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# **Making Interoperability Work**

**Challenges and Solutions for an  
Interoperable Higher Education System**

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## About Hochschulforum Digitalisierung

Hochschulforum Digitalisierung (German Forum for Higher Education in the Digital Age, abbreviated: HFD) monitors, shares and acts on important (inter)national developments and trends around digital transformation in Higher Education. HFD offers a range of pro-grams and fosters community-driven approaches to help education professionals across Germany build key competences. HFD is a driver of digital transformation in the higher education sector. With its strong network of stakeholders, including education and IT professionals, EdTech leaders, students, policy-makers and digital learning ex-perts, HFD occupies a unique position at the heart of digital transformation of higher education in Germany.

HFD was founded in 2014 as a joint initiative by Stifterverband, CHE Centre for Higher Education (CHE Centrum für Hochschulentwicklung) and the German Rectors' Confer-ence (Hochschulrektorenkonferenz, HRK) and is funded by the German Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung, BMBF)

## About Technopolis Group

Technopolis is a leading European provider of policy studies, evaluations, impact assess-ments and related services in the field of research, technology and innovation policy. We offer decision-makers in the public sector, science and administration empirically sound and practical support in the design and implementation of policy measures and pro-grammes.

Since its foundation in 1989 in Brighton (UK), Technopolis has been responsible for hun-dreds of evaluations and strategic analyses of research, technology and innovation pol-icy concepts, programmes and institutions. Technopolis has project experience in more than 35 countries, with the European institutions (European Commission, European Par-liament, European Council) and numerous international organisations (e.g. OECD, UNIDO, World Bank).

Through our locations in 13 European cities and further non-European cities (including in South America and Africa), we can incorporate findings from other countries and regions into our projects and are able to link developments at different political levels.

# Preface

European University Alliances are all about collaboration. In an alliance, we join forces with partner institutions across Europe, and this gives us the opportunity to create educational opportunities for our students that simply did not exist before. But making this work is no easy task, as all colleagues working in a European University Alliance will confirm. We need to reach ambitious goals under high time pressure and with limited funds, and we want a result that is flexible enough to incorporate new partner institutions as the need arises.

The governance of each institution and each alliance is different. This refers to different regulatory frameworks, cultural backgrounds, policies and strategies. As a consequence, **structures and processes** are different which makes workflows between the institutions and within the European University alliances more complicated. Supporting these processes with digital technologies is seen as a key success factor. But digital workflows need organisational concepts and cannot work without accompanying activities.

This is where **standardisation and interoperability** are bound to play a key role. We can move faster and more efficiently if we can put together as many already existing puzzle pieces as possible. Can we connect what we already have, rather than develop new things from scratch? How? We will have a more versatile result if we use broadly accepted standards. Which standards already exist on the European level, which do we perhaps need to create? Who can take the lead?

Interoperability is always multi-dimensional. Even when the technical systems fit together and there is a shared understanding of the data, we need to embed this in organisational structures and processes supported by the **overall leadership of the Alliances**.

It is essential that we exchange our knowledge across Alliances, to avoid reinventing the wheel over and over. The allocation of funding to the alliances is concluded for the time being, so the time for competition is over – it is now high time for **collaboration between the alliances**. Hochschulforum Digitalisierung has made a very valuable contribution to this collaboration by commissioning this study.

Over the past months, Technopolis has conducted a large number of interviews with European University Alliances, leading to this report. With a focus on four scenarios which were selected together with us as the Advisory Board, Technopolis has been able to accumulate **key elements for interoperability** in European University Alliances, in all its dimensions: technical, semantical, organisational and legal. The Alliances who have contributed their case studies will be able to read how their own work relates to the bigger context.

Other Alliances, as well as the stakeholders who make up the wider ecosystem of digitalisation in higher education, will be able to get a good impression of the dynamics of joint course catalogues, joint enrolment, joint learning platforms and joint micro-credentials in European University Alliances. This work provides a good impetus for further work and for the important issue of interoperability as a key to cross-university collaboration.

It was our pleasure to contribute to this study from the role of an Advisory Board.

**Prof. Dr. Andreas Breiter (University of Bremen)**

**Janina van Hees (Utrecht University, formerly Eindhoven University of Technology)**

**Alexander Knoth (Deloitte Consulting, formerly DAAD)**

**Prof. Dr. Gudrun Oevel (University of Paderborn)**

## Executive Summary

Universities face the challenge to adapt to an ever more competitive global education landscape, which is why increased cooperation and interconnectedness between universities in Europe is essential. However, universities are diverse and embedded in their specific institutional, regional, and national contexts, resulting in a highly heterogeneous university landscape. Institutional profiles and priorities, internal processes (e.g. IT structures) as well as framework conditions greatly vary and make it difficult to “come together”. Essentially, the problem can be defined as a **lack of interoperability between universities**.

In this report, we systematically analyse barriers to interoperability of universities in Europe – and ways to overcome them. We use a **broad concept of interoperability**, including technical, legal, organisational, and semantic aspects. We define interoperability as the ability of higher education institutions to interact towards mutually beneficial and agreed common goals. Ultimately, we draw conclusions on how governance elements in the higher education system could be better used to raise interoperability.

We concretely look at **four different cases** of European universities working on cooperative approaches in their mission to widen and improve their educational offerings. These cases include the design and set-up of joint course catalogues, joint digital enrolment processes, the set-up of joint learning platforms and common arrangements for joint micro-credentials. We focus the use cases on the cooperation within alliances supported by the European Commission through the **European Universities initiative**. We concentrate our analysis on the institutional perspective rather than the user perspective.

In comparing the categories of interoperability barriers in the European Interoperability Framework<sup>1</sup>, we find, not surprisingly, that **technical interoperability** is challenging in the process of implementing joint structures and processes in the digital age. Due to varying legacy IT systems in universities, but also a lack of coordination on future technical approaches (including standards), the topic needs urgent attention. However, **organisational interoperability** (i.e. bringing together different organisational cultures, working processes or priorities) is even more challenging. To reach organisational interoperability, universities need to coordinate closely and set aside institutional priorities to reach common goals. Organisational interoperability *can* be achieved if universities and university leadership are fully committed to making cooperation work. This may require universities to “kill their darlings”, i.e. leave aside traditional well-established processes and be open to new ways of organising themselves and their collaborations in an interoperable way. In this context, the “human factor” in moderating a change process cannot be underestimated: a skilled project lead with technical and people skills as well as with a clear mandate and backing from universities’ leadership(s) is needed. This person must be in constant coordination with specialists from IT, International Offices,

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<sup>1</sup> See [https://ec.europa.eu/isa2/eif\\_en/](https://ec.europa.eu/isa2/eif_en/)

teachers etc. of the involved institutions in order to move interoperability forward in the cooperation of universities.

We also show that important challenges have to be addressed not by single universities, but on a wider scale. We conclude that the **main interoperability challenge** for European University alliances is “**systemic**”, based on the **multi-level governance** in the European Higher Education Area – from largely autonomous universities that are embedded in legal and policy frameworks in their respective Member States to European policy making. As a result, there is a lack of clarity and leadership in the manifold landscape of interoperability. These complexities result in a **deep disorientation** among universities on the question of which technical and organisational paths to choose to reach interoperability in their individual cooperation and beyond.

We derive various **recommendations** on how the interoperability governance can be improved. Following these recommendations can help to improve on the legal interoperability disconnect between European Member States (e.g. with respect to formal enrolment requirements for short-term virtual study offers). It would also help to address the widespread disorientation among universities on the future path towards interoperable IT systems in universities in Europe (e.g. on specific standards needed to exchange course information and metadata).

The results of the study call for **more guidance and orientation from policy makers and/or mandated stakeholder organisations** to reduce systemic uncertainty, generate (technical) directionality, and actively shape a trajectory towards an interoperable European university system. An operational step to define this trajectory could be to make it a requirement in funding programmes on a European or national level to use specific (technical) approaches in the funded project. This way, the “power of public money” can be leveraged to reach interoperability in higher education.

Further **enhanced coordination between policy makers and stakeholders in higher education** – including the private sector (e.g. EdTech companies or providers for technical solutions in the education sector) – is also needed. It would help to prevent the (technical) silos that can be frequently seen (e.g. regarding the different approaches to Campus Management Systems). This coordination could happen in established fora of European policy making or within initiatives like the European Digital Education Hub. Also, a stakeholder organisation such as a “European Higher Education Platform”, inspired by the Interoperable Europe Portal<sup>2</sup> could be discussed in this context.

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<sup>2</sup> See <https://joinup.ec.europa.eu/interoperable-europe>.

# 1 Introduction

Interoperability is a key factor in making cooperation between organisations possible. Although the term “interoperability” is often discussed in a narrow sense, focusing on how information and communication technology (ICT) systems can exchange data, the concept can also be defined in a much broader sense. Essentially, **interoperability** is the **ability** of different organisations (that can be entirely dissimilar in how and why they operate) to **communicate with each other** in order to achieve common goals.

Many studies and concrete experiences with cooperation have shown **great challenges in bringing together different organisations** in a mutually beneficial cooperative way (see list of references in this study). This is certainly not limited to the higher education system. However, given the long traditions of universities and their specific situation of institutional autonomy and still strong dependency on framework conditions set by policy makers, the context might be even more challenging in the higher education sector.

Given the high importance of (international) cooperation in higher education and the discussions around the interoperability challenges within the strategic cooperation activities of the European University alliances, Hochschulforum Digitalisierung (HFD) commissioned Technopolis Deutschland with a study covering three overarching questions:

- What are the common **barriers for interoperability** in the cooperation activities of the European Universities alliances?
- What are the **approaches** to overcome these barriers?
- What are the **implications** for the higher education community and higher education policy makers to reach interoperability?

The **scope of the study** was defined as follows:

- The study was to describe how identified interoperability challenges are currently addressed in the concrete settings of the European University alliances. However, particular emphasis is placed on overarching governance mechanisms in higher education. As many of the selected alliances are still in the (early) implementation phase, we concentrate our analysis on the institutional (i.e. university) and governance perspective rather than the user perspective (in particular students as the key target group of cooperation activities in teaching and learning, but also teaching staff as users of joint digital infrastructure). The study was to result in recommendations on how interoperability in higher education could be increased with a systemic approach.
- As a result, the study took a broad perspective on technical, semantic, organisational and legal aspects of interoperability. It did not analyse or focus in depth on one dimension of interoperability only.
- The main methodological approach was a case study approach, relying on research and interviews with currently funded European University alliances all over Europe.

**Introduction**

- Four different use cases in the field of teaching and learning were analysed. Over-arching expert interviews and workshops complemented the research.

The study is **structured** as follows:

- In Chapter 2, we illustrate the conceptual interoperability framework for the study.
- Chapter 3 includes an overview of the study design, scope and methodological approach.
- In Chapter 4, all four use cases are described in detail. To guide the reader, they follow the same structure: outlining the status quo regarding the implementation of the respective use cases in the selected alliances as well as analysing challenges and approaches to achieving interoperability across all interoperability dimensions. **This chapter is of particular relevance for readers from universities and university alliances.**
- Chapter 5 summarises the key findings across all interoperability dimensions. It provides a **synthesis for both universities and other interested stakeholders and policy-makers** in the field of higher education.
- In Chapter 6, we present recommendations on how to more effectively address interoperability in the future. This chapter mainly addresses **policy-makers and stakeholder organisations on the European and Member State** level as well as **universities** themselves.
- Chapter 7 provides a concise conclusion of the study.

Technopolis carried out this study in close cooperation with Hochschulforum Digitalisierung between November 2022 and July 2023. We are thankful to most significant support by an expert advisory body which gave valuable comments on the conceptual framework, the selection of use cases, and (intermediary) study results. The members of the advisory body were the following (in alphabetical order):

- Prof. Dr. Andreas Breiter (University of Bremen)
- Janina van Hees (Utrecht University, formerly Eindhoven University of Technology)
- Alexander Knoth (Deloitte Consulting, formerly DAAD)
- Prof. Dr. Gudrun Oevel (University of Paderborn)

## 2 Conceptual Framework – Interoperability in Higher Education

The institutional capability to cooperate is a **key requirement** for an interconnected and competitive European Higher Education Area (EHEA). As higher education institutions face the challenge to adapt to an ever more competitive global education landscape, increased cooperation and interconnectedness between universities in Europe is essential. European higher education institutions, however, are diverse and embedded in their specific national, regional, and local contexts. For example, each country (and sometimes each region) has their own specific education systems, with their own peculiarities and demands. Each university has their own IT architecture using specific educational technologies and standards that may not be compatible with the setup of other organisations.

In consequence, cooperation between universities comes with various challenges. Establishing **interoperability** between institutions can help to overcome these challenges.

In broad terms, we define **interoperability** for this study as the **ability of higher education institutions to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between them**<sup>3</sup>. For our study this means interoperability of technical aspects (e.g. IT systems), but goes far beyond this.

To be able to systematically analyse the specific dimensions of interoperability, we broadly follow the conceptualisation of the **European Interoperability Framework (EIF)**. Accordingly, interoperability can be distinguished in four dimensions: semantic, technical, legal and organisational. In addition, there is also a cross-cutting layer – governance – linking the different dimensions.

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<sup>3</sup> See European Commission, 2017: New European Interoperability Framework. Promoting seamless services and data flows for European public administrations. [https://ec.europa.eu/isa2/sites/default/files/eif\\_brochure\\_final.pdf](https://ec.europa.eu/isa2/sites/default/files/eif_brochure_final.pdf).

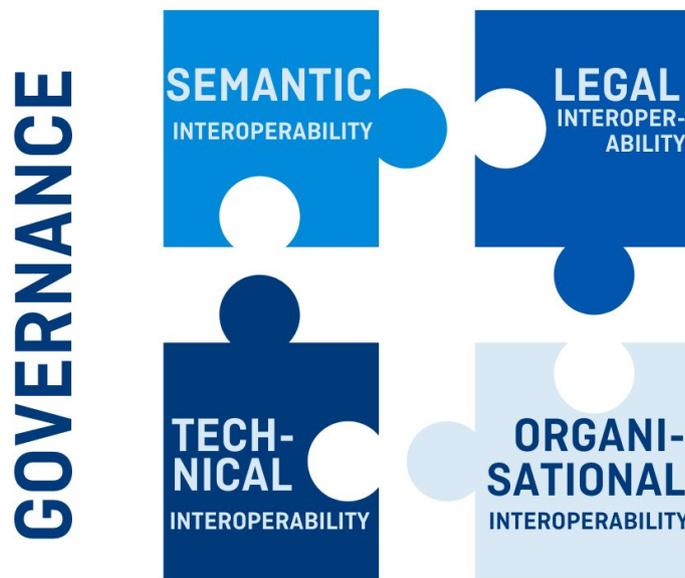


Figure 1: Interoperability Framework (based on the EIF)

**Semantic interoperability** in simple terms makes sure that a sender and a receiver (be it an IT system or persons in a higher education alliance) have a **mutual understanding** of the **message transmitted** (“what is sent, is what is understood”). In our context, it thus refers to the ability of higher education institutions to communicate with – and understand – each other. This concerns the ability to interpret data and information exchanged via an IT system in the same way. However, in a more general way, it relates also to the mutual understanding of ideas and objectives between the involved staff in the alliance members.

**Technical interoperability** concerns the applications and infrastructures enabling the seamless communication between different organisations’ IT systems. Thus, it refers to their joint capabilities of **connecting differing IT systems** for the exchange of information and data. Higher education institutions apply different software and have different procedures to manage their processes. Linking their systems not only requires the use of additional technical solutions (e.g. standards, interconnection services and interfaces) but also the adaptation of their (digital) processes. While automation can play an important role in achieving interoperability, it is not a strict requirement. Interoperable systems can function both with and without automation, depending on the context and the level of integration needed.

**Legal interoperability** refers to higher education institutions’ abilities to cooperate across different legal frameworks, policies and strategies. Individual organisations need to comply with the regulations present in their place of operation. Hence, similarities and differences between legal jurisdiction of cooperating organisations, especially the concrete implementation of rules and regulations, are meaningful for their collaborative activities.

Lastly, **organisational interoperability** is the higher education institutions’ alignment of processes, responsibilities and expectations to achieve their joint goals. Every organisation has their own organic structures and processes that come with their particularities

and demands. Therefore, setting up joint processes and common organisational structures are crucial for increasing compatibility and interoperability of alliances.

**Governance** as a cross-cutting layer affects each interoperability dimension by setting the framework for cooperation between higher education institutions. It looks at questions such as:

- What coordination mechanisms are in place to find common technical, organisational or legal means to bring together universities?
- What processes in the political arena or the higher education community are in place to make sure that a sufficient degree of directionality in the sector developments is given? In more simple terms, how can it be ensured that not every institution does business “its own way”?
- What organisations or institutions exist or are needed to govern interoperability in the higher education system?

The relevance of governance is especially pronounced in higher education considering the need for coordination across different universities, regions and countries within the multi-level governance system in Europe (EU, Member States, regional rules). Consequently, the study places a specific focus on the governance of interoperability: the final sections of this report on “Implications and Recommendations” focus mainly on governance aspects. Earlier chapters cover what establishing interoperability means on a day-to-day basis within university collaborations such as the European University alliances.

## 3 Methodology

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### 3.1 Research approach

For the analysis of interoperability within the European University alliances, the study applies a **case study approach**. The following four use cases on the implementation of interoperable systems in 12 alliances were selected and analysed in detail:

- joint course display, i.e. the implementation of a common, centralised overview of courses offered by different higher education institutions in a cooperation
- joint enrolment, i.e. the establishment of joint admission and registration process to study offers provided by universities in a cooperation
- joint learning platforms, i.e. the platform for the administration and delivery of educational courses, mainly in an online context
- joint micro-credentials, i.e. the certification of jointly offered small, flexible courses or trainings in higher education

The use cases have been selected in close coordination with HFD and the advisory body for this study (see below) according to **different selection criteria**:

- The focus was on relevant and “defined” use cases in the field of university cooperation, for example use cases defined in the Higher Education Reference Model, in the Erasmus Without Papers student journey or in projects such as eduxs.eu or the European Blockchain Services Infrastructure.
- There needed to be a clear reference to the work of the European University alliances, their projects and the associated challenges. In particular, the use cases focus on aspects related to challenges in cooperation activities in the field of teaching and learning (in contrast to research cooperation), thus touching upon topics such as student administration and virtual student mobility.

