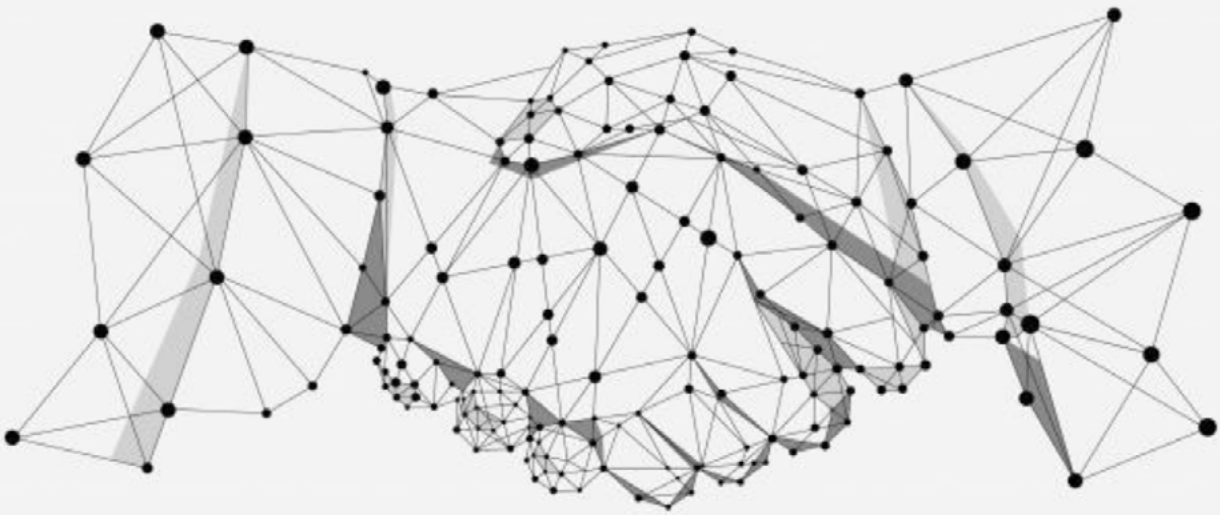
Collaboration in Higher Education for Digital Transformation on European Business

White paper on digital transformation of universities' internationalization process



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Authors:

Kertu Lääts, Kaia Kask, Viire Täks – University of Tartu/Estonia

Tokár Alexandr, Lády Tomáš – Brno University of Technology/Czech Republic

Bernd Kleinheyer – University of Applied Sciences Bielefeld/Germany

Correspondence: **Kertu Lääts, University of Tartu, kertu.laats@ut.ee**

Design: Helina Riisalu, University of Tartu/Estonia

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Abstract

The white paper on the digital transformation of universities' internationalization processes aims to be a blueprint for higher education institutions enhancing the quality of international services and their cost efficiency. Digital transformation in general unbundles core processes of any organization and reassembles them in a new and more efficient way. The present white paper provides some guidelines and an option for changing processes, management structures and hierarchies in universities towards digitized environment, helping their advancement in their internationalization process.

Digital transformation implications for the white paper were gathered through several interviews with three case university representatives and workshops conducted together with relevant stakeholders through a participatory design approach. The outcomes of the workshops resulted in collectively gathered input provided through dialogues and feedback between the participants to establish extended forms of understanding about digital transformation of universities' internationalization processes. Based on the gathered data we can conclude that digital transformation provides diverse opportunities together with its inherent benefits and challenges for the universities to modify their ways to teach, research, operate and cooperate in society.

Our white paper with three case stories can be used as a source of insight of options and possible problems in digital transformation in particular, and future development to modernize universities in general, since digital transformation in higher education has varied options and interplay between technology and organizations' openness for change. Overall, the white paper outlines the concerns of universities' competitiveness and sustainability by means of digital transformation and internationalization.

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1. Introduction

A number of studies on digital learning and the digital university have appeared over the last few years, the most recent one being "The digital turn — Hochschulbildung im digitalen Zeitalter" by Centrum für Hochschulentwicklung (CHE) in Germany[1]. While the emergence of digital teaching and learning can be taken for granted, the underlying process enabling universities to function (e.g., recruitment, student administration, student services, credit administration, budget allocation, controlling, project management, staff administration, staff development etc.) has attracted less attention so far.

Current white paper is motivated by **the shortcoming of the recent debate on digitalization of internal processes** and functioning of higher education institutions. Likewise, higher education institutions are nowadays affected by the emergence of technological tools and changes in the society, such as changing future labor market needs and demographic changes. This leads to an incising role of general skills and future competences of current students, forcing universities to modernize their teaching methods and to apply more team work, knowledge management, lifelong learning and other modern approaches. In addition, wider use of technology in universities makes it possible to use various digital solutions for learning, teaching, documents handling, credit point transfers, supporting and administrating processes. From the other side, the tightening budgets for higher education and competition for better students between the universities, have engaged these institutions to redesign their programs and internal process.

Guidelines and an option for changing processes, management structures and hierarchies in universities towards digitized environment, helping their advancement in their internationalization process

Credibility and reputation of quality providers of higher education need a coherent package of high-quality student services combined with excellent study programs. This white paper **provides some guidelines and an option for changing processes, management structures and hierarchies in universities towards digitized environment, helping their advancement in their internationalization process**.

It is often said that universities, belonging to the education sector as one of the oldest and most traditional sectors in the socio-economy, often lag behind in the modernization of their administration processes and the adoption of new technologies and management structures. However, the contemporary university is viewed as a catalyst between different societal groups being engaged together. Therefore, the main agenda of the current and the future university would be **to become a leader in societal and academic debating** and to act as a catalyst of productive tensions within the society arising

1 *hochschulforumdigitalisierung.de/sites/default/files/dateien/Abschlussbericht.pdf*

from the changes related to the wide technological changes and digitalization processes the society is undergoing. Due to that, **the university itself should be the leader of its own digitization processes**.

This white paper includes theoretical insight and a number of case studies derived from **the digital transformation practice of three universities in Europe** — the cases of Bielefeld University of Applied Sciences (Germany, Brno University of Technology (Czech Republic) and University of Tartu (Estonia).

This paper includes:

1. **A context analysis** describing digitalization trends of higher education institutions, the conditions and reasons of internationalization of higher education institutions.
2. **A map of typical 'digitalizable' interfaces** in higher education process.
3. **A cost-benefit analysis** of digitalization of specific processes (Joint Degrees, exchanges, enrolment etc.) and the main challenges of digitalization.
4. **A roadmap for implementation and a proposal for typical or modern web-based educational platform design** — general models of digital options for increasing the agility of university services.
5. **Case studies on the digital transformation of universities' internationalization process**.

Based on three case-universities, the current paper outlines diverse 'stories' about benefits, costs, problems and obstacles on the digital transformation of universities´ internationalization process. Following these settled, those accounts give an overview of the development and current state of the digital transformation of the case-universities' internationalization.

2. Context analysis of Digitalization of Internationalization process

2.1. Digitalization

Nowadays, digitalization is a widely used term, which covers a wide range of various processes transformed into a digital format by using certain digital technology. In the context of a business models, digital transformation has become known as a phenomenon driven by "the changes associated with the application of digital technology in all aspects of human life" (Stolterman, and Fors, 2004). For this transformation, the subject will usually go through a process called digitization, which turns existing assets into a digital form. Thus, **the digital transformation captures three different elements** (Reis et al. 2018):

Technological, organizational and social elements of digital transformation

- **Technological** — use of new technologies, such as social media, tablets, mobile or other devices
- **Organizational** — changes of organizational processes or the creation of new business models
- **Social** — influences related to humans, e.g. user experience, openness or resistance to change

The potential benefits of digitalization for internal efficiency include improved internal process efficiency, quality, and consistency via eliminating manual steps and gaining better accuracy. Digitalization can also enable a better real-time view of operations and results, by integrating structured and unstructured data, providing **enhanced views on organization data**, and integrating data from other sources. Furthermore, digitalization can lead to better work satisfaction for employees through **automation of routine work**, thus freeing time developing new skills. Digitalization also improves compliance via standardization of records and improves recovery via easier backups and distribution of storage. External opportunities include **improved response time and customer service**, as well as possibilities for new ways of doing business.

Digitalization benefits:

- enhanced views on organizational data
- automation of routine work
- improved response time and customer service

New digital technologies can create opportunities for **new services or advanced offers to customers**. Disruptive changes involve changes in the operating environment of the organization caused by digitalization; for example, a organization's current business may become obsolete in the changed situation (e.g., manual scanning of invoices replaced by electronic invoice). On the other hand, digitalization can create completely new businesses, such as the inclusion of an e-invoice operator, for example (Parviainen, P. et al. 2017).

The digital transformation of a higher education institution could be captured by the following definition:

"Digital transformation is the changes associated with the complete application of digital technology in all aspects of a modern university" (Gavin McLachlan, CIO, University of Edinburgh)

"**Digital transformation** is the changes associated with the complete application of digital technology in all aspects of a modern university". (Gavin McLachlan, CIO, University of Edinburgh)[2]

The use of some digital technology of a higher education institution relates with **different levels of digitalization**. Technology can be used:

- Universally (for example Email or office tools)
- To enhance and support traditional methods of research and education
- To enable new types of innovation and creativity to manage core processes, support services and other processes of universities

Levels of digitalization

The present white paper as one part of the CHEDTEB project tries to capture primarily the **enabling level of digitalization** for the higher education institutions, where **the new types of innovation and creativity**, the greatly valued part of digital transformation relies. Furthermore, the paper sheds light on the benefits and obstacles that universities can face on the path of digital transformation. The white paper outlines, besides other processes of universities, the internationalization as one of the major issues of a modern university.

Higher education institutions can have different solutions and standardization degrees:

- Server-based **decentralised** digital solutions for faculties
- Server-based or web-based **centralized** solutions for a university
- Web-based **information sharing** between universities and other institutions

In addition, the environment where universities operate have an influence on the digital transformation of universities. Are there any **well-developed e-ecosystems and infrastructure** that enhance the development and real use of digital solutions? One of the leading countries in this regard is Estonia, where the various digital platforms and solutions are in use for several state-level services.

Digitalization can also bring **new opportunities and change the roles of universities in society**. It has been stated that "Universities are hubs for social learning. We can go to Google for content. Universities teach us how to learn. Digital can bring social learning at an international level" (Clélia Cothier, McGill University student 2015)[3]. Moreover, digitalization

2 *slideshare.net/MarkRitchie2/digital-transformation-at-the-university-of-edinburgh*

3 *univcan.ca/wp-content/uploads/2016/05/canadian-universities-and-our-digital-future-2015-workshop-report.pdf*

can impact a university's entire operation environment and internal functioning. For example, to serve as a hub of innovations of new technologies for different industries or the public sector.

Digital transformation and in particular distributed ledger technologies have already changed and will fundamentally change the landscape of higher education

Digital transformation and in particular distributed ledger technologies have already changed and will fundamentally change the landscape of higher education. A provider of higher education is affected by digital transformation in three ways (CHEDTEB report "Managing Distributed Ledgers, Blockchain and Tokens")[4]:

- **Education content** — the structure of study programs and the didactics of imparting knowledge
- An education provider is itself an **organization running processes** and is thus directly subject to digital change
- An education provider may **act as a change agent** for the regional community and collaborates with others in national and international research and education networks

As organizations, universities must question whether their processes are optimally structured in such a way that the overriding goal of providing the student with an optimal education as a user of the organization is achieved. Both, **the educational program as well as the organization of education** must be geared to the changed requirements of digital transformation, otherwise the overall package of education won't be consistent and coherent.

2.2. Internationalization process

The internationalization concept has evolved over time containing several key elements. Commonly used definitions of the internationalization of higher education are:

"**Internationalization** is the process of integrating an international, intercultural, or global dimension into the purpose, functions or delivery of post-secondary education" (Knight, 2003).

"**Internationalization is** [...] the process of integrating an international perspective into a college or university system. It is an ongoing, future-oriented, multidimensional, inter-disciplinary, leadership-driven vision that involves many stakeholders working to change the internal dynamics of an institution to respond and adapt appropriately to an increasingly diverse, globally focused, ever-changing external environment" (Ellingboe 1998: 199).

Internationalization can be defined in a variety of ways, but for universities it's an ongoing effort related to their functioning in teaching, research and service for the society. Internationalization refers to a **complex processes**

4 *chedteb.eu/outputs-and-results/implementing-blockchain-and-smart-contract-technologies*

Internationalization refers to a complex processes characterized by a multicultural, interdisciplinary and multi-stakeholder context

characterized by a multicultural, interdisciplinary and multi-stakeholder context. It has to be acknowledged that the focus of international student recruitment **involves various actors** inside the university: students, teachers, researchers, supporting staff, as well as outside of the university, such as internship organizations.

An international university can be built on local needs, and then established on an international level

There can be **two contrasting approaches of internationalization in universities**. It can be a strategically planned issue or simply a non-targeted and a very open approach based on the principle — meaning that everybody, regardless of their country of origin, are welcome to study at the university. As noted by Knight (2006), despite the chosen strategy, **an international university can be built on local needs**, and then established on an international level.

The process of internationalization of the university is impacted and characterized by the cultural readiness for organizational change

Some authors (e.g., Agnew and VanBalkom 2009) argue that universities' journey towards internationalization is **driven by economic and political reasons**. At the same time, the process of internationalization of the university is impacted and characterized by the **cultural readiness for organizational change**. Although this was originally not the scope of the present white paper, the argument of cultural readiness seems to apply to the three case studies included in the chapter 6 of the paper as well.

The more externally oriented universities are more capable of adaptation to environmental changes than internally oriented once

The universities can diverge on their orientation — **externally or internally oriented** (Sporn, 1996; Agnew, VanBalkom 2009), where the more externally oriented universities are more capable of adaptation to environmental changes than internally oriented once. The latter is especially essential, as nowadays the former strongly traditional and bureaucratic institutions of higher education are facing a fast movement towards a market-driven dimension of globalization together with **the changes in the job market and students' requirements**. We are leaving aside the issue of markets and commoditization as this will require a deeper discussion which will go beyond the scope of this white paper. Although we do agree on the basic principle of competition between universities nowadays.

One of the additional challenges that universities might face in going international is **the differences in their academic cultures**. Universities differ in how they work in terms of supporting the development of students' knowledge generation and global competences (cooperation, critical thinking, cf CHEDTEB project Output 4 report).

Some authors (e.g., Fielden 2011; Neale et al. 2018) have raised the question **"How internationalized does a university wish to be?"** In a guideline provided for the governing bodies of UK universities, Fielden (2011) looked towards the final result of internationalization by offering **a set of features of a "fully internationalized university"**, where among others the following aspects are outlined (Neale et al. 2018):

Features of a "fully internationalized university"

- A significant proportion of international students
- An internationalized curriculum
- Social and academic integration between national and EU/ international students
- International collaboration in research
- Academic staff from many nationalities
- Staff and student mobility and study-abroad activities

As Sporn (1999) states, in Europe, the universities´ need to internationalize has, to a large extent, brought about the ERASMUS, COMETT and TEMPUS programs, where the major priority has been given to international academic mobility of students and faculty (Bartell 2003: 50).

In this sense, there are various **aims of internationalization**, which can be characterized by the following list (Valiulis et al. 2006):

- To promote multicultural and intercultural education
- To contribute to the improvement of the learning experiences of exchange students at host institutions
- To contribute to improving the teaching experience of teachers who instruct exchange students in mixed groups with home students
- To improve the level of intercultural competences of all those involved in university education,
- To raise awareness within universities regarding multiculturalism
- To describe exchange students' specific needs in the classroom
- To promote continuous staff training for multiculturalism and interculturalism

Drivers of internationalization

There are **different rationales that drive universities to internationalize**, despite the similarities in their internationalization strategies. The differences lie in what drives them to internationalize, what policy sectors and regulators are driving it (country level like in Estonia or industry level like in Germany), who are the key actors and what are the outcomes (revenues generated, key performance indicators used). The white paper concentrates on the costs and benefits related to academic mobility at the universities, which could comprise a wide range of indicators.

Internationalization indicators

The level of internationalization can be measured by **varied indicators**, such as:

- The number of international students
- Per cent of the world international student population
- Rate of increase in the number of international students over 5 years
- Public spending on higher education at national level supporting academic internationalization
- Availability of qualified labor for policy framing and delivery of academic internationalization

An assessment of benefits and risks is required for setting meaningful aims and parameters of the internationalization of a university

Table 1. Benefits and risks of higher education institutions internationalization.

BENEFITS
• More internationally oriented students and staff
• Improved academic quality
• Strengthen research and knowledge production
• Potential increase in the quality of learning and teaching
• Innovations in curriculum, teaching and research
• Grater international understanding and solidarity

RISKS
• Commodification and commercialization of education programs
• Increase in number of foreign 'degree mills' and/or low quality providers
• Threat of brain drain
• Glowing elitism in access to international education opportunities
• Overuse of English as a medium of instruction
• Loss of cultural or national identity

Source: elaborated by authors based on Knight (2006)

Three case studies included in the present white paper illustrate the wide spectrum universities may span in their internationalization and digitization efforts

However, it is always questionable **how meaningful or useful the selected indicators are**. It is doubtful that they measure potential, readiness, success, and sustainability of universities' internationalization. They do not seem to indicate benefits and risks, nor do they include unintended consequences of internationalization.

