, Master’s in Education. He is the Coordinator, Learning Analytics and Assessment at Distance Education and Learning Technology Applications (DELTA), in the Office of Planning and Assessment.

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Data-driven indicator classification and selection for dynamic dashboards: The case of Spanish universities

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Keywords
KPI classification, KPI selection, Dashboard design, Data-driven design, Spanish universities KPI

1. Summary
In the context of business, dashboards are visual tools that display the most important information about the organization needed to help the top management to make decisions. Since it is important to just provide the relevant and objective-oriented information, the number of indicators included in the dashboard must be kept at minimum. Therefore, the crucial aspect when designing dashboards is the selection of the suitable Key Performance Indicators. To help to carry out this task, we propose a classification and selection methodology, based on the values of the own indicators. This methodology is performed in two steps: the classification of the indicators in three categories (emergent, hot and consolidated indicators) and the selection of the suitable KPIs based on the organization strategies. To illustrate this method, we present a practical case of indicator classification and selection for Spanish universities based on the extensive UNIVERSITIC report.

2. STATEMENT OF THE PROBLEM AND BACKGROUND
A dashboard is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so the information can be monitored at a glance (Few, 2006). The main objective of a dashboard is transforming data into information and turn this into knowledge for the business (Eckerson (2010)). For the dashboard to be effective, it must be oriented to achieve specific objectives, fit on a single screen, present updated information, understandable at a glance and specifically tailored to the users requirements (Few, 2006).

Selecting the KPIs that take part in a dashboard is not an easy task. In most cases this task is manual and specific to a particular case. However, there are some research projects that seek to formalize this process: the model-driven dashboard design technique of Chowdhary, Palpanas, Pinel, Chen and Wu (2006); the description language used in a process-oriented dashboard design of Kintz (2012); and the selection of KPIs through machine learning techniques proposed by Keck and Ross (2014).

Our proposal is framed in the area of methodologies for classifying and selecting KPIs. Our final aim is to formally propose a data-driven KPI selection model that will produce more dynamic dashboards.

3. PROPOSAL
Organizations are increasingly collecting and storing a vast amount of data from all their constituent units. Once this information is formalized and measured, the list of indicators is usually too broad to be managed, as well as diverse, and heterogeneous. To select the most suitable indicators to be part of the dashboard, we propose two steps: classification and selection.

The classification is based on two variables: the age of the indicator and its evolution over time. The indicators are classified then into three categories:

- **Emerging indicators**: Those recently incorporated to the catalogue and still with a low value, but with considerable growth.
• **Hot Indicators**: Those that have an intermediate value, but follow a growing evolution.

• **Consolidated indicators**: Stable indicators, with a high value and with no space for growth.

The indicators can be represented graphically as in figure 1. The horizontal axis represents the moment when the measurement is made from the first time the indicator appears in the catalogue. The vertical axis indicates the value of the indicator relative to the maximum possible (percentage).

The indicators can be represented graphically as in figure 1. The horizontal axis represents the moment when the measurement is made from the first time the indicator appears in the catalogue. The vertical axis indicates the value of the indicator relative to the maximum possible (percentage).

**Figure 1. Proposed classification for indicators**

In figure 1 it is also possible to define roughly the bands in which the indicators of the different categories will appear. The slope of the curves and their position give additional information.

Once the indicators have been classified, we propose that the selection be made according to the strategies adopted by the organization.

To illustrate and validate the classification and selection method, we present a practical example on the UNIVERSITIC report (Gómez Ortega, 2016, 2017; Piriz Duran, 2015), which is a catalogue with more than two hundred indicators of the Spanish university system.

### 4. CONCLUSIONS

An indicator classification and selection method has been presented. As a result we have a list of indicators to be candidates for a dashboard based on the values that indicators take over time. This is what we have called data-driven KPI classification and selection. This proposal is performed in two stages: the classification and the selection of indicators according to their values.

The proposal is a first step to automate some stages of dashboard design. In the future, dynamic dashboards will be deployed, incorporating new emerging indicators and eliminating obsolete ones.

### 5. REFERENCES


6. AUTHORS’ BIOGRAPHIES

Rafael Molina-Carmona received his B.Sc. and M.Sc. in Computer Science from the Polytechnic University of Valencia, Spain in 1994, and his Ph.D. in Computer Science from the University of Alicante, Spain in 2002. He is a professor at the University of Alicante, and he belongs to the department of Computer Science and Artificial Intelligence. He is also a member of the Cátedra Santander-UA de Transformación Digital, devoted to explore new trends in digital transformation. His interests are mainly the applications of Artificial Intelligence to different fields: computer-aided design and manufacture, computer graphics, learning, creativity, information representation and IT governance.

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Findings of the Nordic Enterprise Architecture Cooperation

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Keywords
Enterprise Architecture, EA Meta model, EA modeling, Higher education institution, Nordic countries cooperation

1. ABSTRACT
This document describes the approach of establishing a pragmatic Meta model implementation of a “City plan” in cooperation between two Nordic countries describing the HEI services in accordance to a unified descriptive language and semantic vocabulary. It underpins the challenge to find a level of understanding, when describing organizational capabilities and the relation between academic model and the reality that exists in each individual HEI organization. The task to describe does not get easier as translations from original or natural native language to national translations and descriptions possess an additional barrier of conceiving that has to be mastered.

2. INTRODUCTION
The Nordic Enterprise Architecture Special Interest Group, in short NEA, was established out of the need to find synergy benefits in the HEI sector. Both the Swedish and the Finnish organizations had national plans to redesign a common student information system. The ambition was to tackle digitalization lifecycle challenge of students and administration with a modern Student Information System.

The discussion between the CIO forums recognized the potential to learn from the different approach of each country organization and an information exchange through lessons learned was initiated in 2014. What started as random meetings with simple topics of EA disciplines is now regular activities with yearly meeting and quarterly on-line session with a common agenda and specific questions to work on. The latest effort is displayed in this paper as a joint effort of cooperation.

3. NORDIC EA COOPERATION
The NEA group has built the knowledge transfer since 2015; covering simple topics of EA disciplines to pragmatic semantic vocabulary mapping that are interoperable between all HEI organizations. Other main topics covered during the past 3-year period have been, but not exclusive: (1) Interoperability through semantic tools (iow.csc.fi); (2) Integration patterns and practical documentation repositories; (3) IAM and federated trust models; (4) Master data models and Meta models; (5) EA maturity questionnaires and Peer review; (6) Discussion and building understanding on Capability and Business models and (7) Building a pragmatic Cityplan model and populating with live data.

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1 Known as NEA-SIG or NEA, participants are members of national special interest group in their own country. Chairpersons for each country take turns to lead the cooperation’s agenda.
4. **OUTCOMES OF THE COOPERATION**  
The cooperation has become a starting point for further work for both parties. E.g. from the Finnish part it has been noticed that they could have an option to use a business function element in their meta model and EA-repository. From the Swedish part, it has been a starting point to look at business functions and services at a more holistic view in the HEI sector in Sweden.

In future, we are looking for innovative practices to improve EA work in both countries and find solutions to integrate EA as a tool and method better into management and decision-making processes of the HEI organizations. One possible special task could be to benchmark our universities EA governance models.

5. **ONGOING WORK AND THE FUTURE**  
NEA has collected feedback\(^1\) from the group and listed the as simple bullet points: (1) Work on the service mapping will continue; (2) Merger of HEI - support for harmonization of School merger and faculties using EA; (3) Simplified model can help management to get the big picture in more detail but not overflow them with micro-level details; (4) Common taxonomy for Nordic use to populate the functional architecture and enhance it with business model approach; (5) Invite other Nordic countries to participate as the maturity to perceive and understand the subject itself is now reached and (6) EU GDPR - how to tackle the compliance issue from a lifecycle point of view and data handling descriptions. Displaying the functional capability view would expose the person data processing sweat spots.

The goal will be helping and supporting HEI organizations to reach the strategic goals and both benchmark and learn from each other. Meta models of HEI consortia helps us to understand the importance as a fundamental structure of modeling. However, Meta models do not need to be fully compatible in short term, but at least we have to understand why they are not fully interoperable.

Nordic EA co-operation is a platform for future HEI co-work of Nordic countries and alternatively also for other EU countries to join.

6. **LESSON LEARNED ABOUT WORKING BOTTOM-UP AND TOP-DOWN (NAT. LEVEL)**  
A significant difference between EA work in Finland and Sweden is that EA work in Finland is a requirement set by the government, as in Sweden, EA work is not required as a legal/administrative discipline and thus not coordinated in the same way.

To put it in a more simplified context: in the bottom-up view, you collect lot of details about your environment. Then you list and categorize them and every little detail is important. You face the problem not to see the forest for the trees. As with the top-down view, you see the big picture, but you cannot see the detailed trail that leads you out of the forest.

Common for both views is the need for pragmatic EA governance model. Neither top-down nor bottom-up working is a solution, if University organizations do not have approved EA governance model in use. Through this NEA cooperation, we have gained a common insight and are working on closing this gap.

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8. **AUTHORS’ BIOGRAPHIES**

**Patrik Maltusch** is the head of EA architecture team at Aalto University, Finland. He is also chairperson of the Finnish EA-SIG and one of the lead educators who have coached administration staff in the national Higher Education EA schooling program. Past experience, include working as a customer service instructor for nearly ten years and further fifteen years as network architect and business owner for internal infrastructure design in a global Telco company. Patrik is also a distinguished and accredited security professional, risk manager, system auditor and a certified Higher Education Enterprise Architect. As entrepreneur and start up facilitator, Patrik understands what staying practical means for business. For Patrik interoperability is the key to success in an ever growing and more complex and complicated ecosystem landscape. 

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Process Modelling as a Tool for Development and Communication

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1. SUMMARY
When starting to implement a new student information system, the Learning Services and IT Services in Aalto University decided to tackle the problem of varying administrative processes by mapping and modelling the processes related to studying and teaching. The aim was to obtain a means to communicate these differences and thus enable discussion and decisions needed to harmonize the processes. In the end, the process descriptions proved to offer several other benefits in development and communication across functions, as well. The most powerful use of the process map and process descriptions would be to combine them with other approaches that describe and analyze the current status and future development targets of IT systems and services.

2. BACKGROUND
The need for systematic modelling of the processes related to studying and teaching derived from a situation, where Aalto University was planning to take a new Student Information System (SIS) into use. The implementation was considered too complicated if the processes that it would support would not be carefully modelled, analyzed and harmonized.

3. OBJECTIVES AND SCOPE
For the immediate need in the implementation of the new SIS, the following targets were set for the process mapping and modelling:

- to identify the possibly problematic process phases in the study administration that vary too much to effectively utilize the new SIS
- to give a visualization to communicate these differences and thus enable discussion and decisions needed to harmonize the processes.

In a more general context, the following objectives were identified:

- to identify the different circumstances that require communicating and discussing services related to studying and teaching
- to support other methods and models that are used to describe the present state, development needs and future visions of services and the supporting IT systems.

4. FRAMEWORK AND METHODS
The Finnish national-level reference architecture for support services and administration for studying and teaching was used as the starting point for the process specifications and models. This reference framework has been put together by an expert group with representatives from different Finnish Universities and the work is ongoing. (KOOTuki, 2018) Process mapping and modelling were conducted on levels 1 to 3 according to the Finnish national-level set of recommendations for public administration (JHS, 2018). On the levels 1 and 2 the processes were modelled according to the Archimate notation (Archimate, 2018). On the level 3 the processes were modelled according to the

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BPMN notation (BPMN, 2018). All models were created utilizing the QPR Enterprise Architect modelling software.

The actual work was organized as practical workshops with representatives from all the six Schools of Aalto. SIS specialists from the Learning Services took the initiative to organize the work. In addition, a process modelling consultant facilitated the work and an IT architect documented the results.

5. RESULTS

From the first phase of the process mapping and modelling that had been carried out, the following immediate utilization potential has been recognized:

- Engaging actors from all Schools in the process modelling has been an internal learning process for all participants and it has been the starting point for harmonizing activities in different Schools and Programmes.
- The process descriptions have been utilized in several occasions as a tool to facilitate communication.
- Concentrating on the process modelling has shifted the main focus of conversation from single individual activities to the overall processes.
- The process descriptions have made it possible to evaluate and target the effects of the implementation of the new SIS.

As for the future potential, it has been anticipated that the process map and process descriptions could enable:

- enriching the enterprise architecture from certain viewpoints, because processes from different functions could be linked (e.g. processes in Financial Services and Learning Services)
- building a mutual framework for positioning further development projects in the Learning Services
- utilizing the lean model in recognizing and measuring loss and bottlenecks in processes
- building role-based views and services that collect the responsibilities related to different processes into a single user interface
- transferring from system-driven to customer-driven development model that emphasizes user experience and customer management prior to system selection
- communicating the ongoing development actions to other universities and service providers in an easy-to-understand manner.

6. CONCLUSIONS

Process modelling proved to offer useful support for different purposes from service and system development to communication and collaboration across functions. However, combining process modelling with other approaches that describe and analyze the current status and future development targets of IT systems and services would yield in benefits in a larger scale. An example of such combination could be e.g. developing a governance model according to SAFE 4.0 so that the development actions could be targeted to specific processes and the added value could be measured.

7. REFERENCES


8. AUTHORS’ BIOGRAPHIES

Annika Mauno (M.Sc. (Tech.)) is a project manager in the Learning Services, ICT for Learning, Aalto University. She is currently leading an implementation project of a new student information system in Aalto and working closely with the end-users to ensure a smooth transition from the current systems to the new one. Previously she worked as a system administrator and developer of students’ electronic transactions. Before that, she has gained over 10 years’ versatile experience in teaching, educational development and study administration, working mainly with international Master’s Programmes. Her main professional interests include lean process development in higher education and enhancing the end-users’ experience of student information systems.
Information Technology Governance for Tunisian Universities (ITG4TU): a real experience of IT governance framework capacity building from European Universities

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Keywords
IT Governance, ISO 38500, ITG framework, HEIs.

1. Summary
Information Technology (IT) are becoming an essential part of the business and boards are expecting value from it. However, the results are not always as expected so that they are realizing the necessity to govern IT. IT Governance (ITG) is a matter of each kind of business including universities but unfortunately, the adoption of best practices in order to conduct to good governance is still scarce. Regarding the three obstacles that obstruct the adoption of IT governance in universities namely ITG best practices absence, budget constraints and the inexistence of any method for implementing a framework, and mainly in developing countries like Tunisia, we have developed a project to provide them our expertise in implementing IT governance based on previous experiences but adapted to their specifically necessities and current situation.

2. INTRODUCTION
Nowadays, IT is present in almost every organization. IT is not only related to each activity developed for the business, but also has a significant impact on the success or failure of the business activities. Because of that, organizations are starting to take into account IT as a governance activity like other fundamental pillars of the organization (Juiz & Toomey, 2015). Thus, IT governance is the direction and control of current and future IT assets assuring the effective, efficient and acceptable use of it (ISO/IEC 38500, 2015). In fact, ITG permits an IT manager to focus on three essential requirements: reducing risks, controlling costs and extending the value of the information system (Tsai, Chou, Leu, Chen, & Tsaur, 2015).

In university settings, studies like (Creasey, 2008) discovered a positive relation between effective ITG and organizational performance in universities. As a consequence, ITG is key activity for universities (Khouja, Bouassida Rodriguez, Ben Halima, & Moalla, 2018). However, and despite the importance of the topic worldwide, with relevant actors like, for instance ISACA, the penetration of IT governance in universities is still scarce. In previous and recent studies like, for instance (Jairak, Praneetpolgrang, & Subsermsri, 2015), the three main obstacles in IT governance implementation in universities are 1) lack of clear ITG principles, 2) budget limitations and 3) lack of method for selecting the ITG framework. Problems in IT governance are not particular of a given country or continent. Therefore, we developed an innovative project to tackle the three obstacles by providing a set of experts from HEIs with previous experience on the topic, to implement an IT governance framework based on previous efforts, but also specifically designed for Tunisian universities.
3. THE ITG4TU PROJECT

This project is aimed to gather a set of researchers from four universities with a wide experience in developing and deploying ITG framework models from 3 different countries (Spain, Germany and Norway) to develop, adapt and test a new ITG framework to be implemented in four HEIs in Tunisia. Expected results of this project include a better governance model for IT in Tunisian HEIs as well as an overall modernization of the governance processes for HEIs and a contribution of the cooperation between EU and Tunisia. To achieve these aims the project were divided in different phases, each of them with the necessary activities for its completion.

4. IT GOVERNANCE FRAMEWORK FOR TUNISIAN UNIVERSITIES

The scheduled activities in the project were divided into three phases:

- The first phase consisted of the training of the stakeholders of the HEI, i.e. training on IT Governance. This part consisted of the following activities: in situ training for trainers, training for local entrepreneurs and training future researchers and professionals.
- The second phase was the definition of a framework for IT governance in the HEIs and its future implementation for Tunisian partners.
- The third phase consisted of the deployment of the IT governance framework previously planned and monitoring its results.

![Figure 1: Project phases](image)

Throughout the duration of the project and beyond it some dissemination activities were and are being performed to sustain the project in time, as shown in Figure 1. The idea is to assure that the mechanisms for assess the ITG situation are well implanted, so it is under the plan to maintain the communication with Tunisian universities to trace their activities and check if the proposed goals have been achieved. Furthermore, in the future an assessment of their new situation and the evolution of their ITG should be performed to study the impact of the project and the awareness of good IT governance.

