

Progress on Digitization of Higher Education Processes towards Standards EU & DE

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Abstract

We present ongoing developments and projects concerning the digitization of Higher Education Use Cases and Processes, and Infrastructures in the context of EU developments and standardization efforts (EU SDG). These use cases and projects include: (i) student applications at Higher Education Institution (HEI) portals at university and Stiftung für Hochschulzulassung (SfH) sites for admissions; (ii) secure and trustworthy production of exam certificates for HEI applications; (iii) student mobility digitization, e. g. ELMO, EMREX, EDCI, eIDAS, blockchain; and (iv) standardization efforts embedded in the EU contexts such as XHigherEducationInstitutionExchange (XHEIE).

Orchestrating the process participants (foundation, universities, applicants) is necessary for effective operation and calls for the strategic and systematic expansion of digitization. In the future the Online Access Act (OZG) reinforces the need to digitize admissions processes operated by the foundation.

1 Use Cases for HEI/EDU and Standards

Use Case 1: University Admissions

We distinguish in the federal Germany two kinds of processes: a centralized and a decentralized.

Centralized Admissions: Since 2017/18, Foundation for University Admissions (SfH) took steps to digitize its admission procedures.

First, since October 2018, the SfH application portal has enabled Dutch applicants to download transcripts for study programs with nationwide admission restrictions. The EMREX system is used in combination with the DUO diploma database.

Second, the SfH is involved in German and international initiatives aimed at digitizing and digitally validating graduate or diploma certificates. The first prototypes were developed each jointly by the Harz University of Applied Sciences (HS Harz), the Bundesdruckerei and the SfH (based on eIDAS eID & TS and EMREX/ELMO / blockchain), to prepare nationwide roll-outs. Testing the prototypes for their suitability for nationwide use is intended to be part of the OZG.

The integration of the German OZG user account with the SfH's DoSV technical procedure enables applicants with a higher level of trust to be identified and authorizations to be checked.

Decentralized Admissions: The admission system modules for the former "centralized cases" are going to be integrated also for decentralized admissions systems at University Level, like in student information system's (SIS) e.g. HISinOne, CAMPUSonline SIS, HS Harz eID accounts [1,6,7,8,10].

A document upload can be configured via the SIS admission procedure, e.g. HISinOne, CAMPUSonline [1,10]. An essential requirement for admission at a German HEI is a valid health insurance. The insurance status is digitally queried and stored by SIS via the Student Notification Procedure (SMV in German) at the respective health insurance company [2]. The submission of an insurance certificate by the applicant himself is not required.

Use Case 2: Digital Credentials/Certificates as a Supplement to the "paper"-version

Establishing digital credentials/certificates as "final" step of the student journey successfully depends on the one hand on solving regulatory and technical challenges, on the other hand, on creating added value for users to foster broad acceptance.

As an intermediate step, a combined digital and paper-based version of credentials was set productive at the University of Göttingen in 2017. [3] From the first three years of practical experience and having 15.000 certificates issued, we analyse which of the W3C Verifiable Credential [4] extensively defines features and requirements for a digital credential infrastructure. In the full paper we analyze which of these are already fulfilled by [3] and which not. Thereby we focus on added user value. Applying the modules from use case 1 university credentials only StudIES+ [9] presents a hybrid solution (HS Harz, SfH). Also, Bundesdruckerei and SfH developing a minimal viable product of digital credentials. A comprehensive vision of a possible solution has been developed by the Digital Credentials Consortium as a global solution. [4] On the other hand, PIM represents an EU solution. [5]

Use Case 3: Student Inter*national Mobility

International or national mobility follows in the student's life cycle. The challenge in avoiding media discontinuities arises from the interaction of separate institutions (home and host university). The Platform for International Student Mobility (PIM) is used to digitally handle the process for students and people in the university administration. [5] The focus is on using an international data standard such as ELMO of the EMREX network and EDCI of the Europass program.

PIM allows students to transfer their Transcript of Records (ToR) from the receiving university (storage in ELMO format and as a signed pdf). Afterwards, a digital workflow starts to verify the transfer of credits. PIM also implemented an EDCI format for module descriptions. This allows universities to use PIM services to export and import module information in a structured data format from the local SIS. The goal: to build a module database for a workflow that digitally concentrates HEI internal recognition processes in one system. The required API is being developed in cooperation with the leading SIS providers in the DACH region.

Further, a decentralized way is offered via the EMREX network. At the University of Göttingen, the NCP function is active and allows ToR to be exported. The University of Göttingen and HS Harz validated their NCP vs. UNIT Norway for valid transfer of signed ToR/diploma certificates. A similar transfer was done by University of Göttingen and Bundesdruckerei vs. DUO Netherlands. An open policy question overall is the minimum level of trust for authentications and signatures (HS Harz operated with Level of Assurance "high" for both (i.e. eIDAS eID & QeS).

National initiatives and policies have the goal to align with these European standardization efforts. XHigherEducationInstitutionExchange (XHEIE) and other national standardization efforts directly reference e.g. to EDCI and ELMO.