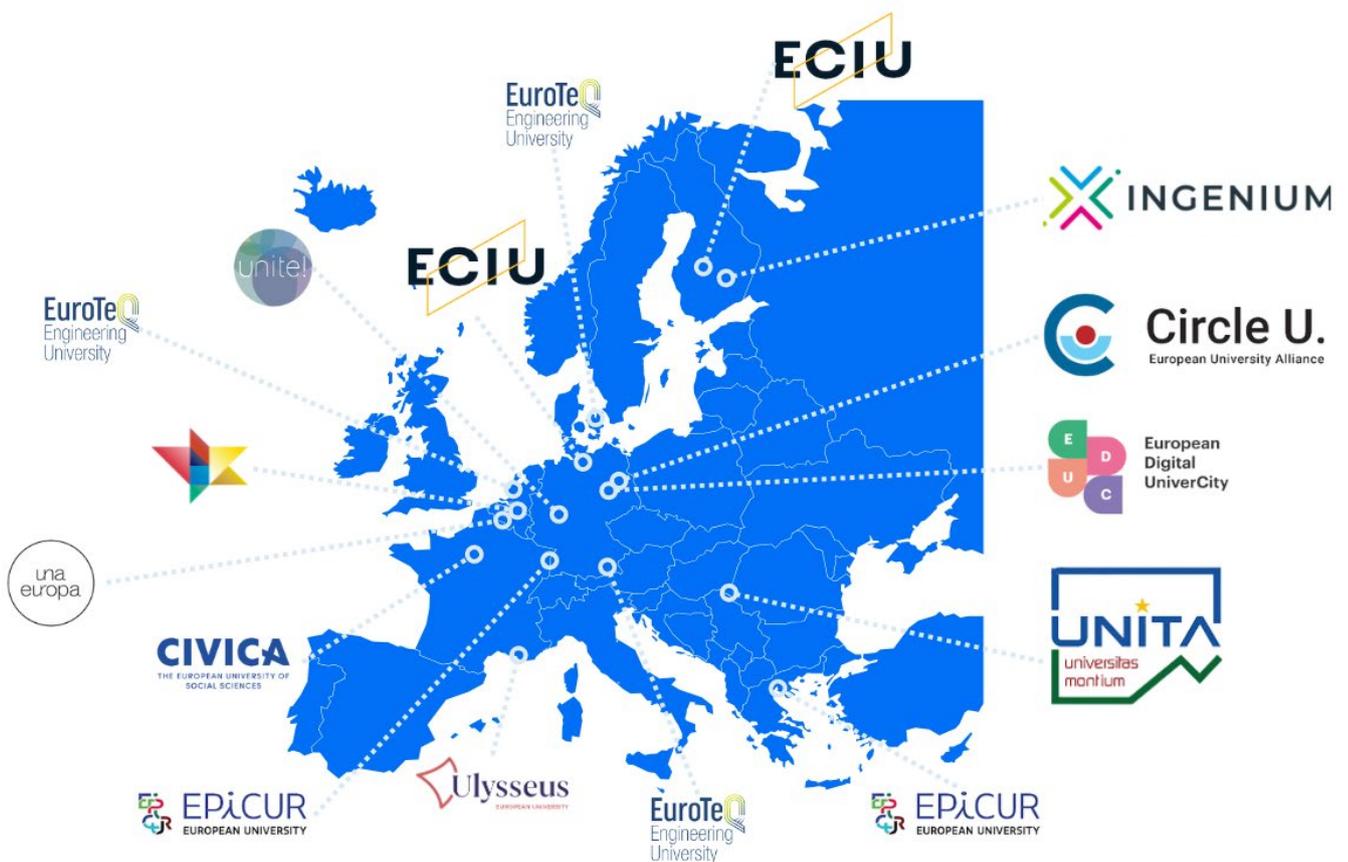
Approaches and challenges in the implementation of the specific use case of three to four alliances per use case were identified and systematically analysed along the **interoperability dimensions of the European Interoperability Framework** (see Chapter 2).

On the basis of these use cases, overarching conclusions on the state-of-play were drawn and recommendations on how to improve interoperability were developed. These were developed by the study team of Technopolis, with regular feedback by HFD and the advisory body.

### 3.2 Methodological approach

The study findings are based on the following **methods**:

- **Interview programme:** In total, interviews were conducted with 12 alliances (27 alliance members in 22 European countries) as well as with 8 experts (e.g. from the European Digital Education Hub or relevant national initiatives on digital cooperation). The map below illustrates the country coverage and the location of interview partners.



The interviewed alliances were selected based on the relevance of the specific use case for their alliances, determined on the basis of desk research and expert recommendations. The interviews give insight into a) the concrete challenges each alliances faces in establishing interoperability and b) the approaches and solutions implemented by the alliances.

Interviewees are usually directly involved with the implementation of the respective use cases at their alliances. They hold positions both at their alliance and their university. A broad spectrum of positions was involved in the interviews, ranging from technical staff, administrative functions, research and teaching staff as well as

university leadership. Most interviewees are project managers, including work package leaders, tasked with delivering on the use cases (e.g. micro-credentials, virtual campus) or they are project coordinators, responsible for the work organisation within the alliance (or a combination thereof). This includes technical personnel working on the implementation of digital projects.

- **Comprehensive desk research:** In addition, (research) literature, policy papers and other relevant documents addressing interoperability and/or the European Universities initiative were reviewed to complement the information on use cases received in the interviews. Sources can be found in the reference list at the end of the report.
- **Consultations with advisory body and HFD:** An advisory body with a background in digitisation and higher education comprising four experts (see Chapter 1) was convened by HFD to provide feedback and guidance on the overall study. Technopolis, HFD and the advisory body cooperated closely on the study's conception and implementation. The advisory body particularly supported with the selection of use cases and interview partners and with feedback on the findings and recommendations.
- **Insights from international workshops and events:** The study team visited several relevant events, most notably the European Digital Education Hub's workshop and the networking event of Hochschulforum Digitalisierung on Interoperability (Berlin, November 2023) to ensure that the study would be connected with ongoing policy initiatives.

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### 3.3 Scope and limitations

The study covers **12 out of 44 European University alliances** and includes a broad spectrum of perspectives: Wherever possible, different members of the respective alliance were involved in the interviews to get a multi-institutional perspective on interoperability. However, the study does not necessarily provide a representative picture of all of the European University alliances' approaches to collaboration and interoperability. Concretely, there are **several limitations**, most notably in the case selection, but also due to the design of the study.

- Firstly, a substantial number of alliances with German members were interviewed to get insight into the particularities of interoperability in relation to the German context as HFD is a German project. While there are 38 alliances with German participation, the challenges of European University alliances without German participation may differ.
- Secondly, the study team was in close contact with the alliances through, at times, multiple rounds of interviews. However, the depth of information available to the study team as "outsiders" to the universities is limited. The study team is therefore cautious of over-interpreting the qualitative findings, e.g. with respect to pointing out the "most advanced" alliances or a definite position on "best practices". Surely, other alliances do have sophisticated approaches as well.
- Thirdly, in the design phase of the study the scope of the study was set to be as "rather broad than in-depth". This limits the extent to which specific interoperability

dimensions are covered in detail in this study, for example with respect to technical details of interoperability.

To sum up, the study neither covers all challenges encountered by the alliances nor does it include all of their approaches or solutions to reach interoperability in the setting of European University alliances. Nonetheless, the study took an **explorative approach covering a broad spectrum of alliances, countries and institutional perspectives**. The fact that key patterns in challenges and solutions to interoperability clearly emerged across all use cases can be seen as a signal of the robustness of the findings. A more focused analysis on specific (technical) approaches and its potential to be rolled out more broadly in the higher education community would be a valuable next step after this study.

## 4 Interoperability use cases in the European Universities Alliances

This section focuses on the four use cases described in Section 3. Based on the interviews with experts from within and outside the European University alliances as well as accompanying research, we present the key insights regarding interoperability challenges and approaches taken to solve them – use case by use case. An overarching analysis of cross-cutting themes is carried out in Section 5.

### Key findings



- Various alliances have set up joint course displays – within the European Universities alliances, but also in other contexts.
- Joint course displays are relatively “low-hanging fruit” in a cooperation. In the European Universities alliances joint course displays are often first steps towards the set-up of a virtual joint campus. They provide immediate visibility of the benefits of the cooperation, especially to students. They therefore help to create buy-in and acceptance of the efforts needed to create interoperability for a university cooperation.
- Technical solutions and standards exist. However, they are often specific to individual European Member States or cooperation activities of universities. European approaches and standards are still at an early stage. Uncertainties about future technical paths hinder the commitment of universities to specific approaches and form a barrier to reach interoperability.
- Interoperability for this use case is largely a matter of aligning semantics and organisational processes. With sufficient commitment from all parties, technical interoperability seems to be attainable in the short to medium term.

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#### 4.1 Joint Course Display

The idea of a “**joint course display**” refers to the implementation of a common, centralised overview of courses offered by different higher education institutions. In the context of this study, this refers to a common course catalogue of European University alliances. This includes courses offered at each alliance’s higher education institution as part of the regular curricula as well as courses specifically developed by the alliance for the purpose of the cooperation.

The benefits of a joint course display in a cooperative setting like the European University alliances are particularly important from a student-centred perspective. The following quote from one of the interviewees underlines this direct benefit.



“In order to get a sense of [the alliance], you have to make it visible to the students. They need to experience it, a joint course display is vital for this.”

However, a broader policy perspective is also important: Transnational mobility of students is a key priority in the European Education Area and the European University alliances serve as vehicle for the establishment of transnational higher education partnerships in the EU.<sup>4,5,6,7</sup> In this context, virtual inter-university campuses represent one of the key elements to increase mobility between alliances’ member universities. Joint course displays are an essential underlying feature of shared campuses as they visualise the options for course offerings. In essence, a joint course display provides visibility to the alliances and their work on bringing together student offerings in the individual institutions. Students are able to directly learn about course offerings at other alliance higher education institutions and participate in classes that their home institution does not offer.

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<sup>4</sup> European Commission, 2020a: Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions on achieving the European Education Area by 2025. [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_20\\_1743](https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1743).

<sup>5</sup> European Commission, 2022b: Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions on a European strategy for universities <https://education.ec.europa.eu/document/commission-communication-on-a-european-strategy-for-universities>.

<sup>6</sup> European Commission, 2022a: Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions. A New European Innovation Agenda. [https://ec.europa.eu/commission/presscorner/detail/en/IP\\_22\\_4273](https://ec.europa.eu/commission/presscorner/detail/en/IP_22_4273).

<sup>7</sup> European Commission, 2023c: European Universities Initiative. <https://education.ec.europa.eu/education-levels/higher-education/european-universities-initiative>.

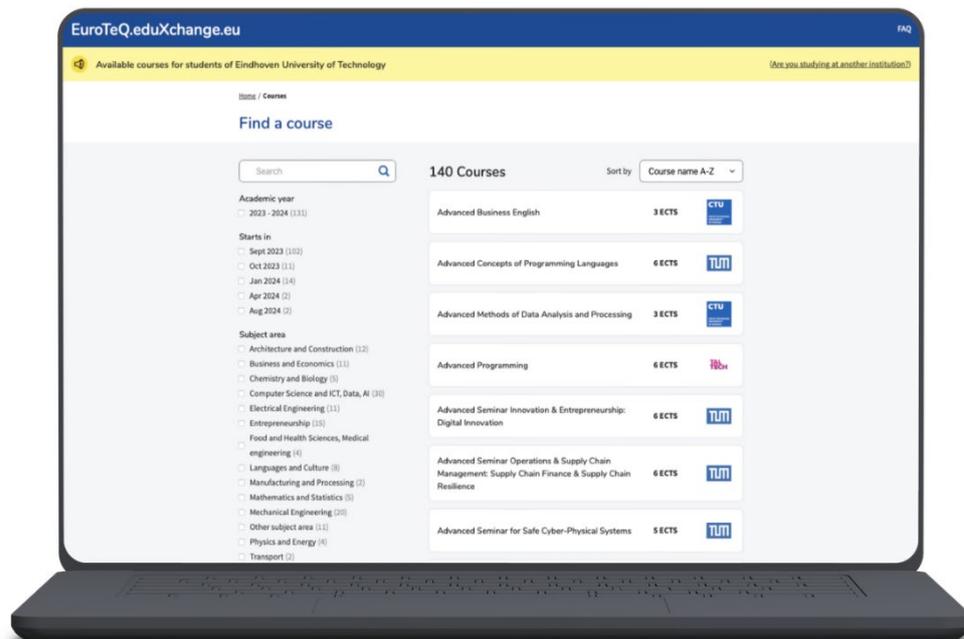


Figure 2: Course Display EuroTeQ alliance (<https://euroteq.eduxchange.eu>)

### The “interoperability landscape” regarding joint course displays

All universities use specific information systems to organise their course offerings. These information systems follow specific [technical and content-related] specifications. For the implementation of a joint course display across different universities, alliances are therefore required to agree on common approaches, both on **technical and on content-related aspects**:

- On the **technical side**, existing data and information within each higher education institution’s system need to be made available to the partner or joint system.
- On the **content side**, alliances need to find agreements on the type and extent of courses digitally displayed on their joint alliance website as well as the meta data relevant for the courses.

On the national level, there are various examples for common course catalogues.

- One example from Germany is the joint course catalogue of the ‘University Alliance Ruhr’, a cooperation between Ruhr University Bochum, University of Duisburg-Essen, and TU Dortmund<sup>8</sup>. Course information is regularly imported via APIs from each university’s campus management system to a search index created with Apache Solr. Students can search for courses based on different topics. After selecting a course, they are redirected back to the individual institutions’ course catalogue.
- eduXchange from the Netherlands is another example of a national initiative for a joint course catalogue.<sup>9</sup> It has been developed by Eindhoven University of

<sup>8</sup> UA Ruhr, 2023: Course catalogue of UA Ruhr. <https://slapps4.ruhr-uni-bochum.de/uahrurvz/>.

<sup>9</sup> eduXchange.nl, n.d.: eduXchange. <https://eduxchange.nl>.

Technology, Wageningen University & Research, Utrecht University and UMC Utrecht, in close collaboration with SURF, the IT cooperation organisation for Dutch education and research institutions. The system allows students to view – and enrol in – over 300 courses offered at the participating institutions (currently 6 Dutch universities).

In most cases, universities setting up a joint course display try to avoid the effort needed to set up additional joint course management systems in addition to their own individual solution. Instead, they usually try connecting existing solutions.



“For us, it really did not make sense to create a parallel course management system”

However, as higher education institutions often use different systems that cannot communicate easily with each other, this is far from trivial. As such, APIs are used to enable the exchange of data between technical systems by standardising the type and format of data. By doing so, alliances are able to create joint course catalogues without the need to agree on a single solution or to harmonise their systems. Each university also “only” needs to conform to the standards given by the selected API. This reduces the need for difficult coordination processes.<sup>10</sup>

There are different initiatives developing approaches to facilitate information exchange between university systems in Europe. **Three initiatives** are particularly noteworthy for the European context: the Open Education API (OOAPI)<sup>11</sup>, the Open Course Catalogue API specification (OCCAPI)<sup>12</sup>, and the Edu-API standardisation process<sup>13</sup>.

- **OOAPI** is an originally national solution developed by a Dutch working group in 2014, facilitated by SURF. It presents an interface for sharing education data between different systems within and beyond educational institutions in the Dutch context. It goes beyond the functionalities of OCCAPI (see below) insofar as the information contained is more detailed (e.g. on the schedule of the course, an important piece of information for the students accessing the course catalogue from the different partner institutions). OOAPI is currently also implemented in contexts outside the Netherlands, notably in the EuroTeQ alliance.
- **OCCAPI** is a European solution developed by the European University Foundation, mostly developed after the model of OOAPI. Since it is based on the same design principles as OOAPI, interviewed technical experts reported that OOAPI and OCCAPI can both be used as alternatives. However, the level of information in OCCAPI is not

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<sup>10</sup> Find more information on the different options alliances have opted for their joint technical setup in the section on joint learning platforms.

<sup>11</sup> Open Education API, n.d.: Open Education API. <https://openonderwijsapi.nl/>.

<sup>12</sup> European University Foundation, n.d.: Open Course Catalogue API: <https://occapi.uni-foundation.eu>.

as detailed as in OOAPI, limiting its practical relevance for the context of the European University alliances: OCCAPI was originally designed for the context of Erasmus Without Paper and facilitates, for example, drawing up the Learning Agreements, i.e. formal documents, signed by the home institution, host institution and students, agreeing what courses the student is to take and assuring credit transfer. For this purpose, it is important to exchange general course information. OCCAPI serves this purpose. However, specific information on where and when a specific course is taking place is not integrated, therefore limiting the usefulness of the OCCAPI API for the purposes of setting up joint course catalogues.

- The **Edu-API** standard is currently under development by the IEdTech consortium. It has been conceptualised as a global standard for the data exchange between student information systems, learning management systems and university administrative systems. Among others, experts on the OOAPI standard are directly involved in the standardisation process<sup>14</sup>. Edu-API is still in an early development stage, characterised in some interviews as being in a minimum viable product phase. Interviewees, however, emphasise the potential connected to the implementation of a global standard in a globalised world of education. On the other hand, they also expressed the need for compatibility with regional (e.g. European) requirements, which might currently be better served by European approaches like OOAPI or OCCAPI.

It is important to mention that a decentralised solution connecting different system using APIs is not the only approach taken by the European University alliances. An example of a different strategy is presented by the EPICUR alliance which has developed a single, overarching solution for the joint course display. Given the – according to interviewees – relatively large resources available for IT staff at EPICUR, they have consciously opted for developing an additional system layer (i.e. a centralised database), as it allowed for faster implementation and implied lower coordination costs on the side of the alliance.

### Objectives and examples of implementation of joint course displays among European University alliances

Various European University alliances have defined milestones in their work programmes relating to the establishment of common course catalogues. For example, one alliance envisioned the introduction of a functional common course catalogue after 6 months – even though this milestone needed to be rescheduled due to the complexity of the issue. Another alliance successfully implemented their joint course display after a two-year process relying on experiences with a pilot project to develop the necessary requirements for a common course catalogue on the European level.

Apart from the challenges of the actual implementation, joint course displays serve several **purposes** for European University alliances and contribute to their overarching objectives.

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<sup>14</sup> IEdTech, n.d.: European Edu API Task Force. <https://site.msglobal.org/about/groups/european-edu-api-task-force>.

- Firstly, they contribute to the **establishment of a virtual inter-university campus** in the alliances. They are seen as one instrument for reaching the high targets on student mobility envisaged by the alliances and stipulated in the calls for the European University initiative by the Commission.
- Secondly, they generate **visibility for the alliance** at each member university. Interested stakeholders at the universities, such as students, are able to see (and participate) in courses offered at other alliance institutions. This creates “push effects” by students: students are aware of the alliance’s opportunities, and they can ask more proactively for common courses and activities. In addition, the activities are a starting point to get teaching staff interested and involved in the alliance’s activities. As a consequence, a certain “pressure to act” on the side of the higher education institutions arises, leading to more activities – and potentially progress – with regard to an upscaling of the joint course displays (e.g. including a larger number of courses, developing new mobility formats or establishing a specific alliance profile). Alliances are also able to demonstrate initial success with a joint course display facilitating the communication of objectives and potential benefits to (internal and external) stakeholders at each university.



“We wanted to show the wealth of our universities by building the joint course display”



“In our work plan, we wanted to prioritise the joint course display, because it shows direct added value added to our stakeholders”

- Thirdly, it allows for the **expansion of associated course management features**, such as learning paths, enrolment, and the recognition of results. In this context, the implementation of a joint course display represents a stepping stone for fulfilling other objectives as it supports the work on future deliverables in the different work packages.



