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Digitization of (Higher) Education Processes: Innovations, Security and Standards

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Abstract

The digitalisation of educational processes is of increasing interest. The area of student mobility in particular can benefit greatly from digitalised processes. However, the number of projects is constantly increasing, and it is a challenge to keep track of them. Therefore, this paper highlights the diverse and projects in the EU, regarding innovations in digitization of education processes (at EDU, HEI, PEI level) and student mobility administration based on different standards and integration of security are presented, as well as views/results from ongoing projects (EMREX/ELMO, Europass/EDCI, eIDAS, EUid,Verifiable Credentials, DiBiHo, Kolibri, NBP initiative, PIM, OZG implementation for SIS, Self-Souverain Identities SSI).

Future research can address extensive interoperability in detailed Layering Concepts for data and protocols - aiding some existing island solutions in standards and platforms in an independent way, also supporting internationalisation strategies.

1 Introduction

In the system of German federalism, the 16 local states have educational sovereignty. There is a lack of centralized, accessible IT services or platforms for citizens at their educational journey for life-long learning all over Germany (not only at HEI or EDU but also at professional job training level PEI). Nevertheless, an integrated innovation process for digitization has the necessity to come up with standards on the relevant levels and interoperability for co-existing standards and systems for student information systems (SIS). A standard platform on a meta-level would enable access and integration of decentralized teaching and learning services for lifelong learning with new possibilities of student mobility. Therefore, the Federal Ministry of Education and Research (BMBF) is funding the development of a initiative prototyping a National Education Platform (in German "Nationale Bildungsplattform" NBP (BMBF, 2022)) as part of a distributed educational digital service infrastructure from a learning user-centric perspective mainly, as well as from (decentralized) educational service provider perspective (in short: EDU, HEI, PEI). Learning User-centric in this context is understood as the end-user such as pupils or students or professionals at learning/training phases on the jobs. Generally throughout DE, the digitization of public administration providers is governed by the "Online-Zugangsgesetz (OZG[1]) / Online Access Act". Essential meta requirements at the central NBP are:

NP1. Openness/ interoperability to a variety of connected EDU, HEI, PEI systems (SIS) as satellites

NP2. Integration of security, privacy, GDPR, self-sovereign user data management

NP3. Integration of open internet and educational standards as well as OZG/EU standards

NP4. Integrating of common metadata management for satellites connections NP1.

Nevertheless, besides the NBP initiative the integration of developments/results from other (ongoing) HEI/EDU digitization projects is important, therefore our paper will be organized in this respect. In the end, we consider some further proposals on a model layer level for integrating co-existing educational standards.

2 Innovations Overview

This section provides an overview on various innovations in digitization of education processes, to address the evaluation of standards and improvements in interoperability in the EU (Strack et al., 2021).

2.1 National Educational Platform Initiative (NBP) - Project KOLIBRI

The project "Kolibri[2]" develops a prototype for the national education platform (NBP) in Germany. All kinds of HEI- and EDU-institutions are enabled to connect their SIS to NBP in a secure and privacy-preserving manner, if possible according to standards also on metadata level. A special challenge for security is the integration of SSO (Single Sign-On) for authentication and authorization processes, which provide different Levels of Assurance (LoA) for the strength of authentication security according to EU eIDAS regulation (LoA: low, substantial, high). The architecture of the project "Kolibri" prototype implements the following features:

[1] https://www.onlinezugangsgesetz.de
[2] KOLIBRI (BMBF) Partners: Bechtle (lead), dataport, univention, HS Harz

- security & privacy, with respect to [3]eIDAS eID[4] & TS standards[5], GDPR, OZG
- integration of an identity broker and authorization system with SSO,
- integration of central collaboration services
- connectors/metadata for decentralized SIS and IDP
- connection to user wallets (with SSI/EUid/eIDAS 2.0 features)
- connections to EU services and standards: EMREX/ELMO, EUROPASS/EDCI/VC.

The interlinking of different HEI/EDU providers includes the interlinking of their identity providers (IDP). A central Identity Broker was set up as an integral part of the NBP to connect the different IDPs of HEI /EDU provider satellite systems.

In addition to these, the login via OZG was connected in order to provide secure identities for citizens without HEI/EDU memberships, allowing fully legally binding at the document transfer level. The connection of the individual IDPs to the Identity Broker is implemented via SAML. This allows the transfer of pure identities as well as additional attributes, such as membership in a group or the LoA of the identity or the login process.