One example of this shortfall is the concerns about **incoming and outgoing student mobility**, which initially was intended to boost cooperation and partnerships between the universities, but has brought about unintended consequences, such as the brain drain issue — the potential loss of the best students (or faculty) or an unconditional reliance on rankings and branding.

An assessment of strengths and weaknesses or benefits and risks is therefore required for setting meaningful aims and parameters of the internationalization of a university. Table 1 summarizes the **potential benefits and risks of internationalization of higher education institutions**.

These factors will always need to be applied **to specific cases of universities** with particular regard to **the role they play in their communities**. This is why the three case studies included in the present white paper were chosen to illustrate the wide spectrum universities may span in their internationalization and digitization efforts.

It will appear that two cases — **Brno University of Technology** and **the University of Tartu** represent examples that seem advanced in their overall internationalization in comparison to the third one, **Bielefeld University of Applied Sciences**. For a detailed comparison along indicators, cf chapter 6 where the details of the case studies are outlined.

The key elements of internationalization can be summarized as the following:

- **Internationalization as a dynamic and unstable process** — the environment changes constantly, as does the university which is part of this dynamic environment.
- A process, which requires **a set of measures of change** — there is no isolated measure to introduce internationalization. This combined set of measures captures all aspects of the learning and teaching experience, including curricula, characteristics of the student population, and infusion of the concept of internationalization through **the research, teaching and service aspects of the university**.
- Internationalization is an essential **innovation driver of a modern university**.

2.3. Combining internationalization and digitalization

Considering **the potential of digitalization** outlined in 2.1, all analysts agree that this will provide a substantial opportunity for European higher education. With the emergence of the European Student Card, digital open-access repositories for research and similar cross-border tools, (initial but promising) steps are being taken to reap the benefits of digitalization in the sense of smoothening mobility and co-operation between European universities.

In this sense, the digital transformation of universities' internationalization processes aims to be a blueprint for higher education institutions wishing **to enhance the quality of international services and their cost efficiency**. The intention of the white paper is to highlight the broader notion of **how digitalization and internationalization support strategic initiatives of a university beyond plain online education and learning**.

3. Map of typical digital interfaces in higher education

In general, digital transformation unbundles core processes of any organization and reassembles them in a new and more efficient way.

Core activities of higher education are education, research and transfer of knowledge

Higher education has always been a sector that has unique organizational models, core processes and objectives compared to other sectors. **Core activities** of higher education at faculty and college level are education, research and transfer of knowledge. **The educational process** includes basic activities such as scheduling, course coordination, teaching, student learning, follow-up, student performance indicators, and examination. **The research process** covers specific activities such as determining goals, applications for funding, identifying partners, conducting research, enhancing the research impact, performance reviews and publishing.

Identified core and support processes provide a basis for analyzing the university value chain

Besides these core processes **the supporting processes** like enabling, planning, and management exist in higher education institutions same as in business organizations. The following figure illustrates, from a management perspective, the complexity of higher education processes using the example of Charles Sturt University (CSU) in Australia, where the identified core and support processes provide a basis for analyzing the university value chain.

Typical higher education interfaces in teaching in an international context are:

- Marketing and student recruitment
- Student application and admission systems
- Teaching and learning systems
- Student engagement and feedback systems

These services seem to be in place at most European universities. But when it comes to more complex interfacing, e.g. setting up a management and administration concept for a joint degree program **a 'New Frontier' of digitizing academic processes and services** can be seen. A multilateral project such as a joint degree is a micro-universe calling for a 'mini-university administration' above existing partner university organizations. When trying to manage the high number of interfaces and processes between a joint degree platform and the partner universities, **the lack of standardization and automatization** in many universities' processes often becomes apparent.

Often university administrations are still functioning as a closed system of internal processes lacking adaptiveness and flexibility for integrating external partners and service providers

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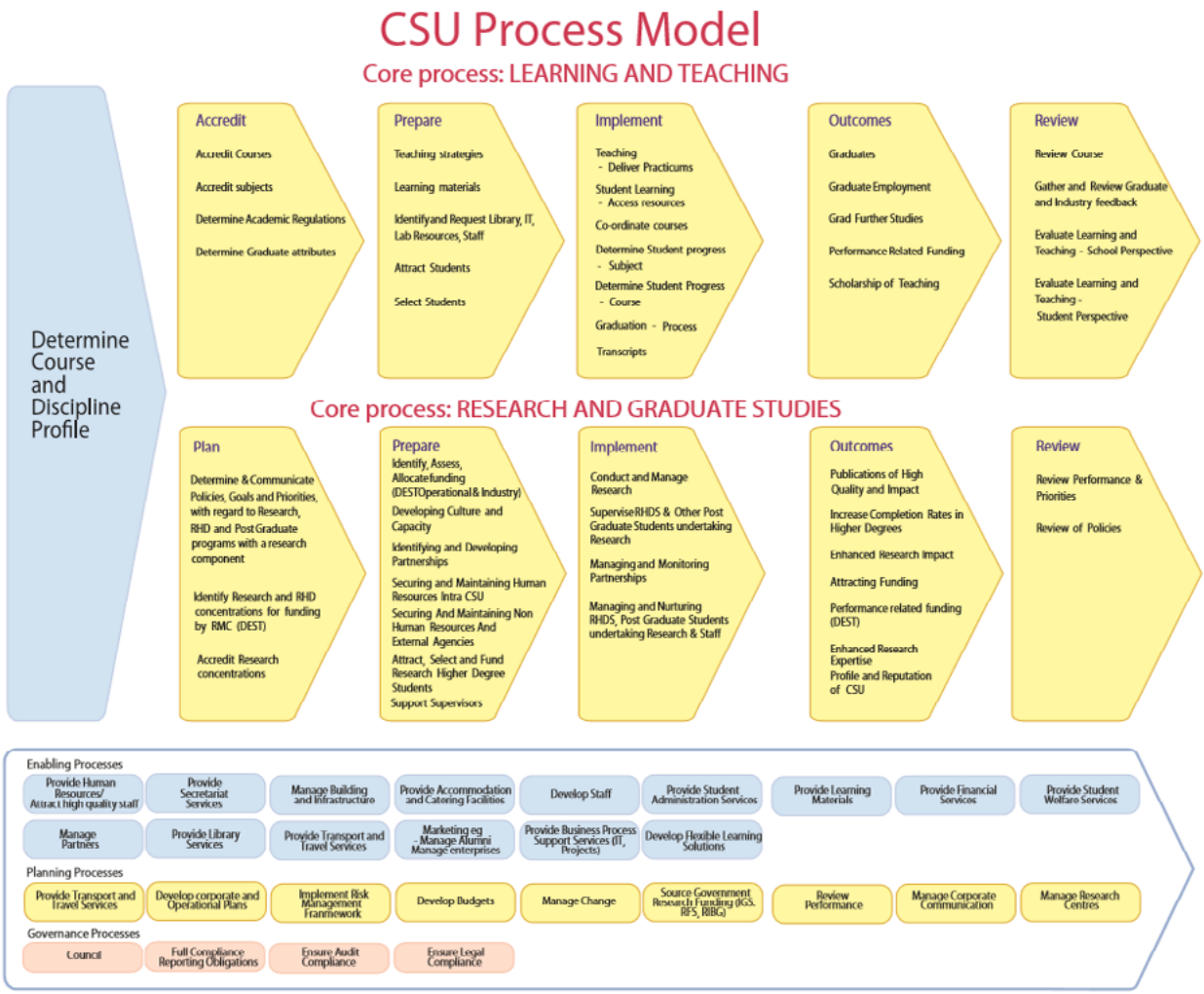

Figure 1. The complexity of higher education processes as illustrated by the example of Charles Sturt University, Australia[5]

Reflecting more deeply on administration problems on the basis of theoretical knowledge about digital transformation and developing smart and cost-effective solutions for the joint degree management will eventually spill over into wider concepts for **the digital transformation of universities' organization**.

No universities nor international programs are exactly alike

These are no small challenges. To tackle them, one has to remember that **no universities nor international programs are exactly alike**. Smaller consortia may seem easier to manage, but for students, wide choices are attractive. Very often there are differences in academic culture, such as teaching and grading methodologies, learning interaction (active student participation versus lectures); thesis defence versus presentation of final paper, in tuition fee policy, where harmonisation is needed. An element of good practice in dealing with these differences is **a very detailed cooperation agreement** with a fair distribution of tasks and financial aspects clearly outlined between higher education institutions.

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5 csu.edu.au/special/wpp/resources/reference-model

An internationalization map comprises three basic elements:

- the study-abroad process
- internationalization at home
- other student-related activities

Leaving aside research and transfer of knowledge with their specific functioning, we can assume that **an internationalization map of a higher education institution comprises three basic elements**: the study-abroad process (outgoing), internationalization at home (incoming) and other student-related activities.

- exhanges
- swaps
- double degrees with obligatory abroad period

- on-campus activities
- curriculum related

- international student NGOs
- social non-academic interaction off campus
- hobby

Figure 2. The structure of HEI internationalization roadmap. (Source: Geldres-Weiss et al. 2015: 4). Abbreviations: SA — Study abroad, IaH — Internationalization at home

Digitalization:

- allows to find ways how to perform routine activities faster with less effort
- cannot be assessed in a simple return-on-investment logic

Value and impact of digitalization can take a variety of meanings depending on a university's legal, ethical and social environment

In the case of digitalization, the focus is not only on the core, but also on **supporting activities** — e.g. issuing, collecting and reviewing documents. Digitalization allows to find ways how to perform these routine activities faster with less effort. Often, the decision in which processes could be digitalized cannot be assessed in a simple return-on-investment logic. It rather connects with the **value-for-money concept, where the impact is connected with the value**.

This means that **value and impact** of digitalization can take a variety of meanings depending on a university's legal, ethical and social environment. Private universities and general and public ones in the Anglo-American world, and, to a lesser extent, in Scandinavia and the Netherlands will usually interpret value as commercial value whereas public universities in Southern, Western, Central and Eastern Europe will be reluctant to fully embrace the commoditization of education. They would consequently seek to maximize educational impact in digitalization and define impact as educational value created.

The value-for-money concept

This concept in the context of higher education is focused on how a university acquires and uses its resources to meet its objectives, e.g. increasing the quality of its teaching, particularly in terms of delivering value for money for students, government and the wider public.

The concept of value-for-money within the university combines achievements under the aspects of economy, efficiencyand effectiveness

Therefore, the concept of value-for-money within the university combines achievements under the aspects of **economy** (reducing the costs of inputs), **efficiency** (getting more output for the same or less input) and **effectiveness** (getting better at what universities set out to do), all measured by key performance indicators (KPIs) shown in formula 1).

"Value for money" = Economy + Efficiency + Effectiveness

Considered from this broader angle, the topic of efficiency has acquired special importance not only in the context of administration, but also for strategic development, governance and management. In order to help create and deliver value to the various stakeholders of an organization **a holistic view of the strategic development of information technology and governance is required** (COBIT). A good-practice framework labeled COBIT (Control Objectives for Information and Related Technologies), created for information technology management and IT governance, can be employed as a guidance of IT developments not only at the business organizations but at the universities as well[6].

The term 'value' thus needs to be defined in the context of the cultural parameters of an organization and (national) education system in general

As stated above, the term 'value' could convey meanings such as the quality of education and research, the marketability of education as a commodity, the workload or lecture hours provided etc. **The term 'value' thus needs to be defined** in the context of the cultural parameters of an organization and (national) education system in general.

Role of governance is to negotiate and deciding on a balance of different stakeholders' value interests

Universities operate in **a multi-stakeholder context** where 'creating value' may have a diversity—and sometimes conflicting—interpretations. It is the **role of governance** to negotiate and deciding on a balance of different stakeholders' value interests. The governance system should consider all stakeholders when making benefit, resource and risk assessment decisions. For each decision, the following can and should be asked:

- For whom are the benefits?
- Who bears the risk?
- What resources are required?

Stakeholders' needs have to be transformed into a university's executable strategy. **Governance** ensures that an organization´s objectives are achieved by evaluating stakeholder needs, conditions and options; it sets directions through prioritization and decision-making; it monitors performance, compliance and progress against agreed direction and objectives. **Management** plans, builds, runs and monitors activities in alignment with the direction set by the governance body to achieve the university objectives (COBIT 5)[7].

6 *For further informationisaca.org/cobit/pages/default.aspx*

7 *isaca.org/cobit/Documents/COBIT-5-Introduction.pdf*

The value created is usually considered higher when the organization as a whole should digitalize

Concerning the level of digital change, the value created is usually considered higher when **the organization as a whole should digitalize**, not every faculty or department within the university independently.

The size of university consortia should be kept reasonable and their composition should consider complementarity of strengths and competences

In the context of internationalization, **the deeper relationship and understanding of academic cultures** of partner universities is crucial for clarifying a stakeholder's benefits, risks and resources. For international joint programs **it is more practicable to run simple mobility patterns** (e.g.: 1 year or 1 semester at one university) to secure a common understanding. The size of university consortia should be kept reasonable and their composition should consider complementarity of strengths and competences. A very detailed cooperation agreement with a fair distribution of tasks between universities with clearly outlined financial resources is beneficial. However, **substantial investment in capacity and human resources is still needed** since the complexity of coordination remains even when all tiny details have been agreed. It should also be taken into account that legal agreements differ, in their handling, function and enforceability, from one country to another. What may appear explicit and strict in one context might be seen as a pure guideline or recommendation in another[8].

A survey undertaken by Bielefeld University of Applied Sciences in 2018 showed that 45% of credit transfers took longer than four months

From a student perspective, **grant-based or specifically funded programs (e.g. Erasmus+) are less of a challenge and positively support mobility**. It should be added though that, in current administrative environments, major headaches admittedly often remain such as swift credit transfer or grant payout. A survey undertaken by Bielefeld University of Applied Sciences in 2018 showed that **45% of credit transfers took longer than four months**[9]. Similar complaints are regularly voiced at other universities, which is why it is fair to assume that **Digitizalization, e.g. Blockchain applications**, will, once trialed and validated in an academic context, provide hands-on solutions[10]. On the student side, complexity of course increases with compulsory internships becoming part of a study program, as more stakeholders from other institutions or business organizations are involved.

It is fair to assume that Digitizalization, e.g. Blockchain applications, will, once trialed and validated in an academic context, provide hands-on solutions

8 *Geert Hofstede and others have pointed out the ambiguity of agreements concluded in transnational contexts. Suffice it here to emphasize the need for regular consultation about a joint understanding of decisions made in a consortium. (Geert Hofstede, Cultures and Organizations, McGraw-Hill ...)*

9 *Exchanging grades of guest students between universities. Results of survey among 5th-semester ISM students. To be published on www.chedteb.eu*

10 *For a more in-depth analysis of the opportunities Distributed Ledger Technologies can provide cf the CHEDTEB project's paper Guide to implementing Blockchain and Smart Contract Technologies in Corporate Environments and Feeding into Higher Education Teaching, chedteb.eu/outputs-and-results/implementing-blockchain-and-smart-contract-technologies*

4. Cost-benefit analysis and the main challenges of digitalization

A cost-benefit analysis of digitalization of specific processes (Joint Degrees, exchanges, enrolment etc) and the main challenges of digitalization

Usually people tend to underestimate the time required for digitalization projects

The cost of digitalization could be measured **by the resources and time required to change the organizational processes involved**. For universities, the complexity of internal processes and hierarchical structures represent specific factors that must be taken into account. Our three cases demonstrate that **usually people tend to underestimate the time required for digitalization projects**, which is essentially for two reasons. One is **the required analysis and remapping of internal processes** that is inevitable for digitalization projects to succeed but is often neglected or avoided. The additional factor is **the multi-stakeholder context** where universities operate. The need to exchange data exists not only between students, academic and non-academic staff, university managers, but under the conditions of internationalization and digital societies, also between universities and state-level authorities.

The required analysis and remapping of internal processes is inevitable for digitalization projects to succeed

Digitalization costs

An overview of **digitalization costs** (project investment) includes the following direct and indirect costs:

- Transaction costs (with service providers or IT developers)
- Development team-related costs
- Process mapping and remapping
- Data migration
- Systems integration and interfacing
- Maintenance
- Training of staff

Digitalization benefits

The benefits of digitalization of are widely acknowledged and comprise the following advantages:

- Digitalized processes are quicker — less waiting time for students, more time for other activities of university staff
- Less bureaucracy and paper-based document handling for university and students
- Better quality of services and support for students
- Supporting the self-management of students
- Higher reliability of data and up-to-date data for students and university staff
- Enhanced data overview for university staff and managers
- Support for international cooperation and networks
- Transparency of processes and outcomes created by universities
- Availability of data for state or EU statistics

Main problems and challenges of digitalization:

- Human nature
- Organizational culture and characteristics
- Absence of necessary resources
- Multi-stakeholder context

The main problems and challenges of digitalization are:

- **Human nature** — resistance to change or its opposite, perfectionism and high expectations, where digitalization is seen as a magic solution for most of the problems in an organization
- **Organizational culture and characteristics** — low support from management, lack of responsibility and trust, resistance to change and reluctance to supposedly lose control, traditional working routines. Frequently there is a potential for conflict between university members and IT designers, in which certain university members are opposed to outsiders suggesting changes to the way they work and deliver services. Similar conflicts and resistance to change may arise between central administrations and faculties.
- **Absence of necessary resources** — lack of IT competences and personnel, lack of suitable service providers, lack of budget and time, lack of capacity to map and remap the processes.
- **Multi-stakeholder context** — it is frequently time-consuming to understand the needs and requirements of various stakeholders and to generate the common ground during the digitalization development process.