In practical terms, the alliances coordinate their work on joint course display within their individual organisation’s governance framework. However, the *modi operandi* with regard to the implementation plans seem to be relatively similar. Generally, the work is carried out under the **direction of one of the work package leaders or the alliance representative of one university**. Higher level decision-makers (CTOs or vice-rectors/presidents/university leadership) are either directly involved (for instance as members of the Management Board of the alliance) or included in the discussions via feedback loops.

Additionally, implementing a joint course display is often a **cross-functional challenge**. Consequently, experts from different domains and different work packages are involved. This includes university mobility administrators (incoming/outgoing), IT personnel, “pedagogical engineers”, and teaching staff among others. In terms of the process organisation, standard instruments of project management, like monthly meetings/jour fixes keep the workflow going.

With regard to the status quo, joint course displays are **implemented to varying degrees** in the interviewed European University alliances. This can be seen, for example, by the mere number of courses which are displayed on the alliance website at the time of the research for this study. For example, Circle U.<sup>15</sup> currently features 9 joint courses in its joint catalogue, Ulysseus<sup>16</sup> around 50 courses, EuroTeQ<sup>17</sup> around 100 courses and EPICUR<sup>18</sup> over 100 courses<sup>19</sup>. Other aspects reflecting the degree of implementation include

<sup>15</sup> Circle U., 2023: Course Catalogue. <https://www.circle-u.eu/opportunities/students/courses/>.

<sup>16</sup> Ulysseus, 2023: Academic Offer: <https://ulyssseus.eu/academic-offer/>.

<sup>17</sup> EuroTeQ, 2023: EuroTeQ course catalogue. <https://euroteq.eurotech-universities.eu/initiatives/building-a-european-campus/course-catalogue/>.

<sup>18</sup> EPICUR, 2023: EPICUR Course Catalogue. <https://register.epicur.auth.gr/assets/courses/catalogue/>.

<sup>19</sup> Some alliances remove courses after completion while others keep them visible. In addition, course catalogues may display courses that require students’ physical presence. The number of visible courses therefore does not reflect the number of courses available to alliances’ students.

the level of available information displayed, the level of coordinating enrolment processes and the extent of courses available to students. The overall progress is often associated with the respective participation in the Erasmus+ calls (first or second generation) of the European University alliances, reflecting the maturity of the cooperation within each alliance. First generation alliances tend to have made further progress than alliances from later generations.<sup>20</sup>

This also relates to the **use of APIs** and thus the degree of automation in the cooperation. Some alliances still add courses manually. In practical terms, this means some alliances (e.g. Ulysseus) use a template to add courses: Staff manually fill in information on courses, which is later added to the course display. However, more automated pulling of information from the individual university systems will likely be realised in the future. In fact, interviews with one alliance suggested that as soon as early summer 2023 the next milestone would be reached: the EuroTeQ partners have created all the relevant connecting end points and the alliance is now in a position to automatically pull information from the individual student information systems of each university in real-time.



In summary, while the benefits of using APIs or standards for automated course data exchange are apparent and the interviewed university representatives from various alliances are aware of the potential, the concrete implementation of completely automated data exchange processes for joint course display among alliances is not yet standard practise. A majority of alliances – at least at the moment – still needs to add course information manually as automated data exchanges have not yet been implemented.<sup>21</sup>

## Challenges and approaches to reaching interoperability

### *Technical interoperability*

Technical interoperability challenges comprise issues connected to the technical setup of common course catalogues. Various interviewed alliances mentioned that, in principle, technical solutions exist (see e.g. OCCAPI or emerging standards like OOAPI and Edu-API above) and the technical implementation is not the main challenge. However, there seem to be barriers on at least two levels.

- On the **strategic level**, a “market failure” or “cooperation failure” in the sense of a lack of coordination with regard to the “course information exchange standard of the

<sup>20</sup> There are, however, exceptions from this “rule”, indicating that an important factor in driving the developments is not only the availability of a longer time period, but also an efficient project management and the commitment of all parties involved.

<sup>21</sup> In this context, an interview partner noted that in some respects, manual data management can also be much easier, at least as long as the numbers of courses are small. However, an automatization obviously will make it impossible to eventually scale up the course display. In this sense alliances also face a trade-of between an easy way to solve current problems and taking the more complex, but potentially more future-proof route of automatization.

future” exists. There is a high level of uncertainty among universities which prevents institutions from opting for one specific standard (and thus discarding another standard). The rationale behind this notion is that the decision to apply one standard will require certain investments which – if the wrong standard is chosen – can mean substantial misallocations of funds. A coordination function (of the European Commission, Member States or institutions from within the higher education community; for technical aspects possibly also standardisation bodies) to provide guidance and set the right framework conditions is therefore missing.

- On the **operational level**, the insights from the alliances suggest that the technical challenges to establishing a common course display are in principle manageable. This even includes automated solutions, where data is pulled from the systems of the member institutions. From an organisational and risk management point of view, pulling information from university IT systems is less problematic than “pushing” or “writing into” them. However, the technical solution needs to be well designed and – for example – a consistency in course information, a harmonisation of subject descriptions and various other aspects are crucial (see also the descriptions on semantic harmonisation).

Interviews with the alliances suggest that resolving issues in other interoperability dimensions, particularly concerning the organisational structure, is key for reaching the necessary conditions to establish a sustainably working and functional common course catalogue.

### *Semantic interoperability*

Semantic interoperability challenges concern a **common understanding** of – and the subsequent agreement on – the **scope and extent of a joint course display**. This relates to fundamental issues which need to be commonly defined and of which the different alliance members might have a (very) different understanding. For example, what can be considered as a “course” (only a traditional course or also a summer school?), how are learning aims/ outcomes defined, what is the mode of delivery (online, blended or hybrid courses?) or the type – and extent – of information about courses presented to users? Additionally, in an international context, seemingly trivial aspects like the starting time of a course need to be defined – the spread of the alliances over various time zones as well as differing semester schedules needs to be taken into account.

“It is absolutely important to have a commonly understood set of descriptors for the courses (learning aims, learning outcomes), only this way you can import meaningful and consistent information into the alliance’s system”

### *Organisational interoperability*

Organisational interoperability challenges are related to the implementation of a joint course display at the working level<sup>22</sup>. There are two issues particularly relevant: the day-to-day organisation of the work on joint course displays and the involvement of university leadership. Both aspects were mentioned as challenges, but also success factors – if implemented correctly.

It is clear that organisations like higher education institutions (even the ones in the university alliances which are evidently open to international institutional cooperation) highly cherish **their institutional autonomy**. The cooperation with other organisations somewhat restricts this autonomy, since common ways and compromises need to be found within a group of universities. Therefore, significant buy-in from many stakeholders in the organisation is needed. While the general support of university leadership for the cooperation in the European University alliance is clearly given, this also needs to be the case on the operational level in work processes like the development of a joint course display.

A barrier mentioned in some of the interviews was the fact that buy-in from all partner institutions in the alliance cannot always be taken for granted. This is problematic since reaching interoperability in a group of universities without the permanent participation of all institutions is clearly a problem. If there is no interoperability with one partner in the network, it is just as impractical for all other partners.

The underlying **drivers for this problem** can be manifold: uncertainty about future (national relevant) framework conditions (e.g. standards) and therefore a lack of commitment to drive forward certain technical solutions which might turn out to be irrelevant in the future; a lack of staff with relevant competences (team mix of skilled persons with technical, pedagogical, project management skills), at times also a lack of coordinated communication between stakeholders or actors in the alliance (partly also due to the pandemic restrictions of the last years).

These different organisational interoperability challenges are approached in different ways by different universities. As mentioned before, approaches for successfully overcoming the challenges tend to involve the following:

- A core dedicated working group driving the development on the course catalogue
- A suitable mix of people involved in the working group, ranging from the alliance coordinator (for the “bigger picture”), IT staff to educational engineers
- The permanent involvement of all member organisations of the alliance: an inclusive approach also bringing the educators/teachers on board (not only university management or administrators). In some alliances it was mentioned that teaching staff, at times, seems to be reluctant to “to give up control on their course material” and

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<sup>22</sup> System level governance challenges on the level of higher education policy are addressed in a later section. The main conclusions regarding governance are also summarised in section 6 of this report.

provide the information to the alliance. Permanently convincing the educators/teachers as well at the universities therefore seems to be important.

- A defined feedback mechanism with the senior university leadership, on technical issues (Chief Information Officer) or overarching strategic issues.

"We needed to get the teaching staff to have their course on display, some wanted to "keep" control over their courses"

### *Legal interoperability*

Legal interoperability challenges refer to issues associated with the regulatory framework on the regional, national and European level. In the case of joint course displays, this concerns **data protection and data privacy issues**. Alliances are obliged to follow data protection rules when sharing data with each other and their students; however, this is less of an issue for this specific use case of course display. First of all, information on courses is often already published via ECTS Course Catalogues on each university's individual website. Secondly, sensitive personal data – for example student data or grades – are not a focus area for the mere construction of a course display. Legal issues thus seem to be more relevant with regard to other use cases of the cooperation within the European University alliances, e.g. admission and recognition.

### **Overall governance**

General **governance issues** arise in the context of developing a joint course display for the alliances as well. Interviewees emphasise the need for a close alignment between the content-related work and the technical implementation of objectives. This is particularly significant in the context of a joint course display. For some alliances, the work on a common course catalogue has been a high priority since the beginning. Therefore, it is often an objective in the early stages of developing a common technical infrastructure. Alliances may not have agreed upon common procedures and significant changes are still likely to be made. Concurrently, the technical challenges for building a joint course display are manageable. While experimentation and prototyping of features have been identified by the interviewees as good practice, overloading the product (in this case the course display with features) and technical lock-ins should be avoided. Alliances can prevent undesired developments by establishing solid feedback loops between decision makers and implementers and following a step-by-step approach.

### **Prospects on interoperability with respect to joint course displays**

Joint course displays are currently implemented in various European University alliances, especially those from the first generation.. They represent a key part of shared

virtual campuses. In this context, the establishment of a course display serves as a stepping stone for further cooperation on issues such as (joint) admission and enrolment, and recognition of courses among others.

The implementation of a joint course display differs between alliances depending on their concrete objectives and general level of progress on an inter-university campus within the alliance, their starting points (e.g. with regard to the digitisation of infrastructure and processes within their higher education institutions and their alliances) and the selected technical solutions. Thus, there are variations between alliances concerning the technical setup and the type and extent of displayed courses, leading to deviations in usability for end users.

This heterogeneity may also be explained by the lack of a dominant standard, differences in financial and personnel resources, as well as uncertainty around the prospects of inter-university campuses on the regional, national, and European level. Consequently, there is a need for **sufficient resource allocation, agreement on specific common standards, and clarity in the policy realm.**

For the foreseeable future, three potential developments seem to be particularly likely.

- First, alliances will likely expand the number of courses available on their platforms and increase participation by students in line with the mobility goal set by the European Commission. While this may appear to be simple task at first, there are informational, organisational, and technical challenges. Potential users, such as students, may not be aware of their opportunities. Thus, alliances will need to convince stakeholders to visit and engage with the common course catalogue by integrating information on courses and contact persons in each university's information pipelines. In addition, processes connected to the addition of courses and ways to access the joint course display will have to be adjusted and scaled up as the existing (technical) setup may not be sufficient to keep up with the larger intake of content and from users. In consequence, alliances may be required to implement significant changes on the technical as well as the organisational – level.
- Second, additional features will be added enhancing the user experience and deepening the connection to the individual university system. This could include the display of courses based on student eligibility and selected learning path as well as options for enrolment and issuing digital credentials.
- Third, alliances may establish a real automation between their IT systems for improving on the current, rather manual process still often underpinning the work on a joint course display. For example, course information may be pulled directly from the IT systems of each university (like it is planned for the EuroTeQ alliance in spring 2023). However, based on the research carried out for this study, it seems that there is still quite a long way to go until this automation is the standard in the higher education sector.



## 4.2 Joint enrolment

### Key findings



- Joint enrolment processes are the next logical step for cooperating universities after establishing a joint course display. This way, students can not only see available courses – they can also register for them.
- Setting up joint enrolment is significantly more complex than creating joint course displays. There are additional requirements (e.g. identification of individuals) for which technical and organisational solutions need to be found and integrated.
- European University alliances have mostly chosen a decentralised or federated solution for the enrolment process in their alliances for various reasons, including the need to process personal data of students.
- Legal aspects are currently unclear – for example on the legal status of students participating in virtual courses or summer schools of a European University alliance member. This is a barrier for the implementation of joint enrolment processes.

“**Joint enrolment**” in the context of this study can be described as a common admission and registration process to study offers provided by universities in a cooperation. In a cooperation like the European University alliances, this process would ideally be seamless and largely automated for all students across an alliance. In the vision of **an inter-university campus**, students should be able to access courses of the alliance directly and without friction – a clear requirement for a seamless student journey between the partner universities. Consequently, the challenge of a joint enrolment has been on the agenda specifically for the European University alliances as part of setting up their shared virtual campuses<sup>23</sup>. The Council of the European Union stresses the importance of this topic by encouraging European Universities to foster their cooperation by ‘exploring the feasibility of joint enrolment of students [...], within the national systems, to make

<sup>23</sup> See for example the European University Factsheet on the objectives of the European University initiative [European Commission, 2022e: Factsheet – European Universities: A key pillar of the European Education Area. <https://education.ec.europa.eu/document/factsheet-european-universities-a-key-pillar-of-the-european-education-area>].

their education [...] careers more attractive, sustainable, and flexible within the alliances'.<sup>24</sup> A similar objective is pursued by other European initiatives: in the European Commission's call for proposals on a joint European degree label, 'joint policies for admission, selection, supervision, monitoring, assessment, and recognition procedures' are considered as minimal requirements for the implementation of a joint transnational degree programme.<sup>25</sup> In addition, the European Commission has contributed to improving registration and admission by developing Erasmus Without Paper<sup>26</sup>, a digital solution to streamline the administrative process between higher education institutions for the Erasmus exchange programme.<sup>27</sup>

Developing joint enrolment procedures is therefore an important area for deepening the cooperation between higher education institutions. However, it entails significant challenges in various dimensions.

### The landscape and framework conditions regarding joint enrolment

Joint enrolment in the context of university partnerships can essentially mean two different aspects:

1. the joint admission to specific courses and programmes at the receiving institution  
as well as
2. the registration of students both legally (if required) and technically at a receiving university in a full degree programme and/or earning ECTS at the receiving university (often called a "degree-seeking study").<sup>28</sup>

A "fully-fledged joint enrolment" as sketched in 2) above has not been implemented by the European Universities alliances so far<sup>29</sup>. This case study focuses on 1): the enrolment to specific courses offered by the alliance.

<sup>24</sup> Council of the European Union, 2022c: Council conclusions on a European strategy empowering higher education institutions for the future of Europe. [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOC\\_2022\\_167\\_R\\_0003](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=OJ%3AJOC_2022_167_R_0003).

<sup>25</sup> European Commission, 2022c: Erasmus+ Programme (ERASMUS). Call for Proposals. European policy experimentation in higher education, p. 31. [https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/erasmus/wp-call/2022/call-fiche\\_erasmus-edu-2022-pol-exp-he\\_en.pdf](https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/erasmus/wp-call/2022/call-fiche_erasmus-edu-2022-pol-exp-he_en.pdf).

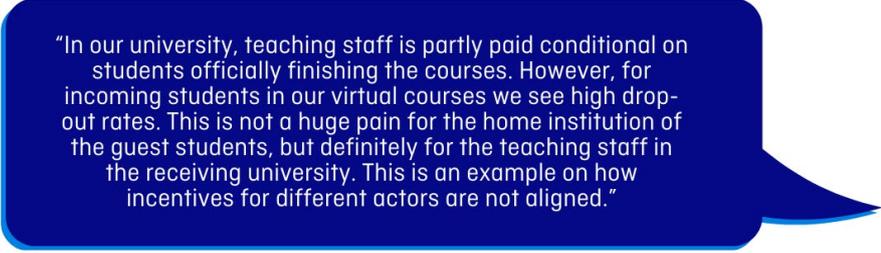
<sup>26</sup> European Commission, 2023b: Erasmus Without Paper. <https://erasmus-plus.ec.europa.eu/european-student-card-initiative/ewp>.

<sup>27</sup> It should be noted though that EWP only encompasses physical semester mobility or blended short-term mobility and does not interfere into the way the exchange student registers for courses at the respective (host) university. Usually, the exchange student is not registered in a specific degree programme in the campus management system of the receiving university in order to provide a high degree of freedom to choose courses.

<sup>28</sup> See for example the Hochschulrektorenkonferenz's paper on framework conditions of participation of international students in virtual study offers (Hochschulrektorenkonferenz, 2023: Verbesserte Rahmenbedingungen zur Teilnahme internationaler Studierender an virtuellen Studienanteilen – Handreichung. <https://www.hrk.de/advance/veroeffentlichungen/handreichungen/handreichung-virtuelle-mobilitaet/>).

<sup>29</sup> Exceptions are joint Master's programme like the programme on "Global Challenges for Sustainability" hosted jointly by the members of the CHARM-EU Alliance.

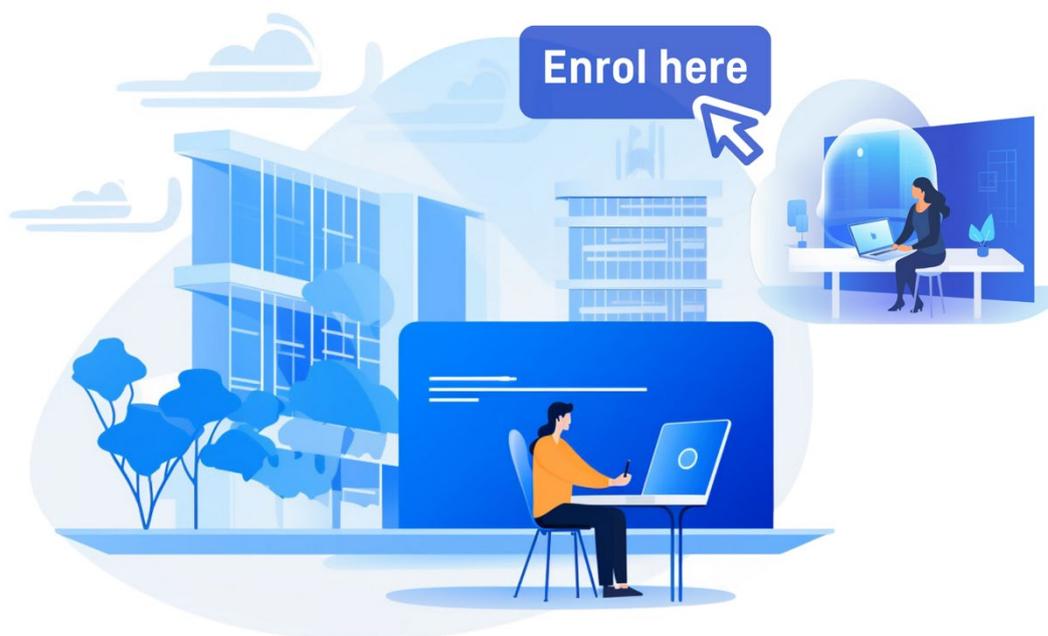
What are some of the reasons which make joint enrolment processes challenging? Firstly, **regulations** at various administrative levels in the European Member States limit the options for implementing a seamless enrolment of students into courses offered by another institution – partly also because of the financial or human resource implications of offering educational courses to students outside the home institutions.