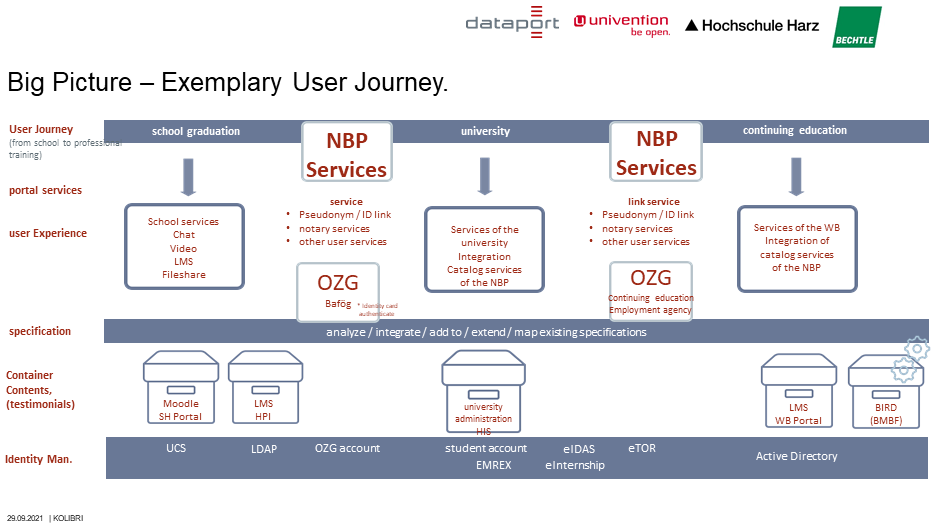

Figure 1: KOLIBRI Prototype Overview

In order to consolidate the different roles of the various HEI/EDU providers and thus create the basis for an authorization system, a common role semantic is necessary. The LoA is especially important for domain transfers of users and SSO. Suppose the LoA of the identity or login process passed by the Identity Broker is not sufficient for the new domain. In that case, the user is required to re-login with a correspondingly higher LoA. Because of the SSI and privacy feature of the decentralized eID system in Germany (with LoA "high" according eIDAS), a blockchain integration is not necessary for an offering of SSI wallet features. To solve problems of multiple identies of a person at different

[3] eIDAS Regulation (EU): https://www.eid.as/#regulation

[4] https://www.bsi.bund.de/SharedDocs/Downloads/DE/BSI/Publikationen/TechnischeRichtlinien/TR03130/TR-03130_TR-eID-Server_Part3.html

[5] https://www.etsi.org/newsroom/news/1111-2016-07-etsi-publishes-european-standards-to-support-eidas-regulation

phases / providers on his educational journey, an identity mapping functionality at NBP was integrated, securely based on notarisations of these identity mappings as a trust service (extendible also for notarisations of relations of identities like parents versus pupils).

The KOLIBRI prototypes are prepared for a public administration platform provider/policies, which therefore could use all options of OZG with legally binding for processes between HEI/EDU systems and the NBP (e.g., form uploads by eID / OZG LoA high to NBP will have fully legally binding without extra QeS on forms; but QeS is offered additionally). In the case of an alternative company-driven NBP providership/policy (without OZG public administration privileges), the fully legally binding would need QeS (according to eIDAS TS). Mainly, open source and standards are used, additionally important eIDAS components got successful security evaluations (e.g. Common Criteria ISO 15408).

The Harz University of Applied Sciences netlab is the first German university to use the online function of the German identity card (eID) for contact with its students and has extended it for the European eIDAS/eID network also an eIDAS-based connection to the EMREX network EU.

The following eIDAS applications have been created:

- eProsecal - university account / cloud wallet with eIDAS/eID & TS (among others QES, seal, ...), as well as eID-based Shares of data
- eNotar - electronically signed notarisations of documents (VwVfG §33) and identities
- eInternship - internship management/contracts between university and company
- eTor/eTestate - registration/attendance management for exams and lab practicals
- Your/MyCredentials - derived identities and notarisations accordingly
- eColloquium - signed colloquium exam forms/certificates.