The three cases case studies included in chapter 6 of the white paper **examine in more detail the practical digitalization and internationalization challenges universities encounter**, and also address the factors and actions that can be mobilized to address these challenges.

In the following we provide basic guidance on how a cost-benefit analysis could be used for developing a digitalization strategy which links an institution's strategic areas and possible indicators.

In general, the cost-benefit analysis and identification of the main challenges helps to clarify first of all the starting point for digital changes, what could be changed and subsequently, mark the path where we want to go in terms of digitalization, and to develop the strategy of digitalization.

Table 2. Basic guidance on how a cost-benefit analysis could be used for developing a digitalization strategy

Strategy area	Proposed indicators
Student mobility	· Number of incoming international exchange students · Number of outgoing international exchange students (including students going on internships) · Number of incoming international degree students · Number of students with out-of-country citizenship (relevant for some high-immigration countries only, e.g. Germany)
Staff mobility	· Number of outgoing staff (researcher/teacher/administration) mobility · Number of incoming staff (researcher/teacher/administration) mobility · Number of exchange agreements with international partne
International collaboration	· Number of co-tutored foreign dissertations · Amount of articles/publications in international / foreign journals · Number of home-published articles/books translated into foreign languages · Number of memberships in international research consortia / communities
Programs	· Number of study programs containing English-taught modules · Number of study programs largely taught in English · Number of dual-/joint degrees and degree alumni
Staff profiles	· Number of staff's diploma/degrees obtained abroad · Number of staff of foreign nationality
International events, projects, organizations	· Participation in international events (speaker, moderator, contributor, listener) · Participation of international guests in local events · Number of participations in international projects (leader/participant)
Infrastructure	· Total number of staff employed at international office/s · Proportion of homepage available in English · Foreign clicks on institution's homepage

Sources: elaborated by authors based on internationalization indicators[11]

11 *zsi.at/en/object/project/2304, che.de/downloads/Indikatorenset_Internationalitaet_AP83.pdf*

5. Roadmap for implementation for typical web-based educational platform design

The idea of this roadmap is to **propose a pathway for the implementation of a typical web-based educational platform**. It provides a model of digital options for increasing the agility of university services.

The implementation of an educational platform design mainly affects the interaction of people, their workflows and processes

Often, when a university is seeking to invest in a campus management system or a learning management system, it may find out that this decision relates not only with the selection of the right educational platform for the university. But these investment choices being made have **broader impact on the university processes**. Frequently, a too simplistic or narrow view is adopted on these decisions how to design the web-based platform.

The following is to provide guidance on **what are the main concerns** in implementing digital platforms for increasing the agility of university services, which is more than identifying the best online educational platform. The implementation of an educational platform design mainly affects **the interaction of people, their workflows and processes**. Often these processes have to be **redesigned or replaced** with new ones. Also, it is important to understand **the background of a service provider**, do they have previous experience on this and what is the tech support they offer after implementation.

Web-based educational platforms create a hub from which staff can administrate enrolment, staffing, scheduling, attendance and other activities all from one central spot

Administrating online courses and resources could be highly complex when there are large numbers of students and multiple curricula or programs run at the same time. **Web-based educational platforms** create a hub from which staff can administrate enrolment, staffing, scheduling, attendance and other activities all from one central spot.

Web-based educational platform is an integrated system of tools and services for managing students' activities, teaching activities, for running management systems, storing data and searching information, disseminating digital communication and building the image of the institution

Many scholars do explore the principles of designing spaces that support learning, but less attention has been paid to the principles of designing and implementing web-based educational platforms. Web-based educational platform is a term used to define an integrated system of tools and services for managing students' activities, teaching activities, for running management systems, storing data and searching information, disseminating digital communication and building the image of the institution. Often it is referred to as the term "digital learning platform" or "learning management systems".

The scope of a web-based educational platform

An educational platform is an integrated set of interactive online services that provides students, teachers, administration and others involved with access to common resources, information and communication tools **to support and enhance educational delivery and management**[12]. Thus, an educational platform is a comprehensive system enabling secure, web-based education and e-learning solutions that uses a simple and intuitive user interface. Digital educational platforms convey many features for education and administration purposes (e.g. course completion rate, credentialing and accreditation, student authentication and many others).

Historically, the scope of these platforms has been diverse. During the 1990s the focus was on learning management systems with simple features (syllabus, course content, assignment submissions, gradebook, announcements), whereas nowadays it is more on easy use, user- driven activities, cloud-based resources with many features such as community discussions, blogs, social networks, discussion fora, video, collaboration tools — i.e. on open ecosystems. Nowadays, the list of services to be performed over the **platform has been broadened from education services** (e.g. enrolment, credit transfer, tuition fees, and credit administration) **to other supporting** (e.g, housing, grant administration) and **cooperation-related services** (e.g. collaboration workspaces, corporate projects).

Educational platforms have the potential to make learning easy and effective by making use of ICT systems, and support collaboration and communication between the users

Overall, educational platforms have the **potential to make learning easy and effective** by making use of ICT systems, and support collaboration and communication between the users within the region and internationally. When used properly, it can reduce staff workload at the universities, minimize expenditure on IT and administration, and enhance learning and teaching both in and outside the classroom[13]. One essential feature is the potential enablement of initiative, active learning (as opposed to 'teaching') and participation on the part of students, lecturers and administrators. Needless to say, this potential can only be exploited if it is supported by an adequate organizational culture.

12 *timelesslearntech.com/learning-platform.php*

13 *Adopted from: itslearning.com/k-12/resources/wp-12-key-benefits-of-learning-platforms-whitepaper*

The effects of web-based educational platforms

The key benefits of using learning platforms at higher education institutions can be seen in[14]:

- **Enhancing the range of resources and personalised learning** — supplement the textbook with a wider range of learning resources, both online and in the classroom
- **Better monitoring of learning and teaching** — help to better understand the process of learning and teaching
- **More opportunities for collaboration and interaction** — different locations and cross-country online collaboration
- **Enhancing digital literacy** — to help develop functional technology skills, collaborative skills and critical thinking about digital technology
- **Improved organisation and communication** — streamlining information sharing between different stakeholders, reducing paper and printing costs
- **Making best use of academic and non-academic staffs' time** by automating many of the tasks
- **Facilitating strategic leadership and management** via an automated reporting system, visualised data, and faster communication between people involved
- **Building the school's identity and community**

There is no clear market of higher education digital learning platforms, and often the service providers' experience is limited

However, the choice and development of the university's digital learning platform **is a complex process**, where difficulties arise from **the different systems in use, which are often hard to integrate**. It is important **to understand what are the university's background and the future strategies** involved in developing the platform. Also, there is **no** and only a limited offer of higher education digital learning platforms, and often the service providers' experience is limited. Therefore, many institutions **create their own systems**, which is why it may appear more important to choose a partner that aligns with the intentions of the university. Thus, the cost-benefit analysis of a potential digital platform is rather multifaceted and not a simple task.

It is important:

• to understand what are the university's background and the future strategies.

• to choose a partner that aligns with the intentions of the university

Hence, "developing a learning platform is often a learning process" (The Future of Learning Platforms by Phil Hill)[15].

To understand **the phase of digital transformation** where a university is currently — early adopter, innovator, 'patchwork' user (operating a variety of systems), integrated system user or any intermediate stage — and where a university wants to go, you need firstly — to identify the starting point for changes, secondly — to clarify what could be changed and digitalized, thirdly — conceive what is the vision of where a university wants to go, and afterwards to imagine the path of change.

"Developing a learning platform is often a learning process" (The Future of Learning Platforms by Phil Hill)

14 *Adopted from: itslearning.com/k-12/resources/wp-12-key-benefits-of-learning-platforms-whitepaper*

15 *youtube.com/watch?v=UI_NruTp-MU&feature=player_embedded*

The roadmap helps gather the intended effects of digital change by identifying digitalization challenges and the benefits that university can anticipate

The roadmap is to **smoothen the path of this development process**. Likewise, it helps gather the intended effects of digital change by **identifying digitalization challenges and the benefits** that university can anticipate. When trying to define a proper path of digital transformation for a certain case, we suggest answering the following questions:

- **What is the history of digital development of our university?** — To outline the governance and systems integration practice inside the university and between other universities/institutions used so far.
- **What is the current stage of digitalization and readiness to change our university?** — To identify the policy, the legal and regulatory (institutional) framework; people's attitudes towards digitalization in the organization
- **Where do we want to go in terms of digitalizing our processes and what is our digital future?** — To renew the vision about the university's future with modern services and sustainable operations and to analyze investment agility.

To increase the agility of university services the technological options of digital platforms need to be assessed as well. **An advantage of cloud-based online platforms** over server-based platforms is better access for all users — administrators, staff members or students. Users don't have to install the software on their own devices. They will also be able to access the platform remotely on their own smartphones, computers, or other devices wherever they are. Cloud-based services together with a service-oriented approach is one reasonable option for cost-effective solutions.

5.1. ICT roadmap

An ICT roadmap helps visualize the pathways to overcome **the main obstacles of digitalization and to ensure success**. The following roadmap outlines modest but purposeful steps in where to start digital transformation of universities and which topics deserve most attention:

Steps of designing a web-based educational platform:

- Conduct a context analysis
- Frame the strategic goals
- Create your own digitalization model
- Identify the main barriers
- Ensure the readiness of the organization and people

Generate common understanding of the necessity of **a web-based educational platform, its main aim and steps**

- **Conduct a context analysis** — determine what needs to change by exploring and mapping stakeholders' needs, and the main problems with existing platforms, systems and data flows
- **Frame the strategic goals** based on the defined problem based on stakeholders' needs
- **Create your own digitalization model**, where the model architecture depends on the complexity of the problem
- **Identify the main barriers** (e.g. culture) and what aspects support the change (e.g. top management support

- **Ensure the readiness of the organization and people** for digital change, win the support of key people in the organization, involve the key persons on the project team, explain the need for change, manage the concerns and doubts about digitalization and the way it will affect everyone at the university

Support web-based educational platform design development

Support web-based educational platform design development

- Involve academic- and non-academic staff, and other stakeholders (partner universities and institutions) if necessary
- Assess the possible service providers' background, generate a common understanding of the aim of digitalization and possible solutions
- Detect core and support processes together with the workflows; remap these, if necessary
- Develop and validate the user case and prototype

Support educational platform implementation

Support educational platform implementation

- Ensure staff and student training
- Secure subsequent technical support

Data exchange between students, lecturers, host universities and sending universities has to be assessed

Within the international context, a university should **ensure meaningful interaction of systems and platforms**. Data exchange between students, lecturers, host universities — and sending universities has to be assessed and standardised solutions for sharing / transferring these data between universities and other institutions are to be implemented. Owing to the civil service mind-set that characterizes many higher education institutions, this type of interface is often neglected at analysis and planning stage and needs early attention.

Universities with a focus on standard education programs may wish to use more centrally standardized solutions, whereas research-driven universities may need more open systems

Universities with a focus on standard education programs may wish to use **more centrally standardized solutions**, whereas research-driven universities may need **more open systems** and may allow faculties to develop their own systems. But as all types of European universities are evolving towards higher integration with **societal organizations, standardized and centralized platforms** may become more of a burden or limitation in the future.

Overall, the pathway to success with digitalization developments requires, **besides the technical skills, a broad awareness of the university's processes, of the environment it operates in**, and of **the needs of its stakeholders**, of the necessity to digitalize and **readiness for people to change**. Also, **staff participation** seems to be vital in designing the web-based educational platform and in every phase of successful digitalization, in general.

5.2. The Future university

Globalization and technological changes have posed **new challenges to teaching and learning** at universities. Predicting the role of current students in the future labour market is not an easy task, but rather a complex phenomenon. Global changes are so complex that solving them requires an increase in general skills, working groups of multi-disciplinary skills, collaboration between faculties and universities, co-operation with societal organizations and the ability to gain process information and to deliver solutions in a range of environments.

Anticipated changes of education and research fields relate with the following trends:

Anticipated trends of education and research fields relate with:

- Content of studies
- Modes and location of studies
- Profiles of degrees and qualifications
- Interdisciplinary research

- **Content of studies** — increasing importance of general skills, digital knowledge and literacy, and teaching using new tools and digital classrooms.
- **Modes and location of studies** — customised, flexible and online education, where students can access learning in real-time, in multiple modes (on-campus, online or combined) and locations (international borderless education); exchange and recognition of credit points to be decentralised via blockchains.
- **Profiles of degrees and qualifications** — mix of degrees and openness to work with external partners (industry, societal organizations) — to create qualifications that respond to changes in the society and changing needs of the workforce.
- **Interdisciplinary research** — creating or developing solutions for the business sector and problems in society using competences from different disciplines.

Future university

Figure 3. Key words illustrating the future university (generated at the CHEDTEB project workshop)

Digital transformation and in particular **distributed ledger technology have already and will fundamentally change the landscape of higher education**. For example, in the future students could enrol for individual modules or for a course of study via a web-based platform, whereby data management is based on block-chain or other peer-to-peer processes.

Our vision of the future university combines openness and digitalization, is creating new ways of learning and collaboration to better serve the needs of students, science, the business sector and society as a whole

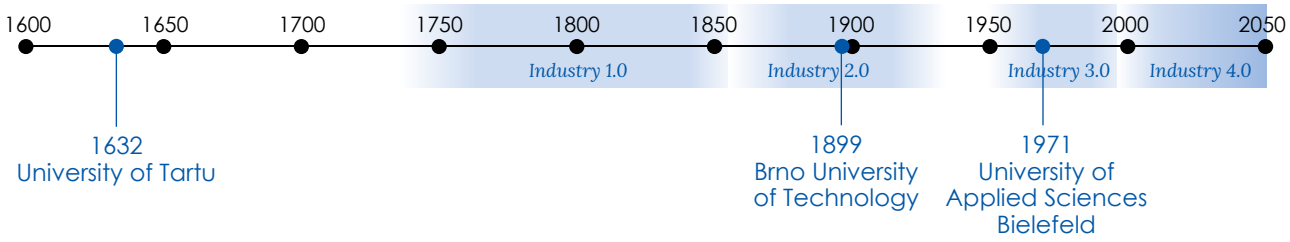
Our vision of **the future university combines openness and digitalization**, and is about creating new ways of learning and new models of collaboration to better serve the needs of students, science, the business sector and society as a whole. It is not only teaching at universities, but also universities' entire governance systems that must change in response to global changes. The use of technological tools (digital solutions for learning, teaching, documents handling, credit points transfers, block-chain technologies) for universities' core, supporting and management processes can influence their effective functioning.