In conclusion, the multiple initiatives aiming at increasing the digitization level in HEIs make progresses, also due to the legal European and German regulations. The challenge is to increase pace and to unify approaches.

2 References

- [1] HISinOne website (2021). *HISinOne*. Retrieved February 26, 2021, from: <https://www.his.de/hisinone>
- [2] GKV website (2021). *GKV Datenaustausch*. Retrieved February 26, 2021, from: https://www.gkv-datenaustausch.de/studenten_meldeverfahren/studenten_meldeverfahren.jsp
- [3] Digital Credentials website (2017). *Digital Credentials at University of Goettingen*. Retrieved February 26, 2021, from: <https://verify.uni-goettingen.de/en>
- [4] Duffy, K. H., Pongratz, H., Schmidt. (2020). *Building the digital credential infrastructure for the future*. Retrieved February 26, 2021, from: <https://digitalcredentials.mit.edu/wp-content/uploads/2020/02/white-paper-building-digital-credential-infrastructure-future.pdf>.
- [5] PIM website (2021). *PIM - Platform for International Student Mobility*. Retrieved February 16, 2021, from: <https://pim-plattform.de>
- [6] Strack H., Bacharach G., Klinner S., Otto O., Schmidt A. (2019). *eIDAS eID & eSignature for HEI/EDU Applications*. In: European Journal of Higher Education IT 2019-1. <https://eunis.org>
- [7] Strack H., Klinner S., Otto O., Schmidt A. (2019). *eIDAS eID & eSignature based Service Accounts at University environments for cross boarder/domain access*. In: Roßnagel H., Wagner S. and Hühnlein D. (Hg.): Proceedings of the Open Identity Summit 2019. LNI (GI) P293 Bonn, S. 171–176. <https://dl.gi.de/handle/20.500.12116/20986>.
- [8] Strack H., Wefel S., Molitor P., Räckers, M., Becker J., Dittmann, J., Altschaffel, Marx Gómez J., Brehm N., Dieckmann A. (2017). *eID & eIDAS at University Management - Chances and Changes for Security & legally Binding in cross boarder Digitalization*. In: EUNIS 2017 – Shaping the Digital Future of Universities: European University Information Systems Organization (EUNIS), S. 133–141. https://www.eunis.org/eunis2017/wp-content/uploads/sites/10/2017/07/EUNIS2017_Book-of_Proceedings_1.pdf
- [9] StudIES+ Website (2020). Student's Identification and Electronic Signature Services. Retrieved February 26, 2021, from: <https://www.studies-plus.eu>
- [10] CAMPUSonline (2021). *CAMPUSonline*. Retrieved February 26, 2021, from: <https://www.campusonline.tugraz.at/home/>

3 Author Biographies

Guido Bacharach, Head of Strategy and Digitization Unit at the Stiftung for Hochschulzulassung in Dortmund since 2014. After his study he had managing positions especially in the sales area and in public services. The focus of his work is on strategic digitization, process improvement and project management. He is member of the Deutsche Gesellschaft für Projektmanagement (GPM e.V.). <http://www.hochschulstart.de>

Dr. Matthias Gottlieb is Senior Researcher at the Technical University of Munich (TUM), Germany. He is Deputy Editor-in-Chief of the International Journal of Engineering Pedagogy (iJEP) and reviewer of numerous journals and conferences. After studying computer science, he engaged in Information Systems research areas such as Big Data and Human Computer Interaction. His current research interests are digitization of business processes, business development, digital transformation, and digital credentials of higher education institutions.

Jan Joost Norder, Product Owner International Services works at the Dienst Uitvoering Onderwijs, part of the Dutch Ministry of Education, Culture and Science. In his role as Product Owner he is responsible for the Dutch Diplomaregister and development of international activities. Furthermore, he has many years of experience in improving the digital enrolment process and exchange of student data in higher education. Since 2018 he is board member of the EMREX Executive Board.

Dr. Hans Pongratz is Senior Vice President for IT-Systems & Services and the Chief Information Officer (CIO) of the Technical University of Munich (TUM), Germany. He is member of numerous boards, committees, reviewer groups, and co-founder of the digital credentials consortium (DCC).

Ramona-Denisa Steiper coordinates the MVP project for the PIM Platform and belongs to the Department of Digital Services for Students and Educational Staff at the University of Göttingen.

Dr. Wolfgang Radenbach works since 2007 at the University of Göttingen, as Head of Digital Services for Students and Educational Staff. His main focus is to advance the digital transformation of all administrative processes at universities.

Prof. Dr. Ing. Hermann Strack, a full professor for network management and computer sciences since 2000 at HS Harz, 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), as well as the coordinator of CyberSecurity Network LSA (see <https://cls.de>). 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, namely in the EU CEF Projects TREATS and StudIES+. <https://netlab.hs-harz.de/research/> <https://studies-plus.eu>

Arn Waßmann, Product Owner for infrastructure of HISinOne, has been employed at HIS eG since 2008. After his studies he was software developer for HISinOne for 8 years. The focus of his work is building the infrastructures for digitalization of higher education processes in Germany.