5. REFERENCES


6. AUTHORS’ BIOGRAPHIES

Beatriz Gómez received the B.Sc. and M.Sc. degrees in Informatics on 2011 and 2013 respectively from the University of the Balearic Islands (UIB), Spain. Currently, she is Assistant Lecturer at the UIB teaching in the area of Architecture and Computer Technology. Before joining the Department of Computer Sciences of the UIB, she served for two years as an analyst and programmer and thereafter participated as an engineer and researcher at the chair Telefónica - UIB of Digital Health and Sustainable Tourism. She is member of the ACSIC research group (http://acsic.uib.eu) in the Department of Computer Science at UIB. Her research interests are mainly about IT Governance and eHealth. Currently, she is the project manager of both Erasmus+ KA2 projects IT Governance for Tunisian Universities (ITG4TU) and IT Governance for Albanian Universities (ITG4AU).

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The European Student Card project

Exchange of data between institutions and Services for the students in mobility

Keywords
Exchange of data; Student e-ID; Student services; student mobility; information systems; digital services; EMREX; EWP; Erasmus+; staff mobility; Bologna process; European Higher Education Area; social dimension.

Abstract
The presentation will trace the results of the project, already presented in the 2017 EUNIS Conference, and give a clear picture of the state of work and its success among the higher education institutions, as well as the perspectives of dissemination/generalization of the card. A presentation of the technical implementation of the exchange platform and the results of the first experimentations on different campuses, as well as the developments of the first priority services for the mobility: access and use of the university libraries, services with payment through electronic payment system, tools of digitalization of Erasmus+ partnerships for HEI and students.

Interoperability and digital services for the development of mobility of students and staff.

The unique European student e-ID and the student status recognition allowed by the European Student cards project is a major contribution to the development of the Student and Staff mobility in Europe. It will simplify the exchange of data between the institutions and open the access to services provided on the campuses in a social perspective, as it is a prolongation of the multiservices cards all across Europe, fruit of the partnership between higher education institutions and other main players, such as organizations of student services and local authorities. In France, the CNCE, Comité National Cartes Multiservices, has at the same time the mission of contributing to the rise of the Multiservices cards and the European Student card.

In a Europe stricken by different crisis – economic, terrorism, political - youth mobility and the European Student card brings strong answers proclaiming the student European citizenship with a common European logotype, with the access to services on campuses essential for the mobility of economically disadvantaged students, and at the same time more access and more control and security.

The European Student Card (ESC) is based on the recognition of the student identity and status regardless of institution, compatible with the existing specific procedures in the different countries and each HEI. The HEI go on manufacturing and issuing their own cards but offer for free to all their students an immediate European status.

The European Student Card is not a new card, it is simply your current campus card with a new dimension: European.

The pilot phase presented in this paper leads to the perspective of generalization of the European Student card with the political support of the different authorities: European leaders, European parliament, European Commission, Bologna Process and Bologna conference of Ministers (Paris May 2018), bilateral agreements such as the Franch Italian summit (sept 2017). In addition the political impetus, the growth lever, as it has worked for the Bologna process, will be the spontaneous subscription of the higher education institutions.

Presentation of the Main deliverables of the European Strategic partnership (2016-1-FR01-KA203-024084, co-funded by the EU): exchange platform, European student card numbers, unique
student e-ID, common holographic logotype, and the experimentation through real student mobilities testing the necessary adaptations on the campuses. Experiments carried out in Eucor, the European Campus the transborder cooperation groupment of the universities of Strasbourg, Mulhouse, Karlsruhe, Freibourg and Basel, and the Crous of Strasbourg and the Studierentenwerk of Karlsruhe. ; the Group Université de Bourgogne France-Comté and the Crous of Bourgogne-Franche-Comté (Dijon and Besançon), University College Cork in Ireland ; Campus Card Berlin (6 universities of Berlin) ; the Educatt network of 5 campuses of Universita Catolica in Italy.

Three working groups have been working with specialists partners on three services for mobility considered as priorities for the project: access and use of university libraries, access to electronic payment systems, digitalization of Eramus+ partnerships and mobilities thanks to a partnership with the Erasmus Without Paper project.

The list of services accessible through the ESC system is open and increasing and will be an essential dimension of the future of the implementation of the European Student Card. The coordination with the other projects, in particular Erasmus Without Paper and Emrex, co-funded by the EU and also based on a student e-ID will be reinforced in order to reach an integration and offer to the HEI in Europe a consistent range of services for mobility.

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Linnaeus-Palme in RAUK: Digitalization of student mobility grant management for HEIs in Sweden

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Keywords
Student mobility, student experience, global perspective cooperation, grant management, system integration (SI), administrative process automatization

1. SUMMARY

The Swedish Council for Higher Education (UHR) provides organizations in Sweden with the opportunity to participate in international exchanges and partnerships. Within the scope of the Linnaeus-Palme partnership and exchange program, Swedish universities and university colleges can apply for project funding. The objective is to establish long-term mutual collaborations and cooperation with HEIs in low- and middle-income countries. Integration of the global perspective can thus contribute to quality improvements in Swedish higher education. In this paper, we present the technical platform that facilitates the application and administrative processes and procedures involved.

2. BACKGROUND

UHR is responsible for the administration of the Linnaeus-Palme student exchange and mobility program. Linnaeus-Palme consists of two parts, namely, a planning part ("Linnaeus-Palme planering") and the actual exchange, partnership, and long-term co-operational part ("Linnaeus-Palme partnerskap"). The program is financed by the Swedish International Development Cooperation Agency, Sida, a government agency working on behalf of the Swedish parliament and government, with the mission to reduce poverty in the world and to contribute to implementing Sweden’s Policy for Global Development. Funding for planning is provided on a participant-related basis. Financial contributions for the partnership program are distributed on a flat-rate basis that is composed of different factors such as travel destination, travel costs, language training, etc. In both cases, applications and participating organizations’ reports need to fulfil the requirements for being eligible for funding by the program such as the structure of the cross-border partnership as well as the general compatibility with the program objectives and principles. The above-mentioned needs call for an adaptable, technical platform that is apt to implement diverging business logic for calculating grant amounts, while using the same architectural and design patterns for the mutually shared procedures.

3. GOALS OF THE RAUK PROJECT

The overall objective of the development project was to build a robust and scalable IT expert application and decision support system that would enable HEIs in Sweden to apply for funding within the scope of the Linnaeus-Palme partnership and exchange program, and further, mainly Sida-funded mobility programs. The internal interface and domain logic of the system needed to be designed according to the requirements of the complete business cycle. The latter includes client application, UHR-operated funding application administration and fund payments dispensation, client reports, follow-up, and application plus report business case closure, but - if need be - also organizational workflows concerning withdrawal of funding. The goal was to create a system that could describe all possible mobility scenarios, and could construct suitable data models for the
client data that UHR needs to capture, process, and store. Moreover, the objective was to produce an IT system where appropriate document formats for accessing and archiving data related to client applications for funding and travel reports could be created. Finally yet importantly, we wanted RAUK to take care of identity management with suitable security policy features as well as appropriate authentication and authorization methods.

4. RAUK’S SYSTEM ARCHITECTURE IN A NUTSHELL

The complete system was developed and programmed in ASP.NET MVC 5 C# (.NET Framework 4.5). A major division lies between the external, web interface client system and the internal, web interface administrative system layer used by managers and administrative staff. The underlying business logic is shared by both of these system parts. Read/Write I/O transactions are executed on to a shared SQL database. RAUK uses a code first approach with Entity Framework as the ORM framework of choice.

The system includes two external system integrations; to the accounting system Agresso, which facilitates payment transactions and refunds between UHR and institutions participating in the exchange program and to the web survey software Webropol. RAUK uses the latter for result reporting and aggregation of travels, collaborations, and cooperation activities. Support is also provided for evaluation, control and approval workflows as well as statistical analysis.

5. PAYMENT TRANSACTION HANDLING THROUGH SYSTEM INTEGRATION (SI)

RAUK handles payment transaction processes through its integration with the external accounting system Agresso. Export of imbursement data (client account numbers and related data) is triggered manually as this step also involves extra administrative surveillance and verification of the figures. Agresso imports these exported data on a daily basis. Next, the UHR corporate finance department initiates further manual and automated procedures, which facilitate funding payment transactions to eligible organizations. Similarly, client refunds that sometimes are necessary (and complicated) due to withdrawal of funding in relevant cases, e.g. owing to travel cancellations, are imparted between RAUK and Agresso through a mixture of manual and automated export and import routines. All in all, this solution allows for efficient administrative business processes in terms of cost and time while providing the best possible supervision and procedural safeguard.

6. LESSONS LEARNT, CHALLENGES, AND FUTURE DEVELOPMENT EFFORTS

Overall, the current implementation of the presented, in-house developed system meets the needs of HEI customers and administrative staff at UHR. The benefits can mainly be thought of in terms of introducing smart, secure, paperless, and digital workflows. Our agile development process has helped us in meeting changing and challenging requirements over time such as modifications in Sida budgeting and the need to reevaluate major business processes.

Concerning digitalization development efforts in the future, we envision on the one hand some extended CMS features. These can help exchange program administrators to work more efficiently while preparing updated information before a new grant application or report period opens. On the other hand, parameter-steered flexibility for designing/redesigning forms and underlying payment calculations for financial contributions are desirable future features of subsequent system upgrades. Another challenge we predict, might lie in future needs for the implementation of AI robotization and automation features with the aim to provide enhanced security, monitoring, and effectiveness in application and funding processing for student mobility in the scope of the Linnaeus-Palme exchange program.

7. REFERENCES


8. AUTHORS’ BIOGRAPHIES

Fei S. Roth holds a B.A. in English sociolinguistics and computer science obtained at the University of Gothenburg in 2014. She is a senior systems developer working at the Swedish Council for Higher Education. Previous work experience gathered at the University of Gothenburg 2012-2017 comprises participation in minor and major international and national projects such as DASISH, DwB - Data without Boundaries, ARIADNE, and Making Nordic Health Data Visible.

Fei’s major interests lie in solid and agile software development, machine learning, AI, big, open and linked data, metadata harvesting as well as research data curation, dissemination, and long-term preservation.

Reijo Soréus has been working at the Swedish Council for Higher Education as a technical application manager of the national Swedish admissions system for higher education since 2013 and has recently been appointed IT Architect at the Department for Systems Management and Operations. Previous experience includes technical application management of the Swedish national SIS Ladok and managing the technical sub-project of Ladok3 as well as application management at Ericsson Radio Systems.

Reijo holds an MSc in Engineering from the Royal Institute of Technology, KTH.
How to create an ecosystem for flexible education?

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Keywords
Flexibility, interoperability, standards, NGDLE, Digital learning environment

1. ABSTRACT

The ability for learners to match their education to their own ambitions, interests, talents and abilities and study in their own time, place and at their own speed and level is the cornerstone of sustainable and future-proofed learning ecosystems. This requires a high degree of flexibility from the construction of digital learning environments. To achieve this, various areas of interaction between systems within the education environment must be standardized and key components of these learning ecosystems must become interoperable. The processes, agreements, standards and responsibilities that must be defined in order to ensure that education ecosystems function optimally, can be easily distinguished along five levels of interoperability. This technological and good practices paper includes three international initiatives that illustrate and differentiate the different layers of interoperability and share the same goal: to create the right conditions for a flexible ecosystem in education to support truly learner-centric, modular learning environments.

2. FLEXIBILITY

Many education institutions, especially in higher education, aspire to make education more flexible and personal (Barber, Donnelly & Rizvi 2013). The freedom of choice in what and how students learn is vital to this flexibility and differentiation. Students should be able to match their individual ambitions, interests, talents and abilities to their education journey (Jonassen and Reeves 1996; Ertmer et al. 2012a). Furthermore, students should be able to study in their own time, location and at their own speed and level (Bok 2017).

With so many individual needs and wants, a flexible approach towards digital learning environments is paramount to allow teachers and students (a relative degree of) freedom to use what they believe is necessary to best support their learning processes (Anderson 2009; Ertmer et al. 2012b; Bates 2015). This in turn requires flexibility in the construction of the curriculum as well as in the digital learning environments that provide access to the curriculum.

Considering the rapid development of diverse digital solutions, each of which cover specific functions, and the ubiquitous nature of digital learning content, it is necessary to develop education environments that can accommodate the diversity of offerings and the rapid pace of change within the digital space (Dron & Anderson 2016). The need to consider educational functions such as assessment, accreditation, personalization, and analytics separately and yet have them interact and communicate with each other calls for an Ecosystem framework for Education.

These key requirements are supported through a modular approach to digital learning environments and futureproof learning ecosystems (Brown, Dehoney & Millichap 2015). By using a modular approach, an additional level of flexibility is assured by using a modular approach in that learners, teachers and institutions can exchange and add various services within their ecosystem without affecting all components. Furthermore, by providing a structured framework, developers can be assured that their products are interoperable with existing systems, authorizing bodies can ascertain adherence to required processes and laws, and users can profit from seamless user experiences.
With the goal of achieving the interoperability and standardization of educational systems, five distinct and essential levels of interoperability have been identified\(^1\). These levels of interoperability illustrate an holistic view of the processes and steps required to support the development of sustainable digital education solutions according to a modular and interoperable approach. The success of each layer of interoperability is dependent on the other layers also being implemented.

Legal interoperability, ensures that the legal frameworks, are in place to protect and foster best practice use of the education ecosystems. Organisational Interoperability of ecosystems determines the responsibilities of all parties involved for the processes required in implementing not only the legal frameworks, but the oversight and delivery of all layers of interoperability. Syntactic interoperability determines the exact format of the information to be exchanged in terms of grammar and format. The meaning of data elements and the relationship between them is defined as semantic interoperability. Technical interoperability covers the technical aspects required in ensuring that all modules and systems within the education ecosystem are able to accommodate the syntactic and semantic interoperability whilst also guaranteeing that the legal interoperability is assured.

**4. DIFFERENT APPROACHES**

All levels of interoperability must be taken into account in order for a modular approach to Digital Learning Environments (DLE) that support modular and flexible ecosystems to enjoy long-term success. Three specific initiatives within the EU will provide examples of approaches to undertaking the implementation of these layers of interoperability in their unique learning and political environments. In Germany, a lot of work is being done at national scale on the legal and organizational layers. In the Netherlands, the effort is organized on a national scale, choosing a generic approach for all institutions of higher education at semantic, syntactic and technical level. In Spain, the Open University of Catalonia (UOC) chose to collaborate with MIT to develop a concrete architecture at syntactic, semantic and technical level that can be used within the institution.

**5. CONCLUSION**

Each of the five layers of interoperability is key to the implementation and integration of learning ecosystems and must be taken into consideration. With three examples at various stages of development, it is possible to see how defining the different layers of interoperability can be crucial to enabling a modular and flexible approach to learner-centric DLEs. Although each example is unique, similarities can be seen in the processes of determining key focus areas and standards.

It is clear that NGDLEs will need to support the deployment and sustainability of individual and interoperable services. The syntactic, semantic and technical levels of interoperability are predominantly the focus of initial developments towards the implementation of such sustainable education ecosystems.

Believing that the future of learner-centric education systems will be modular and require a greater flexibility and interoperability, ensuring that all layers of interoperability have been addressed will lead to sustainable processes and intuitive and innovative learning environments rather than allowing interfaces and requirements to become a barrier to growth and educational design.

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\(^1\) This model is proposed by Beth Havinga (BfB 2018) and based on models employed in other EU countries.
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7. AUTHORS’ BIOGRAPHIES

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Marieke de Wit is senior project manager at SURFnet. She is responsible for the Digital learning environment project, in which she brings IT in education professionals together in networks and collaborative projects in order to support institutions with their developments on the digital learning environment. The last 7 years she was project manager of several innovation projects at SURFnet. Before SURFnet, Marieke worked at the Dutch ministry of economic affairs as policy advisor digital government. She holds masters degrees in business sciences (2002) and public information management (2007). https://www.linkedin.com/in/mvandevecht/

Jeff Merriman is DXtera’s co-founder and Chief Technology Officer. In his role as CTO, Jeff oversees technical strategy, design and development related to the DXtera consortium. Jeff’s career began as Director of Residential Computing at Stanford University in 1987, leading the effort to network all of Stanford’s graduate and undergraduate residence halls. In 1998 he became Director of Academic Computing Technology and began to widen his focus to include issues of educational software infrastructure. In 2000, he joined MIT as Senior Strategist for Academic Computing and served as Executive Director of the Open Knowledge Initiative. Jeff has also served on the Board or Directors of the Sakai Collaborative Learning Environment, and for the Learning Curve Consortium, facilitating educational technology for K-12. Currently, as Associate Director in MIT’s Office of Digital Learning, Strategic Education Initiatives, Jeff oversees Institutional and global projects, extending architectural approaches to educational innovation.
Mobility scenarios supported by the Erasmus Without Paper Network

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Keywords
Erasmus+, Student Information System, digital mobility, data portability, API, bilateral agreement, transcript of records, grade conversion, EWP Network, EWP Hub, EWP Competence Center

1. Summary

EWP (Erasmus Without Paper) is the European project co-financed in years 2015-2017 by the Erasmus+ Programme, Key Action 3 (Prospective Initiatives – Forward Looking Cooperation Projects). Funding has been prolonged by EACEA for years 2018-2020.