These applications were already used in productive environment tests with selected user groups.

eProsecal provides highly secure authenticated access (LoA "high") for various university services/actors through an eIDAS/eID-based logon and account process, including fully legally binding. Processes with multiple multi-user/role references (n:m) can also be mapped. Users have access to the data of all released processes via the eProsecal basic account assigned to them and can also securely share this data with other users and even with authorities with legally binding (eID-based sharing).

With eNotar, a platform is available for providing digitally certified certificates, proof of learning, or documents with a qualified signature that is legally secure, forgery-proof, and compliant with data protection laws only for eID-authorized persons (via eID/eIDAS & TrustServices). This offers significant advantages when converting paper scenarios (e.g., certificates) to fully digitized scenarios by securely linking both worlds. The platforms are connected to the decentralized EMREX network of the EU and tested with the responsible authority UNIT in Norway.

With YourCredentials, the eNotar principle is extended to the authentication of derived identities and attributes from their trust domains/workflow extensions, e.g. for wallets for eIDAS 2.0 / EUid[6].

The eNotar notarisation is compliant to public service laws in DE (VwVfG §3a/§33) and is structured , according to the current practical and legal situation for schools and universities, in a strictly form/document-oriented way. With the appropriate legal expansion, the approach is also suitable for expansion by means of permanent certificate registers.The eNotar instances created in this way are subsequently also suitable for interoperable connection to the European EMREX network for the cross-border exchange of certificates within Europe. A corresponding eNotar prototype with productive eIDAS services as well as an EMREX test connections are available at the Harz University of Applied Sciences. The authenticity of (securely received) notarized certificates/diplomas can be verified and ensured at any time thanks to the qualified electronic signature with (eIDAS) validation services that

[6] https://ec.europa.eu/commission/presscorner/detail/en/IP_21_2663

are publicly accessible on the Internet. With eIDAS-based trust services, in particular time-stamping and long-term storage services with oversignature (BSI standard TR ESOR, eIDAS preservation services/standards) are available, furthermore time-dependent cybersecurity crypto requirements are covered across EU, with the accompanying cryptoalgorithm management (EU SOGIS[7]) providing a further basis for trust.
Additionally, at hybrid documents/protocol/standards level like EMREX/ELMO (or EU invoicing) some further security functions could be considered to improve machine-machine communications/validations: adding (1) purely XML signatures to the existing ones (covering XML only, no attachements), (2) eID/eIDAS authentication attributes (YourCredentials) at ELMO containers.

2.2 DiBiHo & PIM

Verifiable Credentials (VCs) are developed internationally via the W3C DCC. The Project Digital Credentials for Higher Education Institutions (in German: “Digitale Bildungsnachweise für Hochschulen” - DiBiHo) (DiBiHo, 2022) explores a trusted, distributed, and internationally interoperable infrastructure standard for issuing, storing, presenting, and verifying digital academic credentials in a national and international context. Therefore, the project aims to define goals in digital credentials for German Higher Education Institutions independent of specific service providers or vendors. Based on the Digital Credentials Consortium (DCC)'s whitepaper "Building the digital credential infrastructure for the future,"[8] the DiBiHo project conducts a proof of concept (PoC) for various use cases at German universities. As an additional unique selling proposition, the (self-)sovereignty of learners is the focus. This activity includes the specification of a reference architecture and data model as well as the development of prototypes and operational, operator, and support models. Sample processes for digital education credentials' generation, storage, transmission, verification, and revocation (in case of error or revocation) are concretised and evaluated.

The project work takes into account crucial preliminary work and findings, for example from the "Platform for Inter*national Student Mobility" (PIM) project funded by the Ministry of Education and Research (BMBF) and European projects such as EMREX with the ELMO data schema, Europass, European Blockchain Partnership (EBP), European Self-Sovereign Identity Framework (ESSIF), European Student Card Initiative, W3C Verifiable Credentials (VC)/Decentralized Identifier (DID), and from the Groningen Declaration Network (GDN). Essential European data standards from the areas of SDG, OZG and XHigher Education (XHEIE), and the eIDAS Regulation, among others, are also included.