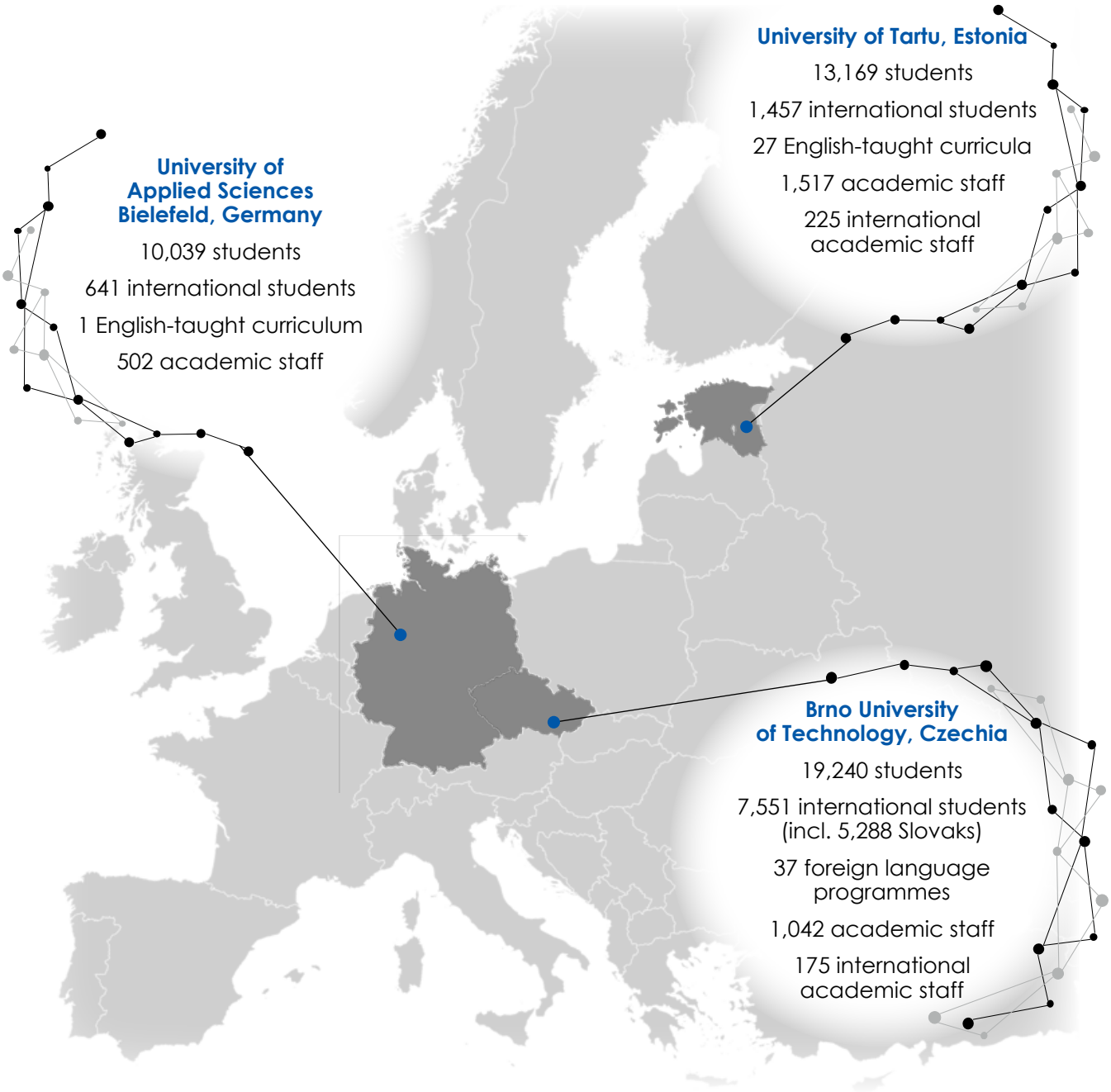
European universities are proud of their history and role in society. Embracing the emerging changes discussed above will, however, determine the weight they will be able to retain or develop in the major transformation European societies are going through. In this sense, **digitalization and internationalization appear as two game changers that will show if universities can continue to play a major role in the development of European societies**.

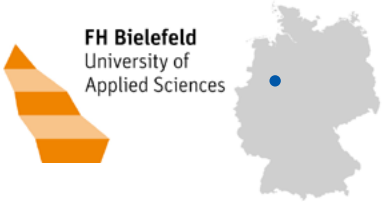
Digitalization and internationalization appear as two game changers

6. Case studies on digital transformation of universities

Based on the studied three case universities current chapter outlines diverse stories and experience about digital transformation, its benefits, costs and main challenges. These stories describe the development and current state of the digital transformation of these case universities with the emphasis on the internationalization as an inevitable path of a modern university.







6.1. Bielefeld University of Applied Sciences (BIUAS)

- More than 10,000 students
- 5 faculties

Context — Universities of applied sciences in Germany

Bielefeld University of Applied Sciences (BIUAS) is a medium-sized HEI with **over 10,000 students in five faculties** and a product of **the 1960'** massive drive in West Germany towards educating more engineers and mid-level managers. Applied research and transfer emerged as the other two main missions from the 1970s onwards. Most of the institutions of applied sciences have kept their regional focus ever since but have considerably broadened their portfolio (arts, health, social sciences).

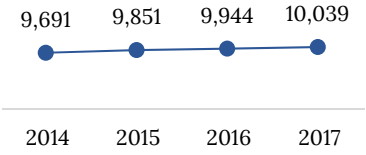


Figure 4. Number of students at BIUAS

These schools conduct **little basic research but an ever increasing volume of applied research** including product and process development often in co-operation with regional industries, and have developed substantial reach and reputation with business and society at large. Doctoral programs are more of a novelty and must be jointly conducted, by law, with research universities.

UASs are said to be **more flexible and agile** than research universities due to their market orientation. Whilst this view has not always been confirmed by the realities on the ground, it has proved right regarding internationalization, which has happened massively over a period of 30 years.

Internationalization and digitalization at BIUAS — status quo

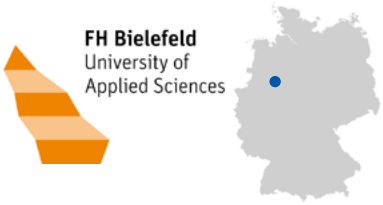
External and organizational factors affecting internationalization und digitalization at BIUAS

Typical factors of UAS's playing into digitalization and internationalization are:

- rapid overall student growth, mainly at undergrad level
- a rural local area
- overwhelmingly regional intake
- a growing proportion of first and second-generation migrants
- high share of VET diploma holders among student population

BIUAS has a history of decentralized multi-campus organization

Although now mostly based on a new (2015) single campus BIUAS has a history of decentralized multi-campus organization. The recent integration of faculties into a campus organization has been counterbalanced by the opening of two external campuses at Guetersloh and Minden. Faculties traditionally enjoy **high autonomy**, and integration with central administration and educational/research centers seems low but is being strengthened.



Factors specific to BIUAS are:

- **a long history of internationalization** (student exchange)
- **elaborate 'international' facilities in place** (buddy system, welcome events, good residential facilities)
- a history of decentralized multi-campus organization
- a growing number of popular industrial immersion degrees where students alternate between campus studies and professional activity

Internationalization at BIUAS — status quo

International student intake falls into two categories:

- international exchange students (and lecturer exchange connected with it)
- intake of degree-seeking students from abroad

Student and lecturer exchange

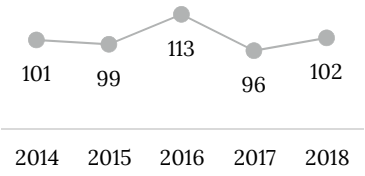


Figure 5. Outgoing students at BIUAS

Outgoing exchange headcount was c. 110 / 10,000[16] per semester between 2014 and 2018. This means that numbers are far from the 20 or even 30% the EU is targeting[17]. Exchange, internationalization and initiatives mostly start at a personal (lecturer) level and are co-ordinated through the International Office. Exchange agreements have been signed with roughly 100 partner schools in 41 countries[18].

The status of local student does thus not imply any statement on nationality, citizenship or residential status

Diversity is additionally boosted by the fact that **a high proportion of students (est. 30%) are from first to fourth or fifth-generation migrant families**. These students acquired their university entrance qualification in Germany, with large numbers not holding a German passport. The status of local student does thus not imply any statement on nationality, citizenship or residential status, which is why **the cross-cultural mix of students** on the ground is much more complex than a mere look at status and international intake numbers suggests.

The cross-cultural mix of students is much more complex

BIUAS was an early mover — even compared to Ivy League research universities — in launching international student exchange. This is contrasted by the rather low number of dual or joint degrees (5 curriculas) and of entire curricula taught in English[19] (1 curricula).

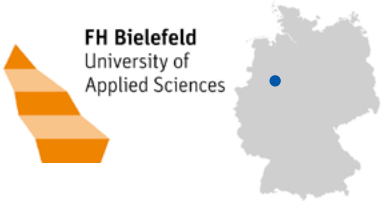
The faculties with a high turnover of exchange students tend to offer a set of modules — sometimes bundled into a certified 'package', worth 30 to 60 ECTS, that incoming students can

16 *All hard data retrieved from Jahrebericht 2017, fh-bielefeld.de/praesidium/rechenschaftsberichte*

17 *BIUAS' student body is actually, due to immigration, far more diverse than mere exchange flows suggest. A high proportion of students are from first to fourth or fifth-generation migrant families and acquired their university entrance qualification in Germany, with large numbers not holding a German passport though. Being a local student thus does not imply German nationality or citizenship.*

18 *fh-bielefeld.de/internationales/profil/partnerhochschulen*

19 *Own enquiry conducted Jan 2019. Whether the number of modules taught in English is a reliable indicator of internationalization is disputed. This matter is not discussed here.*



German universities have found it harder to switch part of their programs to English and continue to expect high standards of German language skills

study in English. Contrary to other 'small-language' countries, German universities have found it harder to switch part of their programs to English and continue to expect high standards (mostly C1 level) of German language skills.

With regards to geographical reach, exchange partner countries are mostly in Western and Eastern Europe, North America and East Asia, less in Latin America and with next to zero partnerships in Africa. Student and staff exchange has diversified over the last 15 years with **more focus directed now at Central and Eastern Europe and also South Asia** — a shift from the original concentration on Western Europe and North America. But attractive partners in those 'new' target regions have turned out **harder to approach** now than in the post-1989 period, probably due to the high saturation and pressure on administrative burdens. The latter factor has also lead exchange scheme leaders to **prioritize larger cohorts to be exchanged with 'premium partners'** that are offered enhanced multi-level co-operation. There seems to be a trend towards refocusing international co-operation on hot spots in an 'economies of scale' approach. This is matched by the fact that individual free-mover stays are less encouraged (though not rejected).

A trend towards refocusing international co-operation on hot spots in an 'economies of scale' approach

Special arrangements like **credit-earning summer schools are in place with North America** to balance exchange headcounts, which has succeeded in keeping study-abroad options in North America open. This is supported by the transatlantic IBSEN[20] that builds frameworks encouraging wider co-operation.

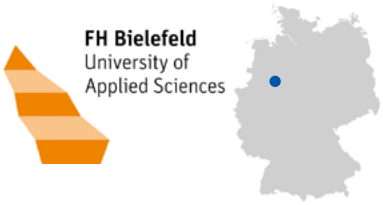
Student feedback on the ease of access and smoothness of exchange procedures has been rather mixed[21], with **paperload and credit transfer procedures** appearing as the most frequently named issues. R&D and other levels of internationalization are left outside the International Office's reach, whichmay make it hard to use the IO's expertise to support broader internationalization.

As to the administrative procedures in a typical Erasmus exchange, the core battlefield of student exchange, there is rather mixed student feedback given on ease of access and smoothness of processes[22]. This feedback seems mostly, to be fair, directed at the EU-enforced paperload and the credit transfer procedures b**etween universities than at the local counselling and information resources** available from BIUAS.

20 *ibsen-network.com*

21 *Internal student survey conducted May 2018, to be published on chedteb.eu*

22 *Cf the CHEDTEB student survey conducted at BIUAS.*



Digitalization and student exchange

The institution's digitalization strategy[23] focuses, in its current stage, on existing administrative core structures and processes but has, as of now, left out the International Office as the external European Erasmus (Erasmus Without Paper etc) process is going **through a reform and requires specific procedures**. The International Office is thus shaping its own digitization strategy. Interfacing the International Office's digital student and mobility administration with the **university's future standard processes** e.g. SIS therefore look like a major challenge especially when considering the ambitious objectives, the institution has regarding internationalization. It is hoped that the governance and co-ordination mechanisms that have been put in place will help lead those processes together.

The International Office is thus shaping its own digitization strategy

Interfacing the International Office's digital student and mobility administration with the university's future standard processes

International degree-seeking students

In a German context, 'international students' are those that acquired their university entrance qualification abroad. Unless enrolling on a program taught in English, international students are mostly required to have C1-level German language skills.

For degree-seeking students, BIUAS' ratio of international / regular student intake has been 600 to 800 / 10,000[24], which appears low considering that most **German HEIs aim at 10%+ of degree-seeking students from abroad**. If industrial degrees and part-time programs that are beyond reach for international students are eliminated, **BIUAS enrolls a quota of 7 to 9% of international students**. Awards[25] and international recreational events have been introduced by the International Office to incentivize integration for international students and to combat high dropout rates.

Efforts to systematically approach internationalization as a strategic field may take time to bear fruit

As an early mover, BIUAS has joined the Kiron[26] initiative seeking to provide study opportunities for qualified refugees.

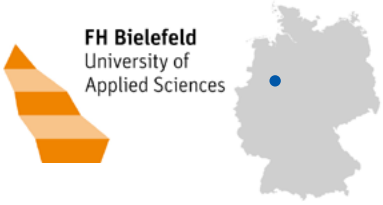
Overall, efforts to systematically approach internationalization at the level of exchange and degree studies as a strategic field have been stepped up but may take time to bear fruit.

23 *All data and strategic decisions on Digitalization retrieved from fh-bielefeld.de/hochschule/organisation/hochschulverwaltung/dezernat-qm/programm-digitalizierung*

24 *Data retrieved from Jahrebericht 2017, fh-bielefeld.de/praesidium/rechenschaftsberichte*

25 *fh-bielefeld.de/presse/pressemitteilungen/24-studierende-aus-10-laendern-erhalten-stipendien*

26 *kiron.ngo*



Visions and strategies of the university impacting internationalization and digitalization

As shown above, BIUAS' internationalization illustrates a number of specifics rooted in its regional orientation and its role as a university of applied sciences.

Goals in internationalization

On the basis of an internationalization audit conducted in 2018, BIUAS has drafted an internationalization strategy[27]. Prime goals are:

- **to increase exchange numbers**, esp. for outgoing
- a much wider participation of all sections of the academic community in international activities
- **to provide all graduates with cross-cultural competence**

In BIUAS specific planned activities and quantified targets of internationalization have not been defined

A general welcome culture is to be established by adapting and simplifying relevant processes. In communicating with regional companies a lot of which have a high international presence, internationalization is presented as a recruiting factor. Specific planned activities and quantified targets of internationalization have not, contrary to other universities, been defined.

Supporting activities of internationalization

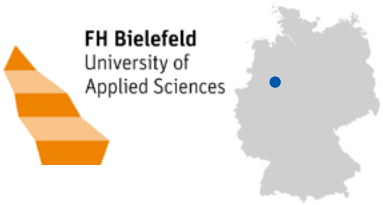
Most specific activities are run at class and degree program level, such as:

- classes and entire degrees taught **in English**
- English for Special Purposes and technical reading to be made compulsory subjects in all curricula
- mobilities to be integrated into curricula
- **summer schools** especially addressed to US and Canadian students
- syllabus taught English offered jointly to local and exchange students
- making internationalization a topic of **co-operation with the corporate sector** (cross-cultural skills training, shaping internationalization strategies in business)

Centralized activities are:

- **the 'Buddy' program** and recreational offers for incomers
- marketing measures designed to increase incoming numbers to gain reciprocity in international exchanges
- an annual cross-faculty **International Week** stimulating international co-operation
- **increased support in EU project proposal** drafting for researchers and lecturers

27 *fh-bielefeld.de/presse/pressemitteilungen/empfehlungen-fuer-die-internationalizierung*



- **developing an international communication concept** (website, literature, events)
- language education of teachers
- international student marketing

A group neglected so far are PhD candidates. Attempts to install doctorates co-tutored with German research universities have had little success, which is why international PhD partnerships are a logical option but have remained at personal levels so far.

There is heavy reliance on internal initiative, mobilization and stimulation

Overall, strategic documents published by BIUAS[28] do show a clear qualitative commitment to internationalization without imposing numbers and timelines. At the same time, there is heavy reliance on internal initiative, mobilization and stimulation.

Results and experience

Student exchange numbers and respective services have been expanded constantly, and sometimes creatively e.g. through summer schools offering credit opportunities to North American students.

Efforts **to expand internationalization to the large proportion of less mobile students**, such as distance, part-time and industrial-immersion students, by offering digitally supported 'international windows', are at preparation level.

As expanding international activities to more sections of the university relies mostly on voluntarism, a more even spread out across all departments and sections may remain a long-term challenge.

Lecturers with a heavy teaching burden find it hard to make long-term training commitments

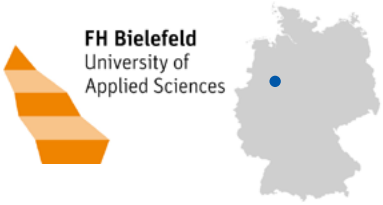
Improving teaching staff's language and cross-cultural skills has encountered issues as lecturers with a heavy teaching burden find it hard to make long-term training commitments. Adjusting recruitment criteria and incentives towards international activities has been encouraged but not been formalized so far.

All this suggests that, expressed in qualitative terms, internationalization has picked up visible momentum but has not penetrated BIUAS' DNA deeply yet.

Admin and program management

BIUAS' International Office has created a comprehensive information system on program calls, funding opportunities, international events and initiatives for all levels of the organization. Parallelly, **a number of transnational alliances, consortia and strategic partnerships and frameworks of regular exchange**, sometimes evolving from teaching to research, have emerged. This has, in return, resulted in

28 *fh-bielefeld.de/multimedia/Hochschulverwaltung/Dezernat+II/International+Office/Downloads/EPS_ECHE.pdf*



a higher administrative burden for the International Office whose staff numbers have been beefed up. On the other hand, the turnover of heads of the International Office seems rather high and may be related to its 'sandboxed' situation[29] with little direct access to management. There are indications that **a closer linkage of the International Office to the presidency may benefit internationalization**.

Gaps, shortfalls and challenges

Structural changes appearing currently on the agenda are:

- **a revised role of the International Office**
- the processes of student management and student lifecycle
- **more agile processes** between central administration and faculties
- **facilitating co-operation in consortia**
- stronger linkages between transnational teaching and research activities (still administrated by separate units)

On top of this, mindset issues will need to be tackled across the organization, such as a more flexible coherence allowing multi-level integration with external partners.