The aim of this paper is to show the state of development of the EWP Network, to demonstrate how the Network will support the electronic exchange of data between partners in mobility excluding use of paper, and to share the plans for the European-wide roll out of the EWP Network.

The ultimate goal is to help the authorities, students, IRO staff or — generally speaking — end users to understand what does EWP mean to higher education and mobility, in practical terms.

2. Erasmus Without Paper Network

At the final conference of EWP 1.0 (Brussels, September 2017) the state of development of the EWP Network was presented. The architecture of the EWP Network is fully designed (specification in publicly available in GitHub [3]), including highly secure communication protocols, the EWP Registry holding the binding information and the digital services to be offered by the participating institutions. The project partners developed connectors between their local Student Information Systems (SISs) and the Network. The Registry which holds the URLs of the connectors has been implemented and deployed ([2]). Testing was carried out using the reference connector and a couple of test installations set up by the development teams. In the paper we give a short overview of the current state of the Network from the technical perspective, and demonstrate what tools and resources are offered to support developers.

However for end users — authorities of higher education institutions, decision makers, IRO staff involved in daily mobility routines and mobile students — the main concern is not a technical perspective but what are the noticeable benefits of digital, paperless mobility. Does it mean no paper at all or no exchange of paper between the mobility partners? What data are exchanged electronically? Who/what triggers data transfer? Is privacy of data respected? And finally — does it mean less burden on all parties involved, better quality of the procedures or more fun for ambitious ICT staff? These aspects of the EWP project constitute the main subject of this paper.

What is the most important is the roll-out of the Network across Europe, dissemination and sustainability. What measures are taken into account to make the Network operational in production with many mobility partners connected? Be it a medium size higher education institution with a homemade SIS, or a client of the commercial mobility software providers, like SOP, or QS Unisolution, or a member of a consortium of HEIs using the same SIS — all should know how to start, what steps to take, and where to ask for help and advice. These are the important issues that will eventually decide about success or failure of paperless mobility in EHEA.

3. SUMMARY

EWP constitutes a significant innovation in current practices for organizing student mobility and has a strong potential to be mainstreamed with a long-term impact. One aim pursued by the EWP
project is the outreach to European and National policy makers to create a shift in administrative culture and the use of ICT tools, by proposing a publicly available network for the exchange of student data and engaging in policy dialogue in preparation of the follow-up programme of Erasmus+. This amounts to a significant contribution for the modernization of higher education, which is one of the tenets of the Modernizing education in the EU Communication put forward by the European Commission [1]. EWP is mentioned in the referenced document.

The institutions of higher education engaged in student mobility are getting aware that to lower the administrative burden of the mobility they must enhance the digitalization maturity. In that respect institutions depend on one another. The institution which is ready for electronic data exchange will encourage its mobility partners to catch up, as it already happens.

Digital services of the educational institution should be exposed in a unified way, by one central access point – the EWP Registry. Once it offers EWP services, next step may be to integrated EMREX scenario, on-the-fly grade conversion envisioned by the Egracons project (http://egracons.eu/), access to the Mobility Tool+ services. We are aiming for the EWP Registry and Discovery APIs to become common underlying parts of other similar projects focused on higher education in Europe. They are designed to be extensible and can be used for all kinds of APIs (even if some of these APIs clash by serving similar purpose in a different manner, depending on the cultural context).

Data exchange means common work on data standards. EWP reuses ELMO implemented for the EMREX platform for exchange of student achievements records [4]. Followers of both projects will continue cooperation on ELMO.

Common data standards, one registry supporting digital services, common security measures implemented by approved security protocols, common policies like the rules of accepting new partners, GitHub as repository for code, specifications, documentation and to carry on exchange of ideas – all this will lead to a common digital EHEA for European Higher Education Institutions.

4. Acknowledgements

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6. AUTHOR BIOGRAPHY

Janina Mincer-Daszkiewicz graduated in computer science in the University of Warsaw, Poland, and obtained a Ph.D. degree in math from the same university. She is an associate professor in Computer Science at the Faculty of Mathematics, Informatics and Mechanics at the University of Warsaw specializing in operating systems, distributed systems, performance evaluation and software engineering. Since 1999, she leads a project for the development of a student management information system USOS, which is used in 54 Polish Higher Education Institutions, gathered in the MUCI consortium. Janina takes an active part in many nation-wide projects in Poland. She has been involved in Egracons, EMREX and Erasmus Without Paper European projects.
EUNIS 2018: Blockchain & Education

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Keywords
#Blockchain #Education #credentials #OpenEducation #identification #Europe #France
#GTnum #Blockchain4Edu

1. Summary

The blockchain as an emerging technology represents to many entrepreneurs, policy makers, leaders and activists a promise for the education and employment sector. The expectation is that blockchain will provide opportunities to disrupt traditional products and services thanks to its distributed nature and features such as the permanence of the blockchain registry and the ability to run smart contracts. The Directorate for Digital Education, within the French Ministry for Education, has launched in 2017 a working group on this subject, in particular for the recognition and records of skills, competences and micro-credentials. The European Commission has ordered a report from its Joint Research Center of Sevilla that led on 17-18 March 2018 to an event in Malta “Blockchain, Credentials & Connected Learning”. Some main aspects of the report and of the conference will be presented.

2. Blockchain & Education

The French working group on Blockchain & Education has focused on three main thematics: diploma, skills, competences and open badges; tracking of mix and remix of open educational resources; identity and identification in a blockchain. A general presentation of its first deliverable and expectations will be made, in relation with the Report “Blockchain & Education” published by the Joint Research Center of the European Commission.


Blockchain is an emerging technology, with almost daily announcements on its applicability to everyday life. It is perceived to provide significant opportunities to disrupt traditional products and services due to the distributed, decentralised nature of blockchains, and features such as the permanence of the blockchain record, and the ability to run smart contracts. These features make blockchain technology-based products or services significantly different from previous internet-based commercial developments and of particular interest to the education sector - although education, with some minor exceptions, is not currently perceived to be high on the agenda of most countries with national blockchain initiatives. In addition, currently stakeholders within education are largely unaware of the social advantages and potential of blockchain technology. This report was produced to address this gap.

Context Blockchain technology is forecast to disrupt any field of activity that is founded on timestamped record-keeping of titles of ownership. Within education, activities likely to be
disrupted by blockchain technology include the award of qualifications, licensing and accreditation, management of student records, intellectual property management and payments.

Key Advantages of Blockchain Technology From a social perspective, blockchain technology offers significant possibilities beyond those currently available. In particular, moving records to the blockchain can allow for: — Self-sovereignty, i.e. for users to identify themselves while at the same time maintaining control over the storage and management of their personal data; — Trust, i.e. for a technical infrastructure that gives people enough confidence in its operations to carry through with transactions such as payments or the issue of certificates; — Transparency & Provenance, i.e. for users to conduct transactions in knowledge that each party has the capacity to enter into that transaction; — Immutability, i.e. for records to be written and stored permanently, without the possibility of modification; — Disintermediation, i.e. the removal of the need for a central controlling authority to manage transactions or keep records; — Collaboration, i.e. the ability of parties to transact directly with each other without the need for mediating third parties.

3. Key conclusions

This report concludes that blockchain applications for education are still in their infancy, though quickly picking up steam. It describes case studies of implementations at the Open University UK, the University of Nicosia, MIT and within various educational institutions in Malta: each of these implementations is in a piloting phase. However, even from these early pilots it is pertinent to conclude that blockchain could probably disrupt the market in student information systems and loosen the control current players have over this market. While many of the applications of blockchain technology cannot yet be imagined, we find that within the educational sphere, the following areas are most likely to be impacted by the adoption of blockchain technology in the near future:

(a) Blockchain technology will accelerate the end of a paper-based system for certificates. Any kinds of certificates issued by educational organisations, in particular qualifications and records of achievement, can be permanently and reliably secured using blockchain technology. More advanced blockchain implementations could also be used to automate the award, recognition and transfer of credits, or even to store and verify a complete record of formal and non-formal achievements throughout lifelong learning.

(b) Blockchain technology allows for users to be able to automatically verify the validity of certificates directly against the blockchain, without the need to contact the organisation that originally issued them. Thus, it will likely remove the need for educational organisations to validate credentials. This ability to issue and then reliably validate certificates automatically can also be applied to other educational scenarios. Thus, one can imagine certificates of accreditation being issued to institutions by quality assurance bodies, or licences to teach being issued to educators, with all of these being publicly available and verifiable by any user against a blockchain. It can also be applied to intellectual property management, for the tracking of first publication and citations, without the need of a central authority to manage these databases. This enables, e.g. the possibility of automatically tracking the use and re-use of open educational resources.

(c) We find that the ability of blockchain technologies to create data management structures where users have increased ownership and control over their own data could significantly reduce educational organisations’ data management costs, as well as their exposure to liability resulting from data management issues.
Finally, we find that blockchain-based cryptocurrencies are likely to be used to facilitate payments within some institutions. The ability to create custom cryptocurrencies is also likely to mean that blockchain will find significant use in grant or voucher-based funder of education in many countries. We further conclude that the benefits mentioned above are only achieved through open implementations of the technology, which (a) utilise open source software, (b) use open standards for data and which (c) implement self-sovereign data management solutions. This said, many of the solutions being proposed by blockchain solution providers, of which there are already hundreds, fail on at least one of these three criteria, since it is easier to build a business case around keeping control of the software, data or standards. We recommend that further development of the technology in the educational field should be considered as a shared competence of the market and of public authorities, to ensure an appropriate balance of private sector innovation coupled with safeguard of the public interest.

For all this to come to be, regulation and standardisation will determine the extent and speed of progress either forward or backward.

Main recommendations Considering that blockchain technology clearly benefits from a network effect when applied transnationally, but also that it affects many areas that are the exclusive competence of Member States, we believe that any policy work linked to the blockchain needs to be of shared competence between the EU and Member States, in line with the principles of subsidiarity and proportionality laid out in the treaties. To ensure development of open blockchain implementations we recommend that the EU in collaboration with Member States consider creating and promoting a label for ‘open’ educational records, which enshrines the principles of recipient ownership, vendor independence and decentralised verification - and only supports or adopts technologies in compliance with such a label.

4. References

5. Author bibliography
Perrine de Coëtlogon hosts a digital working group at national level on Blockchain and Education (Blockchain4Edu) within the directorate for pedagogical innovation of the University of Lille (France), funded by the Directorate of Digital for Education (DNE, Numérilab) within the French Ministry for National Education. She was appointed in 2016 by the French Ministry for Higher Education, Research and Innovation as an expert for Open Education Europe & International, within the Mission for Pedagogy and Digital Technology (MIPNES). She has expertise in OER in France and French-speaking countries. She has studied French and German law at Paris-Nanterre and at the Potsdam University (Germany). Before going back to higher education in 2009, she practised law at the Paris Bar for seven years in French, English and German.

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LTI Advantage: Making Next Generation Learning a Reality

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Keywords: Privacy and Security, User Experience, Digital Learning Ecosystem, Interoperability, Academic Transformation

Background

At EDUCAUSE 2017, IMS Global Learning Consortium announced LTI Advantage, a revolutionary approach for integrating learning applications and platforms that greatly improves the user experience by solving crucial teaching and learning pain points. Based on years of feedback from both institutions and edtech suppliers, LTI Advantage promotes academic innovation, helps faculty reclaim instruction time by streamlining key classroom management tasks, and makes it easier to integrate multiple sources of digital tools and content in the right place at the right time. In this interactive panel discussion hear from IMS Global and leading technology suppliers will share how this next phase of Learning Tools Interoperability (LTI) is essential to helping institutions advance their digital ecosystem and achieve better learning experiences, while streamlining integrations.

Session Description

The moderator (Rob Abel, IMS Global) will provide a brief overview of LTI Advantage to set up the conversation. The moderator will then direct open-ended questions to the panelists meant to encourage wider group discussion in which the audience will be asked to participate. The goal is to allow each panelist (representing different LMS vendors)—through an interactive back-and-forth—to share their priorities, vision, and the pragmatic steps they have implemented to evolve their product feature sets.

The panelists are not yet decided, however IMS Global intends to invite individuals from major LMS vendors (e.g. Instructure, Blackboard, itsLearning, D2L) to participate in the panel.

Session Takeaways

For IT leaders: a key principle driving the evolution of LTI is better security. LTI Advantage ensures user privacy and learning data security by utilizing the latest security model based on industry best practices. This session will explore how LTI Advantage addresses institutional concerns about learning data security between the LMS and learning tools.

For end users: LTI Advantage benefits educators and learners by combining features needed to facilitate the deeper integration of more dynamic content, more cohesive delivery of feedback about grades to students, and more effective ways to manage student teams and roles across multiple learning tools. In this session, you will learn how faculty can realize the benefits of LTI Advantage, an
essential part of learning tool integration to ease burdensome class administration tasks and support innovation “at the speed of now.”

References


Authors Biographies

Dr. Rob Abel is the Chief Executive Officer of the IMS Global Learning Consortium, a nonprofit collaboration of the world’s leading universities, school districts, government organizations, content providers, and technology suppliers, cooperating to accelerate learning technology interoperability, adoption, and impact. Rob has been the CEO of IMS since February of 2006.

Rob is a recognized expert on the use of information and communication technology (ICT) for learning with over 30 years high tech and education market development experience. Under Rob’s leadership IMS has introduced the Learning Impact program, which is setting new benchmarks for high impact applications of technology in support of learning worldwide. During Rob’s tenure IMS has experienced dramatic growth in terms of members, revenues, and achieved significant adoption of IMS work by leading regional education communities worldwide. Under Rob’s leadership IMS is providing a foundation of technical interoperability and industry collaboration that is improving access, affordability, and quality of educational experiences worldwide.

Prior to IMS Rob was Senior Vice President at Collegis (now SunGard Higher Education), the leading provider of ICT services to U.S. higher education, he was responsible for online and academic services provided to over 60 U.S. institutions. As Senior Director at Oracle Education he was a leader and innovator in the development of online learning architectures and related standards. Rob holds a Doctorate in Educational Leadership and Change from Fielding Graduate University, a Masters degree in Management from Stanford, a Masters degree in Computer Engineering from the University of Southern California, and a Baccalaureate degree in Computational Physics from Carnegie Mellon University.
How to Foster Open Access? An Empirical Evaluation of the Obstacles hindering OA-Publication

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Keywords
Open Access, Quantitative Study, Publishing Models, Willingness to Pay, Open Science

1. Summary
While open access (OA) publications are fostered by politics and funders as way to reach large audiences and widely spread the results of research, the share of OA publications remains low. Therefore, we conducted a quantitative survey among the researchers at University of Münster, one of the largest universities in Germany. We tested different hypotheses focusing on several obstacles, including a low impact of OA, a low reputation of OA, and high costs of OA. Our findings show that the OA publishing rate at Münster University is low, despite the fact that OA publications are heavily used as scientific sources, OA publishing strategies receive a high rating and the reputation of OA is very positive. The willingness to pay, however, is significantly lower than the actual costs of OA publications. In addition, we identified a lack of information and a high uncertainty as supplementary reasons for a low OA rate. As expected, we found large differences between the departments.

2. Extended Abstract
Today, approximately 75-90% of research articles are not directly accessible, but locked behind pay-walls which necessitate a subscription or enough money to pay on a per-article basis if the publisher provides this option (Cordis, 2013; Ilva, Laitinen, & Saarti, 2017; Tennant et al., 2016). It is clear that this has a negative impact on scientific progress and on the recognition of individual researchers as well. A study by Warlick and Vaughan (2007) indicates that an author’s choice for a publication model does not depend on an article’s accessibility, but on the quality of the publication. While there is no inherent advantage of OA, some potential disadvantages are discussed in literature. Based on previous work (Coonin & Younce, 2010; Cordis, 2013; McCabe & Snyder, 2014, 2015; McKiernan et al., 2016; Nariani & Fernandez, 2012; Norris, Oppenheim, & Rowland, 2008; Shen & Björk, 2015; Solomon & Björk, 2012; Swan & Brown, 2005; Warlick & Vaughan, 2007), we tested the influence of the factors perceived impact, perceived reputation, acceptable costs and general attitude on the publishing behavior. We assumed that there are significant differences between the departments.

By conducting a quantitative user survey among the researchers of Münster University, we opted for a researcher-centered approach in outlining potential barriers for OA and possible options to overcome them. Münster University’s researchers are from the natural sciences, the life sciences, mathematics, the humanities and social sciences, and from economics and law. This gives us the opportunity to examine differences between the departments. The survey was conducted as an online survey during November 2017. In total, 353 questionnaires were completed which is about 6% of the population.