“In our university, teaching staff is partly paid conditional on students officially finishing the courses. However, for incoming students in our virtual courses we see high drop-out rates. This is not a huge pain for the home institution of the guest students, but definitely for the teaching staff in the receiving university. This is an example on how incentives for different actors are not aligned.”

Furthermore, there are **legal or “de facto” barriers** that are difficult to overcome to develop a seamless enrolment at partner institutions with all related rights and obligations. According to some of the interviews carried out for this study, for example, in some European countries students need to be officially enrolled in the universities and pay semester or tuition fees to receive ECTS credits for successfully completing courses. Sometimes, regulations in different European states are mutually exclusive and contradictory, as interview partners pointed out.

In the context of virtual mobility, the fact that “virtual students” are usually not present at the receiving university, for example to physically sign documents, still seems to have an impact on university procedures. In this sense, a lack of digitised processes is still a barrier specifically for German universities, according to one interview partner. This adds to the ongoing problem of a lack of a legal status in Germany for short-term (virtual) students (see section 5.4 on more details on the legal status).



On the **technical side**, there are no pre-existing, “out-of-the-box” solutions that manage joint enrolment processes in their entirety<sup>30</sup>. While there are, for example, solutions for exchanging course information (see case study on joint course display) or authenticating identities of students, these need to be brought together in one overarching system architecture to create a seamless user “enrolment experience”. Therefore, coming to an agreement on harmonising the existing technical setup or setting up common systems on the alliance level has proven difficult so far.

Technical solutions and initiatives with relevance for joint enrolment do exist. The following have proven to be particularly relevant at present<sup>31</sup>:

- Open Education API<sup>32</sup> and Edu-API<sup>33</sup> for providing information about the courses as such (i.e. description of the course, mode of study, learning outcomes, study load etc).
- eduGAIN for facilitating authorisation and identification of users<sup>34</sup>.

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<sup>30</sup> There are some national approaches though, such as eduXchange in the Netherlands and LADOK in Sweden.

<sup>31</sup> There are other initiatives which are relevant in a broader context (e.g. EMREX for transferring student achievements), but are left aside here to focus on solutions with a direct connection to the use case of enrolment. Additionally, national approaches in Germany (e.g. XHochschule or PIM) play a role in the German system, but were only mentioned infrequently in our interviews. This might be due to the focus of the interviews on international cooperation activities.

<sup>32</sup> Open Education API: Open Education API: <https://openonderwijsapi.nl/>.

<sup>33</sup> 1EdTech: EDU-API: <https://www.imslobal.org/edu-api>.

<sup>34</sup> eduGAIN: eduGain – Supporting access: <https://eduGAIN.org>.

Since the Open Education API and Edu-API are already described above in the use case of a joint course display, the following will concentrate on the description of eduGAIN as the most frequently approach mentioned in our interviews for identifying users intending to enrol in a course. **eduGAIN**, developed and further supported by GÉANT and its predecessor organisation Trans-European Research and Education Networking Association (TERENA), is a **service** interconnecting research and education identity federations<sup>35</sup>. It enables the exchange of information connected to identity, authentication and authorisation between participating federations. Consequently, a student enrolled in one partner university that is part of a federation can access services at another alliance member through a single sign-on solution. This leaves autonomy to the individual institution while users gain frictionless access to content provided by designated services (e.g. a joint course catalogue)<sup>36</sup>. Currently, more than 80 federations are participating, representing more than 8000 identity and service providers. In the context of the European Student Card initiative efforts are made to integrate eduGAIN with the **European student identifier** of the European Student Identifier (ESI) project and the **eIDAS** interoperability framework, currently being deployed by the Member States.

#### Objectives and examples of implementation regarding a joint enrolment process among European University alliances

According to the research and the interviews for this study, implementing joint enrolment processes have so far not been the **focus of activities** of the interviewed alliances. At the same time it is definitely a **(medium-to long-term) objective** for the European University alliances to set up joint enrolment procedures. This is a pragmatic decision based on the available resources and the overall complexity of setting up a joint enrolment process. The interviewed alliances seem to focus on the more quickly attainable objectives (“low-hanging fruit”) that deliver immediate benefits and added value (e.g. a joint course display, which is directly visible to students, staff and the outside world).

Accordingly, automated **joint enrolment procedures have not been fully implemented in the alliances yet**. There is, however, still the need to manage the registration for courses at each university in the alliance. At present, these processes usually require manual tasks by university administrators, students, and teachers.



<sup>35</sup> In Germany, such a federation is DFN, in the Netherlands SURFconext.

<sup>36</sup> An example for service enabled by eduGAIN is the course catalogue of the alliance EDUC or the Moodles of various German universities.

## Examples for joint enrolment processes from selected alliances

In the **EDUC** alliance, students which are taking courses at an institution other than their home institution are not formally matriculated/registered at the “receiving” university. This would imply payment of local semester/tuition fees at the receiving institutions as mandate by current regulations. The enrolment process for specific courses is managed automatically as well as manually. For University Potsdam, as part of the EDUC alliance, the process works as follows: Students access a local application page via the alliance’s joint course catalogue. Applications are collect-ed by using the Typo3 add-on Powermail, a tool to integrate forms into websites. Next, an administrator checks the student’s registration status manually (via email) with the student’s home university. After confirmation that the student is registered, the alliance sends the enrolment information to the student and the course teacher. At this point the student is enrolled in the course.

In the alliance **EuroTeQ**, plans for automating a joint enrolment process are more advanced. Work on the implementation of a joint enrolment process has been scheduled to start in the spring of 2023, with the system expected to go live in 2024. Plans foresee a process combining the use of the OOAPI standard for ex-changing course information and the edGAIN standard for authentication.

The **CIVICA** alliance has implemented the eduGAIN authentication system:

- Courses offered by the alliance are listed on the CIVICA course catalogue, with an assigned CIVICA course code. Bachelor and Master students register for courses at their respective home university using the CIVICA course code.
- Subsequently, university administrators upload a .csv file with names, email addresses and course codes on a secured server. By doing so, students are enrolled in the course via CIVI-CA’s digital campus and have access to the course platform and materials.
- For online courses and seminars offered to early-stage researchers, CIVICA has developed a public course catalogue where early-stage researchers can register directly. University administrators confirm enrolments in the catalogue’s back-end. After registration, relevant course information is automatically sent by email to the participant.

An alternative approach is taken by the alliance **Unite!**. In its case, students are enrolled in the joint “university, i.e. on a separate platform. A separate Moodle in-stance is used where the universities provide their shared courses and where universities allow their students to take the courses supplied on the shared platform.

## Challenges and approaches to reaching interoperability

### *Technical interoperability*

Technical interoperability challenges with regard to joint enrolment concern several aspects. Interviewees frequently mentioned the **heterogeneity in the market for university IT systems** and the **lack of standardisation** as key issues: universities use different software solutions<sup>37</sup> for managing the student information data as well as the enrolment process. They are often not compatible with each other. Even if universities use the same software, different versions and plugins make it difficult to link systems with each other. The uncertainty on future standards (for example the question whether EWP will become a dominant (or the “only”) relevant framework in cooperation of European higher education institutions) may also discourage investment into common alliance systems. In addition, universities have developed their own IT systems over decades adjusted to their specific needs. They might also be “locked into” specific solutions because of running licensing agreements with software providers. Adapting those existing technical systems is a complicated and laborious process. Thus, higher education institutions are reluctant to change their own systems for a common solution that does not necessarily reflect the individual needs at each institution. Technological changes may also render current developments outdated in a few years presenting the risk of malinvestments.

For the technical implementation of joint enrolment, the alliances need to bring together their systems via **solutions for the identification/authentication of users and authorisation of data exchange by the users**. A critical fact is that sensitive information and personal data need to be transferred securely from one university system to another or a common system. The type of data to be transferred and the related risk of personal data leaks raises “red flags” in university administrations.

Technical solutions need to reflect this situation. A **federated system architecture**, which circumvents the need of creating new centralised databases containing sensitive data, currently represents the dominant approach according to the interviewed alliance

<sup>37</sup> As an example: For University of Potsdam, the software MoveON is used by the used by International Office as mobility software (and for connecting to EWP); furthermore, HIS is used for student services (enrolment, student data, examination data, course catalogue etc.). In the coming years this will be updated to HISinOne which will imply the need for new APIs. Other universities mentioned as systems currently in use for different purposes: CACI Osiris, Peoplesoft, Banner, Powerschool, Openschool, Microsoft Dynamics, SITS, USOS, TAS, AcademyFive, Microsoft Navision as well as locally created ones on campus systems.

representatives. OOAPI and eduGAIN were most commonly mentioned in our interviews as potential solutions. EWP is also an important initiative to be mentioned in this context. However, EWP is currently limited to the management of student mobility in the context of Erasmus exchange semesters, and thus only caters to the needs in this specific context. In addition, the tools used for exchanging data through EWP are often mobility databases (such as MoveON). In the case of some of the interviewed universities for this study, the mobility management software is not directly connected to the student services (HIS, i.e. course catalogue, examination data, enrolment etc.) and therefore lacks this connection to the most relevant IT systems.

### *Semantic interoperability*

While semantic interoperability (i.e. the need to exchange information without ambiguity about its meaning) has not been mentioned as a significant challenge for the use case of joint enrolment in the interviews for this case study, **differences in the understanding of “enrolment”** may nevertheless be an issue. In the context of different legal systems or different internal procedures, enrolment as a concept may comprise varying notions, for example of what an “enrolment fee” concretely entails. As a consequence, there is a need to consider the inclusion of distinct aspects and specific elements in common enrolment procedures. Alliances have to agree on their common understanding of joint enrolment to prevent misconceptions regarding general – and specific implementation of – objectives.

### *Organisational interoperability*

In the process of implementing joint enrolment processes, alliances encounter different organisational interoperability challenges. Considering the early stage of working on joint enrolment procedures, these are often abstract and/or related to broader issues on setting up a joint platform or a common course catalogue.

“It was important to make people trust in the system. Among other measures we therefore set up a GDPR committee to make clear our strong commitment to data security”

In general, the complexity of joint enrolment processes requires the **participation of a broad stakeholder group** in the alliances, including not only IT/technical experts, but also legal experts (to cover the legal implications of joint enrolment and the GDPR-related implications) and decision-makers as well as internationalisation specialists and administrators from student offices. All of these stakeholders need to be “on board”.

Activating this wide breadth of actors within the university has proven to be difficult in some of the interviewed alliances. In their daily work, some interview partners experience a variance in the commitment of the alliance members – some see the work on the alliance as a high priority for their institutions, for others this is not necessarily the case. This also affects the commitment to take decisions with potentially wide-ranging consequences (for example a decision for or against a specific technical set-up). As

decisions are made consensually in the alliances, the work on features may stop if no consensus can be reached. Additionally, bringing together not only experts from a variety of thematic backgrounds, but also from different countries comes with its own challenges (related to semantic operability challenges). Technical, legal or other terms need to be explained and language barriers may lead to miscommunication. Alliances have therefore developed task groups to coordinate the work and have implemented feedback loops to build trust between all involved stakeholders in the alliances.

Expectations on the implementation of joint enrolment also differ between universities with regard to **the extent of automation** of joint enrolment procedures. This often relates to the “digital maturity” of individual institutions. Some tasks in the enrolment process are still done manually at one university, while they are digitised at another institution. In general, both the resources and staff capacities as well as the organisational traditions of outsourcing the development of IT solutions or building them in house, differ between universities. This leads to different degrees of digital sophistication of university systems and capabilities to adjust systems for joint enrolment. In this context, the difficulty of hiring competent IT staff due to availability and salary costs of these experts represents a challenge (e.g. in Germany the shortage of skilled IT staff is a widely discussed societal and labour market issue).

As a general take-away for overcoming organisational interoperability challenges, interviewees recommend carefully **managing and monitoring expectations** and adjusting them if necessary, i.e. in case objectives are too ambitious from a strategic point of view or from an implementation perspective. Consequently, the implementation of common enrolment features should be seen as a medium- to long-term, **step-by-step process**. Incremental progress seems to be the most likely form of advancement towards the joint vision of joint enrolment.

### *Legal interoperability*

Alliances face **legal barriers** on the regional and national level to implementing joint enrolment processes. This refers to regulations on **data sharing**, but also on **students’ legal status** while participating in an alliance’s courses. For example, regional regulations in some German states require students to be formally enrolled in case they want to receive ECTS for courses at the respective alliance university. This in turn has implications related to the payment of semester fees (“Semester-/Sozialbeitrag”) in the German university system. The lack of a specific student status in virtual collaborations is therefore an important legal barrier to interoperability.<sup>38</sup>

### **Prospects on the interoperability with regard to joint enrolment**

Being able to offer students a seamless enrolment experience on courses of the alliance, is an important element to increase the added value of alliances’ joint platforms. By integrating admission and registration processes, students can not only retrieve

<sup>38</sup> For the German context, the project HRK Advance points out regulatory reform needs in detail – ranging from a new legal status such as “international non-degree-seeking students participating in selected courses” (internationale Teilleistungsstudierende) to a differentiation between students participating on-campus and off-campus. See publications available at <https://www.hrk.de/advance/>.

information about the courses (via the joint course catalogue), but also directly register for courses. This has huge potential for universities to bring their joint inter-university campus to the next level and upscale their inter-university mobility. Currently, alliances seem to be at the beginning of developing automated joint enrolment procedures. To our knowledge, only some front-runners in the group of the alliances have concrete plans for an “automated” enrolment in the next 2 years. Their progress often depends on the implementation of other features, such as a common course catalogue.

Looking ahead, alliance representatives mention the following aspects that would need to be addressed in order to raise the level of interoperability in the area enrolment processes.

- Existing **legal barriers** (for example with respect to the exchange of personal student data) are particularly problematic for implementing joint enrolment procedures as they limit the opportunities a shared campus provides to students and other stakeholders. The alliances highlight the necessity for supporting legal frameworks on the regional, national, and European level. The initiative by the European Commission towards a **legal statute for European University alliances**<sup>39</sup> may alleviate some of these issues.
- Interviewees underline the need for **IT solutions capable of handling the different elements of joint enrolment processes**. Solutions such as eduGAIN exist and are already used by some European University alliances. Thus, in principle, technical challenges do not seem to be the main problem for joint enrolment (even though they do exist and should not be underestimated). However, individual institutional traditions need to be – at least in part – overcome in order to increase the openness to new enrolment processes in an inter-institutional setting such as in European University alliances.
- The technical implementation of joint enrolment procedures, however, depends largely on **agreements on non-technical details**, not directly related to the enrolment, but on upstream processes like the establishment of joint platforms and common course catalogues. These are prerequisites for establishing common enrolment procedures. With increasing progress in these areas among the European University alliances, future progress on joint enrolment becomes more and more likely.

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<sup>39</sup> European Commission, 2022b: Communication from the Commission to the European Parliament, The Council, the European Economic and Social Committee and the Committee of the Regions on a European strategy for universities. <https://education.ec.europa.eu/document/commission-communication-on-a-european-strategy-for-universities>.

### 4.3 Joint learning platforms

#### Key findings



- Some alliances have set up joint learning platforms, with the alliances of the first generations usually being more advanced with operational systems in place. While some alliances have opted for a “hub” approach, i.e. setting up a platform that serves as a gateway to the universities’ respective local system, others have set up a centralised system that additionally hosts joint learning offers. While these systems in the interviewed alliances are for the most part operational, the integration of the learning platforms of all members has not yet occurred in these cases.
- Many of the interviewed alliances and their members use open source-based systems, which facilitates connecting their platforms via open protocols. Connection with other platforms, in particular commercial solutions, still proves to be difficult. All interviewed alliances tackle the problem with an iterative approach.
- Interoperability for this use case is largely a matter of aligning organisational processes and finding technical solutions connecting open source with commercial systems. While organisational interoperability is a matter of time and commitment, technical interoperability is yet to be fully solved.

**Learning management systems (LMS)** are key platforms used in universities. They are used for the administration, documentation, tracking, reporting, automation, and delivery of educational courses, focusing on online learning delivery and supporting a range of related uses, such as managing courses, users and roles, learning analytics, or online assessments<sup>40</sup>.

LMS play a significant role in **cooperation between higher education institutions** on the international and also national level. Specifically, the setting up of a joint virtual campus

<sup>40</sup> See Ellis, R. K., 2009: A Field Guide to Learning Management Systems. American Society for Training & Development. [https://web.archive.org/web/20140824102458/http://www.astd.org/~media/Files/Publications/LMS\\_fieldguide\\_20091](https://web.archive.org/web/20140824102458/http://www.astd.org/~media/Files/Publications/LMS_fieldguide_20091).

requires, among other things, the construction of infrastructure and the interconnection with the digital platforms of the universities, which is why ensuring interoperability is of key importance. While virtual campuses are a crucial element in the European Universities Initiative, LMS have also generally undergone a massive growth in usage due to the emphasis on remote learning during the COVID-19 pandemic. Thus, **joint solutions have also grown in importance** in recent years.

Among the European University alliances, around 30 aim to set up a joint learning platform<sup>41</sup>.

In the following, **focus is put on joint learning platforms usually in the form of LMS**, though mentioned aspects can also touch upon (data stored in) campus management systems (CMS, sometimes also referred to as student information systems or student management systems). CMS encompass various administrative functions related to student information, registration, admissions, finance, and other institutional operations. Hence, CMS and LMS serve different purposes, but they can be linked to provide a more integrated solution for managing educational processes and data within a university. The specific data shared between them may vary depending on the institutional setup of the universities. All in all, the data processed in CMS can also be a necessary element in facilitating LMS connections, though this is of secondary focus for this study.

### The “interoperability landscape” regarding joint learning platforms

Generally, the openness and related potential interoperability depends on the LMS in use. In Germany, for example, almost all universities use **license-free LMS**, mostly Moodle, ILIAS, StudIP and OLAT/OPAL (in descending order of distribution). They reach 90 percent of all students in Germany (as of 2019) and allow a low-threshold integration of content via interfaces in other LMS<sup>42</sup>. Worldwide, Moodle also dominates with a market share of over 50 % in Europe, Latin America, and Oceania. Specifically in Europe, Moodle is used in 57 % of all degree-granting institutions, followed by Blackboard (18 %)<sup>43</sup>.

In this study, many universities (though not all) in the interviewed alliances use Moodle as well. Overall, in all selected alliances, at least two different systems are in use. Naturally, interoperability between similar systems (e.g. Moodle-based) is easier to achieve than among different systems. In order to ensure interoperability, **data standards** applied in the LMS allow information to be exchanged from one system to another. There are various standards for creating and integrating content into an LMS, including AICC, SCORM, xAPI, and Learning Tools Interoperability<sup>44</sup>. However, connecting open source software (e.g. used in Germany, Finland) with commercial solutions (e.g. used in the

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<sup>41</sup> According to desk research. There may be more alliances that aim to set up a joint learning platform but use alliance-specific terms for it.