Encouraging a training and participation offensive, on both the communication/ language and the functional side, will be a good start.

This **multi-level change process involving all categories of staff** has not yet reached its full momentum. Offering (and encouraging) a training and participation offensive, on both the communication/language and the functional side, will be a good start.

This process will — and has started to — overlap with the overriding **trend of Digital Transformation in Academia**, which is why both issues need to be considered jointly.

Digitalization — status quo and future

Digitalization has recently acknowledged as a major strategic goal and challenge by BIUAS

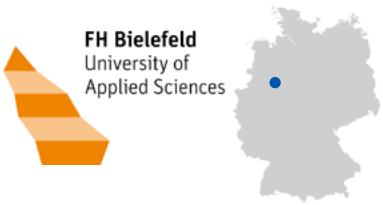
Digitalization has recently acknowledged as a major strategic goal and challenge by BIUAS[30].

Its implementation is characterized by:

- **overarching goals set at institutional level** (cf Goals, strategies and priorities below) and clear definitions of scope and methodology
- **a multi-project approach creating poles of digital competence** (teaching and learning, administration and management, internationalization, property and facility administration a.o.).
- **decisions on priorities** (department and unit level) made on the basis of urgency and demand, strong emphasis on faculty and unit initiatives
- framework of diverse projects overseen by a central co-ordination platform

29 *Cf the chapter on Processes and Management below*

30 *fh-bielefeld.de/hochschule/organisation/hochschulverwaltung/dezernat-qm/programm-digitalizierung*



Admitted challenges lie in the:

- governance and co-ordination
- **transparency** and mainstreaming of initiatives and processes across departments
- **consultation** and integration efforts at all levels of the organisation

Two headaches emerging:

• procurement procedures for software purchasing at EU level

• the choice between open-source and commercial software options

Intensive process mapping was undertaken prior to priority setting in choosing digital platform tools. Two headaches emerging are:

- procurement procedures for **software purchasing at EU level**
- the choice to be made between **open-source and commercial software options**

Processes and management

The main processes for the first wave of digitalization

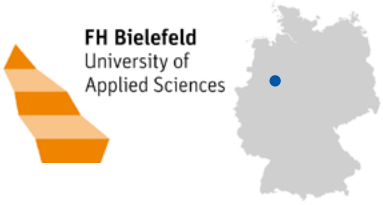
The main processes BIUAS has prioritized for **the first wave of digitization are**:

- student lifecycle admin (applications, enrolment, status) and services (iCaMS initiative)
- course and exams management
- financial management (receivables)
- asset management
- document management e.g. travel expense claims

The second reform stage

At the current initial stage, the main focus seems to be **on digitizing classic administrative procedures and very specific functions**. Teaching, learning management, research and transfer, the main missions of BIUAS, have partly entered into their own, unit-based digitization processes focusing e.g. on e-learning, knowledge management, learning support and project organization. **Structural and cross-departmental changes in the core processes** (e.g. those connecting education and research with administration) preparing the university for overall digitalization seem to be assigned to **the second reform stage**.

The International Office continues to function under the line management of Student Affairs **without reporting directly to the university's presidency**. This constellation seems to **benefit BIUAS' student exchange programs** but will make it hard for the International Office to be a key driver in overall internationalization.



Goals, strategies and priorities

Goals of digitalization

The following **immediate goals of digitalization**[31] have been defined:

- optimizing communication
- making specific processes faster
- enhancing transparency of operations
- cutting down on paper
- managing student lifecycle efficiently
- improving student services
- offering new benefits to users by providing adequate data

Making quick wins without the risk of losing momentum through over-dimensioned projects seems to be the pragmatic logic of the priorities set. This seems reflected in the relative 'hands-off' stance taken by the presidency in installing an oversight council on digitization. The risk of having to interface new processes in the future seems to be monitored by the co-ordination mechanism.

Implementing the university's overall Digitalization strategy

The pragmatic approach that the management seems to take does not neglect **rules and procedures** though. All units affected are tied to:

- **stick to priority areas** to be tackled and follow procedures agreed
- **present roll-out plans** and widely publicize information about them
- **indicate changes in services, processes and organization**
- **carefully and professionally select** external resources and services used

Regular public update sessions for BIUAS staff

These rules may make it easier to win over hesitant staff in the units prioritized. Regular public update sessions for BIUAS staff by e.g. the campus management project iCaMS are meant **to connect the administration-centered projects with faculties and transfer units**. This seems the critical interface that will enhance coherence of BIUAS' future processes.

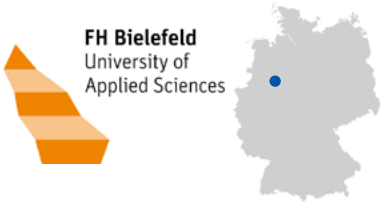
Achievements and next steps

Digitalization strengths

BIUAS's **strengths in digitalization** seem to lie in:

- **the open management approach** taken
- **the pragmatic and targeted definition of priorities**
- **the co-ordination effort** that allows regular review of progress
- **thorough process mapping**
- **long-term orientation**

31 *General objectives under fh-bielefeld.de/hochschule/organisation/hochschulverwaltung/dezernat-qm/programm-digitalizierung; data on implementation retrieved from internal sources*



Adverse or slowdown factors may be:

- procurement procedures at EU level
- interfacing partial or imposed proprietary solutions and respective software systems (e.g. the administration of the Erasmus Plus programme)
- the high standards of data protection in Germany
- the required adjustment of organizational culture

Slowdown factors

The university's management does appreciate, it is true, quick wins but does not seem to sacrifice diligent execution. Implementation methodology seems to consist of a combination of scrum and waterfall. Overnight breakthroughs are not to be expected but **time and budget limits are imposed strictly**. As a number of external services such as campus management software are subject to tendering at EU level, **considerable delays** will have to be dealt with. **The high standards of data protection in Germany** will probably further slow down progress in critical areas, which is why **review intervals have been kept tight** so unnecessary loops can be avoided.

Marketing strategies at BIUAS

BIUAS has a strong but not exclusively regional **focus on Eastern Westfalia** in its teaching, research and transfer missions. This is reflected in recruitment, with certain degree programs and research projects requiring wider windows.

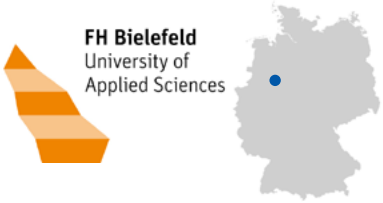
Marketing activities and channels

Student marketing and recruitment of degree-seeking students at international level is mainly channelled:

- **through national websites** listing all degree programs in Germany (information resource with little marketing impact)
- **Social Media and advertising campaigns** run by the German Academic **Exchange Servcie** (DAAD)
- BIUAS activities at **large international educational fairs** (NAFSA, IAIE)
- **BIUAS' website**
- circulation of PR material and field trips to target countries
- participation in **target country exploration trips** offered by DAAD

Recruitment of degree-seeking students from Western Europe is virtually, probably due to language barriers, at zero level

Most international degree-seeking students seem to come from **Central and (South)Eastern Europe, Turkey, Russia, Ukraine and Northern Africa**. BIUAS has mostly refrained from using international recruiting agents. Recruitment of degree-seeking students from Western Europe is virtually, probably due to language barriers, at zero level.



University's strategic priorities put forward by BIUAS' marketing are:

- **close connections with regional administrations and businesses**
- the city's human scale, **quality of life and historical background**
- its **affordable cost of living**
- its **recreational potential**
- the much-cited **welcome culture and corresponding services offered by the organization**[32]

The BIUAS' website offers basic information mainly for incoming exchange students. Further marketing effects derive from participation in international consortia and alliances although this channel mainly reaches exchange students.

Recruitment of degree-seeking students abroad is still modest and relies mostly on traditional marketing channels

The overall picture is that despite a good potential for increasing international intake, recruitment of degree-seeking students abroad is still modest and relies mostly on **traditional marketing channels** (fairs, brochures, listings).

Internationalization and IT tools used at BIUAS

Digitalizing the institution — specifics of international relations

Internationalization needs digital support, especially over social media

It is obvious that internationalization needs digital support, especially over social media, in order to massively expand.

As stated above, BIUAS's International Office needs to pursue its own digital strategy and will connect its evolving and expanding digital infrastructure with the local campus management system.

Measures to ease the integration of exchange students

Measures taken **to ease the integration of exchange students** are:

- **Registering all incomers as fully enrolled students with local digital identities and access** to systems and services
- **Collecting credit records at faculty level** and feeding them to the International Office for transfer
- **Adjusting IT framework of the Intrnational Office to new EU requirements** (Erasmus mobility tools, Erasmus without Paper solutions, EMREX, International Student Card)

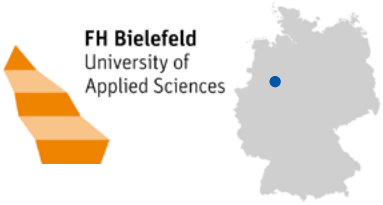
Harmonizing these separate 'rotating disks' into a coherent local system calls for **close mutual consultation and continuous alignment**.

Ambitious requirements awaiting tackling

More ambitious requirements awaiting tackling are:

- **digital services** to students, lecturers and researchers (credit transfer, international travel, budget control in

32 *progruen-ev.de/pdf/2016_05_25_Wiss_stadt_Bi_Kurzzus_fassg_ZWISCHENBERICHT_PHASE2.pdf*



international projects, diploma awards, residential services, residential status clearance, event management, team teaching a.o.)
- **digital platforms** for joint international activities of consortia of universities, institutes and companies

Experiments and pilot projects

In order to validate the benefit and feasibility of blockchains in international higher education, **an experimental blockchain was set up, in the context of the CHEDTEB project**, by BIUAS using tools provided by the University of Maribor as a co-operation partner. The process selected for trial was credit transfer for exchange students. The experiment has proved that direct credit transfer from lecturer to student and the sending institution's credit administration is possible and may cut the often laborious transfer process considerably shorter.

Benefits and problems of supporting international activities by digitizing processes

It is generally hard to quantify the costs and benefits of educational and similar processes in monetary terms. This is why a simple qualitative overview of possible benefits and problems arising from digitized internationalization[33] may do on this occasion.

Table 3 summarizes the main benefits and problems of supporting international activities by digitization process.

It is obvious that most opportunities are viewed from a rational viewpoint whereas **a good deal of the problems appear from a sometimes irrational (but very relevant) perspective**. Solutions will need to addressed this by appropriate measures.

Table 3. Benefits and problems of supporting international activities by digitizing processes

BENEFITS
more **agile** processes (better and faster student services)
better **scalability** (i.e. for expanding activities quickly but also for running small-scale projects more efficiently)
better **participation** for smaller units
freed-up **capacity** for **counselling, tutoring, debating** and **creating value**
better access to **data** and **transparency**
more educated **decision-making**
reduced errors arising from manual data transfer
seizing international opportunities more easily
easier distance studies, bigger reach for university

PROBLEMS
digital skills shortage
mindset issues (change, can-do mindset, 'digital' mindset)
older staff likely to lag behind
connecting the 'value creation' chain (teaching, research, transfer) to digitized administrative services
digitalization seen as a one-off effort with little awareness of permanent challenges
high student expectations (credit transfers, status updates, grades etc)
BIUAS **administration's low involvement** in international activities so far

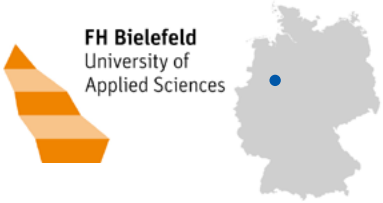
Challenges in the university's digital transformation in general and impact on its internationalizations processes

It is generally fair to assume that **internationalization can benefit enormously from the use of digital tools and processes**. In this respect, BIUAS has chosen a path that implies both opportunities and drawbacks.

Challenges and risks

Keeping the stream and workflow of tool and process development for general administration and international mobilities separate remains, irrespective of the fair reason for doing so, a serious risk. **Systems integration and interfacing may be complicated and expensive** and solutions may be approximative. If BIUAS largely bases its internationalization

33 *The following overview is derived as an analogy from an analysis of digital transformation scenarios in business undertaken by the CHEDTEB project, cf. chedteb.eu*



strategy on increasing mobilities, it will be crucial to have digital support capacity and to design a seamless integration of the two or more systems. Students expect ever swifter credit transfers, status updates, grade reports and other services and increasingly make those the criteria for selecting their study-abroad location. In the long run, this may call for technologies and services that go beyond centrally administrated databases. **Distributed Ledger Technologies (DLT) and Blockchain** offer adequate opportunities but have so far been kept outside the considerations of the planning process. Another headache seem to be **open-source solutions that are generally easier**, at least theoretically, **to interface with existing or newly implemented environments** such as the BIUAS' campus management system in-the-making. Parallelizing the implementation of both solutions may thus become a true planning challenge.

Distributed Ledger Technologies(DLT) and Blockchain offer adequate opportunities but have so far been kept outside the considerations of the planning process

Going beyond mobilities, it also becomes apparent that **a one-stop-shop approach** that shows one digital 'face' to the partner will help speed up both digitalization and internationalization across departments and missions. Whether **centralization of all international activities** at the International Office (and corresponding software solutions) **or a more flexibly connected cluster** makes sense cannot be determined at this stage and place. In this sense it may be useful **to adopt an outside-in perspective** looking at BIUAS as a multi-purpose partner (students, R&D, transfer, HE policies), very much in the way future consortia will be operating, i.e. combining different types of activities. If it is true that trust is the most valuable asset in academic co-operation, **an integrated approach** allowing external access to a multitude of functions through a single gateway such as an International Office seems a necessity.

A one-stop-shop approach that shows one digital 'face' to the partner will help speed up both digitization and internationalization across departments

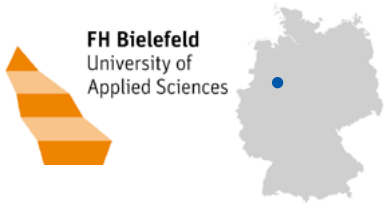
An integrated approach allowing external access to a multitude of functions through a single gateway such as an International Office seems a necessity

Another problem arising on the horizon is the fact that BIUAS' administration has, in the past, not seen much overall involvement with international activities. If internationalization and digitization are to reach all levels of the institution, **administration staff should be encouraged to participate actively in projects** and in building partnerships, including travelling abroad. It is almost certain that internal administrative functions will be much more connected — whether in an analog or digital sense — to external and international partners in the future — be it personally or digitally.

As regards digitalization, it seems appropriate to devote prime attention to winning over staff

In regards to digitalization in its own right, **experience of public administrations shows a general hesitation on the part of staff to embrace change** or to face change in a 'can-do' manner. If this adds to the issues that **process redesign** — which is what digitization usually entails — inevitably provokes, it seems appropriate to devote prime attention **to winning over staff**. The experience of private companies

Internal administrative functions will be much more connected to external and international partners in the future



undergoing digitalization has proved that this is the win/lose divide in digitalization.

Management has, so it seems, anticipated mindset issues, and has approached **internal communication systematically**. As of now, this has not yet resulted in faculties and the 'value creation' chain becoming fully involved in the organization's effort. Most lecturers and departments rather seem to be watching digital developments within administration from **an outside perspective** or be working on other faculty-specific circuits.

As soon as teaching, research and international co-operation are massively integrated with administrations, digitalization will start becoming an institution-wide trend.

As soon as teaching and research, as well as international co-operation are massively integrated with administrations, digitalization will start becoming **an institution-wide trend**. Minor forerunners of this are projects like **digital exams, digital degree course management and the e-learning initiative** run by the library's knowledge management department.

6.2. Brno University of Technology

Context

- More than 24,000 students
- 9 faculties

Brno University of Technology (BUT) located in Brno, of Czech Republic is a major Czech university **founded in 1899** with over **24,000 students enrolled at 9 faculties**, namely Faculty of Architecture, Faculty of Civil Engineering, Faculty of Fine Arts, Faculty of Electrical Engineering and Communication, Faculty of Chemistry, Faculty of Information Technology, Faculty of Business and Management and Faculty of Mechanical Engineering. Part of the university are also three university institutes – Central European Institute of Technology, Institute of Forensic Engineering and Centre of Sports Activities.

Vision and strategy concerning digitalization and internationalization

Strategic priorities

Internationalization as a part of the long-term strategy for 2016-2020

Internationalization should be considered of the key features of any modern university and BUT is of course no exception. Most of the general internationalization strategy is formulated in **the long-term strategy for 2016—2020 and Erasmus policy statement**. Individual faculties do have their strategic objectives in internationalization, but the need for a unified university strategy has led to current revision.

Internationalization is one of the important performance indicators with **influence on university funding and visibility** both domestically and abroad. It is also a matter of prestige and is important for improving BUT's standing in the university ratings.

The integration of international mobility agenda into the electronic records management system is still pending task

As of now, there is not much in terms of formal digitalization policy in internationalization, apart from **the still pending task to integrate the project and international mobility agenda into the electronic records management system**. This is mostly dependent on the future existence of a unified partners and mobility management system, which would cover the entire process (which due to partial decentralization is not the case today).