Our findings show that there is a high level of agreement with the concept of OA, while the traditional Closed Access model and the Open Choice model favored by big publishing companies are largely rejected. Moreover, the reputation and the impact of OA articles seems to be comparatively high in most departments. The only clearly negative aspect of OA seems to be the costs for article-processing charges (APCs) which considerably overrun the researchers’ willingness to pay. Another important obstacle we discovered in answers to open question is a high uncertainty about OA and a lack of information about existing OA journals, publication models, reputation and funding options. This uncertainty leads to higher search costs for OA publications which researchers simply avoid by sticking
to closed journals. Since their impact and reputation is at least as high as that of OA journals, there is a clear cost-value advantage on the part of the traditional Closed Access model. Unlike previous studies, this survey allowed to examine different departments and discover their large heterogeneity in terms of OA. While the life and natural sciences already have an OA-friendly culture and their researchers often use OA journals as a source and as a way of publishing, the humanities and economics and law very often use rather traditional materials such as printed sources that are not suitable for OA. In addition, the conditions in view of funding and APCs, the reputation and impact of OA-journals, the relevance of the publication speed, and the department’s culture vary considerably, resulting in a different usage of OA. This leads to the conclusion that a one-fits-all OA strategy for all departments is not very promising. Nonetheless, our findings also reveal some opportunities to foster OA in general. We recommend non-bureaucratic and interdisciplinary ways of funding for OA publications and a seal of approval for high quality OA journals awarded by trustworthy non-commercial institutions, such as the German Research Foundation or similar public institutions.

3. References


4. AUTHORS’ BIOGRAPHIES

D. Rudolph is managing director of the IT center (Zentrum für Informationsverarbeitung, ZIV) of the University of Münster (Germany). He received his PhD from the University of Münster, where he also studied communication sciences, economics and modern history. His graduate thesis has been appraised as one of the best dissertations in 2014 (German Thesis Award). His research focuses on the
diffusion of innovations, the management of research data, and digitalization processes in higher education. More info: https://www.uni-muenster.de/forschungaz/person/7445

A. Thoring is a research assistant for public relations and marketing at the IT center (Zentrum für Informationsverarbeitung, ZIV) of the University of Münster (Germany). She graduated from University College London (UK) and the University of Münster with degrees in communication sciences, publishing, and strategic communication. Her research focuses on strategies and tools of corporate communications and digitalization processes in higher education. More info: https://www.uni-muenster.de/forschungaz/person/17026

R. Vogl is director of IT for the University of Münster (Germany) since 2007. He holds a PhD in elementary particle physics from University of Innsbruck (Austria). After completing his PhD studies in 1995, he joined Innsbruck University Hospital as IT manager for medical image data solutions and moved on to be deputy head of IT. His current research interest in the field of Information Systems and Information Management focuses on the management of complex information infrastructures. More info: http://www.uni-muenster.de/forschungaz/person/10774
Analytics in Action: the LMS perspective

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Keywords: Learning Analytics, Evidence, Data, GDPR

Summary
Learning Analytics gives better insight into the teaching process and targeted feedback to students, ultimately resulting in improved education. It makes it possible to follow students' digital footsteps, that can be recorded and analysed, leading to the creation of comprehensive data collections. With this data, it is possible to measure the quality of the teaching materials used, to see how the digital learning and working environment is used, etc.

The use of educational data and analytics is gaining momentum as institutions seek to provide real-time insights, interventions, and sometimes even predictions to improve student learning outcomes.

Learning analytics offers many possibilities and many universities are performing experiments around the study of data. A large scale implementation is not a matter of course, there is hesitance to use Learning Analytics at a large scale, due to factors like the extensive European privacy regulations. From a technical perspective there is uncertainty about what standards to implement to make interoperability between the different components work. In Europe, both XAPI and Caliper are used.

We invited leading LMS providers to join a panel discussion and talk to us about Learning Analytics. We’ll hear from them how they are involved, what they are offering and what they are exploring. We’ll ask them their view on interoperability within Learning Analytics and where they think open standards fit in? We’ll want to know their preparedness for the GDPR at May, 25 with them and open up a discussion with them and with the audience to see how IMS help accelerate progress in learning analytics in Europe and how European vendors and users can help IMS with that.
Nynke de Boer is a project manager for innovation within education at SURF, the national collaborative organization for ICT in Dutch higher education and research. Her focus is on the use of learning analytics and open standards within the field of higher education. Before working for SURF, Nynke worked in the field of computer-based testing for the last 20 years for both commercial businesses (Pearson VUE) as the Dutch government (College voor Toetsen en Examens). In her last role, she was responsible for the development and implementation of the testing system Facet, in use at all secondary schools (vo) and higher vocational institutes (mbo).
EUNIS 2018: Open standards in Europe

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Keywords
Standards, IMS, Interoperability, SURF, Europe

1. SUMMARY

SURF is the collaborative ICT organization for Dutch higher education. We provide universities with services to help them get started with new technologies enhancing education. There is a lot of focus on interoperability and the use of open standards to work towards a good working educational ecosystem. This session describes the work we do in this area and the challenges we face. It also touches on the work that IMS Europe is doing in the region.

2. EXTENDED ABSTRACT

One of the trends we see is that researchers, students and teachers want to be able to choose their own online tools and not be limited to the tools that the university is offering. But they also want secure and reliable access to university information, processes and the basic infrastructure. In order to create a smooth working ecosystem with all these components, open standards are a necessity.

SURF is the collaborative ICT organization for Dutch higher education and provides access to the best possible internet and ICT facilities. It also supports universities in their search for ways to improve education with the help of ICT. We do this by means of investigation, white papers, seminars, training, experiments and running operational services.

For example, SURF has created a wiki that provides information on open standards within education, so the universities can make the right choice for interoperability standards

Open standards are used on a large scale in Europe. Interoperability between different vendors however is not at the level it should be, therefore interoperability and integration costs are still too
In a properly working educational ecosystem, standards need to get a lot of focus. This focus is not always there within organizations. And where it is, users of the standards are searching for ways to influence the development of it.

For international standards - such as those from IMS - to be successful in Europe, it needs to be Europe proof. Specific regulations, processes and terminology should be addressed in the standard, without making it too complex.

What is the way to go to accomplish that? How do we contribute and what are these Europe-specific characteristics that should be taken in account?

In Europe, we need to unite and agree on the standards that will make the change within education. We also need to make sure that we contribute by participating in communities that enhance the relevant standards to make sure European characteristics are taken into account in the standards. If needed, we can create new standards, but always with a link to existing standards.

To make sure Europe is well represented within IMS, the IMS Europe board was launched in early 2018.

In our session, SURF explains why open standards are important and provide you with guidelines as to where to start to use them. We also look at the most popular open standards in education right now and talk about the way they are created, maintained, edited and how you can you provide input.

We guide you through the way SURF handles open standards and connects the relevant users in the universities in the Netherlands to be able to learn from each other, to identify common needs to be addressed and we organize actual contribution.

Finally, we introduce you to IMS Europe and invite you discuss the role of this new organization with us.

3. AUTHORS’ BIOGRAPHIES

Nynke de Boer is a project manager for innovation within education at SURF, the national collaborative organization for ICT in Dutch higher education and research. Her focus is on the use of learning analytics and open standards within the field of higher education. Before working for SURF, Nynke worked in the field of computer-based testing for the last 20 years for both commercial businesses (Pearson VUE) as the Dutch government (College voor Toetsen en Examens). In her last role, she was responsible for the development and implementation of the testing system Facet, in use at all secondary schools (vo) and higher vocational institutes (mbo).
ABSTRACT

GERMANY GOES DIGITAL. RIGHT NOW!
A couple of years ago Germany and the Netherlands decided that they wanted to cooperate on the field of digital enrolment in higher education. Almost 25% out of 90,000 incoming foreign students studying in the Netherlands come from Germany. By far the largest population, so a very good reason to find common (digital) grounds for cooperation.

In the Netherlands the process of enrolment in higher education is 100% digital since 2013. Studielink is the national enrolment portal and DUO, the executive agency of the Dutch Ministry of Education Culture and Science, has a legal basis for supplying personal and educational data during the enrolment process. Furthermore, DUO facilitates the Dutch Diplomaregister containing almost 9 million diplomas which Dutch citizens can download via PDF.

Unfortunately, in Germany enrolment in higher education is still a paper based process. There is no enrolment portal or diplomaregister neither of national, nor on federal state level. But things are changing! Two German organisations have started pilot projects with DUO in order to digitalise their processes: the Stiftung für Hochschulzulassung (SfH) and uni-assist.

The SfH pursues two tasks of services for the admission to study at German non-private colleges and universities on behalf of the German federal states. Until now the applicants have to submit their documents in a paper form. From 2018 onwards Dutch applicants will be able to send their digital diploma data from the DUO Diploma Register to the SfH.

uni-assist provides preliminary checks for international student applications and brings this service for more than 180 HEIs in Germany. Its core responsibility is the assessment of foreign school and university certificates and determining their equivalence to German educational standards. Until now applicants have to submit their certificates in paper form. From 2018 onwards Dutch applicants will be able to send their digital diploma data from the DUO Diploma Register to uni-assist.

The exchange of data between DUO and SfH/uni-assist uses two different techniques: SFTP(Secure File Transfer Protocol) and EMREX. Sounds difficult, but easy to use and implement. And even better, it works!

The three organisations believe that these pilots with SFTP and EMREX will give a boost to digitalise the enrolment process in Germany and that it will lead to the creation of a German diploma register. The Dutch-German collaboration is live, working and yes, DIGITAL!
Digital Credentials and Open Badges: A Roadmap for Connecting Educators, Learners and Employers

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Keywords: Digital Credentials, Open Badges, Employability, Skills and Competencies, Interoperability

Background

Digital credentials is changing the way we think about and represent learning, competencies, and achievements inside and outside of the institution. Changing employment opportunities and work requirements mean that learners are pursuing higher education with a focus on improving their employability. Student mobility and lifelong learning means that skills and competencies need to be represented in ways that transcend the boundaries of language and culture, for institutions as well as employers.

An increasing number of organizations are collaborating within IMS Global to develop standards to facilitate the exchange of competency-based data and achievements via a secure, verifiable framework. Centered around Open Badges, a technology pioneered by Mozilla and the MacArthur Foundation in 2011 and under the stewardship of IMS Global since 2017, a framework of standards and technologies is emerging to meet the requirements of modern education and employment.

In the work being conducted, a set of fundamental challenges appear, and form focal points for the continued healthy evolution of a functional digital credentials ecosystem. The challenges include:

- The need for decentralized, fully secure and reliable verification of claims;
- The need for machine-readable cross-mapping or unified expressions of skills and competencies between institutions and employers, and across cultures and locales;
- The need for changes to both infrastructure and culture to enable credentials consumers, such as employers, to make use of digital credentials to build a more effective and precise practice for locating and obtaining candidates.

Session Description

In this presentation, the future of interoperable digital credentials will be discussed, with focus on the following questions:

- What are good examples of badging programs being offered by institutions today?
- What are the barriers to a broader adoption of digital credentials in educational technology?
- How are employers being engaged to become proactive consumers of digital credentials?
- What is IMS’s roadmap for standards such as Open Badges, Extended Transcript, and Open Pathways to establish secure, reliable and interoperable connections among educators, learners, and employers?
References


Authors Biographies

Markus Gylling is a solutions architect with IMS Global Learning Consortium, where he works in the domains of Analytics, Digital Credentials and Accessibility. Prior to his work with IMS Global, he worked as CTO of the International Digital Publishing Forum (IDPF) and as CTO of the DAISY Consortium. Through his work with IDPF & DAISY he has during the past one and a half decades been engaged in the development of global scale standards, tools and educational efforts for the realization of inclusive and accessible e-publishing and e-reading. Markus lives and works in Stockholm, Sweden, from where he also oversees IMS Global’s European operations.
ESMO Project: Towards European Identity Federation Convergence for a Simpler and Trusted Student Mobility

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Keywords
eIDAS, CEF, INEA, eduGAIN, NRENs, STORK, STORK 2.0, Pan-European, Student Mobility, Identity Federation, Cross-border services, Digital Identity, Authentication, Authorisation, Trust, Interoperability.

1. Summary

ESMO, which is an acronym for eIDAS-enabled Student Mobility, is an EC co-funded project, through the CEF Telecom programme 2017 call on eIdentification & eSignature. As a proposal carried by leading participants of the now finished STORK and STORK 2.0 projects, and institutions currently highly involved with NRENs and GÉANT from Spain, Norway and Greece, it aims to produce the tools and infrastructure to promote convergence among the two main blocks currently advancing in the European Identity Federation scene: eduGAIN and eIDAS. This initiative will be launched on April 2018 and through the 15 months of its execution it will work to deliver quality software to facilitate the interconnection of attribute and authentication sources with the academic services, especially those addressed to students in mobility, with a focus on building a wider interoperability and increased trust by adding the benefits of eIDAS (state backing, trust on the authentication and data sources) with the eduGAIN strong points (popularity, availability, flexibility), thus helping to attract private sector services for both federations. The main goal is to achieve visibility among the stakeholders to demonstrate the convenience and usefulness of the project expected results and thus ensure the needed sustainability to lead the way for convergence. EduGAIN and eIDAS are strong initiatives, with great potential, but both have their strengths and weaknesses. Finding the way to potentiate their synergies is key to build the trust needed across institutions in public and private sectors that will someday develop into a fully connected Europe.

2. BACKGROUND

STORK and STORK 2.0 projects opened the way for a European-wide effective interoperability of official eIDs and services in the public administration sector, with the potential to extend to other activities and even to the private sector, by building a trusted authentication network. Prior to this, through the GÉANT initiative, higher education sector showed its proverbial vision on cutting-edge advancements by already having a well established and operational authentication federation involving a substantial number of academic institutions and national-level federations in many countries, not limited to Europe: eduGAIN.

EduGAIN has the numbers, both in services and in identity providers, and also the technical expertise, which reflects on the convenience, flexibility and simplicity of its building blocks. Its major drawbacks come from the governance and organisation aspect, as well as from the trust in the provided identities: being internal identities from the institutions involved, they don’t have the legal strength to be used in most services involving sensitive data, thus limiting its expansion beyond the offering of cross-academic institution services. STORK explored the problem of federating these trusted identities, especially on the legal and organisational aspects, and its outcomes have derived on the eIDAS regulation and the deployment of an infrastructure to ensure this interoperability. STORK 2.0 went further by exploring how this functionality could be expanded to cover the needs of other sectors (banking, education, health), and to explore the inclusion of other sources of information for this sector specific purposes. Both projects provided a set of conclusions: that to
extend to other sectors, the availability of information sources covering a majority of the population is critical for the adoption by users and service providers. This means, in the academia sector, involving the universities as attribute providers, to make affiliation, enrolment and degree information available to services, but the high data trust standards of eIDAS are a drawback, especially when different institutions have to be queried and the process requires re-authentication at each source.

3. GOALS AND EXPECTATIONS

The project aims at promoting the interoperable use of and uptake of CEF eID in the Higher Education sector and facilitating the technical interoperability between eIDAS and eduGAIN. It will enable cross-border electronic identification and authentication in Higher Education Institutions from Spain, Norway, and Greece through the eIDAS network, as well as the exchange of simple academia sector specific attributes in compliance with the eIDAS framework, and beyond the minimal eIDAS attributes set, like the affiliation with the university of origin; name of the institution, etcetera. Specifically, the goals are to:

- Connect the IT infrastructure of the partner universities to local eIDAS nodes allowing their services to use the eIDAS eID;
- Demonstrate the benefits of eIDAS-enabled eID cross-border interoperability in the academic sector, by enabling the secure exchange of certain academic information between academic institutions, and proposing and providing a suitable specification of academic attribute schema design, aiming towards a better convergence with the current de facto standards being used in eduGAIN, that is based on eduPerson and eduOrg; the approval of this vocabulary for academic sector attributes will be proposed for approval by the eIDAS Technical Sub-group, promoting the usage of the sector standards at an state level.
- Leverage this interconnection with cross-border mechanisms supporting also the exchange of simple academic attributes over the eIDAS network and with the definition of a model (apt to be replicated in other sectors and flexible enough to fit different state needs) focused on scalability towards eIDAS integration and sectorial governance of trust. The model will hide national complexities enabling to centralize at the national level the discovery of attribute and service providers. It will provide its own transport mean for attributes, reproducing the eIDAS model to allow attribute aggregation but trying to help mitigate, to the possible extent, the problem of different principals authenticating at each source when retrieving attributes from different sources.
- Test the above-mentioned infrastructure across borders, leveraging on the national extensions of the eIDAS network, and providing guidelines for its extension to other countries;
- Contribute to increase eIDAS eID uptake and use in the European Higher Education Area and the sustainability of the provided services, through strategic liaisons to key actors and dissemination of the action’s results to other Member States.

The main technical outcome will be a tool to be deployed as a sectorial hub (for example, by NRENs operating national federations), allowing attribute translation and aggregation, with a modular design to support multiple protocols and protocol translation. This will help minimize the integration cost with eIDAS of the HEIs/NRENs federation components already connected to eduGAIN, as the entities won't have the need to support two integrations; and also the new entities joining the federated identity scenario will see their costs reduced, as they will be able to use common federation software to connect to eIDAS instead of having to use the existing eIDAS software, which is still scarce and not subject to the guarantees that a heavy usage and maintenance cycle provide.

4. REFERENCES


5. AUTHORS’ BIOGRAPHIES

José Pascual Gumbau Mezquita is Head of the Office for Innovation and IT Auditing at Universitat Jaume I in Castellón (UJI), director of the corporate Systems Plan and coordinator of the IT Innovation Laboratory (Teclab). He is as well coordinator of the IT/IS Analysis, Planning and Governance Subgroup at the Spanish Rectors Conference ICT group (CRUE-TIC) and member of the GTI4U Research Team on Planning and Governance of the Information Technologies. From 2006 to 2017 he was director of the Technology Planning and Forecast Office and head officer of the STORK and STORK 2.0 e-academia pilots.