<sup>42</sup> See Thelen, T., 2018: Lernmanagementsysteme an deutschen Hochschulen – derzeitiger Stand, aktuelle Baustellen und zukünftige Trends. Technische Informationsbibliothek (TIB).

<sup>43</sup> See Hill, P., 2017: Academic LMS Market Share: A view across four global regions. <https://elite-rate.us/academic-lms-market-share-view-across-four-global-regions/>.

<sup>44</sup> See Colman, H., 2022: eLearning Standards Comparison: AICC vs SCORM vs xAPI vs cmi5 vs IMS Common Cartridge. <https://www.ispringsolutions.com/blog/elearning-standards>.

Netherlands) can be particularly difficult, according to interviewees, with few standards and interfaces between the systems available.

### Objectives and examples of implementation regarding joint learning platforms among European University alliances

The European University alliances **aim to set up a “virtual campus”**: for instance, ranging from a “virtual inter-university campus environment to broaden the opportunities for virtual mobility and the development of new courses” (EPICUR<sup>45</sup>), a “virtual European inter-university campus that connects the regional innovation ecosystems” (UNITE!<sup>46</sup>), an “interactive virtual environment that contains information for all community members [...] bringing together activities in a personalised digital environment” (YUFE<sup>47</sup>) to a “virtual campus as unique entry-point for students and anybody interested” (UNITA<sup>48</sup>). The alliances have in common that they pursue a **“one-stop shop”** for students, teachers and other stakeholders that features additional supporting materials and discursive elements for joint courses and other purposes. In the absence of a joint physical campus, the **virtual campus is the central infrastructure** intended to make the inter-university campus visible and accessible as well as to facilitate cross-alliance mobility.

For example, the alliance EPICUR aims to offer “innovative functionality to monitor and recognise mobilities” (e.g. analytics, gamification), “to minimise manual administrative work for supporting mobilities”, and “to be interoperable and scalable in order to support inter-alliance mobilities, other alliances or associated partners”.<sup>49</sup> UNITA defines its virtual campus as an integrated set of digital services, also offering a virtual place to exchange and collaborate with the virtual campus users (e.g. via thematic working groups), while the so called UNITE Metacampus is a platform for digital mobility that connects the universities of the alliance, to enable mobile access exclusively to the range of programmes and diversity of activities that are offered through Unite. Overall, the interviewed alliances share general objectives with only slight differences in their visions (e.g. gamification as an element in EPICUR).

The interviewed alliances **vary in their progress** regarding the establishment of a virtual campus: For example, some alliances have already set up platforms that have been in use for several years already. Other alliances have developed a proof of concept but have not yet fully started with implementation.

According to the interview results, **few joint, fully-functional learning platforms** have been established as of now. The **concrete set-up of the virtual campus environment** differs from alliance to alliance: ranging from a fully joint platform (i.e. hosting joint

<sup>45</sup> See EPICUR, 2019: The European Partnership for Innovative Campus Unifying Regions. <https://education.ec.europa.eu/sites/default/files/document-library-docs/european-universities-factsheet-epicur.pdf>.

<sup>46</sup> See UNITE!, 2019: UNITE! University Network for Innovation, Technology and Engineering. <https://education.ec.europa.eu/sites/default/files/document-library-docs/european-universities-factsheet-unite.pdf>.

<sup>47</sup> See YUFE, 2022: YUFE Virtual Campus. <https://yufe.eu/yufe/yufe-virtual-campus-travel-around-europe-despite-the-pandemic/>.

<sup>48</sup> See UNITA, 2021: UNITA-Universitas montium. <https://education.ec.europa.eu/sites/default/files/document-library-docs/european-universities-factsheet-unita.pdf>.

<sup>49</sup> See EPICUR, 2021: EPICUR Campus. Interview with Thrasyvoulos Tsiatsos. <https://epicur.education.ec.europa.eu/epicur-campus-interview-with-thrasyvoulos-tsiatsos/>.

courses), to hubs serving as a gateway to the respective LMS of each institution, to individually connecting all LMS (or a combination thereof). Typically, the institutions opt for solutions that they are already familiar with. Often, one higher education institution takes the lead in providing technical infrastructure.

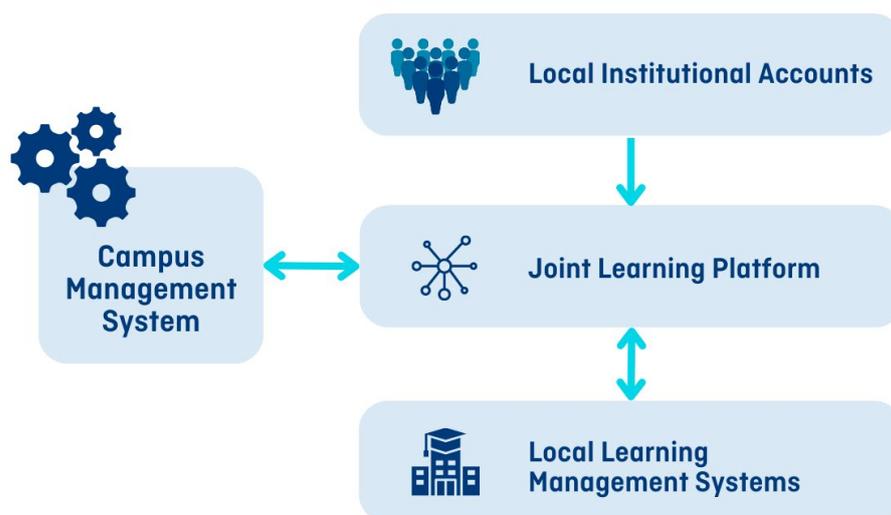
The alliance **UNITE** has been using a separate platform, referred to as Metacampus, for two years. Metacampus integrates the respective LMS of the partner universities via interfaces. Here, it is possible to log in with one's institutional account to access the platform's services. Most of the partner universities use Moodle as their local LMS, which facilitates integration. Metacampus is also Moodle-based and hosted and operated by a spin-off of the Polytechnic University of Catalonia. Due to this external provider – which is also directly connected to one of the alliance's universities – the services can be provided in a swift and qualified manner. As a next step, the alliance plans to integrate more functionalities and courses into the platform; for this purpose, efficient ways to transfer courses are currently being explored.

Alternatively, the **YUFE** alliance has created a custom-made virtual campus. YUFE has launched four different portals to address all stakeholder groups (students, staff, citizens, entrepreneurs) and areas of activity in YUFE. The student portal was the first portal to be launched in 2020. Via the YUFE Virtual Campus, students can select courses and activities and in addition can also keep track of their enrolment in these courses and personalise their learning path. The system informs students about new courses and activities in a customised way, which aims to enhance student-centred learning. Currently, manual intervention is required to exchange YUFE Student Journey data between individual partners. The aim for the future is to run proof of concepts and pilots for full automation and integration throughout this process.

In the alliance **EPICUR**, the Virtual Campus Learning Platform (VCLP) is part of the EPICUR Inter-University Campus (EIUC). It is hosted by Karlsruhe Institute of Technology and made available to all partner universities. It is based on the free and open-source software ILIAS that is popular at German and Swiss universities. ILIAS (like Moodle) is web-based, hence requiring only a web browser on the client side to use it; the functionalities can also be extended with free and commercial plug-ins. As the VCLP is a complete LMS, courses can be directly hosted on the platform, if teachers wish to do so. The usual approach is to provide the courses on the local LMS and share it with the VCLP. Students can access those courses via the VCLP. While ILIAS has built-in support, the connection to Moodle-based platforms currently works via plug-ins. The connection to other universities that use commercial LMS is a topic that it is currently being worked on. This general approach has also been used in the German state of Baden-Wuerttemberg in other higher education contexts (CampusConnect<sup>50</sup>), in which an interface for connecting LMS was created through middleware (E-Learning Community Server). The Karlsruhe Institute of Technology was able to draw on the experience and opted to host the VCLP in a similar way.

Figure 3: Exemplary high-level architecture of a virtual campus at EPICUR

Based on EPICUR Inter-University Campus<sup>51</sup>



<sup>50</sup> See CampusConnect. <https://www.campusconnect.de>.

<sup>51</sup> See EPICUR, 2022: The EPICUR Inter-University Campus (EIUC). <https://archive.epicur.education/the-inter-university-campus/>.

Based on a comprehensive analysis of existing solutions within each of the partner universities and the employment of a first pilot Moodle-based LMS, the alliance **UNITA** decided to use different solutions for different scenarios. For the scenario of a hybrid classroom, the alliance decided against the development of a new LMS. After all, all of the UNITA universities use Moodle. As a result, the alliance intends to communicate between the local LMS through open protocols and plug-ins that require little support within the individual higher education institutions; this also has the advantage that the teaching staff do not need to familiarise themselves with a new environment. For the integration of joint courses, the alliance plans to use a common Moodle-based system. For this purpose, the functionalities that UNITA wants to make use of (e.g. translation tools) will need to be integrated. As the alliance is part of the second call, the development of the virtual campus has not been developed as far as in alliances from the first call. As a next step, the pilots will be opened to a testing phase that includes students.

Generally, a **hub approach** has the advantage that the alliances do not have to agree on one particular joint learning platform but can keep using their own solutions, ensuring both acceptance at the respective university levels and technical benefits. The “hub”, a joint learning platform that serves as a gateway, directs the users to the respective LMS of each institution, i.e. a system “on top” that functions as a connection to the decentralised servers. According to the alliances, it is not feasible to convince member universities to change or replace their locally used systems. Thus, connecting a separate, newly developed joint platform at alliance level to local systems is an approach taken by some of the interviewed alliances. The full integration of LMS is also, according to the interviewed experts, sometimes **not realistic within the timeframe of the European University initiative’s funding period**. Still, some alliances, such as EPICUR, have chosen to implement a centralised approach in **establishing a fully joint platform**, enabling the hosting of joint learning offers and at the same time allowing students seamless access without the need for them to create new accounts.

## Challenges and approaches to reaching interoperability

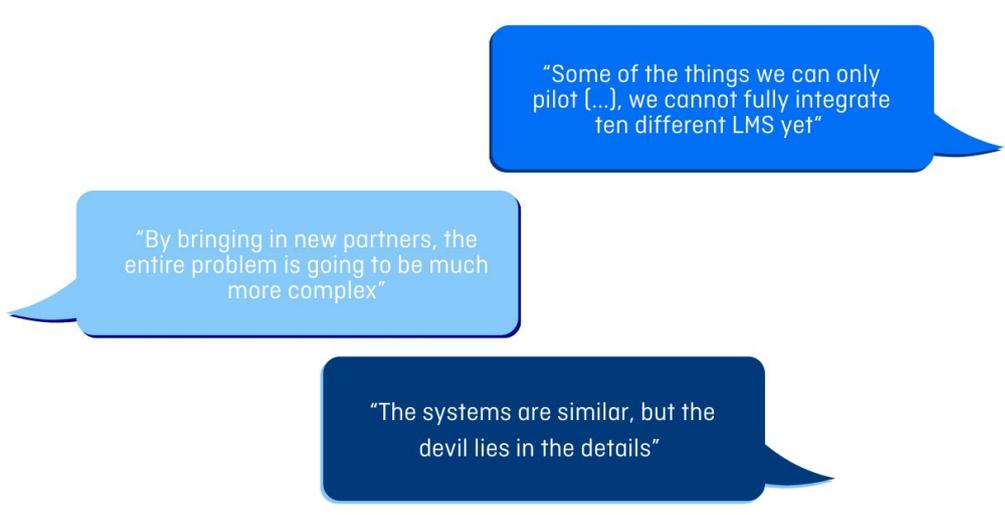
### *Technical interoperability*

A major challenge is the fact that each university already uses individual technical solutions for their own institutions and thus **fundamental decisions** have to be made on what kind of approach to take for a joint system: whether to [fully] merge different systems, potentially abandoning one's own technical solution in favour of a cross-alliance approach, or integrate different approaches via [loosely or closely coupled] systems.



The **compatibility of the systems** depends highly on the local platforms in use. Some interviewees highlight that their locally used system is not intended to share data with other platforms due to security regulations at their universities, rendering interconnection difficult. Thus, the alliances sometimes rely on [manual] workarounds. For the integration of both open and commercial LMS, some alliances are currently examining options to use standards [e.g. OneRoster<sup>52</sup>]. The integration of open source-software can often be achieved via plug-ins and open protocols, according to interviewees.

<sup>52</sup> See 1EdTech, 2023: OneRoster/Learning Information Services/Edu-API. <https://www.imsglobal.org/activity/onerosterlis>.



"Some of the things we can only pilot (...), we cannot fully integrate ten different LMS yet"

"By bringing in new partners, the entire problem is going to be much more complex"

"The systems are similar, but the devil lies in the details"

If an alliance decides on a joint platform, key decisions on **whether to rely on commercial or open-source solutions** also are paramount. Most of the interviewees recommend technical solutions based on **free and open-source software**. The broad use of Moodle on an international level and the respective technical expertise on the university level is particularly advantageous; some interviewees also pointed out that the linking of Moodle and ILIAS, both open source-based, can be realised. However, various experts observed that some universities have reservations concerning the use of open-source software given – according to the interview partners – an *alleged* potential to be vulnerable to cyber-attacks. Furthermore, it is difficult to find open-source solutions for certain functionalities envisioned for the joint platforms (e.g. translation tools for a multilingual inter-university campus). Generally, all interviewed alliances emphasise the importance of relying on **existing solutions as much as possible**, instead of creating new solutions from scratch.

Common to all interviewed alliances is an **iterative approach**: they first developed a concept and launched a basic environment as a pilot, identifying challenges and solutions along the way. Continuing in this way, they expanded the platform's functionalities (e.g. regarding reporting, collaborative environment, analytics, enrolment of students in summer schools) step by step. After all, while the systems are often similar on the surface, the technical details (e.g. with regard to the administration back-end) entail complex implications for implementation. Hence, it is important to continuously experiment with small steps in order to make continuous, explorative progress instead of discussing all eventualities in advance.

"Establishing the system creates more ideas, it's an ongoing process, new ideas come up regularly"

Furthermore, at the moment, many of the interviewed alliances report that substantial data exchange is done with the help of manual checks. As a next step, the alliances aim to examine ways to integrate more **automation** into their processes. However, this also depends on the current degree of automation within each university, possibly requiring fundamental steps at university level before expanding the cooperation within the alliance.

### *Semantic interoperability*

Some interviewed experts see a **lack of common understanding** of the objectives and concrete content and services to be implemented in a joint learning platform as a challenge. Often, it takes a long time to discuss what is intended by each party before the actual work plan can be developed. The different native languages represented in each alliance also come into play when agreeing on key terms and objectives. This challenge can be addressed via explicit processes and discussions (see also below).

### *Organisational interoperability*

Most interview partners consider organisational interoperability the most important challenge in this use case.

During the piloting and implementation of a joint platform, it can be difficult **to pool both the relevant expertise and the decision-making authorities** within the alliances to ensure effective governance. For this purpose, the alliances have set up specific **structures**. At the core is usually a development team responsible for the joint platform. One alliance specifically created an “IT board” that includes relevant IT experts of each partner university. As another relevant body, some alliances have set up a Sounding Board encompassing all Work Package leads; they are included for feedback, testing and evaluation loops. For broader decision-making, it is also crucial, according to the interviewed alliances, to reflect ideas and implementation stages with decision-making authorities within the alliance. Across all structures, the experts recommend the participation of all alliance members including all relevant levels (IT and digitisation experts, teaching and content experts, university leadership) in order to **accelerate digitisation as a comprehensive, cross-sectional task**. In particular, staff with both IT expertise and a mandate to make key decisions is highly beneficial to making progress.

In general, the interviewed alliances highlight the importance of effective **expectation management**. After all, stakeholders with various backgrounds and differing expectations regarding a joint virtual campus are involved in the initiative: while the expectations for the content to be integrated may be high among the teaching and executive staff their technical understanding of what is and what is not possible may not be as strong. In turn, IT staff may not be aware of the learning processes and the particularities of the student lifecycle relevant to the deployment of a virtual campus. Hence, this can lead to misunderstandings between the higher education institution’s management level, teaching staff and development teams.

The interviewed alliances also perceive a **lack of qualified (IT) staff and frequent** staff turnover as challenges to effective project implementation. While this is a challenge likely to remain relevant over the coming years, it is important to produce and preserve

all documentation so that knowledge management and information flow between former and new staff can be managed effectively. Some alliances chose to outsource certain project deliverables, though this is often costly. Related to that is the **lack of long-term financial perspective** inherent in the European Universities initiative. Currently, many alliances do not perceive sustainable funding mechanisms for the maintenance of IT infrastructure.

Interviewed experts recommend having in-depth discussions on the joint platform during the application phase for the funding initiative to assess how complex the challenge could be. At this stage, experts with the necessary IT expertise are often not involved as much as would be beneficial to **discuss the fundamental pros and cons of different approaches**. Similarly, having a systematic kick-off phase in which “breaking points” for key decisions that have to be made, is considered crucial. This would help the alliances to get started soon after the commencement of the project. In this context it is important, according to the interviewees, to conduct an initial **comprehensive analysis** of existing platforms and standards in use as well as an analysis of functionalities that are to be featured in the joint platform. Some alliances have surveyed their member institutions in order to identify needs and existing solutions.

### *Legal interoperability*

Questions of legal interoperability are also of importance in the context of a joint learning platform. In particular, **data protection** is a key issue named by several interviewed experts. After all, participating countries differ in their privacy regulations and respective implementation of platforms and tools, rendering the creation of a secure GDPR compliant solution more difficult. Direct and close communication with the data security officers at each involved university can help find a solution. Some alliances have specifically drafted a multilateral data protection agreement in which they have specified all relevant details. Specifically, they have tried to keep the amount of data shared among the partner universities as minimal as possible.

„We have a multilateral data security agreement that is our main legal framework“

“We are trying to keep the amount of data shared among the universities as minimal as possible“

### *Overall governance*

Last but not least, the overall **interoperability governance and landscape in Europe** is perceived by interviewed experts as uncoordinated and lacking leadership. As a result, many higher education institutions are reluctant to make long-term decisions as it is unclear which standards and approaches to the creation of joint learning platforms will remain or become relevant in the future.

### **Prospects on the interoperability with regard to joint learning platforms**

For the **further development of joint learning platforms**, upcoming topics encompass the management of quality assurance as well as automation. A related challenge will be the interconnection of the campus management systems and their close interrelation with the LMS, according to the interviewed experts. With regard to quality management, some alliances plan to install a cross-alliance quality management office. Other alliances plan to create a common IT department within a legal entity that is planned to be established for the alliance. This department is likely to have the necessary capacities to further develop virtual campus solutions.

The interviewed alliances predict that their chosen solutions will be **viable for some years**, but not indefinitely. What will be especially challenging is the integration of more partners and their respective systems. Furthermore, if at some point, a large number of courses are to be integrated into the LMS, substantial capabilities and resources will be required, though some scaling up is possible with the current solutions. In that context, the **sustainability** of funding plays a key role in ensuring that solutions can be further adapted, and infrastructure adequately and continuously maintained. Additionally, legal aspects play a role in the longevity of the approaches. A legal entity which some alliances intend to establish will be helpful as the legal rights to the platform as well as maintenance costs for the infrastructure can be embedded there.