The platform PIM (PIM, 2022) combines transferring (personalised) examination data in a digital format via EMREX and module data (unpersonalised) via EDCI to an end-to-end digital recognition workflow. This platform proofs at the moment the applicability of the largest German/Austrian SIS, i.e. HISinOne, FlexNow CAMPUSonline as well as to major mobility software providers (MoveOn and MobilityOnline). This enables HEI to fulfill the requirements imposed by the current Erasmus Charta for Higher Education (ECHE, 2022) to foster student international journey across Europe and beyond. (livesciences[3], 2022)

Additionally, aggregating course catalogs of multiple HEIs via OOAPI is explored in several European University Networks (OOAPI, 2022). These inter-institutional projects would enormously benefit from establishing European standards for data exchange and secure identities on a broader level.

[7] https://www.sogis.eu/documents/cc/crypto/SOGIS-Agreed-Cryptographic-Mechanisms-1.2.pdf
[8] https://digitalcredentials.mit.edu/wp-content/uploads/2020/02/white-paper-building-digital-credential-infrastructure-future.pdf

2.3 Digitization of the German "Hochschulzugangsberechtigung“

The German "Hochschulzugangsberechtigung“: In order to move from secondary to tertiary education in Germany, a so-called "Hochschulzugangsberechtigung" (HZB) in the sense of an "upper secondary school diploma" is required. This higher education entrance qualification is located at EQF level 4 in the European framework and in Germany can have 6 characteristics (Cedefop EU, 2019) - from the (legally guaranteed) possibility to study all courses at all universities (AHR) to different restrictions in the choice of courses and/or universities.

In order to digitize this document itself, which is very important in the German education area, as well as its use, several initiatives and projects were carried out in Germany in 2021:

Digital Certificate in North Rhine-Westphalia (DIGIZ NRW): At EUNIS 2021, it was already reported about a concept developed in the cooperation between the German ”Network for Digital Evidence“ (Netzwerk Digitale Nachweise - NDN; (Netzwerk Digitale Nachweise, 2022)) and the German Bundesdruckerei (bdr, 2022) to digitize German HZBs in such a way that they are readable by the normal user, the contents of the HZB are machine-readable and the whole digital certificate is integrity protected. For this purpose, a PDF was selected as the envelope layer, which simultaneously served as the presentation layer (image of the certificate) and had an XML embedded as the data layer, in which the certificate data is mapped in a machine-readable manner in the European data format ELMO (EMREX, 2022) and (EMREX response XML schema, 2022). Signatures at PDF and XML file as well as additionally a hash code of the entire certificate in a blockchain would support integrity.

The German state of North Rhine-Westphalia (NRW) conducted a field test (Digitales Zeugnis NRW, 2022) for this concept in summer 2021 with participating schools, participating universities, the Foundation for University Admission (Stiftung für Hochschulzulassung, 2022), and HIS eG . This field test has shown that the concept can also be used by schools and universities and, but appropriate security concepts and evaluation procedures are required yet. Further field tests in NRW but also in other local states are planned in 2022.

Project XSchule (XSchool): One of the lessons learned from the DIGIZ NRW field test is that not all information of the German HZB could be mapped in the data layer (XML in ELMO data format) so far. Also, the semantic interpretation of the data mapped there was often unclear. This problem is attempted to be solved by the XSchule project, an initiative derived from the German Online Access Act (OZG), at least on a national scale. To this end, XSchule aims to create a standardized specification of data exchange across the local states in the German school administration system in order to enable data exchange without media discontinuity between the actors in the school life situation and thus to digitize school administration services in an interoperable manner following the Online Access Act (OZG) and the Single Digital Gateway (SDG). (XSchule, 2022). The project is initially concentrating on the application areas (classified as priorities) of "school change" and "university entrance qualification" (what is the German „Hochschulzugangsberechtigung“). A first version of such a specification has been created and is under review.

Cooperation with European initiatives: Although the first successful communications with other European countries have taken place within the framework of the DIGIZ field tests (such as within the framework of the PIM project (PIM-Platform for Inter*national Student Mobility, 2022) with the help of the European transport system for educational data EMREX (Emrex, 2022) with the countries Sweden and Norway), the national specification of the data required for EQF level 4 in Germany will not be sufficient to carry out this exchange successfully for other (European) countries as well. To achieve this, Germany participates with two initiatives in the European project EBSI (EBSI, 2022). Both initiatives aim to send (among others) German HZBs also via the blockchain infrastructure of EBSI with Self-Sovereign-Identities (SSI) and as Verifiable Credentials (VC), i.e. with an envelope, data and presentation layer different from the DIGIZ projects to other European countries - but if possible also to receive EQF level 4 credentials from these countries for processing in German authorities. One challenge here is that there are currently two European standards for the data layer:

The ELMO standard, which has been used for many years by productive systems such as EMREX and Erasmus-without-paper (EWP) (Mincer-Daszkiewicz, 2017 and EWP, 2022)), and the Europass-Learning-Model (ELM, (European Commission, 2022)), which has evolved from the Europass Digital Credential Infrastructure (Europass, 2022). At the moment, there are EBSI-moderated discussions between the representatives of the two data standards and the European Commission to develop a common European data model in the medium term.