Graduated with a Master’s Degree in Mathematics (majoring in Computation Sciences) and Certified Information Systems Auditor (CISA) by ISACA, has a profound knowledge of ISO 38500 norm and COBIT, ITIL, ISO 20000, ISO 27000, ISO 9000 and EFQM standards. Has also worked as a professor at the Computer Science and Engineering Department at Universitat Jaume I and as a consultant for several companies in the fields of Technology Innovation and Applied Mathematics. He is also a frequent lecturer at graduate school master courses, expert courses and conferences.

Francisco José Aragó Monzonís graduated with a Master’s Degree in Computer Engineering at Universitat Jaume I in Castellón, Spain, in 2008. Since then, he has developed a career as a programmer and analyst, both as a freelance and for the same university, in computer security and cryptography related projects. Participated in the final steps of STORK project as a programmer, but in STORK 2.0, took a more leading role in the eAcademia pilot, both in executive and technical aspects. Has an active collaboration with the Spanish NREN, RedIRIS, where he designed and operated a platform to facilitate the connection of public universities services to the national central authentication system, Cl@ve, and its interaction with eIDAS.
Data repositories and RDM

Great strides have been made in recent years in understanding the importance of research data management, mapping relevant RDM workflows, and identifying useful RDM components. Most of the focus, in terms of both conceptualization of the problem, and development of tools designed to address the problem, has centred around data repositories, and in particular making data in data repositories more accessible and reusable, i.e. what happens to data after it gets into a repository.

The assumption has been that data and metadata goes into repositories directly and in an unprocessed and unorganized fashion, and there has been little discussion about data and metadata before it is deposited in data repositories. This oversimplification of the research workflow is increasingly untenable; as tools for managing and organizing active research data proliferate repositories need to be designed in ways that better facilitate interoperability with these active research data tools. This paper examines the growing importance of one active data research tool -- electronic lab notebooks (ELNs) -- and how they add value to the RDM workflow and enhance the benefits repositories are bringing to RDM in terms of greater data capture and FAIR principles.

Electronic lab notebooks are emerging as a key vehicle for managing and organizing active research data

Data repositories are intended and designed as vehicles for deposit of research data after it has been actively produced, manipulated, and analysed in the research process. In contrast, ELNs are intended and designed as vehicles for capturing, organizing and managing data during the research process. ELNs are used by an important subset of the research community, those engaged in research involving life sciences and chemistry as well as materials science and nanotechnology.

Connected ELNs

ELNs fall on a spectrum of interoperability. At one extreme they act as siloes that have the benefit of ‘liberating’ data that previously was recorded on paper and hence unavailable for subsequent reuse or query, but in turn themselves operate as siloes because it is difficult to get data out of them. At the other extreme is the ‘connected’ ELN, which is designed (a) to easily ingest and/or link to data from multiple other resources and tools, (b) interoperate with other research tools, and (c) export data in multiple formats and
configurations including directly into data repositories. The concept of the connected ELN was pioneered by RSpace, which has emerged as the first true connected ELN.

Connected ELNs and data repositories in the research workflow: the RSpace example

Data export in RSpace is powerful and flexible. Individual researchers can export some or all of their data, principle investigators can export some or all of the data produced by researchers in their group, and administrators can export some or all of the data produced in the system. Data exports can be of individual documents or collections of documents in preconfigured collections such as projects or folders, and in ad hoc groupings based on e.g. a search for documents with a particular tag or keyword. Exports can be in a variety of formats, including Word for future editing, pdf for preservation or presentation, html for a searchable offline record of the research that maintains its folder structure, or xml, which is machine readable and suitable for ingest into other systems.

These powerful export capabilities are a key aspect of the connected approach that underpins RSpace’s architecture, and provide the basis for bespoke integrations with three widely used data repositories: Dataverse, Figshare and DSpace. It is possible to deposit data, and requisite metadata, directly from RSpace into each of these repositories. Some other ELNs have taken preliminary steps to follow this lead, e.g. Lab Folder supports deposit of datasets into figshare, and Hivebench supports deposits into Dataverse.

Benefits of a connected ELN used in conjunction with a data repository

Data repositories are designed to be platforms for making data publicly available for access, query and reuse. A connected ELN like RSpace that integrates with data repositories complements and enhances this functionality in several ways. First, it massively increases the pool of data available for deposit into repositories by giving researchers a vehicle for capturing data during the research process. Second, it enables researchers to organize and structure this data with far greater power and flexibility than is possible in repositories. Third, the convenience of direct deposit from an active data tool they are already using makes it far more likely that researchers will take up the option of depositing their data into a repository.

What further developments are needed

Three developments would make it possible to realize the potential benefits of widespread use of connected ELNs in conjunction with data repositories. The first is greater recognition in the repository and research data community of these potential benefits. This is beginning to happen.

Jisc has consulted on the needs and requirements for a Next Generation Research Environment and, following the report’s recommendations, will investigate work required in the Research Data Shared Service project for closer integration between active and archival research data, and for integrating research data and research administrative data, testing this within the Jisc test environment. In the Research Data Shared Service, Jisc is working with 16 UK universities and more than a dozen vendors that are either supplying their system (like figshare and Preservica), or supporting the development of the service and the open source platforms within the service (like Artefactual Systems etc). While the

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1 https://researchdata.jiscinvolve.org/wp/2017/07/19/ngre-recommendations/
2 http://repository.jisc.ac.uk/6669/
3 https://www.jisc.ac.uk/rd/projects/research-data-shared-service
service at the moment focuses on the main priority requirement for universities in meeting their research funder mandates for research data, so from the deposit to publish and preserve workflow, consultations have demonstrated that integrations with ELN’s is a priority. Primarily to bring the process of creation and capture directly into the research workflow, and to help to support seamless and interoperable creation to re-use. This is an important part of enabling the open science agenda for better and more transparent research.

The second is for entities like Jisc, EUNIS, IMS Global, Educause, the NSF and NIH, UK Research Councils and funding entities in other parts of the world, to continue to work together on standards and interoperability to enhance the integrity of research and reproducibility, increase public trust in research, and enable new and better research, as well as to contain costs and lower barriers for science to become commercialized, and thereby to generate economic and/or business benefit, and to extend the scope of these efforts to include the active phase of the research cycle, when research data is actually captured, and the interface between the data capture phase and the data preservation phase.

The third is enhancements to the APIs provided by repositories. Currently repository APIs do not support structured import of data. This means that the data structures that have been created by researchers in ELNs and other active data management vehicles cannot be retained during the transfer of data from the ELN into the repository, resulting in wasteful loss of meaning and metadata, and making the data in the repository less useful, and harder to query and reproduce. Dataverse and RSpace are working on an enhanced integration that will enable carryover of data structures created in RSpace after data has been deposited into Dataverse. The Jisc research data shared service is now being enhanced to become an Open Science service and to seek to develop APIs and extend the metadata model along similar lines as the RSpace and Dataverse approach.

In this paper we haven’t addressed integration with CRIS systems, however they too are an important research system where interoperability between data creation and curation tools such as ELNs and repositories is important, the Jisc research data shared service is working with CRIS vendors to support this workflow within universities around research data.

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1 See e.g. the important recent presentation by Agustina Martinez at Cambridge, ‘Cambridge Use Case: Integrating RSpace and Cambridge Apollo Repository, and setting out a vision which puts ELNs and data repositories as twin hubs at the heart of a modern integrated RDM infrastructure, using Jisc’s RDSS as an example https://www.repository.cam.ac.uk/handle/1810/274024
RESEARCH INFORMATION HUB IN FINLAND — THE FRUITION OF INTEROPERABILITY

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Keywords
Metadata, research information systems, interoperability, ORCID ID, permanent identifiers, CSC

The National Research Information Hub in Finland will consolidate, link and share existing research metadata into one hub. Its data sources are HEI’s, research institutions, data archives and both public and private research funders. It provides a single, uniform, open and comprehensive access point for all the research being conducted in Finland. The extended abstract describes the planned solution, sketches the current situation and discusses the recognized benefits of the Hub. The architecture and data model are briefly described.

1. THE PROBLEM
Despite the continuous efforts the research metadata remains by and large siloed. Considerable resources are spent and enormous amounts of metadata collected by the different actors of the research community (authorities, funders, HEI’s, research facilities, etc.). Collected metadata is stored in several different and isolated locations where the information is difficult to locate and use. This forces researchers to enter same information multiple times.

2. THE SOLUTION
The National Research Information Hub provides homogenous access to heterogeneous resources. The Finnish Ministry of Education and Culture has assigned CSC - IT Center for Science Ltd. to develop the Hub in close co-operation with the funders and HEI’s (https://research.fi). It offers a single, uniform, open and comprehensive access point for all the research being conducted in Finland. The Hub is a service entity where existing research metadata is collected and interlinked in a form that allows ease of use in any other service. The machine-readable interfaces allow for the transfer and use of information in various services, thus enhancing the commensurability of information and reducing manual input. Hence no extra work is added to researchers normal workflows. A public portal offers the Hub’s contents to the general public.

The Hub connects four national metadata hubs which cover different aspects of research metadata (Figure 1). VIRTA Publication Information Service is a completed metadata hub that complies bibliographic information of nearly all scientific publications done in Finland (Puuska, Pölönen, Engels, & Sivertsen, 2017). The other data warehouses collect metadata from funding, research infrastructures and research data. The possibility for a database containing researcher information is explored.

The chosen architecture for the Hub is partly dictated by the existing systems. Data providers retain the ownership of the metadata copied to the Hub which then functions as a central database. Metadata is not requested in real time from the original sources. Automatic batches are the primary way of the data input but in some cases delivery by API is planned. User interface can be used for small amounts of metadata input (i.e. for publications see: https://justus.csc.fi). Open API’s will be provided for reading and searching metadata from the Hub. Metadata exchange follows standard structure agreed between involved parties.
Interoperability requires also common concepts and vocabularies (Remes, Alonen, Maltusch, af Hällström, & Westman, 2017). Together with the Finnish network for research administrators CSC has created vocabulary containing central concepts within research administration. To ensure international compatibility these concepts are mapped to CASRAI terms when possible. Using interoperability tools developed by CSC (Alonen, & Remes, 2017) these concepts are linked to the Hub’s data model which is also compatible with the CERIF.

The Hub distinguishes researchers and links their outputs together with persistent digital identifier, ORCID ID. Researchers without ORCID ID’s are recognized using the combination of their personal information. Furthermore the possibilities to use international ORCID-registry for enriching and supplementing metadata are examined. Preliminary plans exist of a new service linked into the hub and utilising ORCID ID where researcher can give permissions to third parties willing to use her information. The broader international development is followed and plans exist to connect the Hub for example to OpenAIRE and knit it into the international framework.

Useful international benchmarks are for example SweCRIS in Sweden (www.swecris.se), Cristin in Norway (www.cristin.no), and NARCIS in the Netherlands (www.narcis.nl). While these have functions similar to the Hub, none are as comprehensive.

3. REFERENCES


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Academia and industry cooperation based on open research data: case study

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Keywords
Academia and industry cooperation; case study; innovation; open data; technology transfer.

1. Summary
Increasing global competition and speed of technological change are forcing both academia and industries to look for new opportunities to increase their competitiveness [Kesting et al.]. The response of the University of Latvia (UL) was defined in its research strategy [Strategy] back in 2016. Beginning 2016 there is ongoing work on attracting industry top players to cooperate in research and development. Because of continued and focused work to attract industry in September 2017 University of Latvia and Microsoft Innovation center (LUMIC) was opened. This research paper describes the cooperation model and one of the first pilot projects that will be run in LUMIC - project Gene - data lake that will be used to show the results of established cooperation that is based on open research data.

2. LUMIC operational model
Increasing global competition and speed of technological change are forcing both academia and industries to look for new opportunities to increase their competitiveness [Kesting et al.]. Universities have to compete for additional funding, while companies, particularly in high technology business environments, are facing a stronger pressure to innovate. Universities seek to deal with this situation by academic engagement, thereby providing external research support for businesses [Kesting et al.]. The response of the University of Latvia (UL) to this challenge was defined in its research strategy [Strategy] back in 2016. The strategy defines that “The UL in the year 2020 is one of the top science universities in the Baltic region and holds its place among recognized European and global research and innovation centers”. The strategy implementation plan stated that UL is planning to work to attract industry players (local and global companies) that can enable technology transfer processes in UL.

LUMIC was established to serve as a platform where industry professionals, IT companies, academics (researchers and scientists), entrepreneurs, developers, students, K12 pupils, and government decision makers can meet to work together on innovative solutions for the cloud-first, mobile-first world. LUMIC is a platform for those who are willing to actively participate in the digital transformation process in Latvia and to equip themselves with skills and knowledge required in the digital age by creating a space where they have access to a range of technologies, workshops and events, and which enables development of innovative solutions. LUMIC activities are structured in four major programs: (1) entrepreneurship development, (2) skills development, (3) apps development, and (4) ICT innovation ecosystem development.

These programs are designed to foster collaboration on innovative research, technology, and software solutions, bringing together all the stakeholders. By reaching various groups in the society, LUMIC eventually will transform into a hub of local innovation and entrepreneurship.

As one of the assets that is planned to be used in LUMIC activities and projects is open data that is available as part of the government Open data initiative.
3. Gene - health data lake project

For the last 20 years, academic research has been the major, and often only, driving force behind the spectacular development of gene transfer technology for the therapy of rare genetic diseases. Developing these forms of therapy is however complex and requires skills and knowledge not necessarily available to the industry, which is better placed to develop processes and products and put them on the market [Mavilio].

Biomedicine and medical technologies are some of the core industries in Latvia and development of biotechnology is one of the key priorities of the Smart specialization strategy [SSS]. Latvia actively develops international networks and builds collaborative project in precision medicine that is part of biomedicine. It is defined that competitive advantage of Latvia is infrastructure, data available for research, and the flexibility that the country can provide by being small and agile.

Scientific research in genomics has a strong track record in Latvia, as well as an adequate normative regulation, i.e. The Law on Human Genome Research [Law] that came into effect in 2004. It is defined that with the advancement of medical technologies and data processing technologies, Government of Latvia has decided to establish The North European Center for Excellence in Precision medicine that works on a national level consolidating achievements in medicine and technology. A multifaceted project that is run by UL in collaboration with pharmaceutical and IT trend setters in the field, is aiming to develop an open data-driven infrastructure - data lake which will store different gene and health related datasets and make them available for a wide range of research questions.

Cooperation between academia and industry is an opportunity to de-risk innovative approaches and ensure a faster and more economical development of therapies for diseases with high unmet medical needs and low profit expectations [Mavilio] and this opportunity will be explored in one of the first projects in LUMIC.

The gene and health data-based prediction service will be piloted in the field of lung cancer prediction creating the required supporting IT infrastructure with capabilities to integrate and analyze data. This solution will support the following five interrelated use cases: Data acquisition; Data processing and anonymization; Data analysis; Data provisioning for research and Precision medicine; User analysis in interface and infrastructure environments. The outlook of the project is that it acts as an open platform to attract and engage the flagship industry players to pilot their solutions on a national scale. We expect that the platform will be ready for first pilot developments in 2018, and we are planning to have the first applied research results by 2020.

4. REFERENCES


AUTHORS’ BIOGRAPHIES

Signe Balina is Deputy Rector for Digital Society Matters at University of Latvia. Signe obtained doctoral degree in Economics in year 2002 and currently is a professor at the University of Latvia, Faculty of Economics and Management. Since 2009 Signe Balina is a president of the Latvian Information and Communications Technology Association (LIKTA) that is a professional association uniting organizations of ICT industry, research and educational institutions, as well as ICT professionals. Main objectives of LIKTA are development of information society and growth of ICT industry. Since 2010 Signe Balina is a chairperson of the Board of “IT Competence Centre” which promotes a long-term cooperation between ICT enterprises and science institutions in the fields of natural language technologies and business process analyses technologies.

Renate Strazdina is Country Manager for Microsoft Latvia brings to Microsoft her international experience from consulting business throughout the Baltic States. Renate is native from Latvia, graduated from Riga Technical University and holds doctor degree in Computerscience where she is active as a leading technical researcher for last 12 years. Her 15+ years of professional experience was in advisory services specializing on government sector, educational and welfare matters and information technology. This allowed her to develop wide knowledge and experience in project management; e-Service process design; IT supervision of implementation: IT project audit; IT governance and organizational change support and development of IS concepts and requirements (including IT strategy developments). Strong research professional with a PRINCE2 focused in Project management from APM Group. Board member of Latvian Information Communication Technology Association. https://www.linkedin.com/in/renate-strazdina-b3751116/
1. SUMMARY

In the Spring 2015 Rectors’ Conference of Finnish Universities of Applied Sciences decided that all applicants in the field of Social services and healthcare should do a pre-selection exam before the final entrance exam. If the pre-selection exam would have been arranged in the same manner as the entrance selection exams, it would have resulted in very laborious and costly effects.

Metropolia University of Applied Sciences decided to create a system where the exam could be arranged and done online. Metropolia started a project called SOTELI and created massive online exam service for applicants in the field of social services and healthcare. With using this service around 40,000 people every spring and 10,000 people on every autumn participates on this online exam at the same time. The results of this exam are transferred to national admission system after the exam.