Electronic request form as an achievement

The other partial achievement is the creation of **the electronic request form**, that records the demands of the individual officers and **contributed to the transparency and communication** with the IT department.

Goals and main elements of internationalization at BUT

Focus on internationalization

Internationalization activities have recently been given much needed focus along with **more human resources and funding opportunities**. It is therefore possible to expand to beyond what used to be in the past.

The main elements of internationalization are associated with the mobility programs

The main elements of the internationalization at BUT have long been associated, at least on a central level, primarily with **mobility programs**: Erasmus+ being the most well-known and most utilized. There are also other programs though, such as **CEEPUS or Aktion**, and furthermore numerous individual mobilities through so-called **free movers scheme**. BUT also publishes opportunities it is not directly responsible for, but considers them a good addition to the offer for its students and staff — **opportunities provided by the Academic Information Agency, Fulbright Commission and others**.

Promotion of mobility schemes:

- International Mobility Day
- Social media
- International contests

The important role of the Foreign Relations Office has also been **to promote these mobility schemes via organized events such as the International Mobility Day, social media and contests**. This is especially true in the past two years, where the mobility numbers of outgoing students have stagnated at best (although the staff mobilities increased significantly).

To achieve the goal of attracting more participants, BUT has also cooperated with **the Erasmus Student Network** and, more recently joined **the Brno International Student initiative in cooperation with the Brno municipality**, which aims at collecting feedback and employing student ambassadors to promote city of Brno as a student destination and studies at BUT.

BUT is also active in numerous international project of excellence in research and in organizations, such as EUA, EAIE or CESAER.

Most recently, BUT has identified several **key priorities**, which include:

Internationalization key priorities

- **establishment of partnerships with universities in Asia**, which have high educational and research potential
- **recruitment of fee-paying students** (this shall be accented, as according to records, the numbers have dropped by 2/3 over the last five years)
- **establishment of more joint/double degree programmes**
- **PhD student mobility**
- **recruitment and integration of foreign researchers and young professionals** to BUT research facilities, which leads to a demand for an agenda of services for incoming long-term mobilities (Welcome Service).

The efforts to fulfill these objectives lie on **the responsible contact persons at the faculties** (which usually comprise of 1-2 international officers under a vice dean and the central bureau, comprising of 9 full time employees, vice rector and eventual student assistant.

Marketing and strategies at BUT

All the main **activities are coordinated by BUT Marketing Department** in cooperation with the International Office. However, there is as well space for particular BUT **faculties to design their own promotional materials for its activities and events** (e.g. International Week, International Conferences, Summer School etc.)

The BUT mainly uses current **network of partnerships** and at the same time it is trying to develop activities to deepen relationships for efficient exchange both academic staffs as well non-academic staff and students between the BUT and partners.

In the near future will be created **a plan of International campaign and its goal is to promote English study programs** at the BUT. Based on mutual communication with partner HEI´s worldwide BUT focuses on potential interested students whom are presented study programs taught in English.

Strategies at BUT:

- Network of partnerships
- International campaign to promote English study programs
- Campaign based on online and ofline sources
- Mobilities of Scientists
- Student ambassadors

The campaign´s main goal is to **attract new students** from all over the world to study at BUT. Activities in International area will be **coordinated by Marketing department and supported by International office**. For this campaign both **online and offline sources are used**. Between the offline the brochures, promo flyers, promotional items are delivered. In addition, BUT participates at the international fairs, where is a direct opportunity to reach out to the prospective students. At the same time are supported **mobilities of scientists** whose help to spread the good name of the BUT.

New possibilities are actively seeking so the promo materials can be better distributed between the high school students with interest to study at our university. There are activities to established **a network of ambassadors between students** to support communications channel between university and potential interested person in study at our university. We at the BUT are trying to secure the most of information about target destinations important for BUT that have been determined by BUT leadings. This information can be supplied at the best level by foreign students actually.

As **online sources** are used brand new university website, presentations, promo videos, active work on social medias (YouTube, Facebook etc.), cooperating agents, platforms, portals.

Another part how to fulfil one of the strategic objective is **to set up the price for English study programs at the competitive level** compared suchlike universities at the similar level in International ranking system.

Marketing activities and channels

Multilingual study portals help to promote the university abroad

- masterstudies.com
- educations.com
- portal.studyin.cz

The BUT actively uses **multilingual study portals** (masterstudies.com, educations.com, portal.studyin.cz) which help to promote the university abroad. All the information is maintained and updated to keep them as much actual as possible. Used portals were recommended by Czech universities that means the basic authenticity of the portals services.

In future BUT would like to implement **a targeted use of direct mailing to potential interested students** whose go through the paid portals and increase communications between the BUT and those interested persons.

It means **regular newslettering** about events and news at BUT, new promo materials to attract them, catch their attention and convince them to choose and come to the BUT as an ideal university to get the best practice.

Marketing channels:

- Direct mailing
- Regular newslettering
- Cooperation with regional institutes

BUT cooperates with regional institutes as well such as JCMM[34] which helps and encourages international incoming students by scholarships. Another regional organization is **South Moravian Informational Center, Regional Office or the Expat Center** which help by sharing experiences. The last mentioned office — the Expat centre helped BUT methodically to set up welcome service. Last but not least the BUT encourages **sharing good practices between Czech universities** by platform Study in the Czech Republic[35].

Internationalization and IT tools used

BUT has been utilising several key tools to facilitate its internationalization activities and their administration

BUT has been utilising several key tools to facilitate its internationalization activities and their administration. Note that this counts just the BUT systems, for the purposes of this discussion we omit **compulsory tools used in some European projects, such as Mobility Tool, the URF participant portal** etc.

Key tools include **the information system (Apollo)**, which is used to manage outgoing mobilities of both students, recent graduates and staff members within Erasmus+ programme and freemovers.

This is **interconnected with the electronic application** used for incoming students within short-term mobility programmes and serves to transfer data from the e-application form and the course selection to the faculties for approval.

Online travel order system

In terms of mobilities of teaching and administrative staff BUT utilises **online travel order system to digitize the administration of the employees' business trips**, most notably:

34 *South Moravian centre for International mobilities, jcmm.cz/o-nas_en*
35 *portal.studyin.cz*

- allows to order a deposit online
- calculates daily subsistence automatically according to current legislation
- sums up the costs in each particular category (travel, accommodation, other expenses)
- both the travel order and the final accounts is signed electronically online
- allows attachments (thus preserving copies of all the document readily available at any time)

BUT also licenced the Office 365 software with all of its main functions. Not all department chose to use it on a daily basis, however, there have been suggestions that features such as Sharepoint could be taken advantage of for easier share of documents between responsible officers.

Digitalization now and the future

Now the attention has been paid primarily to internal administrative procedures

During the past years, the attention has been paid primarily to **internal administrative procedures**, e.g. application forms, grant agreements or mobility management.

The basics include **the recording of student and staff mobilities, budget planning and automated print of mobility contracts**. The partner institutions are recorded and transferred to the electronic application for incoming participants; however the current database is less then optimal for the purpose and offers little in terms of future applications.

In spring of the year 2019, the Foreign Relations Office has thus started a project of **new partner and agreement database**, which should be implemented in the year 2020.

Its objectives include:

Objectives of new partner and agreement database

- provide complete and up-to-date info on possibilities of mobility
- web-based map and application form
- provide streamlined procedures to BOTH incoming and outgoing
- provide control and evidence of incoming staff — Welcome Service
- facilitate application process, courses selection etc.

Benefits and obstacles of university's digital transformation

Feedback on digitalization in internationalization

No formal survey on digitalization performed among students or staff

To this day we have no prior knowledge of a formal survey performed among students or staff on the topic of digitalization by BUT itself. The university does receive **a feedback on administrative issues in a more informal way though**, for example through meetings of the project teams or from

students at promotion events (such as International Mobility Days) and particularly during and/or after the mobility.

Outside BUT, there have been initiatives particularly from **the Erasmus Student Network** and other bodies to revise the processes in general, particularly in **the Erasmus+ programme**, which is the most prominent and should serve as an example of good practice in the future. Common demands include rationalization and simplification of the document agenda.

Common demands of digitalization include rationalization and simplification of the document agenda

Current situation of the digitalization and internationalization processes at BUT

Leaders of Foreign Relations Department at BUT have been feeling the need to have a system that speed up and digitizes whole process and minimize bureaucracy on both sides, university and student

Digitalization of the international mobility process will be done by our own recourses at BUT

It was decided that **the digitalization of the international mobility process** will be done by our own recourses at BUT. Thus, the priorities of the IT department have been shifted towards other important issues, what is one of the mentioned obstacle, the lack of IT staff. However, the work has already begun by specifying accurate as possible job description and regular meetings with IT department where discussed problems are or determined subtasks to achieve the goal step by step.

The digitization process is therefore longer than we expected

Thanks to these meetings, arise new requirements as a better settings and design of the system in few areas that should be included in digitization so the **digitization process is therefore longer than we expected**.

Currently the IT department connects existing systems to share the data

Currently we are at point, where the IT department connects existing systems to share the data, as it is needed and where the system´s designs are drawn and could be step by step entered to system and tested in near future.

The main idea of the digitalization in internationalization is connect information from Bilateral agreements and Memorandum of Understanding with mobility of students and staff (incoming and outgoing) **to get some statistic and strategic information and to have actual information in one moment in one place**. Also paper issue like needed documents (e.g. Learning Agreement, Transcript of record, Traineeship Agreements etc.) should be done electronically.

Students complain about administrative overload

Many students complain about **administrative overload**. Due to the nature of BUT as a technical university, students are already accustomed to online forms of communication, which are also led by many academic lecturers in their professional areas, and the paper form of requisition becomes especially time-consuming for them e.g. now students fill in paper application, after notification of results they fill their Learning Agreements. Those documents approve the subject guarantor

In the case of the introduction of digital student travel, employees and teachers will be able to effectively and efficiently control the course of the student's journey and other data associated with university studies

and then vice-dean of the relevant faculty, **so for students is very difficult to meet these representative and let sign the documents and after all this to send the documentation to abroad in short time**. This documentation is then also necessary to grant agreement, which are subsequently filed in a file cabinet containing a student folder. Here would be lots of saved time for both students, academic representatives and officers, too.

When introducing an online form of selection, nomination and administration of student paths, the system will conveniently and transparently record student paths from start to finish, with university control.

From perspective of employee, digitizing foreign journeys represents **an increase in employee efficiency, especially in terms of time, data overview and service**. Foreign and study officers are now conducting electronic and paper-based student documentation as they are required, based on approved paper documentation, to introduce information into the study system and student register. In addition, teachers and faculty managers who approve student mobility are busy checking paper documentation with information in both BUT syllabuses and a foreign partner. **In the case of the introduction of digital student travel**, employees and teachers will be able to effectively and efficiently control the course of the student's journey, the consistency of the course with the course of study and the introduction of journeys and foreign results in all compulsory systems and records associated with university studies.

In case of digitalization of academic staff mobilities it is necessary **not only to properly record where and why it runs but reduce the rate of paperwork as in the case of students**, too. BUT has in-house software for business trips, which serve as a tool of evidence, which need extension to could provide statistics about frequency, location and perhaps achieved achievements and new contacts through these paths, etc.

Table 4. Benefits and obstacles of the digitalization and internationalization process at BUT

BENEFITS
speeding up and **minimise the bureaucracy** for the university and students' sides
saving time on document handling for students, academic representatives and officers
making statistic and **actual information available** in one moment at one place
decreasing administrative overload and increase employee efficiency

OBSTACLES
the systems integration and interfacing, some faculties operate with their own systems
shortage of IT personnel
cooperation between International Office and IT development and **prioritising necessary developments**

Benefits and obstacles

To summarise the main benefits of the digitalization and internationalization process at BUT relate mainly with the minimizing bureaucracy, saving time on document handling, making actual information available and decreasing the administrative overload (Table 4).

Challenges in BUT digital transformation of internationalization process

One of the main challenges of continuous efforts at digitalization of BUT's internationalization processes has been **the shortage of personnel**, mainly in the IT department, that could be dedicated to this task and **the decentralization of many internationalization activities**.

Also, the priorities of the IT department have been shifted towards other issues (albeit also important), notably the electronic documents and record management system. It has only been recently since there has been an increased focus on activities of the international department again.

The Foreign Relations Department tries to capitalize on this recent development, but at times is also overwhelmed by urgent tasks, so things are not moving as quickly as desired. Nevertheless, **the new online request system** has contributed to **better communication** with the IT department and it creates pressure on both sides of the work process to be responsive in a timely manner.

Important to discuss the development and gradual adoption of the central solution

The other problem which may hinder the development of the international IT tools may also be the fact that **the modus operandi of the individual faculties in decentralized activities and processes may also vary**, not to mention, that at least one of the faculties does not utilize the common information systems on a regular basis. It is therefore important to broadly discuss the proposed development and convince the partners at the faculties to gradually **adopt the central solution**.

6.3. University of Tartu

- More than 13,000 students
- Classical university with 4 faculties

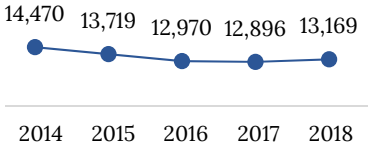


Figure 6. Number of students at the University of Tartu

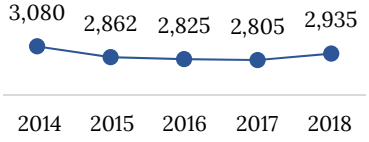


Figure 7. Number of employees (FTE) at the University of Tartu

Context

In Estonia, digitalization initiatives in society have led by the government. Estonia has the ambition to be **one of the leading countries as a digital society**. Every citizen can have an ID-card, which can be used for signing to electronic documents, making bank transfers, and voting by internet on elections. Also, Estonia has e-government, e-business register, e-tax register, e-health system, an i-voting system for elections. There are only three services, which are not available: marriage, divorce and funerals.

In 2014, Estonia became the first country in the world what offering **e-residency** to foreigners. It gives them the opportunity to establish a company in minutes, give digital signature, send encrypted documents, do bank transfers via the internet and declare taxes without travelling. It helps to save time and money which would otherwise be spent on bureaucracy. By May 2019, Estonia has given its' e-residency to over 45,000 persons from more than 154 countries[36].

Conditions of **digital society** have contributed Estonia becoming a hotbed of many successful start-ups. The best known of them was definitely Skype, currently owned by Microsoft. Several others can be named here: TransferWise (money transferring's), Gueardtime, (digital technology products and services), Bolt (formerly known as Taxify; transportation network), Fortumo (SMS payments), Skeleton Technologies (energy storage solutions), Pipedrive (sales management tool), AdCash (online advertising platform), ZeroTurnaround (software development) and Proekspert (data science solutions). These are just some examples of globally attractive Estonian start-ups.

Since 1992, after Estonia regained independence, Estonian educational system is reformed. Tthe system has transformed from the soviet state regulated administrative **model to a modern university governance model with the key performance indicators, modern learning/teaching environment with digital tools and digital workflows and services**.

Founded in 1632, University of Tartu (UT) is **an only classical university in Estonia** with the four faculties (Faculty of Arts and Humanities, Faculty of Social Sciences, Faculty of Medicine, and Faculty of Science and Technology. UT with **more than 2,900 employees and 13,000 students** is taking almost a half of research and development part of the state budget.

36 estonia.ee/et/e-eesti

In the following table are some general data about the teaching, research, services, and position in the international rankings of the University of Tartu during 2013—2017. The internationalization of UT describes the **gradual increase of international students English thought curriculas**. The rate of international students from all students has been gradually increasing over the five years from 3,6% up to 9,3%. Similarly, the number of English-taught curricula has been steadily increasing from 6,7% put to 12,2% curricula. A fourth of the students admitted to master's studies in 2017 were international students. The rate of international research and teaching staff has been rather stable between 8% and 10% of academic staff.