#### 4.4 Joint micro-credentials

##### Key findings



- 33 alliances have launched or plan to launch joint micro-credentials. However, there are various developments related to micro-credentials on the national and European level, resulting in a (currently) rather dynamic and unpredictable environment. Some alliances have piloted micro-credential programmes and largely remain in a trial and testing phase. At the same time, other alliances are at the forefront of experimenting with new approaches, getting involved in key EU initiatives (e.g. EDCI, EBSI). In the following analysis, most interviewed alliances have just started with their joint micro-credential programmes, which is why there is few information on interoperable solutions available. Instead, these alliances have highlighted general challenges with regard to micro-credentials.
- Interoperability for this use case is largely a matter of agreeing on a cross-institutional definition of micro-credentials, and finding technical solutions (standards, infrastructure, verification technologies) suitable for their own alliance.
- Still, legal challenges remain, in particular regarding cross-alliance quality assurance and the coherence of micro-credentials issued by alliance members with respective national qualification frameworks.

Increasingly flexible learning pathways have grown in importance over the last few years, leading to the diversification of course programmes in higher education. In particular **micro-credentials** – smaller, more targeted and flexible qualifications – , are considered an important element to adapt to learners’ needs and modernise education. European initiatives such as the European Skills Agenda, the EU objective to achieve the European Education Area by 2025, the Digital Education Plan, or the 2020 Osnabrück Declaration on VET Policy all highlight micro-credentials as an element to support life-long learning. The same applies to national policy documents such as the coalition agreement of the current German Federal government. As a result, educational institutions are increasingly offering micro-credentials: by rebranding and restructuring

existing programmes or creating new programmes, often through partnerships with other institutions, industries and learning platforms<sup>53</sup>.

Micro-credential development is also proceeding at **the European University alliances**. For example, 22 out of 34 surveyed German higher education institutions participating in European University alliances are planning to use micro-credentials in their alliance, 8 surveyed alliances are already using them (survey conducted in 2022)<sup>54</sup>. According to our own research, **33 alliances** are currently working on micro-credentials, of which 11 alliances are already awarding them.

In general, most of the alliances have lifelong learning at the core of their joint long-term strategies<sup>55</sup>. In the context of promoting internationalisation and student mobility, the use of micro-credentials could entail a low threshold to establish joint courses on an alliance level and improve cross-border academic recognition. However, they do not constitute a standardised education or training offer; rather, they vary substantially in duration and the International Standard Classification of Education (ISCED) level at which they are offered<sup>56</sup>. This affects the recognition and portability as well as joint implementation of micro-credentials. If the vision of the European University initiative of “seamless mobility (physical, virtual or blended)”, with flexible curricula leading to a European Degree is to come true, the automated recognition of examination achievements – including micro-credentials – via **digital certificates** is an important next step.

### The “interoperability landscape” regarding micro-credentials

In Europe, micro-credentials have been gaining momentum in **policy discussions**. Various EU Member States are moving forward with piloting micro-credential programmes and discussing adapting national legislations and quality assurance systems<sup>57</sup>. For example, based on a survey conducted in 2021, 14 out of 34 responding European countries have already implemented policies related to the recognition of micro-credentials, while eight further countries have the topic currently under discussion<sup>58</sup>.

<sup>53</sup> See OECD, 2023: “Micro-credentials for lifelong learning and employability: Uses and possibilities”, *OECD Education Policy Perspectives*, No. 66, OECD Publishing, Paris. <https://www.oecd-ilibrary.org/docserver/9c4b7b68-en.pdf?expires=1679645057&id=id&accname=guest&checksum=E5E38C77A66EDC445186E8950411A14A>.

<sup>54</sup> See DAAD, 2022b: Micro-Credentials in Europäischen Hochschulnetzwerken. [https://static.daad.de/media/daad\\_de/infos-services-fuer-hochschulen/weiterfuehrende-infos-zu-daad-foerderprogrammen/auswertung-micro-credentials-an-eun.pdf](https://static.daad.de/media/daad_de/infos-services-fuer-hochschulen/weiterfuehrende-infos-zu-daad-foerderprogrammen/auswertung-micro-credentials-an-eun.pdf).

<sup>55</sup> See OECD, 2021: “Micro-credential innovations in higher education: Who, What and Why?”, *OECD Education Policy Perspectives*, No. 39, OECD Publishing, Paris. [https://www.oecd-ilibrary.org/education/micro-credential-innovations-in-higher-education\\_f14ef041-en](https://www.oecd-ilibrary.org/education/micro-credential-innovations-in-higher-education_f14ef041-en).

<sup>56</sup> See OECD, 2023: “Micro-credentials for lifelong learning and employability: Uses and possibilities”, *OECD Education Policy Perspectives*, No. 66, OECD Publishing, Paris. <https://www.oecd-ilibrary.org/docserver/9c4b7b68-en.pdf?expires=1679645057&id=id&accname=guest&checksum=E5E38C77A66EDC445186E8950411A14A>.

<sup>57</sup> For instance, a Micro-credentials pilot (2021-2023) was launched in the Netherlands, including 32 higher education institutions. The pilot intends to further develop the micro-credentials concept within the Dutch system, in line with European developments (Versnellingsplan, 2022: Micro-Credentials Pilot. <https://www.versnellingsplan.nl/en/Kennisbank/pilot-microcredentials-2/>).

<sup>58</sup> See Lantero, L., Finocchietti, C. Petrucci, E., 2021: Micro-credentials and Bologna Key Commitments - State of play in the European Higher Education Area, MICROBOL.

Organisations in Europe, for example the European Association of Distance Teaching Universities (EADTU), open universities and larger European MOOC providers have been working on a 'European model' of micro-credentials for well over a decade. As a key development in recent years, the Council of the EU adopted a proposal for a **Council Recommendation on a European Approach to Micro-credentials for Lifelong Learning and Employability**<sup>59</sup> in June 2022, in which a list of measures to support the development of a micro-credential ecosystem are recommended. Furthermore, several related **EU research projects** have been implemented: for example, OEPass, eSLP, MicroHE (which developed guidance on micro-credentials recognition in Europe), or MICROBOL (which analysed how to apply Bologna tools for micro-credentials offered by universities).

In the context of micro-credentials, a **variety of standards, infrastructure and technologies** come into play.

With regard to the **fundamental ontology**, the European Commission is continuously developing the **European Learning Model (ELM)**. The ELM is a metadata model aiming to establish a single semantic vocabulary for learning in Europe. By unifying technical vocabulary, it aims to allow for seamless data interchange across borders. ELM is aligned and interoperable with other models; e.g. it is compatible with ELMO and the European Blockchain Services Infrastructure (EBSI) (see below) and linked to existing frameworks, classifications and policy developments (e.g. with the Council Recommendation on micro-credentials). The model is also built on open standards, in particular the W3C Verifiable Credential data model. Thus, ELM aims to effectively support data exchange and credential recognition, also playing a key role in the context of micro-credentials<sup>60</sup>. In 2023, there will be several highly relevant developments for micro-credential adoption taking place, with the **release of ELM version 3** containing full micro-credential support in mid-2023, followed by the development of an application profile for micro-credentials (verifying micro-credentials against schema) at a later stage. Other relevant frameworks include e.g. the multilingual classification of European Skills, Competences, and Occupations (ESCO), which is intended to provide consistent terminology on skills (also addressed by micro-credentials) in order to be understood and recognised by both educational providers and the labour market.

A key initiative is the **Europass Digital Credentials Infrastructure (EDCI)**. As a technical infrastructure, it is a set of standards, services and software which allows institutions to issue digital, tamper-proof qualifications and other learning credentials within the European Education Area, ensuring the verification of the validity and authenticity of digital credentials. It consists of the following pillars: standards (including European Digital Credentials for learning<sup>61</sup>), services (including an EDCI Issuer and Wallet), and software. The

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<sup>59</sup> See Council of the European Union, 2022b: Council recommends European approach to micro-credentials. <https://www.consilium.europa.eu/en/press/press-releases/2022/06/16/council-recommends-european-approach-to-micro-credentials/>.

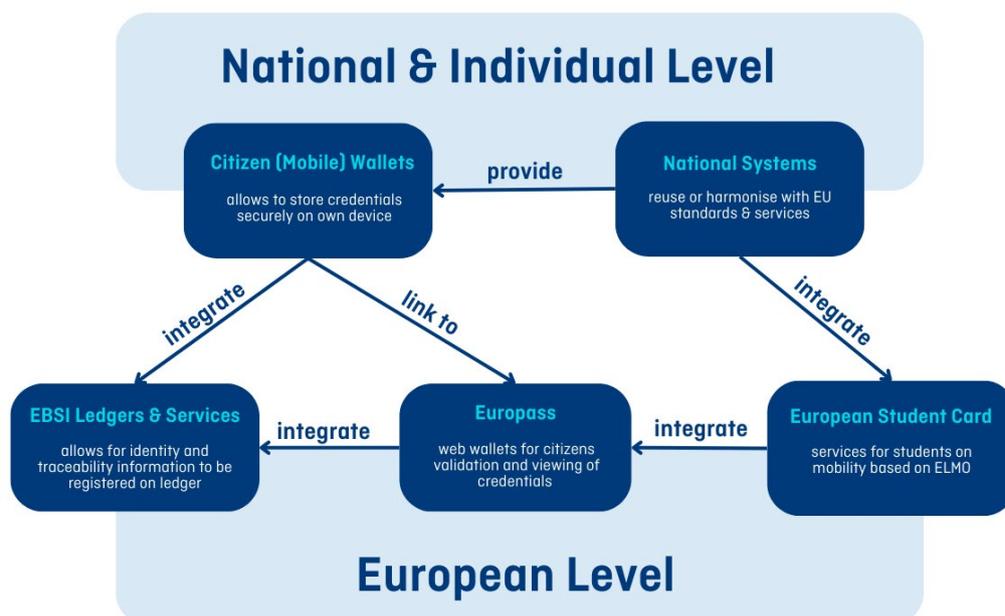
<sup>60</sup> See European Commission, 2023h: Upcoming launch of the European Learning Model v3. <https://europa.eu/europass/en/news/upcoming-launch-european-learning-model-v3>.

<sup>61</sup> The EDC format is an extension of the international standard for "Verifiable Credentials", adding additional fields specific to Digital Credentials in education. The European Commission launched the EDC in 2020 through which micro-credentials can be issued in the EDC format, stored and verified by third parties. See European Commission, 2021a: Interoperability with EDC.

underlying EDCI Data Model is an extension of the W3C Verifiable Credentials Data Model and is also aligned with the ELMO/EMREX Standard, aiming to ensure broad interoperability. For the collection of credentials, **(digital) data wallets** are a necessary tool. Most prominently Europass offers the functionality of a wallet to users, but they are also provided by other (commercial and public) providers.

Generally, there are different verification methods for micro-credentials. A key initiative in that regard is the **European Blockchain Services Infrastructure (EBSI)**, launched in 2018: It explores how different types of information could be certified using a decentralised architecture, using a common standard (the aforementioned European Digital Credentials for learning), wallets as digital interfaces and blockchain as the technology infrastructure. Ultimately, this is meant to give control of the credentials to the student. The basic architecture of EBSI is composed of APIs, Smart Contracts, and the ledger<sup>62</sup>. A first cross-border pilot with two European University alliances was launched in July 2021. Today, EBSI is a ready-to-use infrastructure going into production with a network of 38 nodes in 21 countries and a number of wallet providers testing the product. As an alternative to blockchain verification, public key infrastructure can also be used.

Figure 4: Next steps for a European Micro-credential Ecosystem



Technopolis Group, based on DCU/ECIU MicroNet Webinar – Building the blocks for a European Micro-Credential infrastructure: the next steps for ECIU & Europass. March 8, 2023.

As a result of the mentioned activities, it is planned to integrate these and other efforts (e.g. European Student Card) in the coming years for an emerging learning credentials space (see figure above). Despite these ongoing developments on the European level,

<https://www.consilium.europa.eu/en/press/press-releases/2022/06/16/council-recommends-european-approach-to-micro-credentials/>.

<sup>62</sup> See European Commission, 2023d: Introducing EBSI. <https://ec.europa.eu/digital-building-blocks/wikis/display/EBSI/Home>.

there exist various interoperability challenges regarding the recognition and portability of micro-credentials in European University alliances and beyond.

### **Objectives and implementation of joint micro-credentials in the European University alliances**

Various European University alliances have incorporated lifelong learning and specifically **joint micro-credential offers** into their strategies. The concrete offerings can vary with regard to their respective target group (students or lifelong learners), carrying implications for their respective implementation (in particular anchoring in the credit system and quality assurance procedures for micro-credentials for students pursuing a degree). Open schools, summer schools, competence clusters and new offerings like “colliders” (series of courses specifically designed as micro-credentials) are mentioned as concrete formats by universities<sup>63</sup>. According to a study<sup>64</sup>, micro-credentials are currently frequently offered as extra-curricular activities for which participants can get ECTS credits; a degree based on micro-credentials has not been established yet. The alliances thus **vary in their progress**:

- Concretely, the alliance **ECIU** aims to anchor “new recognition models in more systemic and transformative efforts to develop 21st century life-long learners capable of addressing major societal challenges”<sup>65</sup>. For this purpose, the alliance **developed a “challenge-based approach”**, a framework for challenge-based learning where students team up to solve societal challenges aided by taking suggested or needed smaller learning units (micro modules), e.g. on intercultural skills or subject-oriented upskilling. Achieved learning outcomes are documented through micro-credentials. Specifically, ECIU wants to develop strategically focused micro-credentials in key areas. The alliance plans to develop a Learner’s Wallet which brings together different micro-credentials. The alliance is also involved in EBSI, looking into new educational models where micro-credential programmes are being co-developed between different types of institutions across Europe. The aim is that EDCL-based digital credentials can be exchanged between European universities in a standard way. The alliance has not developed concrete (long-term) solutions yet but is currently actively discussing and exploring several options for implementation. Similarly, the alliance **UNITA** is planning to make use of EBSI for micro-credentials and provide students with digital wallets.
- Other alliances have also launched first joint micro-credential offers, such as the **Aurora alliance** with its programme on “sustainability & climate change”, allowing the “participating universities to share the latest research results with students in

<sup>63</sup> See DAAD, 2022b: Micro-Credentials in Europäischen Hochschulnetzwerken. [https://static.daad.de/media/daad\\_de/infos-services-fuer-hochschulen/weiterfuehrende-infos-zu-daad-foerderprogrammen/auswertung\\_micro-credentials\\_an\\_eun.pdf](https://static.daad.de/media/daad_de/infos-services-fuer-hochschulen/weiterfuehrende-infos-zu-daad-foerderprogrammen/auswertung_micro-credentials_an_eun.pdf).

<sup>64</sup> See Craciun, D., Kaiser, F., Kottmann, A. and Van der Meulen, B., 2023: Research for CULT Committee –The European Universities Initiative, first lessons, main challenges and perspectives, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.

<sup>65</sup> See ECIU, 2020: Towards a European Micro-Credential Initiative. [https://assets-global.website-files.com/562fb917aa38ca2e349b422e/5e8f1274009e48f02b9cd81a\\_ECIU%20University%20Towards%20a%20European%20Microcredentials%20Initiative%202020\\_fina....pdf](https://assets-global.website-files.com/562fb917aa38ca2e349b422e/5e8f1274009e48f02b9cd81a_ECIU%20University%20Towards%20a%20European%20Microcredentials%20Initiative%202020_fina....pdf).

real time through research-led teaching and challenge-based learning”<sup>66</sup>. The alliance **Una Europa**, too, has launched a micro-credential programme in “sustainability”<sup>67</sup>. This programme is considered a pilot for the alliance to extract learnings for the development of further programmes. Moreover, Una Europa is part of the early adopter EBSI programme and thus exploring the use of blockchain. Overall, the alliance aims to develop a suitable framework by the end of 2024, starting with the implementation in 2025.

- In turn, the alliance **4EU+** aims to look into digital initiatives to support the storage and easy-sharing of micro-credentials by the credential-holder (including through secure digital wallets) and to ensure portability and authentication of micro-credentials awarded by the alliance institutions. Until a digital solution is in place, 4EU+ plans to issue paper/PDF certificates and/or make use of other types of portfolios<sup>68</sup>, thus adopting a cautious position.
- Other alliances in the new funding period have just begun their work on micro-credentials. For instance, the **INGENIUM Alliance** has started to develop micro-credentials, embedded in their aim “to renew the study selection of higher education institutions by creating possibilities for more open degrees, where students can modify their curricula”<sup>69</sup>. Beneficial will be the long tradition of open degrees at some of the participating universities.

### Challenges and approaches to reaching interoperability

Various challenges regarding micro-credentials could be identified in different interoperability dimensions.

#### *Technical interoperability*

The **use of (technical) standards and standardised approaches** in the context of micro-credentials is heterogenous across alliances. According to interviewees, many universities often do not want to move away from the standards that are already used at their institution.

On the one hand, technical issues can be identified with regard to the institution’s **IT systems integration perspective**, such as the practical usability of EDCL, how universities should automatically generate those credentials, and how they should be incorporated into the student curriculum data model<sup>70</sup>. Furthermore, interviewed alliances describe that the different learning management and student information systems in place would need to be integrated or connected in order to allow for the effective issuing of

<sup>66</sup> See Aurora, 2023: First Aurora micro-credential “Sustainability & climate change” awarded. <https://au-rosa-universities.eu/first-aurora-micro-credential-sustainability-climate-change-awarded/>.

<sup>67</sup> See Una Europa, 2022: Micro-Credential in Sustainability. <https://www.una-europa.eu/study/micro-credential-sustainability>.

<sup>68</sup> See 4EU+, 2022: Key considerations: 4EU+ Position on Micro-credentials. [https://4euplus.eu/4EU-466-version1-position\\_paper\\_microcredentials.pdf](https://4euplus.eu/4EU-466-version1-position_paper_microcredentials.pdf).

<sup>69</sup> See XAMK, 2022: XAMK participates in developing a new European University. <https://www.xamk.fi/en/bulletins/xamk-participates-in-developing-a-new-european-university/>.

<sup>70</sup> See position paper on behalf of the FOREU2 subgroup on Digital Services and Data Sharing, 2022: Towards an integrated European Higher Education Area digital space.

micro-credentials. In one alliance, they are currently building a central system in which all relevant information (except for grades) will be in one place.

On the other hand, **digital open badges** defined internally within a group of universities can already be used to validate accomplishments (though not tied to ECTS). Though simpler to implement, such small-scale solutions may only pilot the validation of micro-credentials but do not constitute a long-term solution, according to the alliances<sup>71</sup>. Instead, **EDCI can be used to create and issue (joint) digital credentials**. The advantage is that EDCI is implemented by the European Commission and free for universities to use.

However, according to an interviewed expert, only a minority of the alliances (up to 8) have so far voiced interest in using EDCI. Among the interviewed alliances, one decided to make use of EDCI for their joint micro-credentials.