The project achieved its goals and objectives. Metropolia University of Applied Sciences implemented the aforementioned electronic pre-selection exam system and offered other universities of applied sciences the opportunity to introduce the system. The system is currently being used by 20 universities of applied sciences. The pre-selection test system utilizes common pre-selection questions approved by the Board of Trustees of the ARENE Board of Education. At the moment at least over 100,000 people have participated on these online exams and their results have been one criterion for pre-selection process in the field of social services and healthcare in Finland.

2. THE PROJECT

SOTELI-project was started in October 2015. SOTELI had to be an agile IT-project because the project had only six months to create massive online exam service from scratch. The project also had to create integrations to Finnish national admission system (OPINTOPOLKU).

3. SOFTWARE SOLUTION

The actual exam software was decided to build on proven technology. Metropolia’s technical partner Eduix Ltd has long experience in building browser-based applications for web form based data collecting. Early on in the project, one of Eduix’s products was decided to be modified to be exam software, because it had the basic function needed on the client side and it had thoroughly tested...
functions at saving the data at the server side. The original software was modified to suit the needs of the project. Unmodified software had more functions that were needed in actual exam software, but it also lacked some required functions.

Examination software was built to include the periodical automatic saving of participant answer in the background using AJAX-web technologies. Also, the examination answers on the server side were split into two main functions: the actual answers were decided to be saved by automatic saving or by the user action in the selected main instance of the participant. Another automatic time-based function was built to stream the answers to the Elasticsearch index during the examination.

4. HARDWARE SOLUTION

Hardware setup planning started with evaluating the capacity. It was clear when evaluating the capacity needs that it was necessary to run full-scale load tests. First load tests were run from the internal network. Soon it was noticed that load tests run from the internal network were not enough. Load tests were transferred to cloud servers so that the load test would also include hardware outside the local network. Also, tests simulated better the actual situation when the load was generated from the cloud. To simplify, we made DDoS attack simulations against our MOES environment.

The load was balanced to different servers. The total amount of servers was 21. There were 3 different login servers, 15 exam servers and 3 servers for the Elasticsearch indexes. The total number resources used in MOES were:

- 96 Virtual CPUs
- 252 Gb RAM memory
- 630 Gb HDD (SSD)
- 10 Gbit/s Internet connection bandwidth
- 20 Gbit/s Internal network bandwidth
- 2 geographically separated and mirrored data centers using F5 load balancer

5. RESULTS AND OUTCOMES

The first exam was held in Spring 2016. There were 37,000 applicants participating in the massive online exam. This was the first time ever in Finland where there were so many people making the same online test in a 1,5 hour timeslot.

It was very exciting for the technical staff to gather together on the morning of the exam and start monitoring the system operations, throughput and also to look for live commentaries about the exam on the popular public discussion boards on the internet. After the first half an hour it became evident that no disaster was about to take place and every piece of the system was working just as planned. Two hours of thorough and intense monitoring of various logs, system loads, as well as the loads and performance of the whole infrastructure, showed no signs of disappointment. The system stayed completely responsive and fast during the test, as it was planned.

6. REFERENCES

7. AUTHORS' BIOGRAPHIES

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Migration of a web service back-end from a relational to a document-oriented database

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Keywords
relational database, migration, document-oriented-database, MongoDB, LINQ, SQL

1. INTRODUCTION

IT infrastructure and applications are becoming more important to the universities’ processes and employees and to students and their daily life. This leads to increased competition among the universities to present the best and most appealing services to their students. There are many examples of small-scale developments that support individual learning use cases.

Often these services are instantiated by a student or research project but have to be maintained by universities technical personnel on the long term. Without considering enhancements, maintenance costs alone can be high to keep the services operational and migrate them towards new technologies.

One of these services of RWTH Aachen University is an Audience Response System (ARS) used to support large-scale lectures with more than one thousand participants. The ARS is currently supporting more than 40 lectures and other events. As part of the application lifecycle, the technological basis needs to be migrated so the service can be continuously operated.

2. PROBLEM STATEMENT

In the current infrastructure, the database server poses a single point of failure. An off site backup protects from data loss but allows neither automatic fail-over nor scaling. Like many modern real time web applications, this scenario requires scalable application and database software architectures. Our goal therefore is to migrate the application to a more scalable topology that uses replication in order to distribute data store and access to all available nodes.

The database should thus be migrated from Microsoft SQL Server to MongoDB. Changing the database back-end, however, also affects parts of the application logic. Based on the example of the ARS, a general approach shows standard cases when migrating from a relational to a document-oriented database model. As there are many services using the infrastructure, the goal is to generalize these cases to develop guidelines for migration of these other services.

As a relational database, the current SQL Server supports the use of constraints. This means that there can be references between datasets in the database. Using an ORM further allows accessing the referenced datasets directly via the object model.

The ORM LINQ to SQL offers a programming interface that integrates seamlessly into the LINQ language extensions offered by the C# programming language and allows addressing relations and attributes directly from code.

3. DATABASE MIGRATION

Obviously, migration of the database engine also requires migration of the object mapper and database connection classes. It is however required that the general functionality of the migrated class structure retains the described properties like accessing with LINQ and compile time syntax checking. The database migration is therefore performed in three steps:

1. Analysis and simplification of the current database model:
Reducing the complexity of the database model and existing relations allows effectively utilizing the trades of the new database system.

2. Conversion of database connection and object models:
   Actually migrating existing source codes to the new database models and drivers and trying to preserve most of application logic.

3. Validation and migration of existing data:
   Migrating existing data and using automated unit and integration tests to compare the application behaviour before and after the migration.

4. GENERALIZATION
   Based on the possible archetypes of relations (1:1, 1:n and n:m) general guidelines were formulated: these identified cases serve as a reference when other applications need to be converted. Document-oriented features such as embedding, referencing or using multiplicity of lists allow more efficient data structures than often modelled using relational databases.
   For example, typical intermediate relations can be removed as it is possible that multiple references can be directly stored in documents. Furthermore, it is also possible to combine or remove tables by hierarchically integrating information from multiple relations into a single document.
   Migration to a document-oriented database system additionally allows an optimization of the applications, since each document can be individually modified or extended in its structure. This allows applications to change the stored data more evolutionary and thus increases the overall maintainability of the software.

5. CONCLUSION
   The migration of a web service back-end to a different database system should be well considered. Without a basic concept, it is not possible to successfully perform such a migration without service interruptions. Already existing structure of the database relations must be analyzed and adapted to the new system. Subsequently, optimization points of this structure can be characterized.
   Looking at this first use case, the migration was very successful. Compared to the old technology stack, it did not only increase long-term maintainability of the software but also reduced overall resource consumption. The set of generalized guidelines further ease future migrations planned in the near future.

6. AUTHORS’ BIOGRAPHIES

   Sebastian Drenckberg, B.Sc. is software developer at the IT Center of RWTH Aachen University since 2017. In 2017, he finished his B.Sc. studies in Scientific Programming at FH Aachen University of Applied Sciences and his apprenticeship as a mathematical-technical software developer.

   Marius Politze, M.Sc. is research associate at the IT Center RWTH Aachen University since 2012. His research is focused on service-oriented architectures supporting university processes. He received his M.Sc. cum laude in Artificial Intelligence from Maastricht University in 2012. In 2011, he finished his B.Sc. studies in Scientific Programming at FH Aachen University of Applied Sciences. From 2008 until 2011, he worked at IT Center as a software developer and later as a teacher for scripting and programming languages.
INTRODUCING AGILE TO ERP (UNIVERSITAS XXI) DEVELOPMENT

1. Summary

Agilism is becoming the paradigm for software development, but many software manufacturers, or software/IT departments are used to work with traditional methodologies. In Oficina de Cooperación Universitaria (OCU) we have started to transform our way of developing software (our ERP for universities called UNIVERSITAS XXI) from traditional to agile. These first steps in this transformation have interesting outcomes for us, we want to share: difficulties, advantages, lessons learned...

2. INTRODUCING AGILE TO ERP (UNIVERSITAS XXI) DEVELOPMENT

Scrum, Kanban, Lean, SAFe, LeSS, DA, Scrumban, are an example of the diversity of models that we have at our disposal to apply the principles of agilism as a software development methodology. The adoption of these models responds in many cases to fashions by which certain terms are popularized and push organizations to make changes in their processes and techniques.

The effect of applying these models only because they are fashionable can result on a forced adoption not adequate to the reality of each organization and its software, forgetting that, although methodologies can help to improve development, original values of agilism must be the base to follow.

These values are fixed in the agile manifiesto:

- We are uncovering better ways of developing software by doing it and helping others do it.
- Through this work we have come to value:
  - Individuals and interactions over processes and tools
  - Working software over comprehensive documentation
  - Customer collaboration over contract negotiation
  - Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more.

Scrum has become into a “de facto” standard, but is it suitable for large organizations?

In 1993, Jeff Sutherland formally invented the Scrum process, adopting many other practices already in use, such as the daily Stand-up meetings, and with the passage of time it becomes a de facto standard for many organizations that decide incorporate agile methodologies to your software developments.

The detractors do not take long to appear and many focus on the suitability of the methodology for small start-up organizations, but not so much for large organizations. In response to this criticism, the concept of Big Agile emerged, scaling Scrum, with frameworks such as SAFe (Scaled Agile Framework) or LeSS (Large Scale Scrum), which help to make a comprehensive agile management, not only at the project level, but also of program and portfolio.

The standardization of Scrum as a working framework in the development of software has not prevented the popularity of other methodologies such as Kanban, for development cases more focused...
on maintenance than on the project. Other variants have also emerged that imply an innovation on these models, such as:

- **ScrumBan**: mix the best of Scrum and Kanban, in which you can give cases such as a Kanban slate with planned time frames (i.e. sprints).
- **Dual Track Development**: establishes two parallel work paths, one dedicated to discovery (Discovery track) and definition of new functionalities and another to the development and delivery (Delivery track) of the products with said functionalities; More information in this interesting article on how to configure Jira with Dual-Track Scrum.
- **Modern Agile**: redefines the principles of the agile manifesto, trying to flee from large frameworks and the excessive bureaucracy that is being generated around the agile methodologies that have already been implemented for some time, as in the case of Scrum.

The emergence of practices such as DevOps or User Xperience, in which it is necessary to involve the operations and design teams throughout the life cycle of software development, or the increase in the trend of team relocation, are causing organizations feel that in their processes of digital transformation it is necessary to adopt agile methodologies for their operation, but making small adjustments (process tailoring) to the methodology that suits their needs, as promoted in the DA (Disciplined Agile Framework).

In conclusion, it is very important that these processes of change are based on the values of the agile manifesto, and that they know how to adapt to the objectives of each organization to achieve a balance between methodology and needs, putting agility in front of the labels.

During last two years OCU has run a pilot project in the department responsible for the development of the core of UNIVERSITAS XXI (ERP for universities) introducing the agile philosophy.

The main difficulties to adopt the new paradigm has been:

- Gain management trust in the agile transformation
- Methodology tailoring: Development vs Support
- Mini-waterfall vs Scrum: mind the gap
- Remote teams & Tools: JIRA, Slack, Skype...

But regardless these barriers, the experience has shown the big advantages of the approach to agilism:

- Team commitment
- Software delivered more frequently
- Customer needs are fulfilled more precisely
- Time to market
- Predictability

The current roadmap is to increase progressively the scope of the project reaching more units of UNIVERSITAS XXI software development.

3. REFERENCES


4. ABOUT THE AUTHORS

**Roberto Clemente** is Team Manager in the unit of core development for UNIVERSITAS XXI, in Oficina de Cooperación Universitaria ([www.ocu.es](http://www.ocu.es))

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**Oficina de Cooperación Universitaria** is a Higher Ed Management software manufacturer. The company belongs to six Spanish Universities. Its ERP “UNIVERSITAS XXI” is used by around 100 universities in 9 countries.
8 Years of Experience in SCRUM- and KANBAN-driven Development of Campus-supporting Software Systems

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Keywords
Agile development, SCRUM, KANBAN, teaching

1. Summary
This extended abstract outlines the spectrum of experiences from 8 years of SCRUM and KANBAN combined development of campus supporting software systems at a Swiss university. In the meantime, these experiences have been integrated into the curriculum as part of an innovative teaching format.

2. Findings in Agile Development of Campus-supporting Software
The University of St. Gallen in Switzerland is one of the leading business schools in Europe, accredited by EQUIS and AACSB, and a workplace as well as "think tank" for around 8'500 students and 2'900 academic staff.

The holistic study approach taken at the University of St. Gallen with its highly permeable study programs, as well as the aim of a comprehensive digitization in the student administration, imply specific requirements to the underlying application landscape, which - as various analyses of the past have shown - can only be met by integrating purchased standard software components and proprietary developments. This has led to the establishment of a software development group as part of the central IT services that has been organizing itself for 8 years along an agile development methodology: While SCRUM is used for running software development projects, KANBAN supports the software maintenance and evolution as part of a continuous change management process. Today, 11 software engineers, 1 SCRUM master, 2 product owners (as representatives of the house-internal customer side), 2 test engineers and a UX designer work under SCRUM/KANBAN in teams of varying composition. SCRUM sprints last 2 weeks; software releases are linked to the SCRUM sprint cycle and happen every second sprint.

The methodological basis has been stepwise refined and improved over the years. Key findings from the process of continuous improvement include:

- When initially introducing SCRUM and KANBAN, implementing these methodologies completely and close to the corresponding guidelines (Schwaber & Sutherland, 2017)(Anderson & Carmichael, 2016) is worthwhile. A subsequent tailoring is possible, but should remain on detail level: e.g. omitting effort estimates for tasks due to lack of benefit, and estimating story efforts only.
- The university-wide prevailing understanding of project management derives from the "waterfall model" ("what is specified is delivered") and thus, collides with the paradigms of SCRUM/KANBAN. These methodologies and their associated metrics, but also their benefit in terms of flexibility provided to the customer, must be explained carefully, especially to the university management.
- The mentioned relevant guidelines are based on an ideal world, with highly available employees being able to always fully concentrate on their SCRUM project - teams work interactively and in the same location. But the real world is a different one. However, the smart use of digital support, such as an electronic interactive SCRUM/KANBAN board, can sufficiently compensate for challenging boundary conditions.
- The behavioral maturity of the software development group improved significantly:
  - Frequent customer feedback and requirement changes are considered as not disturbing, and as something useful to improve the product. SCRUM/KANBAN team members see themselves in the same boat as the customer - "we develop the product together with the customer".
  - As part of the regular retrospective or KAIZEN meetings, a SCRUM/KANBAN team conducts for...
itself an open and self-critical discussion. Identified weaknesses, errors and corresponding measures are then communicated transparently to the management. This requires a fault-tolerant management culture.

- The efficiency and effectiveness of the software development and integration group could be verifiably increased significantly. Exemplary findings in this context are:
  - The separation of project related and day-to-day work into the SCRUM and KANBAN processes has significantly reduced the “disturbance potential” of day-to-day business.
  - Self-assessment skills have improved significantly, also due to the use of methods such as planning poker (Grenning, 2002). This results in more reliable planning forecasts for customers.
  - A constant flow of work is more important that single optimizations, compare the theory of constraints (Goldratt, 1990). As an example, team members indicate the occurrence of a show-stopping problem by pulling a virtual rip cord, which leads to an immediate join effort by the team to address and resolve the issue.
  - Prioritize and sequence consistently in all process steps instead of “developing on call”. For example in KANBAN, tasks are classified - “express tasks” have a “price” for the customer, there can only be one “express task” at a point in time. In addition, the allowed number of tasks that are labeled ‘work in progress’ are limited.
  - Quality cost is lowered by early and automated testing and consequent setting of “definitions of done” for each process step.
  - Involvement of customer representatives while releasing is a must: If the customer concludes that business cannot be executed using the actual software release, a rollback is mandatory.

It is intended to further stepwise transform the existing processes into a DevOps approach with continuous delivery capabilities (Kim, Behr, & Spafford, 2013).

3. Unexpected Benefits for the Curriculum

In the meantime, the university and its central IT services have agreed on a next step to profit from the attained maturity of the agile software development capabilities within the central IT services. At Bachelor's level, the central IT now gives a class aiming at the following learning objectives:

- Participants are building up practical SCRUM skills while understanding SCRUM's success factors.
- Participants are enabled to develop web applications using state of the art software technologies (angular, node.js, html5, typescript).

On the one hand this means that the central IT as a true user of its own applications discovers previously overlooked potential for improvement. In addition, central IT strengthens its internal acceptance. On the other hand, the university is able to expand its curriculum in a crucial domain.

The weekly course is open to all Bachelor's subjects and is structured as follows: Since the participants have very different backgrounds, an initial short evaluation of their IT knowledge is carried out. On that basis, the course management divides the group of students into SCRUM teams as heterogeneous as possible. This way, the members of a team are perfectly able to cover the various roles that need to be covered: Product owner, SCRUM master, designer, tester, or developer. Appropriate assignments ensure that the team members share their individual learnings within the team. After the initial acquisition of necessary basic knowledge, the teams begin to implement step-by-step an application using the SCRUM method, a simple but appealing chat web app. Sprints last one week, reviews are carried out with the “customer” - the course management - and are reflected on and evaluated in the plenary session. The results of the retrospectives carried out by the teams themselves are also discussed.