Table 5. General data about the internationalization on the University of Tartu 2014—2018

STUDENTS	2014	2015	2016	2017	2018
Number of students	14,470	13,719	12,970	12,896	13,169
incl. Estonian students	13,784	12,898	11,990	11,701	11,712
incl. international students	686	821	980	1,195	1,457
Percentage of international students	4.7%	6.0%	7.6%	9.3%	11.1%
CURRICULA					
Number of curricula to which students were admitted	168	168	159	162	161
incl. Estonian-taught curricula in the first and second level of higher education	154	149	138	136	134
incl. English-taught curricula in the first and second level of higher education	14	19	21	26	26
English-taught curricula ratio	8.3%	11.3%	13.2%	16.0%	16.8%
EMPLOYEES					
Number of employees given as full-time equivalent (FTE)	3,080	2,862	2,825	2,805	2,935
incl. academic staff	49.3%	50.4%	49.6%	51.1%	51.7%
Number of teaching and research staff (FTE)	1,520	1,443	1,402	1,432	1,517
incl. international research and teaching staff	141	121	119	143	187
International research and teaching staff ratio	9.3%	8.5%	8.4%	10.0%	12.3%
RESEARCH PUBLICATIONS					
Number of publications	2,870	2,600	2,669	2,512	2,374
incl. number of high-level publications	1,958	1,830	1,902	1,709	1,709

Source: University of Tartu Annual Report 2018[37]

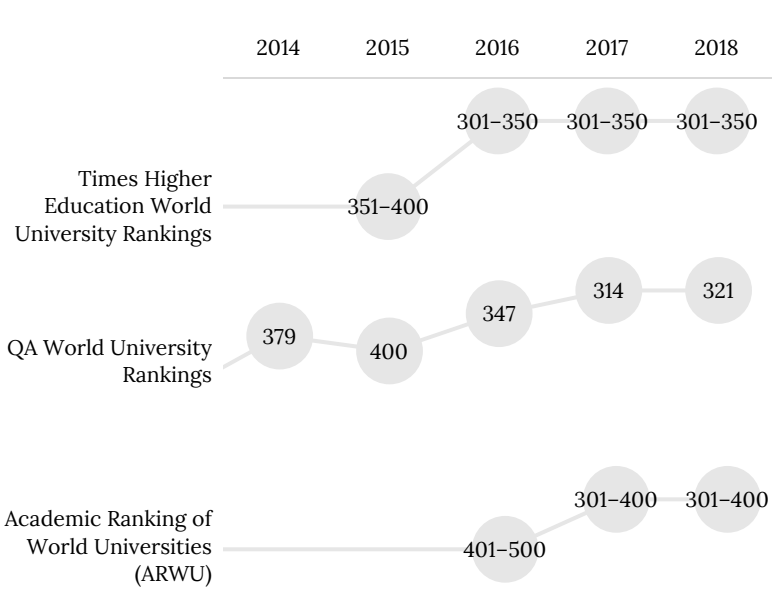


Figure 8. Position in international university rankings[38]

Times Higher Education World University Rankings (THE)

301–350

QS World University Rankings

321

Academic Ranking of World Universities (ARWU)

301–400

37 *ut.ee/sites/default/files/www_ut/ulikoolist/ut_annual_report_2018.pdf*

38 *ut.ee/et/tartu-ulikool-rahvusvahelistes-edetabelites*

The University of Tartu has followed the principle that in bachelor's studies, an English-taught curriculum may be opened only if it is also possible to study in Estonian in that particular field of study. For the master and doctoral level there is no such principle. **In 2017, seven new English-taught curricula were opened**:

- European Languages and Cultures
- Folkloristics and Applied Heritage Studies
- Educational Technology
- Innovation and Technology Management
- Actuarial and Financial Engineering
- Central and Eastern European, Russian and Eurasian Studies
- Geoinformatics for Urbanised Society

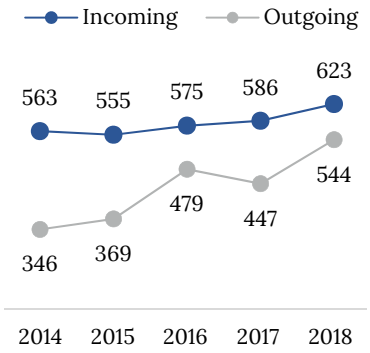


Figure 9. Incoming and outgoing students at the University of Tartu

In 2017, three curricula of the University of Tartu received the European Commission's Erasmus Mundus Programme funding for joint programmes and won international recognition. The joint curriculum of four universities "Excellence in Analytical Chemistry", got the grant for the second time already. Two more UT master's curricula — "Computer Science" and "Central and Eastern European, Russian and Eurasian Studies" — were supported by Erasmus Mundus. With these two curricula, UT is a partner in consortia led by Aalto University and the University of Glasgow, respectively.

Since year 2013 is **the amount of in- and outgoing visiting students is in favor of incomers**. The highest number of visitors are in the last study year 2017/2018, where 623 were coming to visit UT and 544 UT students were visiting universities abroad. In 2017 there were almost 1200 international students who were matriculated at the University of Tartu. The countries of visiting students coming to Tartu is rather mixed. The majority came from Germany, Italy, Czech Republic, France, Russia, Ukraine, Georgia, Turkey and India. UT students main destination countries for studding abroad are Finland, Germany, France, Spain, Sweden, Italy and other EU countries.

Figure 10. Strategic directions at the University of Tartu for 2015–2020. Source: Web page of the University of Tartu[39]

Vision and strategy concerning digitalization and internationalization

Activities of the University of Tartu are guided by the Strategic Plan for 2015–2020 and its strategic directions are presented on the Figure 10.

A 2020 objective declares, "The university develops existing curricula and creates **new international curricula based on strong research fields**, providing students with a motivating international learning environment of excellent quality and competitiveness in the labor market"[40].

39 *ut.ee/en/international*

40 *UT Strategic Plan for 2015–2020, ut.ee/en/university/strategy*

Internationalization goals:

- to enhance the competitiveness
- to prepare students for work and communication in multicultural environment
- to expand academic exchange of students and staff

Among the general strategic objectives more specific internationalization goals are elaborated, where UT enhances the competitiveness of its members, prepares students for work and communication in **multicultural environment**. UT involves top-level experts from abroad, expands academic exchange of students and staff. In addition, **UT has joined several regional and European cooperation networks** to reinforce its international co-operation ties and to increase its international visibility (Coimbra Group: CG Scholarships to the UT, European University Association — EUA, The Guild of European Research Intensive Universities, LERU and Central-European universities — LERU, Utrecht Network and U4 Network. The networks function as a channel for efficient communication and foster the exchange of researchers, teaching staff and students. Co-operation networks also facilitate the search for new partners and strengthen academic and cultural ties between universities.

The goals of each area of teaching and research are set in the strategic plan of the respective area and activities are carried out at the level of institutes and colleges.

Internationalization key performance indicators

UT strategic goals are elaborated **by the faculties' strategic plans and key performance indicators**. These key performance indicators are used for governance purposes. Among these key performance indicators there are following indicators, which connect with the internationalization process:

Table 6. Internationalization related aspects and key performance indicators at UT in 2017 and 2020

Key performance indicators	2015	2016	2017	2018	Target 2020
Teaching					
Percentage of English-taught curricula in the first and second level of higher education	14.2%	16.5%	20.2%	20.3%	≥ 25%
Percentage of international students	6%	7.6%	9.3%	11.1%	≥ 12%
Percentage of international academic staff	7.6%	7.7%	9.3%	11.8%	≥ 10%
Research					
Number of high-level research publications per academic staff member	1.27	1.36	1.19	1.13	≥ 1.3
Percentage of publications among the world's top 10% most cited research publications	13.5%	13%	14.3%	15.3%	≥ 12%

Source: University of Tartu Annual Report 2018[41]

Digitalization and strategic goals

No clearly stated vision or strategic objectives of digitalization

Concerning digitalization, at the UT there are **no clearly stated vision or strategic objectives** at the central or faculty levels. However, **UT has developed various central systems** during last 15 years to increase efficient data handling, to provide information for good governance, to modernize learning environment and other information systems. For example, the data about the UT web-based courses in table

41 *ut.ee/sites/default/files/www_ut/ulikoolist/ut_annual_report_2018.pdf*

below provide a stable progress illustrate the wider use of digital tools in learning and teaching sphere. At the central level, there are prioritized development initiatives, such as renewing study information system, tracking KPIs, where the centrally coordinated IT investments are budgeted.

Table 7. The use of e-learning at the University of Tartu	2014	2015	2016	2017	2018
Partly and fully web-based courses					
Number of courses (percentage of all courses)	1,841 (22%)	2,049 (25%)	2,413 (30%)	2,737 (35%)	3,738 (49%)
Incl. number of fully web-based courses	130	130	122	116	120
Number of participants	50,729	56,761	64,996	74,789	100,076
Online continuing education					
Number of participants in online continuing education	7,731	9,525	16,452	22,559	18,493
Number of MOOCs	2	6	10	15	20
Number of MOOC participants	335	3,111	8,001	11,935	8,991
Number of Moodle courses	2,876	3,535	3,910	5,010	6,054
Number of videos					
In UTTV video portal		4,045	4,260	5,166	6,997
In Panopto video platform				1,236	4,319

Source: University of Tartu Annual Report 2018[42]

Across the years there has been increase in the number of partly and fully web-based courses and its participants, online continuing education, MOOCs and its participants, and Moodle courses.

Digitalization now and the future

There are four main central information systems at UT:

Main central information systems:

- Study Information System
- Document Management Information System
- Asset Management Information System
- Personnel and Financial Information System

- **Study Information System (SIS)** for organizing the study process (including continuing education) and drawing up summaries of the study results for both international and local students.
- **Document Management Information System** for registering and managing university's documents.
- **Asset Management Information System** for managing the university's real estate.
- **Personnel and Financial Information System** for organizing accounting and personnel operations.

Most important and biggest system is SIS with lots of data and connected with other systems. There are data about every student at UT and when they start to study, they sign agreement that their personal data can be used. Apparently, not all data are available for all UT staff. SIS has access restrictions depending on the position and needs for data. In SIS there is obtainable a feedback from students for the courses on a regularly bases. However, SIS is considered as a very old and not very user-friendly system. Thus, at present there is a development project to renew SIS.

In SIS there is obtainable a feedback from students for the courses on a regularly bases

42 ut.ee/sites/default/files/www_ut/ulikoolist/ut_annual_report_2018.pdf

SIS has a connection with a Estonian Education Information System, where data from UT SIS are transferred every night via X-road to the state level system.

Financial and personnel management

For organizing the university's financial and personnel management, the following systems are in use:

- **Financial web** for managers and financial account holders for tracking funds, making and analyzing potential financial decisions and planning the budget. Every month users get overview of their Project. 800 people are using budget. And managing money — it is very open system
- **Salary web** allowing managers to make salary decisions. The salary web also presents staff salary data and analyses that help make salary decisions.
- **Asset web** to allow persons in charge of asset accounting to track assets and perform procedures related to asset management.

Workflows and environments for day-to-day work

Day-to-day work is supported by intranet desktop workflows and environments

Day-to-day work is supported by various workflows and environments on **the intranet desktop**, which are used, among others, for the following:

- processing and coordination of **draft university bylaws**;
- submitting and processing university **staff's travel orders and reports**;
- submitting and processing university's **internal invoices**;
- managing and tracking university **staff's leave periods**;
- announcing and processing **competitions for academic positions**;
- submitting and managing **academic mobility applications**;
- registration for and giving **feedback** on in-house training courses;
- **E-voting for managers** — University Senat, faculty level management decisions could be organized as e-voting.

IT development ordering process: justify, approve and review the project

IT-development ordering process was implemented since autumn 2013. The intention was to ensure, that:

- development projects are justified (profitability analysis), priorities are set and there is a defined customer;
- depending on the volume of development, the IT Development Council approves the development;
- the IT Development Council also regularly reviews the IT development ordering process.

In order to get the balanced views, IT Development Council includes both academic and non-academic staff.

Principles for investment into IT development

The head of the unit must submit an application if the estimated cost of **the investment exceeds 20,000€** or the estimated **workload exceeds 1,000 working hours**. The IT Development Council evaluates the application and assigns a rating to it. Based on the ratings assigned to the applications, **a ranking will be generated** which will be taken into account when drawing up the draft budget of the IT department. However, the ratings are often problematic, due to the **fragmented developments and lack of long-term view of digitalization**. It is not reasonable to use uniformed assessment just looking on the separate projects and evaluate were we spend money and what are the results what we get out from these projects. This leads often to incompetent buyer case.

Fragmented developments and lack of long-term view of digitalization

Example 1

First attempt: Incompetent Buyer

In 2008 Head of IT Department of UT initiated a development project the Knowledge and Reporting Information System (KRIS) with no extra budget. In 2013—2014 the Ministry of Education and Research of Estonia invested in this project 123,000€. During the project, there was no interface to see for university team members. The first launch was at 2015 and it included just one report view, no analytical views and there were a lot of errors. **Later audit detected several problems** with unconsolidated data loading, unreliable data etc. There was a mistake already at the beginning of the project. Since **service provider did not have experience how to build a data warehouse**, but university members could not understand that and it took a year to see some interface. Finally the project was canceled.

Incompetent buyer and not experienced service provider

Second Attempt: UT Statistics Dashboard

At the end of 2017, Vice-Rector for Research of UT initiated Statistics Dashboard project. Rector's Office allocated 50,000€ from university development fund. By June 2018, working prototype was launched and ready to connect with other UT information systems (statistika.ut.ee). Before we had to agree, what information should be available — official statistic once per year, monthly finance data, and information about students, both local and international students, staff, programs, research, projects and entrepreneurship. Later the programmers knew what to provide — **5-year overview and graphical presentation of main statistics**. The Statistics Dashboard gives transparent view about the university and supports governance in general and right at the meetings, if necessary.

Statistics Dashboard gives transparent view about the university and supports governance in general and right at the meetings

Figure 11. The statistics dashboard of the University of Tartu[43]

Benefits of university's digital transformation

SUCCESS factors

Critical factors of successful IT developments:

- top managers
- earlier experience
- programmer as a member of the research group
- suitable software

Based on previous experience, we can summarize that the major **critical factors of successful IT developments are**:

- **The involvement of top managers** — Vice-rector for research of UT took the lead and dashboard was one of his priorities
- Both, the initiator (Vice-rector) and programmer had **the earlier experience of developing a dashboard**, although in another sphere
- **The programmer was also a member of the research group at the university** and knew what are the target group needs
- Instead of information systems (BI or data warehouse) development, **free software for statistical computing and graphics (R) was used**

Other universities and institutions can develop dashboards in a similar way

Other universities and the Ministry of Education and Research of Estonia can develop dashboards in a similar way. Next project is already under negotiation with Rector's Conference and Information Technology Foundation for Education — HITSA. This time the Statistics Dashboard programmer will be a mentor to the analyst of UT helping to develop her skills and knowledge as a programmer of R.

Example 2. Development principles of the new Study Information System (SIS2)

The current Study Information System or SIS as the official academic affairs information exchange environment at the UT is 15-year-old system, which is still reliable, but some of its aspects — **convenience of use, service design, technical design and architecture — lack the present-day**

43 statistika.ut.ee

A new study information system (SIS2)

requirements. The development of the new SIS2 has based on the service-based system. The aim of SIS2 development is to create **a new-generation study information system**, which would be flexible, reliable and supportive of students' studies. **The project team** includes a project manager-analyst and an analyst from the Office of Academic Affairs, and a project manager, a designer and six developers from the Information Technology Office.

The Office of Academic Affairs analyses the service or the process and decides on the necessity of the service. **The Information Technology Department** checks whether suitable technological solutions exist and offers them, and, in cooperation with the Office of Academic Affairs, interfaces are discussed. If there is no suitable technological solution for the service, it is developed locally at the university. The Office of Academic Affairs tests whether the service functions as needed.

The stages in the development process of SIS2 are software business analysis, creation of a prototype, development, testing and implementation of the solution. Faculties and support units are invited to provide feedback on the prototype and test the developments. The students are involved through a contact person at the Students Council. **SIS2 is developed in cooperation** with Tallinn University of Technology, the Estonian University of Life Sciences and the Estonian Academy of Arts with the intention to work out standardised solutions.

Challenges in university digital transformation

Example 3. From Spaghetti-Oriented Architecture to SOA

From the Bunch of Web Services architecture to Service oriented architecture

In 2016, there was widely spread of understanding at the UT that **the information systems were outdated morally and technologically**. There was just a Bunch of Web Services architecture, which are working and information is there, but this could be better-organized using more service-oriented architecture development.

Digitalization goals of the project:

- reduce the amount of human effort and errors
- the emergence of new data-driven services
- enable better use of data for analytics
- to shorten the development cycle of information systems
- joint development
- to reduce development costs

Hence, the goal was to:

- **reduce the amount of human effort** (and possible errors due to that) in administering, exchanging and managing information
- **support the emergence of new data-driven services**
- **enable better use of educational data for analytics and research purposes**

In addition, the university wanted **to shorten the development cycle of information systems** and to generate conditions for joint development, and **to build up the capacity to work together with the aim of reducing development costs in the future**.