„We decided to use EDCI and a qualified e-seal, it builds trust within the alliance“

However, some interviewed alliances state that EDCI is not easy to use (e.g. technical issues, a complicated interface, and the need to acquire a qualified e-seal) and implementation requires substantial resources at the universities. Alternatively, universities can rely on **commercial or public solutions in their home countries** that can be easier to use. In the Netherlands, for example, a central edubadges platform<sup>72</sup> was set up. While EDCI is generally on the right track to interoperable solutions, an increasingly accessible, user-friendly solution on the European level would be beneficial.

A foundation for internationally accepted credits is secure access to digital proofs of competences and trust in the institutions issuing them. The **verification of credentials** can be divided into two subtypes: validating the issued credentials and, verifying credentials issued by other institutions. Universities might use platform websites or IT integration for verification and validation<sup>73</sup>. Currently, **different technologies are being experimented with**. For example, **blockchain technology** can be used for various purposes in the education sector, including the issuing of certificates, verification of accreditation pathways or digital identities. Blockchain approaches, as currently piloted in EBSI, are expected to take more time to mature, though, according to interviewed experts, and are thus not readily available. While the piloting of these technologies will entail valuable learnings, it is highly important to ensure alignment at different (university, national, European) levels in the process. As a current alternative, **public key infrastructure (PKI)** can be used for verification.

<sup>71</sup> See position paper on behalf of FOREU2 subgroup on Digital Services and Data Sharing, 2022: Towards an integrated European Higher Education Area digital space.

<sup>72</sup> See SURF, 2020: edubadges: issuing digital certificates to students. <https://www.surf.nl/en/about-edubadges>

<sup>73</sup> See Kiiskilä, P., Hanafy, A., Pirkkalainen, H., 2022: Features of Micro-credential Platforms in Higher Education. In: Proceedings of the 14th International Conference on Computer Supported Education (CSEDU 2022) – Volume 1, pages 81-91.

“We want a qualified e-seal as a consortium, but are still trying to figure out whether it’s easier for single institutions”

Overall, in order to ensure sustainability and interoperability, the use of suitable **open technical platforms and systems based on open standards and data models** is considered essential by the interviewed alliances. The compliance with ELM in particular, whether in public or private products, should be ensured. Currently, some interviewed alliances observe that higher education institutions prefer to wait for **directive decisions on the national level**, e.g. whether it will be the expectation that EBSI or other technologies are to be used. Central to all future endeavours, according to interviewees, should be to ensure open, easy-to-adapt solutions for higher education institutions and maximum flexibility for the learner.

### *Semantic interoperability*

A clear and unequivocal definition of micro-credentials is essential for informed discussion, and for adopting standards-based practices. However, there exists a **lack of consensus on how micro-credentials should be understood and defined**, and how the concept integrates with existing offerings of small-scale, targeted, certified learning programmes and other existing qualifications. This limits the portability of micro-credentials beyond individual universities, collaborative networks, and national systems, as well as the set-up of joint micro-credential programmes.

As described above, the Council of the EU released the following definition:<sup>74</sup>

- *“‘Micro-credential’ means the record of the learning outcomes that a learner has acquired following a small volume of learning. These learning outcomes have been assessed against transparent and clearly defined standards. Courses leading to micro-credentials are designed to provide the learner with specific knowledge, skills and competences that respond to societal, personal, cultural or labour market needs. Micro-credentials are owned by the learner, can be shared and are portable. They may be standalone or combined into larger credentials. They are underpinned by quality assurance following agreed standards in the relevant sector or area of activity.”*
- *“[...] Member States are recommended to adopt and promote the use of [...] the European standard elements to describe a ‘micro-credential’ [e.g. name of the holder, the achieved learning outcomes, the assessment method etc.]”*

The interviewed alliances consider the definition to be **important for increased interoperability** in (international) cooperation. The openness of the definition (e.g. undefined number of credits) is partially perceived as a benefit so that universities can develop their own approaches. For example, the alliance Una Europa advocates for the definition

<sup>74</sup> See Una Europa, 2021: Our view on micro-credentials. [https://una-europa.imgix.net/stories/Input-paper-micro-credentials-consultation\\_final.pdf](https://una-europa.imgix.net/stories/Input-paper-micro-credentials-consultation_final.pdf)

of learners to remain as open as possible to “ensure a truly inclusive and open approach”<sup>75</sup>. The inclusion of standard elements to include in the description of micro-credentials is also considered highly relevant by the interviewed experts as it can support consistent understanding and easier recognition.

Other alliances, however, do not consider the openness of the definition to be useful because it is **still up to universities, alliances and Member States to define micro-credentials** in more detail. In some EU Member States, discussions are ongoing on how to define micro-credentials in the national context following the Council recommendations and what this means for implementation (e.g. led by a high-level working group in Finland, as well as by a European Digital Education Hub squad). As a result, universities are hesitant in moving forward before national systems provide clarity. The parallel national discussions and the openness of the definition also imply that alliances still need to agree on a definition for their own networks; usually, this constitutes an intensively discussed topic within alliances.

Other than relying on the Council’s definition, some interviewed alliances also want to increasingly align their approach with other related European frameworks, such as ESCO to describe the acquired skills in standardised ways.

### *Organisational interoperability*

Issues with regard to organisational interoperability are relevant to the coordination of the alliances in general, but in the context of micro-credentials less relevant than other interoperability dimensions, according to the interviewees.

Common to all interviewed alliances is a **“step by step” approach**: interviewed experts approach the topic step by step, developing pilots in their alliances. Along the way, they encounter difficulties regarding technical and other details that may entail complex implications for implementation. For this purpose, the interviewed alliances have set up specific processes and structures (e.g. overarching innovation committees or cross-alliance teams on quality assurance in joint educational offerings, educational technologies etc.) and selectively consult external experts as needed.



„We are now offering micro-credentials as a pilot, the goal is to learn from that”

*Legal interoperability*

In the context of micro-credentials, **challenges in legal interoperability** play a major role. Advances in educational recognition, in particular within **national qualification frameworks**, provide a basis for interoperability: national systems would have to explicitly recognise forms of micro-credentials as qualifications. By doing so, they would achieve the recognition status of qualifications, being recognised by default within the jurisdiction. However, while in the EHEA, academic recognition is regulated by the Lisbon Recognition Convention, there are different national accreditation regulations (e.g. regarding the grading scheme, definition of ECTS etc.), which poses a challenge for the European University alliances<sup>76</sup>. At the same time, relevant developments with regard to **Higher Education strategies on the national level** are ongoing in many EU Member States; for instance, a newly released Higher Education strategy in Finland highlights the importance of the link between universities and the labour market, affecting how micro-credential offers are developed and implemented by Finnish universities.

According to interviewees, the **Council Recommendations on micro-credentials would need to be integrated into national legislation** as soon as possible to facilitate recognition. This could also support an integrated digital approach to micro-credentials. Some alliances argue that the European Qualification Framework for Lifelong Learning be used as a reference instrument, together with the QF-EHEA (Qualifications of the European Higher Education Area – Bologna)<sup>77</sup>. Furthermore, more general flexibility in study curricula on the national level could also be beneficial.

All in all, it is difficult for the alliances to make (long-term) decisions due to uncertainties within their national frameworks, which is why many **universities tend to hesitate in moving forward**, according to interviewees.

**Quality assurance** is also a key issue with regard to micro-credentials in general<sup>78</sup>. After all, the absence of a common definition (see above) results in the fact that micro-credentials may not be trusted due to the general lack of transparency around standards and comprehensive criteria to assess their quality. Robust quality assurance can establish a foundation of trust among higher education institutions and thus support the academic recognition of micro-credentials. Once this trust is complemented by the alignment of micro-credentials with national frameworks and their incorporation into registers and credit policies, micro-credentials can achieve recognition and portability comparable to that of conventional academic degrees<sup>79</sup>.

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<sup>76</sup> See Craciun, D., Kaiser, F., Kottmann, A., Van der Meulen, B., 2023: Research for CULT Committee –The European Universities Initiative, first lessons, main challenges and perspectives, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.

<sup>77</sup> See Una Europa, 2021: Our view on micro-credentials. [https://una-europa.imgix.net/stories/Input-paper-micro-credentials-consultation\\_final.pdf](https://una-europa.imgix.net/stories/Input-paper-micro-credentials-consultation_final.pdf).

<sup>78</sup> See Hudak, R., Camilleri, A. F., 2018: The Micro-credential Users' Guide. MicroHE. [https://microcredentials.eu/wp-content/uploads/sites/20/2021/05/D3\\_3\\_MicroHE-Users-Guide-1.pdf](https://microcredentials.eu/wp-content/uploads/sites/20/2021/05/D3_3_MicroHE-Users-Guide-1.pdf).

<sup>79</sup> See OECD, 2023: "Micro-credentials for lifelong learning and employability: Uses and possibilities", *OECD Education Policy Perspectives*, No. 66, OECD Publishing, Paris. <https://www.oecd-ilibrary.org/docserver/9c4b7b68-en.pdf?expires=1679645057&id=id&accname=guest&checksum=E5E38C77A66EDC445186E8950411A14A>.

The respective approach to quality assurance depends on the national education and training systems. In Europe, over 50 surveyed quality assurance agencies in 2022 reported that the largest challenges to the external quality assurance of micro-credentials were “lack of supporting national legislation”, and the “the lack of clear definitions/descriptors to allow for micro-credential quality assurance requirements to be relevantly captured”<sup>80</sup>.

Currently, some alliances tend to rely on the **institutional-level approach**, i.e. the quality assurance of micro-credentials is implemented by the programme’s respective providers / lead universities. Related projects such as MICROBOL also suggest that the quality might be assessed based on the providers’ ability to ensure and monitor the quality of their programmes<sup>81</sup>. Other alliances are currently developing quality assurance processes aiming to implement a single quality assurance policy. Thus, the development of quality criteria is a crucial step to be taken for joint micro-credentials. In order to simplify existing quality assurance requirements for European Universities, a **European Framework for the Comprehensive Quality Assurance of European Universities** is being currently developed. The Framework aims to contribute to the enhancement of the internal quality assurance of the alliance and to support the fulfilment of national quality requirements. With this one framework and the corresponding quality assurance procedure, the alliances can be externally evaluated instead of being subject to multiple (national) frameworks<sup>82</sup>.

Last but not least, **data protection** is also a challenge raised by interviewed alliances. After all, students need to agree to the use of their data (including metadata e.g. on acquired skills) for digital credentials that can be shared with university partners. In practice, this proves to be a challenge as permission needs to be explicitly obtained. One alliance explored directly asking students for permission; out of over 100 students, only 15 students granted permission. This could be solved, according to the interviewed alliances, by establishing central national mechanisms for learners to give permission for their data to be used across institutions when registering at the university.

### *Overall governance*

According to interviewees, there is the **need of a clear governance system on the European level in alignment with the national level** to trust the micro-credentials, including the types of credentials as well as mechanisms to verify their authenticity. While there are several initiatives underway, unclear or unfitting framework conditions on the national level as well as uncertainties regarding future European and national solutions hinder progress at university level.

<sup>80</sup> See Huertas, E. García, E., 2022: Mapping External QA Practices for MC across the EHEA: Results of ENQA Survey, European Association for Quality Assurance in Higher Education (ENQA), Brussels. [https://www.enqa.eu/wp-content/uploads/2.-Survey-results\\_ENQA\\_MC\\_20220922\\_Final.pdf](https://www.enqa.eu/wp-content/uploads/2.-Survey-results_ENQA_MC_20220922_Final.pdf).

<sup>81</sup> See MICROBOL, 2022, *Micro-credentials linked to the Bologna Key Commitments*, MICROBOL, [https://microbol.knowledgeinnovation.eu/wp-content/uploads/sites/20/2022/03/Micro-credentials\\_Framework\\_final-1.pdf](https://microbol.knowledgeinnovation.eu/wp-content/uploads/sites/20/2022/03/Micro-credentials_Framework_final-1.pdf).

<sup>82</sup> See EUniQ Project, 2021: European Framework for the Comprehensive Quality Assurance of European Universities. <https://www.nvao.net/nl/attachments/view/european%20framework%20for%20the%20comprehensive%20quality%20assurance%20of%20european%20universities>.

Some experts call for a **coordinated, comprehensive approach** to address the four main groups of stakeholders of micro-credentials: the learners, the higher education institutions, the providers and the employers. For example, a key step in such an approach could be to install a system with standardised metadata on micro-credentials that all stakeholders could access and use<sup>83</sup>.

### Prospects on the interoperability with regard to joint micro-credentials

All in all, the European University alliances can prove to be **key drivers** to ensure alignment, exchangeability, and transferability of credentials: There is already growing mutual trust in each other's quality assurance and assessment processes, which facilitates and supports portability and recognition of micro-credentials. In parallel, technical solutions are currently being developed. Still, challenges to interoperability remain, in particular regarding the legal (national qualification frameworks, quality assurance policies, data protection), semantic (cross-alliance definition of micro-credentials) and technical dimension (e.g. technical standards, usability of existing solutions on the European or national level). The alliances are piloting micro-credential programmes, but a level of uncertainty and hesitancy remains for the universities.

**Coherence in the framework conditions** is considered extremely important in order to move forward with joint micro-credentials. This includes, according to interviewees, the linking of micro-credentials with Bologna commitments, accreditation and recognition and the inclusion in the European Qualification Framework. European cooperation and coordination are thus considered essential to bringing the micro-credentials movement further. There are already highly relevant consolidation efforts on the European level underway, paving the way for substantial progress. According to an interviewed expert, for example, ELM is increasingly becoming a key standard in Europe, with many Member States referring (or considering to refer to) ELM on the national level. Within a decade, the expert expects this to be the dominant standard to describe information about learning opportunities. Still, details are yet to be conclusively determined and clarified as well as implementation to be facilitated.

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<sup>83</sup> See NUFFIC, 2022: The Rise and Recognition of Micro-credentials. <https://www.nuffic.nl/sites/default/files/2022-03/The%20rise%20and%20recognition%20of%20micro-credentials.pdf>.

## 5 Key findings: Overarching challenges and good practices

After having reviewed specific use cases of cooperation and the interoperability challenges related to them (Chapter 4), the subsequent chapter shows overarching patterns and cross-cutting observations in the interoperability dimensions guiding our analysis. We also summarise the strategies and good practices of the interviewed alliances to overcome the challenges.

### 5.1 Technical interoperability

Universities – both within the European University alliances and beyond – are moving towards digitising their educational offerings and their administrative processes. This also means the increased use of various digital technologies in university administrations. Thus, it is no surprise that technical interoperability is a topic to be addressed in university cooperation activities.

In fact, technical aspects are often in focus in debates about interoperability. This results in other important interoperability dimensions (covered in other parts of this study) to be somewhat neglected<sup>84</sup>.

#### *Challenges in achieving technical interoperability*

In all of the use cases analysed for this study – as different as they are – we have found that the following overarching technical aspects are relevant **barriers** for reaching seamless cooperation.

- **Heterogeneity in existing and emerging technical systems:** An important aspect are the different pathways of the past which have led to a fuzzy technical landscape. Some of these pathways are specific to European countries and their higher education systems (e.g. eduxchange developed as part of the Dutch Acceleration Plan for Educational Innovation with ICT; PIM in Germany related to the National Education Platform/Nationale Bildungsplattform), some are even specific to individual universities. Even worse: there is some evidence that a lack of coordination around current technical developments does not lower, but in fact raises the diversity of the technical landscape. Examples are parallel activities in the standard development for describing course material (OOAPI vs Edu-API) or Member State initiatives which are not (sufficiently) aligned with other national or international developments. This creates technical silos which are detrimental to interoperability.

<sup>84</sup> See, for example, the assessment the output paper by the EDEH Educational Interoperability Squad in European Commission, 2023a: A Vision for Educational Interoperability Output of the EDEH Educational Interoperability Squad, p. 19: “In terms of policy focus, legal and organisational interoperability are often ignored or deprioritised [against] semantic and technical interoperability”.

“We [the higher education sector] seemingly have too much money, we set up separate technological systems, just because we have the money”

„[I am] fearful that there will be various standards that are not converging”

To be fair: many stakeholders are clearly aware of the importance of coordination needs. Interfaces between initiatives like ELM, ELMO, EWP and EMREX are a clear indication of this. Similarly, experts involved in the development of OOAPI actively contribute to developments in Edu-API. This fundamental attitude of openness to cooperation instead of “competing” with other initiatives – coupled with governance instruments facilitating this openness (see our conclusions of the governance dimension of interoperability) – is surely the only way forward on the road to interoperability.

- **Commercial interests running against technical interoperability.** In many cases, universities do not develop the technical systems needed for their internal processes themselves. Even though in different European Member States traditions regarding the decision of “making or buying” a new IT tool differ<sup>85</sup>, universities in general often rely on external software providers, for example for their Learning Management Systems, Campus Management Systems or Student Information Systems. Our analysis has shown that the commercial interests of software providers are at times an inherent barrier to interoperability. As is the case in other industries, campus software providers tend to have an incentive to strategically de-standardise their products. This allows them to create lock-ins, meaning that the clients (the universities) are restricted to continue working with the specific IT tool. Many stakeholders from universities report that they have been in touch with their software providers in order to open up the system to other solutions (e.g. software used in the partner institutions of the European Universities alliance). The reaction to these requests from software providers, however, is usually slow – or even non-existent. This is a barrier towards reaching higher technical interoperability.
- **Short-term cost considerations distorting the investment decision against adaptable open source software.** The use of open-source software (OSS) as opposed to commercial, proprietary (closed) software usually gives universities a much higher degree of freedom to modify an IT system<sup>86</sup>. Whenever there are suitable

<sup>85</sup> In some interviews it was pointed out that in various Eastern European countries, universities tend to develop software to larger extent in-house rather than outsourcing this task. Reason for this include relative labour costs for IT experts, according to our interviewees.

<sup>86</sup> As one interview partner for this study put it: “The advantage of open source systems is that operational expertise is available at universities”.

open-source products on the market, it seems important to make use of OSS.<sup>87</sup> However, in the short term there is often a trade-off between opting for OSS and proprietary “closed” software: OSS tends to require substantial initial investment to be tailored to the specific institutional needs of a university. In the short term, OSS is at times more expensive than an off-the-shelf commercial product. In the long term, OSS provides more options and flexibility to reach interoperability with other systems (for example with an IT system from a partner university in an alliance), especially with other open-source systems. Commercial software, on the other hand, is at times more cost-efficient to implement in the short term but has more restrictions in adapting the software to reach interoperability with other tools. Given budgetary restrictions and because of challenges regarding the lack of in-house IT staff, universities tend to be tempted to opt for the seemingly less expensive proprietary solution.

The examples above show that it is often impossible to separate the purely technical barriers to interoperability – which could be solved by skilled IT staff alone – from obstacles that need to be tackled by non-technical experts, but through coordination mechanisms that are directed at the higher education community. Put differently: there are concrete “good” reasons for an individual university to opt for a specific technical approach. These decisions are influenced by the framework conditions in which the universities operate. However, interoperability in international contexts to other universities is in this case not necessarily a top priority for universities. This, in turn, means that systemic governance mechanisms (for example coordinated standardisation processes which lead to technical harmonisation) need to be in place. Without them, an interoperable technical landscape cannot evolve. These governance mechanisms are addressed later on in this study.