4. REFERENCES

5. AUTHORS’ BIOGRAPHIES

Christoph Baumgarten studied computer science at the Technical University of Braunschweig, Germany, at Master’s level (1995), and gained research experience as a visiting scholar at the Arizona State University as well as ETH in Zurich, Switzerland. In 1999 he received his PhD at the Technical University of Dresden, Germany, within a state-funded Research Training Group. His professional experience comprises various IT management positions, including CIO of the University of St. Gallen, Switzerland (2009-2017), and Head Capability Development AIM (Aeronautical Information Management) at Skyguide Swiss Air Navigation Services (2003-2009). Since mid-2017 Christoph Baumgarten is working as a lecturer in business informatics at the FHS St. Gallen.

Originally active in the field of machine mechanics (Werfo AG Switzerland, 1997-2000), Christian Buttazoni completed his extra-occupational studies in software development at the WIFI, Austria, in 2000. From 2000 to 2002 he was employed as a full stack developer at VisionOne AG in St. Gallen, Switzerland. Since 2002 he has been working for the University of St. Gallen in the field of application development, most recently as a senior software developer and lecturer for software development at Bachelor’s level.

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Anchoring student credentials to the blockchain using zero knowledge proofs

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Keywords
digital credentials, blockchain, education

1. ABSTRACT

Today, we live in a digital era where more and more attestation services are being transitioned away from paper yet the educational credential is still based on paper evidence of one’s skill set. While paper credentials might have been sufficient in the past, today’s technology makes the process of counterfeiting them almost trivial which means that in most cases the credential itself is no longer a proof of one’s skill set but it requires confirmation from the issuing institution, something which also becomes impossible if the issuing institution ceases to exist. This in turn has enabled the creation of an entire industry focused solely on verifying validity of educational certificates. A new digital form of certificates whose authenticity can be proven or disproven without examining its contents of could alleviate these problems while at the same time complying with existing privacy laws in digital space.

2. SYSTEM OVERVIEW

Digitizing student credentials presents several unique problems. The issuer must provide infrastructure for hosting them, dangers of potential data breach can never be fully mitigated and the validity of these credentials is automatically tied to the existence of the institution that issued them. With the advent of blockchain technology it has become possible to store proofs of existence on a distributed database thus eliminating the need for hosting infrastructure as well as rendering data breaches impossible and enabling ownership of the credentials to be efficiently managed in the digital space.

The term blockchain is somewhat specific and if we want to include both public and private solutions the term distributed ledger or ledger for short, is more appropriate. The concept of issuing educational certificates on the distributed ledger is based on publishing digitally signed hashes of xml, pdf or json files containing information about the certificate. The published hash has a twofold purpose, to provide an immutable timestamp of when was the credential issued and to ensure that the digital file issued to the user has not been tampered with. With that in mind it would be more precise to use the term anchoring or linking to the ledger since the certificate itself is not being stored.

We recognize that in the academic credential eco system the ownership of any certificate is shared between the issuing institution and the receiving individual in that the institution reserves the right to revoke the credential and the person has the right to use at as a proof of his or her skill set. With this in mind certificates would be hashed and the digest would be cross-signed with the institutions private key to verify their origin and with students’ public key to confer ownership. The institution would use a different private public key pair for each certificate derived from a single master seed key in what is known as a hierarchical deterministic key pool. The resulting data would then be broadcast to the rest of the network and added to the ledger. This scheme allows the issuing institution to revoke the certificate but denies it the ability to display it. The student on the other hand controls to whom and when he will show his certificate.
The display of certificate would be done by checking the hash of the individuals file against the one stored on the ledger through a smart contract which would check the validity of both keys that were used for signing. The actual physical display of the certificate represents the most difficult problem in the process. Current solutions rely almost exclusively on smartphone apps which bring a whole set of problems with them. From modification of viewer apps and display of false certificates to the theft of users’ secret keys by malicious apps or by transmitting touch inputs. The loss of phone or simple hardware failure is also a problem. The issuing institutions could also host their own web viewers but this renders the entire point of certificates on a ledger and not to mention the concept of self-sovereignty, kind of mute.

If the institution decides to revoke the certificate it would simply nullify the private key that was used to sign it and the smart contract check would fail rendering the certificate itself no longer valid. Another major disadvantage of paper-based certificates is that once issued they cannot be revoked. This might sound counterintuitive upon hearing at first, since educational certificates are and have been revoked in real life. They key lies in the way in which revocation is achieved, which is by checking the validity of each certificate with the issuing institution.

It is important to note that this system is completely independent of the actual software implementation of the ledger or blockchain and that it would be wrong to cater towards one specific ledger architecture since the only property that is of actual benefit is its immutability. We state that full vendor independence must be observed when implementing long term projects in the digital area to mitigate against potential obsolescence of certain implementations.

3. REFERENCES


4. AUTHORS’ BIOGRAPHIES

Mirko Stanić

Mirko Stanić has a Master’s Degree in Information and communication technology from University of Zagreb (2010). He has worked in Central Applications Office since 2011 as the lead software developer on the Croatian Higher Education Admissions system (NISpVU2). His work is divided between working as a developer in software projects and working as a consultant on specialist projects.

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An innovative, mobile-based, multi-merchant, student loyalty system spreads in the Greek Islands: The Aegean Club / Yummy Wallet case

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Keywords: Mobile, multi-merchant, coalition, loyalty system, university, reward system

1. SUMMARY
The purpose of this case study is to present an innovative electronic platform for student loyalty management, with extended marketing features, launched by the University of the Aegean, to be applied in 6 islands with more than 30,000 students, staff and alumni. The attempt focuses on establishing a reward mechanism, primarily a student demand aggregation, loyalty and payment system, integrated with a multi-merchant (coalition) management, marketing and charging system. The proposed approach has to be based on a win-win solution for both participants, the University of the Aegean’s academic community and the commercial business environment in the islands of the Aegean, which cannot be achieved with ordinary approaches. The proposed solution, “Yummy Wallet” – an ingredient of the Aegean Club overall student programme of the University, is currently being applied in the first two islands and constantly evolving, to be a very useful and re-usable method and platform.

2. RATIONALE AND BACKGROUND
Despite research contribution, Universities constitute a source of economic growth by supporting economically even the weakest communities. Primarily, academic communities, consisting of students, professors and administrative staff with a confident ratio of professors and students, are being a tower of financial contribution to their region.

The University of the Aegean is situated in six islands in the Aegean Archipelagos, which are Lemnos, Lesbos, Chios, Samos, Syros, and Rhodes and consists of five schools and sixteen Departments. The UAegean’ s academic community is large enough (fifty thousand members) to contribute economically to these islands. Specifically, Karlovasi, on the island of Samos, in which they are consists three departments of the University of the Aegean, represents an urban example. With a total population of approximately 7000 permanent residents, academic community represents 30% of the city’s population. Considering the cost of living, with a total mean amount of €700 per month - student, it is estimated that island’s income from academic community counts hundreds of millions per year. By including all departments and academic members we can easily calculate a quantity of hundreds of millions income per year for these islands. Nevertheless, until now, there hasn’t been any reward mechanism for this huge financial contribution.

Therefore, an innovative solution which will reward academic members, is required, especially nowadays, due to the current economic crisis in Greece. This reward mechanism will combine the financial power of the academic community with multiple merchant coalition. The goal is to design a reward system of advanced functions which encouraging and motivating the academic community, especially students, using it with affiliated stores.
3. OUR PROPOSAL FOR A MOBILE-BASED LOYALTY SYSTEM

The original idea was an integrated electronic payments and loyalty marketing system based on mobile phones and plastic cards that would combine the following key features:

1) Payments with the mobile phone as well as via a plastic card at affiliated cashless campus stores.

2) The possibility of refunding money to the academic community as a reward when buying from these partner stores, with this money being readily available at any ATM in the country.

3) Percentage of the return on each transaction to be shared between the student-consumer and the University of the Aegean through a scalable system.

Each time the student is going to shop in one of the affiliated stores and pay in any way (cash, credit, etc.), he will be rewarded with euro points, which will be added to his digital wallet. The student will be able to ‘withdraw’ some or all of their money from an ATM or leave them in their piggy bank.

This way the system provides value and benefits for all, since students, through their mobile devices, can monitor their “e-wallet” and see their savings increased, merchants with a loyalty system can easily attract new customers, keep existing ones, have detailed analytics of each customer’s purchasing trends, track sales growth, promote marketing campaigns and post promotional material, while the University of the Aegean will be taking part of the moving - refunded money as income.

YW is the mobile app that gives value to m-payments. YW is a cross between m-payments & coalition loyalty reward services that helps retailers get customer data, interact with them & increase sales while consumers enjoy the ease of m-payments with loyalty benefits & rewards across the market.

This particular methodology has several advantages as it leaves open all the possible coverage of present and future system needs, since it could serve as the basis for the University, functioning as an application for all faculties and all communication requests.

Through long and in-depth discussions with people from all over the banking sector and Loyalty Marketing companies we were able to look at the boundaries of the industries (e.g. internet banking, e-wallet restrictions in the program) and on the other hand, through everyone’s experience, to find the best solutions for the planned program by matching the best of both worlds.

4. USEFUL CONCLUSIONS

There is a lack of a mobile app that gives value to mobile payments with coalition loyalty schemes & personalized Marketing tools. If you look at someone like a web multi-store most likely they know relatively little about their customer but they make good use of the data they do have. YW traditionally has a huge amount of data about their customers - members and they intend to get the potential of it by the use of an analytics-based CRM online software. They plan to use data from their members, including their transactional history and personal information, to determine what products or services would be most useful for them.

In addition, YM intends to develop some accompanying online tool:

1. The creation of an online marketplace where the collaborating companies will be able to expose - sell their products and services will increase their influence cycle outside the narrow local boundaries of Samos but, it is also a lure for their possible participation in YM program since the know-how and the implementation of an e-shop on their part is a costly, laborious process.

2. With the same logic and in the same direction, a web-based list of businesses participating in the program can be created to help them to be found easier but also to display them through it, not only on the website list but mainly on Google’s search results, since the indexing in such a list also involves the Google business indexing with very privileged terms in terms of the page that will appear in its search results, just as it happens with video black-links, online store, and social media reports.

Those online applications (marketplace, online business directory etc.) will not only dramatically increase the system’s capabilities, but mainly constitute the basis on which a transformation of the present system into a merchant multi-tool can be achieved in order to meet the merchant communication needs as a whole.
5. AUTHORS’ BIOGRAPHIES

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Athanasios Davalas obtained his first MSc degree in Educational Leadership, Management and Emerging Technologies from Universita degli Studi Guglielmo Marconi in 2015 and the second one in Digital Innovation and Entrepreneurship from the University of the Aegean in 2017. He is currently a PhD Researcher at University of the Aegean in Greece. He is interested in artificial intelligence for and with web engineering, search engine optimization, Facebook and Google advertising. The last 12 years he works as a project manager and web developer for Dreamweaver.Gr and as an instructor of e-learning at University of Piraeus, Greece. He has published three books related to SEO, WordPress and OpenCart Technologies from Fylatos Publishing.

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founded the software company Cardisoft SA, (President & Chief Executive Officer), a software company that provides Student Management Software for Higher Education. Build the company to be the leader in the market, to 500,000+ users, and great profitability, and sold in 2012. He was awarded the title of a “Business Distinction” by Ministry of Development. He holds an Electrical and Computer Engineer degree and a Master in Information Technologies. He has also a rich R&D experience as project leader of national and Euro projects.

George Papazidis holds a multi-profile executive with management, sales, marketing, entrepreneurship and leadership skills in the software industry. He is able to think ahead and innovate in terms of direction for marketing and sales. He can develop and review quantitative analysis measures for corporate marketing and sales and lay out goals and provide direction for members of the sales and marketing teams on ways to measure progress towards the goals. He, also, gained significant experience, cooperating with New York School Construction Authority, as an Environmental Investigator & Manager of toxic substance projects (asbestos & lead) in New York Public Schools ensuring compliance with environmental legislation. He plans to continue expanding his knowledge in management, product management, sales, marketing and environmental areas. Specialties: Strategy, Marketing & Sales, PR, Management, Product Management & Design, Business Planning & Development and Environmental.
appUMA: smart, reliable and customizable App

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Keywords
Mobile apps, QR codes, Oauth, identity management.

1. SUMMARY
In 2013, we knew that we needed something to be closer to our users. We had an overloaded website with tons of information and social networks. Also, we had a specific website for students, so they can check their academic records. However, when we checked students' opinions feedback was not what we were expecting because we realized that they were focused on marks and, maybe, tutorials. After a brainstorming session, we decided to develop an app to improve our users experience. First of all, the app must be clever. We needed something beautiful and clear because our users could get lost and confused easily in any other way. Second, we need something with fault tolerance so app must work even servers are down because we want frustration-free users. Moreover, users must be able to configure some parts in the app to adapt it to them. Finally, app must be easy to use.

2. ARCHITECTURE
Our first approach was students first, so we prepared everything we needed and that mainly was a set of web services to query around any student entry. At first sight, our design has many pieces but we can simplify everything in two pieces: App and duma.uma.es (also known as DUMA). App could be seen as the user interface of the system. DUMA is the University Identity Panel, where users manage their identity: aliases for email, telephone numbers, password, permissions, ... It's the cornerstone when we talk about ID management in UMA (Figure 1). App will always connect to DUMA to get information and DUMA will know what to do to get the right information. So, we isolate app from servers with sensitive information, we could say DUMA is like a data firewall.

3. APP
One of the new things we introduced in this app to minimize phishing and all the problems related to login in small screens (like mobiles used to have) was the “secure web step”. Users must login first in DUMA using any browser (Bootstrapping OAuth for mobile apps using QR codes. EUNIS 2013). Users can customize the App from preferences. They can choose what they would like to see in the sidebar and what kind of push notification they are interested in (Image 1). Also, some features can be shown only to privileged users and these permissions can be managed from DUMA so the App can automagically change on the fly. Last year, we added the ID card and it received a warm welcome. It became the official ID card in our University and even is accepted in museums to get discounts. Recently, we open to the public a new service called CodCod. CodCod is a service that use the camera and QR codes to check anything about attendance (classrooms, congress...).

3.1. Homepage
Our homepage has a simple design but very useful so users can find what they are looking for: news, my info, study plans, directory, preferences and messages (Image 2). News, study plans and directory sections are connected directly with official sources so we don’t need to be worried about that information because the right people will update that info and automagically the app will be updated too. We should mention that messages section is not a WhatsApp or similar. This section is the place where users can check push notifications received in last 10 days. But this section has a
bonus, push notifications are usually ugly and only plain text, so we designed a system that allow us to send rich push notifications, so if any user goes to this section then she will be able to see more information moreover the plain text part he read in the push notification. All this will be possible if the person who sent the notification writes a beautiful and long push, of course. Finally, my info section. This is the most important section for any user because this section is all for them.

3.2. My Info
As we said, this section is the most important section in the App. In this section, we know who the user is, so we can show precise and useful information and options to him or her. For example, if we know that you are a teacher, you will see your subjects and all your students. If you are a student, you will see you subjects and all kind of information related to them. And if you have these two profiles, you will see both of them. Furthermore, some options here could be hidden or shown on demand from DUMA. For example, in chancellor election season we show information about census and we don’t need to upload any new version to stores to do that. Now, let’s talk about main features here. First of all, ID card (Image 3). This is not any card is the official ID card in our university because we are moving towards no paper, no plastic. As we mention before, this ID card is accepted in museums and that’s why we added expiry date below the photo. Also, we thought it would be good to add some kind of animation so, we added a clock. Anyway, if you tap on the ID card, you will see the reverse and it’s here where users can find more useful information, for example, about their affiliation. This reverse can grow up because it has a list-style so it can be longer than the front. Secondly, our QR code scanner also known as Codcod. This development was made by two people to test and certificate how easy it is to add new features developed by “third parties”. We had a QR code scanner in our app because we use that in login step. So, question was: how much time do we need to add another one but with a different behavior? The answer couldn’t be so amazing: 2 minutes. Actually, the complex part was in DUMA because there’s where we have to do the “heavy” development process: web services, interfaces, permissions, ... In spite of everything, developer only needed a couple of days to get everything working perfectly. Another key point is “Teaching” and how teachers can get updated information about their students on the fly. As we mentioned before, every teacher has a list of students with all useful information about them (name, photo, email and mobile). So, they can send an email to students directly from the app and even dial telephone numbers.

4. RESULTS
The first third-party application has been taken from the concept to deployment in less than 2 weeks. All requirements have been met but CodCod had so warm welcome that we had to create a wish list to future updates. Teachers now have the ability to check class attendance in a glance and export lists in CSV format but more people are using CodCod to do things we have never thought about. App adoption is great and every day we receive more and more feedback to improve the app. Finally, platform neutrality requirement was met. App adoption is great and every day we receive more and more feedback to improve the app. From the beginnings, App has been downloaded 51000 times (iOS: 15700, Android: 35300). 11900 times since 1st Sep 2017 (iOS: 4000, Android: 7900). Students are happy and satisfied because they are notified when their results are published.

5. FUTURE
The main objective for the near future is to optimize the application and generate documentation and some snippets to anyone willing to offer identified services to members of the University. Once this has been achieved, the next step will be to increase the services connected to the app. Second objective is including NFC technology in app to be able to develop new features like access control about. And third, multi-language app because our app now is only available in Spanish.