2.4 Decentralized Admissions & Student Management

The Online Access Act (OZG, 2021) specifies 10 criteria (Reifegradmodell, 2022) for digitization. Only if each of these criteria meets a minimum level (3 of 4), called maturity, then a function is considered digital. Level 3 means that the process can be carried out online. Level 4 includes, among other things, the once-only principle (OOP, 2022) of the SDG. The function results from the administrative process. The legislator has determined which processes must be digital according to these criteria. The infrastructure of the SIS of the university must enable the processes to be carried out digitally and in compliance with the law. Therefore, all current efforts are focused on expanding the infrastructure of the SIS.

The criteria and the current status of implementation in the SIS HISinOne (HIS OZG, 2022) are presented below. HISinOne is the most widespread SIS in Germany.

Criteria	Description	Target level	Status in 02-2022
Standardized description	Comprehensive coordinated description of the specific administrative service according to a predefined scheme (FIM, 2022).	4	Unknown - Universities have to do this themselves
Online request	An application can be made online using a web form.	3	Ready
Federal User Account (bund.ID, 2022)	After setting up the Federal User Account, the required personal data are conveniently transferred from the user account to the administrative service.	3	development in progress
Authentication	Reliable user authentication	4	development in progress
E-Payment (E-Pay, 2022)	Digital payment process must be available.	3	specification in progress
Uploaded documents	Receive documents digitally.	3	specification in progress for special documents
Accessibility / Usability	The SIS must be accessible and easy to use.	4	WCAG 2.0 (WCAG2, 2022) at Level AA (HIS BITV, 2021) - Continuous improvement process established
Communication	Communication via e-mail between university administration and user	4	Ready + specification in progress for summary presentation
Notification	Legally compliant notification of the	4	development in progress for VwVfG §41 +

	administrative act via Federal User Account mailbox		specification in progress for OZG §9
Portal integration (OZG, 2021)	Link the central administration portal (bund.de, 2022) with the SIS.	Unknown	Universities have to do this themselves.

XHEIE (XHEIE, 2021) is a standardization project of the state of Saxony-Anhalt and the Federal Ministry of Education and Research. It is intended to enable easy data exchange between SIS. The piloting phase will begin very soon (XBildung, 2022, p. 30), using the Diploma Supplement as an example. Unfortunately, only the data model is specified in XHEIE. The transport layer is not considered. It is also unclear how this data model will relate to the EU standards (EMREX, Europass, etc., see chapter 'Cooperation with European initiatives'). Therefore, having a universal import/export mechanism within a SIS certainly makes sense. Its task would be to transform the local data structures into the different data models and vice versa. Depending on the selection, the appropriate data model can then be used.

Next steps: When the SIS infrastructure is developed by the end of 2022, process optimisations (see chapter 'BigPicture NRW') will have to take place. In particular, the sensible integration of the data models (XHEIE) will play an important role. In particular, the on-boarding processes will benefit from the optimisations. In particular, the different responsibilities (centralised vs. decentralised) and the different criteria for allocating study places must be hidden from the users.

Further work needs to be done on the interface with the higher education sector for digital and electronic documents (see chapter 'DiBiHo'). Incoming documents, which are required for enrollment, for example, should be able to be processed as automatically as possible. The higher education institutions also provide documents that are required, for example, in the context of personal careers. It must be possible to use a certificate reliably in digital application procedures even many years after it has been created.

3 Discussion, Results, Outlook

We presented innovations on different levels:

- Innovations in use in productive test environments for selected groups: at HEI / HS Harz based on security standards like eIDAS TS, eID TR BSI and eIDAS eID regulation with additional fully legally binding,a transfer to EDU level is planned in 2022; at PIM project
- prototypes for exploring test cases: NBP, NRW DIGIZ, HISinOne
- methods, models and concepts for further discussion – see below.