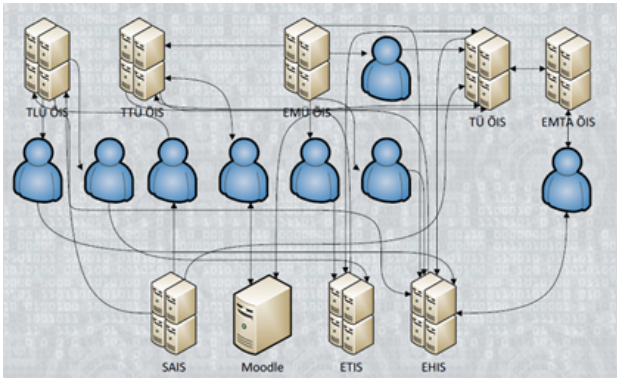


Figure 12. Initial stage with not Standardized Information Systems

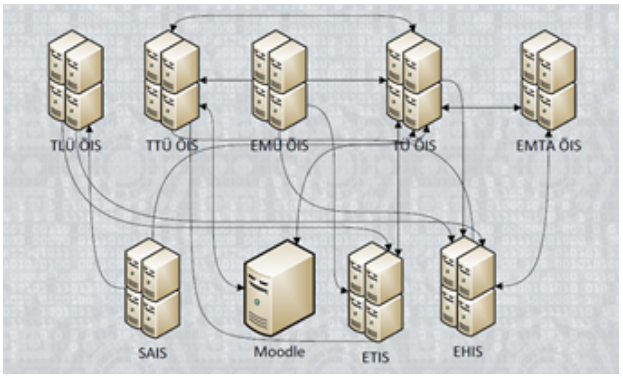


Figure 13. Step 1: spaghetti-oriented architecture with common standards

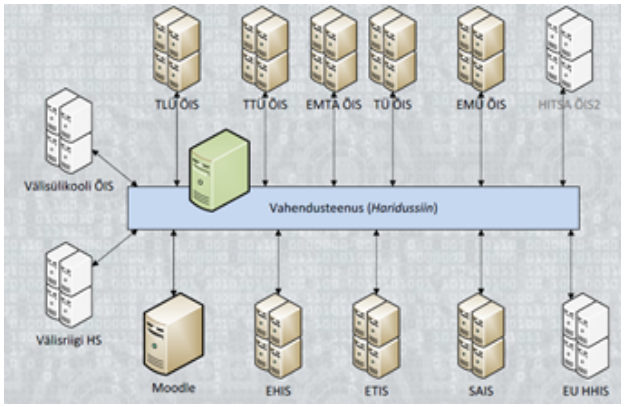


Figure 14. Step 2: data exchange service

The first step was to develop a spaghetti-oriented architecture with common standards, where people are engaged in the data transfer process between information systems at the universities. At the second step, the standardization was prepared. Standardization allows the data from disparate sources and, based on rules you define, to transform into a consistent, usable format.

Step 1: spaghetti-oriented architecture with common standards

Step 2: data exchange service

However, for the second data exchange step UT members realized that there is **too much innovation**. In addition, the university faced **a lack of skills and knowledge, motivation to change**, time, budget and willingness to test, study and invest to something new.

Sometimes it could be **a problem to find a suitable service provider**. Unfortunately, Estonian enterprises (service providers) are not capable to offer this kind of knowledge (service) yet.

Searching for the ways to COOPERATE

For building up a **joint program data transfer** between institutions, we should know **what data is required at the state level** and then think how we can develop.

In Estonia, three public universities out of six were starting projects for the development of their SIS during the years 2016—2017. Ministry of Education and Research was in the middle of procuring the analyses of business rules and their own data collection needs within the Estonian Education Information System (EHIS). Information Technology Foundation for Education (HITSA) — was procuring first phase SIS development for professional higher education institutions and vocational schools, also involving a private university.

The major challenges to cooperate were **the difference in the development phases of SISs of the stakeholders and different project funding instruments** for their developments.

Building up the MANAGEMENT structure for cooperation

Cooperation is based on consortia based steering group together with Standardization Committee and IT committee

Consortia based steering group (the Estonian e-University) within HITSA – members from all the universities and representatives from the professional higher education institutions as well as Ministry of Education and Research. Two sub-committees have been set up:

- **Standardization committee** – for the purposes of harmonizing definitions and representation of data, defining the scope of core data/parts of processes, which could potentially be developed jointly.
- **IT committee** – for the purposes to discuss the principles of interoperability and integration, look for the possibilities of extracting some parts (services) from existing information systems, which could be replaced by new ones, also trying to look into more recent, less time consuming and less costly ways for the development.

Higher education data exchange standards development steps by Standardization committee should include the following activities:

- Create ontology
- Manage ontologies and semantic annotations
- Annotate XML schemas.
- + BPMN

Business Process Modelling Notation (BPMN)

Wise way to develop system with business process modelling

It is wise way to develop systems with **process pictures**, UT did not start with this. Development process started usually from interviews, but it is not enough, you must draw Picture and keep table with data required. Here is one example of process schemes used for commenting during the development process. **The business process modelling** seems to be more effective than the other way around.

Business process modeling consists in a graphical representation of processes in a business model. Its primary goal is to offer a general notation which can be understood and used by all the involved stakeholders. Common language, which **improves communication** between analysts, in charge with the design of systems and application, and programmers, responsible with the implementation of requirements of the analysts.

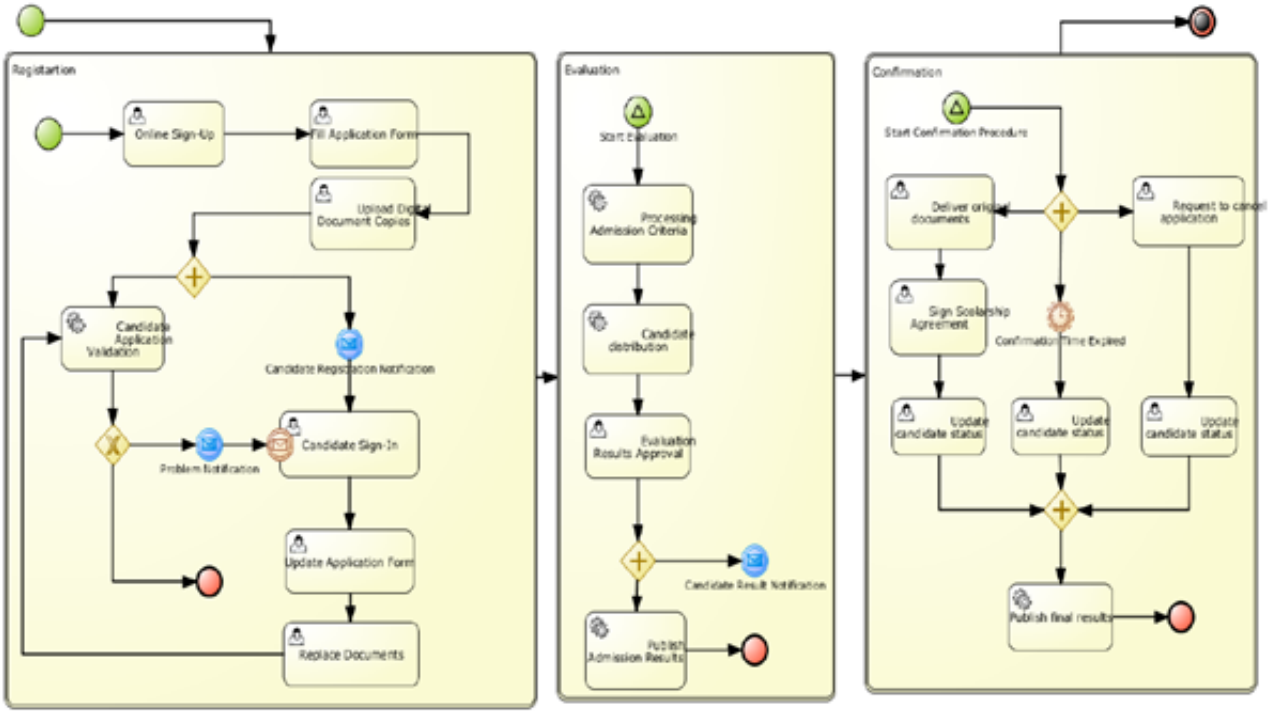


Figure 15. The business process modelling. Source: Web page of The non-profit association Universities Estonia[44]

Example 4. Use your own resources — IT research fellow

UT Working Environment of Academic MobilityUser took two years to launch. At the beginning, UT tried to rely on one of the outside service providers, but **did not inspect their background and competences on this field**. All the institutions (chief info technology officers) preferred to use the same programming language that they have used so far and they were too afraid to use other language. Thus, it was too much innovation and change expectations. After two years with no big result, **UT asked help from inside at the Institute of Computer Science**. A Research Fellow of Software Engineering from this institute presented in the seminar a prototype witch he made with **14 days** and a working system (with some extras, like the workflow analytics) was launched with **3 month instead of 24 month**.

Base for success:

- Readiness to develop the systems
- Interesting tasks attract programmers
- Use own resources

For UT and Estonia in general, the problems that hinder this business process modeling approach relate primarily with **the lack of programmers**. Usually programmers with higher salary, although working quickly, are above the budgeted expenses for the university are too high to compete with business sector. Nevertheless, based on the UT experience, **interesting tasks** are attractive for programmers and it's often not a question of money. Programmers could be attracted by **the interesting tasks to develop systems for the university**. Moreover, the readiness to develop the systems from the university side is as much important. **Own programmer** from inside the university could be one of the options and seems to be important in team building.

44 *ern.ee/et/leht/kommenteerimiseks*

7. Conclusions

The current white paper provides **an overview of the present digitalization trend within an international university context**. Findings are based on theoretical underpinnings and the experience of three case universities. Under the condition of rapid development of technology and global competition, universities must continuously engage in the preservation and strengthening of their position on the international research and education landscape. We do agree with the notion that **digitalization provides a substantial opportunity for European higher education**. With the emergence of e.g. the European Student Card, digital open-access repositories for research and similar cross-border and collaborative tools, (initial but promising) steps are being taken to reap the benefits of digitalization in the sense of smoothening mobility and co-operation between European universities.

Digitalization of higher education institutions is creating new ways to learn, new models to operate and collaborate

Digitalization of higher education institutions is creating new ways to learn, **new models to operate and collaborate** to better serve the needs of students, science and society. Digitalization facilitates:

- Paper-to digital solutions
- Decentralized digital solutions for faculties (management, administration, student management, learning, research, collaboration, organization)
- Central solutions for university (management, administration, marketing, PR, cooperation with the private sector/society at large)
- Information sharing between universities (national, global; statistics, alliances, transfers, budgets, lobbying)

Digitalization can impact a university's entire operation environment and internal functioning, bring **new opportunities but also change the role of universities in society**.

Table 8. Changes in universities' activities, real-world and digital changes

Activity	Real-world changes	Digital changes
Education, study programs	new skills, new knowledge, new teaching styles	new tools, digital classrooms
Research	connecting/merging R&D and education	creating or developing digital solutions for companies
Organization	re-organized processes, flatter hierarchies, decentralization	web-based and data-based work processes and collaboration
Role in society	closer collaboration with corporate world, unis growing into change agents, higher demand for innovation transfer	platforms, social media

Educational programs as well as the **organization itself must be geared** to the changed requirements of digital transformation, otherwise the overall 'package' of education

won't be consistent and coherent. Motivation for change starts firstly, from an 'opportunity' mindset, and secondly, from acknowledging that information systems in higher education are outdated regarding both concept and technologies.

In addition, the environment where universities operate has an influence on the digital transformation of universities. One of the leading countries in this regard is Estonia, where the various digital platforms and solutions are in use for several state-level services.

A cost-benefit helps clarify the starting point of digital change and mark the path where we want to go in terms of digitalization

A cost-benefit analysis and identification of the main challenges of digitalization helps clarify first of all the starting point of digital change (What should be changed?) and subsequently, mark the path where we want to go in terms of digitalization. The benefits and risks will always need to be applied to specific cases of universities with particular regard to **the role they play in their communities**. This is why the three case studies included in the present white paper were chosen to illustrate the wide spectrum universities may span in their internationalization and digitization efforts. It appeared that two cases — Brno University of Technology and the University of Tartu represent examples that seem advanced in their overall internationalization in comparison to the third one, Bielefeld University of Applied Sciences.

The potential benefits of digitalization include improved internal efficiency (internal process efficiency, quality, and consistency, eliminating manual steps and improving accuracy), enhanced access to the organization's data, and better options for integrating data with other sources. Furthermore, digitalization improves compliance via standardization of records and improves recovery via easier backups and distribution of storage.

Digitalization allows to find ways how to perform routine activities faster with less effort. Often, the decision on which processes could be digitalized cannot be assessed in a simple return-on-investment logic. It rather connects with the value-for-money concept, where the impact is connected with the value. This means that **value and impact** can take a variety of meanings depending on a university's legal, ethical and social environment.

Concerning the level of digital change, the value created is usually considered higher when **the organization as a whole should digitize**, not every faculty or department within the university independently. In the context of internationalization, the deeper relationship and **understanding of academic cultures of partner universities** is crucial for clarifying a stakeholder's benefits, risks and resources.

Generally, users (students, academic staff, management) have higher expectations in terms of functionality, design, interoperability and tend **to underestimate the time for digitalization**

projects. Development itself is often time-consuming and costly — the systems are monolithic and do not support partial upgrades very well.

A roadmap helps to smoothen the path of digital transformation that universities ca anticipate

This white paper provides a roadmap **smoothening the path of digital transformation**. It helps gather the intended effects of digital change by identifying digitalization challenges and the benefits that universities can anticipate. When trying to define a proper path of digital transformation for a certain case, we suggest answering the following questions:

- What is the history of digital development of our university?
- What is the current stage of digitalization and readiness to change our university?
- Where do we want to go in terms of digitalizing our processes and what is our digital future?

The white paper comprises also an ICT roadmap helping visualize the pathways that are to overcome the main obstacles of digitalization and to ensure success and digital options for **increasing the agility of university services**. Within an international context, a university should ensure meaningful interaction of systems and platforms.

The three case studies included in chapter 6 of this white paper examine in more detail **the practical digitalization and internationalization challenges** universities encounter, and also address the factors and actions that can be mobilized to address these challenges.

The three case universities (Bielefeld University of Applied Sciences, Brno University of Technology, University of Tartu) operating in Europe have their own history and context with relatively strong academic cultures. Brno University of Technology and University of Tartu are rather 'open' and 'externally' oriented — strategy and objectives are clearly stated and have, during the last five years, shown an increasing trend of internationalization of their education and research spheres in comparison to the third one, Bielefeld University of Applied Sciences, where developments have been slower.

Overall, the three universities are involved in staff and student mobility and study-abroad activities, meaning internationalization is an everyday process in all three universities. Internationalization is more a strategically planned at Brno University of Technology and University of Tartu, but for digitalization, despite different development projects, **the lack of systematic approach and IT competences** was acknowledged. Also, **the underestimated time for digitalization** and a perfectionistic view with **too high expectations towards IT** were found to be inherent, but often unanticipated features of digitalization. The digitalization process takes longer time than initially expected.

Differences and similarities in digitalization and internationalization appearing in the three universities cases of the white paper are summarized in the following table.

Table 9. Differences and similarities in digitalization and internationalization in three case universities

	Brno University of Technology	University of Tartu	Bielefeld University of Applied Sciences
DIGITALIZATION			
Strategy		Not publicly defined	
Current situation	Not fully centralized, some faculties have own information systems	Centralized information systems (studies, applications, documents, assets, finance and personnel)	Centralized system, decentralized digitalization approach
Current developments	Systems integration and interfacing	· Standardization of processes · Cooperation with other universities in Estonia	· Planning to develop new centralized system · Long-term view, focus on sustainability of developments
Specific challenges		Remapping of core and supporting processes	Resistance to change (loss of control), creating trust
Common challenges	· Lack of clarified objectives of digitalization · Perfectionism (high expectations on IT) · Digitalization process takes longer than initially expected (remapping processes, changing organizational culture) · Underestimated time for negotiations (multi-stakeholder context) · Lack of resources (shortage of IT competences and IT staff inside university, finding suitable service providers, handling procurement) · Handling data protection regulations		
INTERNATIONALIZATION			
Focus	World-wide (Asia) span	Graduates who change the world	Combining strong regional focus on Eastern Westfaliawith internationalization
Strategic key priorities	Defined by specific indicators	Defined by specific indicators	Internationalization as a global objective, no quantitative indicators used
Proportion of international students	23%	9%	1 to 6 %, depending on definition
Proportion of international academic staff	13%	10%	1%
Common challenges	· Lack of strategy or vision · No clear and measurable goals · No good positioning · Lack of systematic approach (what are strategy and measureable goals, whom to promote and what channels are optimal to use)		
Execution of marketing strategy	· Main activities coordinated by central Marketing department in cooperation with International Office · In addition, faculties can also design their own promotional materials for activities and events		

The future now

Success digitalization requires besides the technical skills a broad awareness of:

- the university's processes and operating environment
- the needs of its stakeholders
- the necessity to digitalize
- people's readiness for change

Overall, the choice and development of a university's digital platforms is a complex process, where difficulties arise **from the different systems in use**, which are often hard **to integrate. It is important to understand what is the university's background and the future strategies** involved in developing the platform.

Thus, the pathway to success with digitalization developments requires, besides the technical skills, a broad awareness of the university's processes, of the environment it operates in, and of the needs of its stakeholders, of the necessity to digitalize and of people's readiness for change. Also, staff participation seems to be vital in designing the web-based educational platform, and in every phase of successful digitalization in general.

The future university combines openness and digitalization

Our vision of the future university combines **openness and digitalization**, and is about creating new ways of learning and new models of collaboration to better serve the needs of students, science, the business sector and society as a whole. It is not only teaching at universities, but also universities' entire governance systems that must change in response to global changes. The use of technological tools (digital solutions for learning, teaching, document handling, credit point transfers, block-chain technologies) for universities' core, supporting and management processes can influence their effective functioning.

Digitalization and internationalization appear as two **critical game changers** that are transforming European Academia and European societies and will show **if universities can continue to play a major role in the development of European societies**. It is a question of time when and how universities will integrate with the global digital world with the possible benefits and challenges they can encounter there.

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