6. REFERENCES
7. AUTHORS’ BIOGRAPHIES

M. Baleriola has a degree in Computer Science Engineering and also a Master degree in Software Engineering and Artificial Intelligence from the University of Málaga. He started writing books about ethical hacking and Linux in the 90’s. In early 2000’s he landed in web programming and near 2008 he met Django and fell in love with Python. Nowadays he is working as a sysadmin and developer in Central ICT Services of the University of Málaga. Project Manager for official University of Málaga website.

V. Giralt is the CIO for the University of Málaga. Graduated as an MD from University of Málaga in 1986, and became a member of the University IT team in 1987 as a programmer. Has worked as a programmer for the University and as a systems administrator both for the International University of Andalusia (1990-1995) and the University of Málaga. Chairs Board of Directors of the Groningen Declaration Network Foundation. Secretary of the Internet Society Spanish Chapter. Member of the Student Mobility EUNIS task force, member of the RedIRIS identity task force, member of the Spanish Identity Federation Advisory Committee, member of the SSEDIC EU expert network on electronic identity.

A. Muñoz has a degree in Computer Science Engineering and also a degree in Technical Engineering in Computer Management from the University of Málaga. Since 2006 he’s gaining experience in everything related to Java, Oracle and Android (J2EE, Oracle database, Oracle Application Server, Android SDK, JSF, Hibernate,…). At present he works as J2EE developer in Central ICT Services of the University of Málaga. Previous occupations include Isoft Health in the E-siap project based on Javax Swing and RMI Technology, CGI Group, NÁCAR Information Technology. SL. Working for Vodafone España with J2EE technology. He participated in the development of applications that got ORACLE Spain’s best management software project award and Computer World’s award for citizen impact in 2007.

J. Canca has a degree in Mathematical Sciences. He has been Assistant Professor at the Languages and Computer Science Department. He is currently the CIO of the University of Málaga and has been the director for the ICT services for the past fifteen years. Member of the working groups eGovernment and Government IT in the IT Commission of Spanish Rectors Conference.
From application to dormitory - housing process in University Study-Oriented System (USOS)

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Keywords
Dormitories assignment, Housing, USOS, USOSWeb, USOS API, System integration

1. Summary
The task behind this project was to streamline the process of applying for dormitory places for students, to relieve university administration in the assignment procedure and to provide data exchange with third party dormitory administration systems. Those goals have been achieved within the framework of existing and widely used USOS 1 (University Study-Oriented System, used in most of the main Polish HEIs) and its satellite applications. New modules can be adopted for local circumstances and be used as a foundation for other applications, eg. mobile apps.

2. EXTENDED ABSTRACT
Getting a suitable accommodation is one of the top priorities for students, especially for the freshmen when old-school networking is not a case yet. Universities all over the world provide housing opportunities, although in most cases the number of dormitory rooms is limited. The process of obtaining a place to spend the most of the academic year used to be long and challenging for all the parties. Students, who fill applications, selected group of faculties (or other departments, or even other entities) called the trustees review students' applications and award them places in dormitories. Finally, dormitory administration, handle the checking in & out of the. In the last couple of years USOS, together with its satellite systems, has gained new modules assisting and automating the process.

Before the major overhaul, USOS had a module which allowed university administration to record application delivered on paper. Then an outcome of the application has been recorded in the database. Finally, when students arrived at dormitories doors, administration could also perform basic hotel operations (as check-ins & check-outs) within the system. Student ID cards could be used as entrance keys. The whole process, while helpful, provided only little support for university administration.

USOSweb is a web application used by students and academic teachers. Students can check their grades, apply for classes and much more. For about 5 years now, instead of going through long, paper
dormitory application, students fill one in USOSweb, which is already their university virtual home. All the basic student data are in the system, the rest can be provided in the series of relatively easy forms. Students enter their dormitory preferences, as well as additional information that might influence outcome of their application.

USOSweb is also used for a selection process. Once students’ applications are complete, trustees can (either automatically or by-hand) assign students to certain dormitories. In case of an automated process, an advanced algorithm (varying from university to university) can assign hundreds of dormitory places in a very short time. Algorithms are based on certain criteria. In most cases mean income, distance from the university to the original home-place and community action or volunteering are the main factors that are taken into account.

Modular structure of the system allows local developers to use their own algorithms, either based on the one distributed with USOS or written completely from scratch. Different groups of students can be subject to different algorithms.

While USOS has by now most features needed by a hotel-like management system (including payment management and circulation forms...), in many cases dormitories use their own, third party systems. That’s why a new module for USOS API REST-like interface has been created to allow exchange of data between those external systems and USOS.

New methods allow communication in both directions, providing information about entitled students as well as giving back crucial information about check-in and check-out. With that, university departments can use its housing resources more effectively.

On top of streaming the application process, detailed data available in USOS provide better possibilities for allocating dormitory places and substantially facilitate reporting to higher education supervising institutions.

3. Acknowledgments

The author thanks Paweł Posiełęży and Wojciech Rygielski for a great support and stimulating discussions.

4. AUTHORS’ BIOGRAPHIES

Michał Żabicki graduated in computer physics in the Jagiellonian University in Krakow and in 2013 obtained PhD in theoretical physics from the same university. Since 2012 he is a software developer at the Center of Integrated Systems Development, Jagiellonian University.
E-LEARNING AT SLOVAK UNIVERSITY

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Keywords

1. Summary
The Slovak University of Agriculture in Nitra (SUA in Nitra) uses e-learning more or less “unrestrainedly”, mostly in the framework of various projects, or using the results of projects in the teaching process. As an example, of the 134 registered electronic courses and electronic objects in the electronic support database of SUA in Nitra, 129 were created within the projects, most of them KEGA and Leonardo da Vinci. Therefore, a group of employees of the Slovak University of Agriculture in Nitra, together with co-researchers of the University of Economics in Bratislava and the University of Žilina, decided to submit the KEGA project entitled “Creating an University E-learning Portal of SUA in Nitra (005SPU-4/2014) that was adopted, funded and solved by the Cultural and Educational Grant Agency (KEGA).

2. Problem
The project’s goal was to innovate the proposed concept of wider e-learning implementation in the teaching process of recent years and to propose a modern education system at the Slovak University of Agriculture with an emphasis on ensuring its quality. Precondition for the success of this strategic goal was to build the university e-learning portal based on LMS Moodle (Moodle’s Highest Stable Version), editing the graphical environment and ensuring the greatest possible compatibility during the transfer of courses from old versions of faculties’ installations of Moodle to the new portal.

3. Background information
The years 2010 - 2013 were the preparatory phase for the creation of the university e-learning portal at the SUA in Nitra. A new wave of interest in e-learning has come to grips with the KEGA project, not only by the team of solvers, but also by the eager course designers. Several training sessions were organized, electronic instructions were developed. The e-learning survey at the SUA in Nitra was conducted based on polling that have been published on the faculty web site, in LMS Moodle, by the employees requesting the head and secretaries to distribute questionnaires both in printed and on-line form, by asking students to distribute questionnaires in the form of URL notification. Anonymous questionnaires created in Google Forms were used for the survey.

4. Major conclusion
96% of respondents were full-time students, only 4% were students of external study (14 students). 54.5% use e-learning courses in the learning process.
87.8% use LMS Moodle. Surprising answer is 10.8% students who use the LMS system, but do not know how. 69.5% use LMS during the time outside the classroom as a support for education directly related to the university studies. At school, LMS Moodle is used by 39.3% students to support contact education. Most of the study materials are created in MS Word, followed by PowerPoint, then MS Excel. 6.1% of respondents do not know or they are not interested in what format was the studying material created.

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Up to 80.1% of respondents indicated that the e-courses used at university are University of Nitra courses, 23.2% external (created by external supplier), 13.3% hosted (operated on the infrastructure of another organization). 35.9% of respondents prefer classical textbooks or scripts, which are the most used support for the study compared to the electronic course (28.9%) and the files stored in the file repository (23.6%). This means that students are looking for additional resources for education also at Portal of Universities.

However, the materials for self-study got the most of the respondents from the Internet, the second is file storage. The library is visited by 36.4% of respondents (figure 1).

On November 22, 2016, at the Congress Center of the Slovak University of Agriculture in Nitra, a seminar on E-learning at the SUA in Nitra took place, which included the competition for the best electronic course at the SUA in Nitra. The competition and the seminar confirmed the importance of creating a full-university e-learning portal at the SUA in Nitra.

The e-learning surveys that took place at the SUA in Nitra showed that students and employees have positive attitude towards e-learning, but there are relatively few electronic courses, some of which are presented as courses, but in fact, they are still just file repositories. This is despite the fact that the file repositories are quite available to the teacher, one of them being a repository site directly in LMS Moodle.

### 5. REFERENCES


### 6. Grant support

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7. AUTHORS’ BIOGRAPHIES

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Applying a Virtual Reality Platform in Environmental Chemistry Education to Conduct a Field Trip to an Overseas Site

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Teachers can lead students where they want them to go

360° VIDEO
Field Trips, How applicable are they?

Case studies* have shown that VR can manifest a virtual environment close to the actual environment where learning about the real/actual environment can take place at a fraction of the cost of a conventional field course.

Here, we demonstrate the conduct of a virtual overseas field trip for 74 students with the use of a web-based virtual reality (VR) application.


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**Methodology**

- **74 Students**
- **1.5 Hours**
- **Lecture Created by Professors**
- **2 Classes**

**Key Responses**

- Majority Positive
- Students are receptive to VR
- Only mild dizziness as side effect

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**Participants:**

We also would like to thank Your VR for the VR lenses.

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Teaching Learning Analytics - A Case Study

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Keywords  
Learning Analytics, Visualization, Student Success Technology, Blended Learning, Game-based Learning, Collaborative Learning, Agile Methodologies  
Teaching, International Student Teams, Short-term Student Mobility.

1. SUMMARY

The idea behind learning analytics is to gain insight into students' study progress. It is used for example at the University of Kentucky [UK15] to identify students at risk completing their degree in order to provide them with personalized counselling services. But as data is the new oil, education on data science in general becomes more crucial. This is reflected in new master degree programs, but how to give students in "ordinary" curricula the opportunity to peek into this field?

In our poster we share experiences from our short intensive courses on learning analytics. At first, we provide key details on context and concept of the course. Following, we will showcase the most inspiring student projects. For example, they recommend students electives similar students attended and visualize, if students attended a course earlier or later than intended in the program and its result on the average grades in the exams. Finally, we briefly discuss operational elements that other EUNIS institutions can transfer to setup a similar course on their own.

2. COURSE OUTLINE

ATHENS is a network of 23 universities in 14 European countries that enables students from their third year of study to attend a 10-day exchange program at partner institutions. Twice a year about 60 one-week scientific intensive courses are offered in each session. Topics come from the research fields at the partner institutions and focus on engineering, natural sciences and mathematics. Roughly 4,000 students participate annually in the program, about half of them attend a course abroad. [PT17]

Since 2015 we offer a course on learning analytics within this program. Due to the tight time frame as a one-week block course, we apply a blended learning approach for quickly diving into the necessary theoretical knowledge. Ahead of class, participants research independently one topic from agile software development and business intelligence. With ICT supported communication and shared data in the cloud (Google Docs), students prepare a short introduction for the upcoming block course. For some, this is their first presentation in English - an element that becomes more important later in their studies as well as professional life.

We also use a game-based learning approach for in-class exercises with selected playful activities accompanying the presentations by the students. With these so-called "agile games" [MM15] students experience the differences between agile software development and classical methods of project management and practice typical challenges in professional life and international collaboration in heterogeneous teams despite the limited course length.

The second pillar of the course week and the focus of our poster are the learning analytics projects of our students. Students design, implement and test their application in teams of 4 or 5 members to foster project-based collaborative learning [SK12]. Thus, participants gain first-hand experience with agile methods that they can also apply to their studies. For example, they can use effort estimation techniques for other group work or time boxing routines when writing term papers or their master thesis. The block course ends with a short project presentation as well as a sprint retrospective [BR13] for feedback and review on the collaborative work.

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3. LEARNING ANALYTICS PROJECTS

The modular study structure at European universities deriving from the Bologna process allows students to choose individually some parts of their studies. To support the selection, learning analytics and good visualizations for study program options gain importance.

![Figure 1: Students’ Learning Analytics Projects](image)

The student teams in our course week determine the needs of the future users of their applications. From students for students, they present in which sequence students attended the courses in a degree program, they illustrate which electives similar students attended and they recommend courses based on the choice of previous students.

However, learning analytics is not just for students. Also lecturers and examiners as well as study program designers and student counsellors can gain insights into students’ behavior. Thus, one team showed lecturers the different degree programs of students attending their course and another demonstrated to examiners which average grade students achieved depending on the semester students took the exam. The distribution of students’ attendance in a curriculum is revealed to student counsellors by one team and if students attend a course in an earlier or later semester than intended in the program. Another team visualized certain courses in the Bachelor’s degree program that are specific milestones for a subsequent Master’s degree program.

4. DISCUSSION

By deciding on appropriate visualizations for different aspects of student data, participants get the opportunity to lay hands on some basic data science in a context they are very familiar with. Hence we can recommend to other institutions to offer such “appetizers”. But which operational elements would we suggest to facilitate the setup of similar courses?

A one-week block course puts on a tight time frame, but the advantage is that participants don’t have several other courses at the same time. To give students a head start in prototyping their apps, we provide them with a pre-installed virtual machine and a basic software development infrastructure.

The biggest challenge is the data. For the teams’ projects we use anonymized data on students’ progress, courses and exams from our university’s student information system. To ensure privacy is here as important as selecting meaningful data. The amount of varied aggregated data should also give sufficient flexibility for students’ ideas on learning analytics.

5. REFERENCES


6. AUTHORS’ BIOGRAPHIES

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Innovation of education by implementing new technologies

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1. Summary

We live in a time that is driven by the development of information and communication technologies. Information and communication technologies may interfere with all areas of our lives, including education. Our article displays survey research results which is focused on using ICT in the education process at selected university in Žilina. The main objective of this article is to identify problems related to the lack of students interest for lectures and identify opportunities to increase their interest and attention using ICT technology. In order to achieve this objective, we used a quantitative method that helped us to identify the current state of this issue. We conducted primary marketing research with targeted questions. Our respondents were students and teachers of the selected department of the University of Žilina. Data were obtaining by electronic questionnaire. This approach has proved to be a powerful tool in analyzing the current situation of the given issue and possibilities of further development. Research results also point to the diverse perceptions of students and teachers and may serve as a starting point in the process of raising students' attention to lectures.

2. ABSTRACT

Primary marketing research is a system of collecting, analyzing, evaluating such information that has not yet been collected and obtained directly from the market. Our primary research was devoted to identifying reasons why students have lack of interest in lectures, to indentify the perception of ICT technologies in the process of education among students and teachers. In the orientation part of the research, we concentrated on the choice of the area where we conduct the primary reasearch. We were interested in students and teachers at the Department of Communications at the University of Žilina. The second step was to identify a research problem. The research problem is focused on low student interest in lectures at particular department. In the figure below you can see determination of sample size. The basic set consists of 23 teachers and 320 students.

![Sample size calculator](image)

Figure 1 Sample size calculator

After calculating the sample size we set goals and assumptions of research, linked to the questionnaire question:
Goal 1: Find out how many lectures the student is going to attend,
Goal 2: Find out what is the main reason for students' dissatisfaction with lectures,
Goal 3: Find the satisfaction of students and teachers with online lectures,
Goal 4: Identify teachers' relationship to ICT,
Assumption 1: A maximum of 10% of students attend all lectures of enrolled subjects,
Assumption 2: At least 40% of respondents consider lectures to be boring and not interesting,
Assumption 3: At least 30% of respondents consider online lectures to be very good,
Assumption 4: More than 50% of respondents identify ICT as a very good learning tool.
These assumptions were determined on the basis of expert interviews and analysis of the issue.

3.1. Research results

Question 1 - Gender
67% of female respondents and only 33% of male participated in marketing research dedicated to ICT
in the education at selected university department

Question 2 - Status
Out of the 181 respondents, 83% were students and 27% were respondents who identified the
teacher's answer.

Question 3 - Class (question only for students)
Out of 150 students, there are 23% students in first year, 17% in second year, 25% in third year, 15%
in fourth year and 20% in last year.

Question 4 What is your field of study at the Department of Communications? (question only for students)
Out of 150 students, 30 % students study E-commerce and management, 44% students study Postal
technologies and services and 26% students study Post Engineering.

Question 5 How many lectures do you attend?
Out of 150 students, 5 students attend every lecture, 22 students attend 75% of lectures, 45 students
attend 50 % of lectures, 70 students attend 25% of lectures and 8 students don`t attend lectures at
all.

Question 6 Why students' interest in lectures is falling?
On the figure 2 you can see student´s opinion on lectures, why their interest in lectures is falling.

![Student's opinion on lectures](image)

Question 7 What do you think about online lectures?
Most of the teachers (89%) think that online lectures can be very useful in education process, 8% of
them think that online lectures are not good idea and rest of team don`t have opinion yet.

Most of the students think that online lectures are useful and only 3% don´t think so.
We can say based on the primary marketing research we have revealed not only students' attitude
towards lectures but also to online lectures, which were introduced at the given department.
Students and well as teachers think positive about online lectures. Online lectures can be helpful
tool in motivating students to attend lecture.

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4. REFERENCES


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