Ongoing: We observe and propose different layer concepts to integrate different levels and co.existences of standards across EU: XML/WSS structuring, semantic layering, network and data layering according IPv6[9] standards principles (RFC 2640/8200).

The different observed objectives in Europe and on a global level can be seen as a layer structured model, consisting of three segments: Packaging, Data, and Presentation.

Packaging consists of Layer 1. Layer 1 represents a certified envelope with a validated Issuer and Learner. The VCs standard can be located in this abstract layer.

[9] https://www.ietf.org/blog/ipv6-internet-standard/

Data includes the Layer that consists of a specific data model. While Layer 2 is unstructured information, Layer 3 is structured and unstructured information such as ELMO/EMREX or the ELM. Layer 4 is only structured information.

Presentation has two stages Layer 5 and Layer 6. Layer 5 includes a given format for the presentation of a credential. It enables a standardized readable presentation. This implies that every educational certificate has the same look and feel i.e. the logo has the same position and size in height and width. In addition, Layer 6 enables an individual presentation of an educational certificate. This means that, for example, fonts, font sizes, format, colors, and even the logo can be adapted to the individual needs of the respective institution.

Figure 2 highlights the different identified stages without the dimension of security.

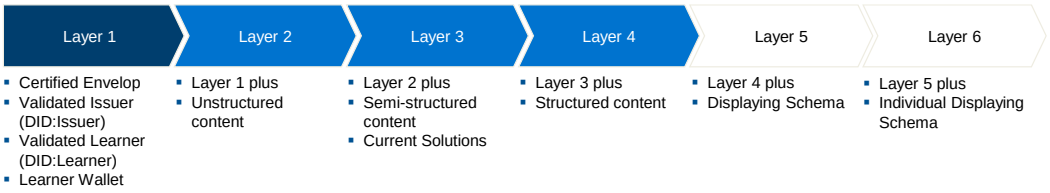

Figure 2: Layer Overview Concept

This layer structure in comparison to an IPv6 extension header can be introduced similarly. Applying the *Packaging* as a main header with an object pointing to the next header of *Data*. Thereby, each applied header has an object pointing to the next header of the layer infrastructure. Thus enables the possibility to extend the layers as far as needed. Additionally IT security and data protection layers can be implemented without disturbing the found layer structure. We recommend to the observe a security segment as integrated over all six layers. After the headers follows the payload of an credential. Comprehensive IT security concepts require attention in individual components as well as the overall system. Testing according to Common Criteria and against common principles, for example in the areas of cryptographic basics, authentication, access control, network and internet security, physical security / physical attacks, security evaluation and certification, data protection and data security, and blockchain, eIDAS trust services would be a possibility of representation in this security segment (Eckert, 2018).

Example EMREX: EMREX is implemented in HISinOne. The learner selects the data source from a list of higher education institutions (EMREG). A forwarding to the SIS of the source university takes place. The address for the return is also given. It is more or less the mailbox for the envelope (layer 1). The data is sent to the return address in a structured form (ELMO-XML) with the student's consent (layer 4). Part of the structured data is also a ToR as a PDF file (layer 3). It serves as an additional control option for the employees. The learner and the recipient (examination office) can view the data via a viewer embedded in the SIS (layer 5). The presentation is not uniform and is therefore determined by the SIS. EMREX/ELMO does not provide any specifications for the presentation.

The Stiftung für Hochschulzulassung (SfH) uses EMREX to process university entrance qualifications of Dutch applicants via DUO (NL) for Germany-wide admission-restricted degree programs (human medicine, veterinary medicine, dental medicine and pharmacy). At the moment, the use of about half a dozen transfers per semester is quite expandable.

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5 Author Biographies

Guido Bacharach, Former 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.) and co-founder of the German Netzwerk-Digitale-Nachweise. 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.

Prof. Dr. Hans Pongratz is CIO of the Stiftung für Hochschulzulassung (SfH), full professor at the Technical University of Dortmund and was former 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).

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. 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://clsa.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-standards-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/implementation of 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, StudIES+. https://ec.europa.eu/inea/en/connecting-europe-facility/cef-telecom/2015-de-ia-0065 https://studies-plus.eu https://cslsa.de

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.