#### *How European University alliances address technical interoperability*

For the short term, the study team identified several good practices which facilitate the development of interoperable technical systems.

- **Always be open-minded and avoid the “not-invented-here syndrome”.** Experts working on a specific solution tend to favour self-developed approaches against solutions developed elsewhere, even when these “outside” solutions have large benefits. There are often good reasons for this notion, for example, when the approach is tailored to the individual needs of the institution. However, it is also hugely important to keep an open mind to other, alternative technical approaches from peers in the higher education community – even when it might take an effort to switch from one

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<sup>87</sup> See also the Berlin Declaration on Digital Society and Value-Based Digital Government (Council of the European Union, 2020a: Berlin Declaration on Digital Society and Value-Based Digital Government. <https://digital-strategy.ec.europa.eu/en/news/berlin-declaration-digital-society-and-value-based-digital-govern-ment>) which points out the importance of open source software to strengthen Europe’s digital sovereignty and promote interoperability in Europe. See also the approach for the development of XHochschule which stresses the importance of using non-proprietary and free technology such as the W3C Technology Stacks (XHochschule, 2023: Vorgehen. <https://xhochschule.de/web/node/2>).

established, well-known solution to a new system. Without a healthy degree of open-mindedness, technical silos prevail.

In some cases, there are available solutions on the European level that can be used by alliances and individual universities. For example, with the European Digital Credentials Infrastructure (EDCI), there are in principle standards, software, and services that ensure interoperability in the context of micro-credentials.<sup>88</sup> For example, the alliance **ECIU** makes use of EDCI instead of national solutions.

- **Take it step by step and build pilots to later scale up.** The alliances we interviewed for this study pointed out that the most promising approach to achieve technical interoperability in a specific setting is to “take it step by step”. In the use cases for this study, the European University alliances first focused on developing the technical approach for a joint course display. Only when this system was up and running was the next step (a joint enrolment process) taken. Similarly, various European Universities are currently piloting joint micro-credential programmes and are collecting experiences in a trial and testing phase. Reaching technical interoperability is a complicated issue and it is important to reach one “small” milestone after another. As stakeholders pointed out: it is important to be pragmatic.

The alliance **YUFE** has opted for agile project management to work on the alliance’s joint virtual campus. This includes quick deliveries and short throughput time in so-called “sprints” to produce results while experimenting and learning from the pilots developed.

- **Respect individual partners’ autonomy, create hubs and do not over-engineer new centralised systems:** the dominant design strategy to achieve technical interoperability in cooperation of European Universities alliances seems to be to create “hubs” or “middlewares”. These are set-ups which bring together individual systems of the partner organisations, as opposed to a strategy that creates a centralised, new system, set up from scratch. While the latter strategy has its benefits, in the context of the European Universities it was important to respect the autonomy (and the existing technical set-up) of the individual institutions and not to overstrain the investments needed for reaching interoperability. The decision to select an approach towards a federated system with as little harmonisation as possible conforms to a

<sup>88</sup> See European Commission, 2020b: Europass Digital Credentials Infrastructure (EDCI). [https://ec.europa.eu/futurium/en/system/files/ged/edci\\_presentation.pdf](https://ec.europa.eu/futurium/en/system/files/ged/edci_presentation.pdf).

crucial requirement: that individual universities need to be able to smoothly operate within their individual national framework conditions. These are without doubt crucial for universities under the current higher education governance framework (e.g. because they are related to legal requirements). Any approach that ignores this fact will ultimately fail.

The alliance **EPICUR** has created a Virtual Campus Learning Platform (VCLP) as part of the EPICUR Inter-University Campus. It is hosted by Karlsruhe Institute of Technology (KIT) and made available to all partner universities. It is based on the open source software ILIAS. This general approach has also been used in the German state of Baden-Wuerttemberg in other higher education contexts (CampusConnect), in which an interface for connecting LMS was created through middleware (E-Learning Community Server). The KIT opted to host the VCLP in a similar fashion, facilitating the connection of the individual systems of the EPICUR members.

## 5.2 Semantic interoperability

In computer and information science, semantic interoperability is often defined as the ability of computer systems to exchange data with unambiguous meaning<sup>89</sup>. Semantic interoperability makes sure that data exchange or data federation between different agents leads to meaningful results. In short, it ensures that “what is sent is what is understood”.

In this study we take a **broad perspective on semantic interoperability**, not only in a computer science sense, but also by simply looking at the problem of European Universities alliance partners having a different understanding of specific terms. As trivial as it might seem, in international cooperation activities, it is not a given that “what is sent is what is understood”. In many of our interviews with representatives of alliances this was a frequent theme.

Reaching semantic interoperability in (higher) education has of course long been on the agenda of higher education policy – even if it was not discussed under this label.

- Through the European Qualification Framework, EU member states defined an instrument to make national qualification systems comparable. In this sense, the EQF

<sup>89</sup> See for example the definitions in the National Interoperability Framework Observatory (European Commission, 2023e: NIFO - National Interoperability Framework Observatory. <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory>). For the context of this study, we concentrate on semantic interoperability in a narrow sense, leaving aside syntactic interoperability (i.e. using the same technical description, the same coding rules).

serves as a translation tool to, for example, make sure that what the German qualification of a *Meister* or *Fachwirt* actually means is understood beyond Germany.

- Similarly, the harmonisation of the study systems in Europe through the Bologna process aimed to make sure that German qualification levels attested by a *Diplom* or *Staatsexamen* were recognised outside Germany (in this case often by replacing a *Diplom* by the Bachelor/Master system).
- Also, the European Credit Transfer System helps to create interoperability by creating a common framework to describe the workload associated with elements of a study programme.

These prominent examples show that ensuring semantic interoperability is a well-known challenge in the European higher education system.

The research in the context of the use cases in this study has shown that creating **semantic interoperability is key in cooperative contexts like the European University alliances**. Ensuring that what is sent is what is understood is not only needed on the higher political level such as in the Bologna process, but also for the nitty-gritty details that matter when setting up a joint course display or working on a joint understanding of micro-credentials.

As such, it is of course key for all parties involved in a European University alliance – as in every other cooperative setting – to come to agreements both regarding content-related and process-related aspects. Essentially, all members have to share a **common understanding of key terms** to be able to work towards the same objective.

### *Challenges in achieving semantic interoperability*

The challenges connected with this have various roots:

- Firstly, there is the **language barrier**. European University alliance members are in different countries with different national languages. Without doubt, staff involved in the set-up of the European University initiative are usually experts with significant international and intercultural experience and excellent English language skills. Still, it is not uncommon that the different language and cultural backgrounds result in misunderstandings.
- Secondly, differences in understanding may exist at each institution with regard to **specific terms or concepts**, including the definition of a “course” or the meaning and legal implication of “enrolment” in a course. A frequently mentioned example is the term “semester period” which in Germany usually runs from October to March as well as April to September. In Sweden, on the other hand, the “fall semester” begins in mid or late August and ends in mid-January, while the spring semester begins in mid-January and ends in early June. Clearly, by talking about the “start of semester period” it is not necessarily “understood what was sent”.

- Thirdly, it is not uncommon for there to be **different underlying visions and ideas**, for example on a “virtual campus” or “joint enrolment” that were formulated in an application for a European Universities alliance and which now have to be put into practice in a commonly accepted way.

#### Examples for a lack of semantic interoperability in the context of the use cases in this study

- Joint course display: What can be regarded as a “course”? Is a summer school a “course” or only a traditional educational offer?
- Joint enrolment: What does enrolment mean and imply (semester fees, social security aspects etc.)?
- Joint learning platforms: What is understood as a “platform”?
- Micro-credentials: What exactly is understood by micro-credential? Is a “micro-degree” (for example as used in the German discourse) the same? What is a skill (to be recognised in context of a micro-credential)?

The following quotes show the importance of semantic interoperability.

“Being clear on semantics is very important. Once you reach a common understanding, it doesn’t really matter what technical standard you use”

“What is very important is that we finally come to clear definitions”

“We really needed to spell out processes and understand each other’s definition of data”

### *How European University alliances address semantic interoperability*

The following approaches were mentioned by the alliances or were derived by the study team on the basis of our analysis.

- **Create regular fora for information exchange.** Virtual or in-person meetings do take time, but in the end extensive communication lowers the risk of misunderstandings (i.e. semantic in-operability). Recurring meetings, in-person workshops and constant communication are essential components, without which semantic interoperability is not possible.

“The better known the objectives and content are known and understood among the relevant stakeholders, the easier it was to discuss and make progress”

- **Being alert to and aware of the problem** that the cooperation partner does not always share your understanding – as clear as it might seem to you. If misunderstandings arise, you will sooner or later learn it “the hard way” – for example when you aim to set up a joint course display and realise only later in the process that partners have different understandings of what course elements should be included in the system. Frequently challenging one’s own understanding is therefore helpful to identify problems as soon as possible.
- It can also help to **create explicit ontologies or glossary documents** of key concepts of the cooperation. These can be designed as living documents in which definitions of specific concepts are made explicit. This way all cooperation partners have the opportunity to work to an explicit definition of topics as “simple” as a “study course”. Implicit, underlying understandings of individual members of an alliance might not be shared across the alliance members. A glossary or ontology is therefore a simple tool to create a “reference document” for all partners involved.

### **5.3 Organisational interoperability**

From an organisational point of view, the European University alliances are coalitions of individual entities which cooperate to jointly reach common goals and visions. The member universities remain individual organisations. By no means can a European University alliance in its current state be seen as one monolithic organisation. This remains true even though some of the alliances have established their own legal entities for their alliances by mid-2023<sup>90</sup>. Still, the individual organisations of the alliances each bring along their **own traditions, established processes, and individual needs**. Large member universities may also cooperate with partners in other national or international settings and

<sup>90</sup> See for example the alliance UNA Europa which has established an organisation under Belgian law (vzw), the alliance ECIU which has set up an entity in the Netherlands (foundation under Dutch law) and 4EU+ which have created its legal non-profit entity under German law.

have to take into account the organisational needs of these. For example, the Ruhr University Bochum is not only part of the European alliance UNIC, but also cooperates closely with Technical University Dortmund and University Duisburg-Essen within the University Alliance Ruhr.

### *Challenges in achieving organisational interoperability*

It is not surprising that bringing those institutions together, some of which with centuries-old traditions, is challenging. Well-known generic barriers to inter-organisational cooperation all apply to the context of the European University alliances: these include the trend of large organisations to stick to their well-rehearsed and (sometimes) well-functioning processes, the need to build up trust before real cooperation can unfold, or the coordination costs of bringing together different entities.

The traditional importance of autonomy for universities – rooted in values such as the independence of research, science, and teaching – makes it even more difficult for cooperation activities between universities to succeed.

Various quotes from our interviews with alliance representatives underline this perspective.

“Each of our institutions is an independent university, we are used to our autonomy: if we try to build common processes, someone will be in pain”

“Our cooperation is not complicated from a technical, but rather from an organisational point of view”

During the course of this study, organisational interoperability has evolved as the most important interoperability dimension of all. The **thorough understanding of the processes** within each involved university, the harmonisation of these processes and the ability to manage the needs and peculiarities of the individual universities to bring together an alliance that is “more than the sum of its components” is hugely complex.

### *How European University alliances address organisational interoperability*

The key question is how to set up **processes or organisational settings that can enable organisational interoperability**.

Without doubt, it is one of the most important prerequisites of success for a European University alliance, that all presidents or rectors of the partner institutions fully back the path to cooperation that was once defined in the application to become a truly cooperative European University alliance. In many instances, this will be the case considering

the prestigious context of the European University initiative. However, as years go by, institutional priorities, persons in leadership positions and political framework conditions change. Nevertheless, the **backing of institutional leaders** is surely one of the most important prerequisites for universities to be able to reach organisational interoperability.

On a more practical level, the following take-aways can be defined as good practice to reach organisational interoperability. These structures are common in the current European University alliances we talked to.

- **Mandating and supporting a dedicated project manager** with strong communication and people skills combined with a sufficient understanding of the technical challenges. Usually this would be work package leader, interacting both on the strategic and the operational level. As one interview partner put it: “Having the right person with the right mandate in the right place is key”.
- Equipping the project manager with a **core team of (technical) experts** to be able to solve the technical challenges arising in the cooperation. In this context, some interview partners said that, in their opinion, a focus of the experts needs to be ensured: “1–2 persons working on the technical implementation and interoperability 90–100% of their time is better than 10 persons working 10% of their time”.

The alliance **CIVICA** used to allocate their work on technical features between their members. However, the experience of working on interoperability underlined the need for a focused core team of technical experts to make progress in a timely manner. Thus, they have established a dedicated team of technical experts with sufficient capacities to focus on the implementation of certain features.

- Under coordination of the project manager, bringing together a **wider team of experts** with domain knowledge in university administration, teaching and learning, and internationalisation as sparring partners. The perspective of students should be considered as well (e.g. for the usability of a joint learning platform). In addition, the interdisciplinary task force should also be complemented by work groups which focus on specific aspects. Some interviewees mentioned the need to put a focus on also internationalising those departments which are – different to the International Offices – not “international” by default or by “tradition” (e.g. the financial department or the legal department).
- **Creating a strategic sounding board** where senior leaders from the involved institutions are regularly briefed by the responsible project manager and can provide (high-level) input. It should be clearly defined that the project manager has sufficient leeway to take decisions within their mandate. It is important for the project manager

to be free to operate so as to be able to move things forward. One interview partner told us, “Currently, institutions are too hesitant to make decisions”.

The alliance **YUFE** created a Sounding Board in which all leaders of the work packages, the strategy level of each member university (e.g. CIO) and other key members come together (including the product owner responsible for the joint virtual campus). These representatives are included for testing and evaluation loops, reflecting ideas as well as making key decisions concerning the set-up of the virtual campus.

- According to our interview partners – and in line with experience from other contexts such as agile project management – it is usually beneficial to strategically **focus the work on interoperability challenges** on topics where a clear added value for key university stakeholders (students, teaching staff, administrative staff) can quickly be achieved. If users can try out the interoperable solution and see a clear benefit for themselves, the process gains both momentum and buy-in from more actors.
- At the same time, adequate **expectation management** is also of high importance, i.e. communicating feasible options and navigating different interests. In general, building up fully interoperable processes in alliances of universities can take significant time. An example is the design of a joint course display which has taken some of the interviewed alliances around two years.

#### 5.4 Legal interoperability

European University alliances operate within the **legal frameworks established at the European, national, and regional level**. Although the national level (or in the case of Germany, for example, the state level) is an important reference point for universities in Europe, they have to comply simultaneously with different regulations. Even when there is European harmonisation, differences in the implementation of regulations on the national and regional level may hamper cooperation. Consequently, the execution of joint projects is exacerbated by the necessity to follow a diversity of legal requirements.

##### *Challenges in achieving legal interoperability*

In practice, the severeness of legal interoperability challenges differs for the alliances depending on the specific context or task. A recurring topic is **data protection issues** and here specifically the differences in dealing with privacy and data sharing regulations on the country level. While the EU General Data Protection Regulation (GDPR) applies to all Member States, national data protection laws can be stricter. Even worse: in order to

guarantee that all legal requirements are met, institutional data protection officers tend to be conservative when drafting institutional data protection guidelines. While this can be understood from the perspective of an individual person responsible for data protection in an organisation, in practice this essentially means: if in doubt, data sharing cannot take place.

“Every country has their own privacy regulations. This makes international cooperation difficult”

„Every university has different ways of dealing with legal regulations: these differences at the universities are one of the greatest challenges“

Another issue concerns the **legal status of students** while taking part in courses offered by the alliances, especially when the student would like to earn credit points (ECTS). Some German *Bundesländer* (states) have defined a new status “Europastudierender” (Europe-students) for students from international partner universities. Students with this status can take part in virtual summer schools or courses for a defined period of days (e.g. 30 days for summer schools) and can also take exams. In other *Bundesländer*, a formal enrolment in the host university is still required, implying the payment of semester and infrastructure fees. Other legal statuses such as *Gasthörer* (*guest students*) are possible, but students with this status often cannot take exams. The examples show: this current legal framework is clearly incompatible with the idea of short-term virtual mobility of students in the European University alliances.

Another legal challenge mentioned in interviews is related to **licensing arrangements of software** used by alliance members: different IT tools or software are used by alliance members (see the problem of heterogeneity in the section on technical interoperability). To reach interoperability, it would be beneficial if the alliance partners had the opportunity to use a specific piece of software – even for a limited amount of time – in order to test hands-on whether this tool could also be implemented at other universities. However, legal arrangements such as licensing rules often stand in the way.

#### *How European University alliances address legal interoperability*

Overall, the European University alliances face the challenge of coming to common solutions that satisfy different legal demands in place at their member institutions. Currently, **work-arounds** are often needed to establish legal interoperability – for example when participants in virtual courses are formally enrolled at a university. This makes it possible for them to take exams, but also implies the payment of semester fees. With these work-arounds, some degree of legal interoperability can be reached. For the

continuous integration of alliance members, however, there is a need for more harmonisation between countries.

Specifically, two **strategies** can be laid out for universities to work towards higher legal interoperability.

- In areas where the universities have room to manoeuvre to define rules themselves (e.g. in somewhat European harmonised subject areas): In these cases, universities should **systematically work towards aligning their internal policies**, for example their GDPR interpretations. In the case of GDPR, this can lead to common personal data protection policies (i.e. a formal agreement within the alliance) instead of individual policies relevant for single universities. This increases legal interoperability.

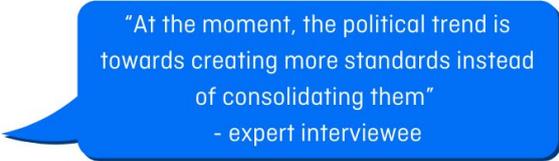
In the alliance **EPICUR**, the alliance members have drafted a common data security policy that is in line with European regulations. This agreement serves as a reference document for the cooperation between alliance members, which has greatly facilitated discussions on how and what kind of data to share e.g. in the context of their joint virtual campus.

- In areas where the universities have to rely on policy makers to create legal interoperability: in these areas, the only remaining option for individual universities is constant **lobbying and information exchange** with national and European law and policy makers about their regulatory needs and about practical solutions to fulfil these needs. An example of such an opinion formation forum is the German project HRK Advance. Based on stakeholder consultations and focused studies, specific recommendations regarding adaptations of the regulatory framework are made. On the European level, the groups FOREU1 and FOREU2 (or a combination thereof) and other organisations could fulfil this objective.

### 5.5 Overall governance of interoperability

Higher education institutions in the European Higher Education Area work in a **multi-level governance system**. They are largely autonomous institutions, but act within legal and policy frameworks defined by Member States. In addition, EU policy is an influential governance layer, for example by driving key educational initiatives (like Erasmus+ or the European University initiative) and defining long-term strategies for the EHEA.

Within this complex governance system, the use cases have shown that there are various parallel developments and initiatives that, in part, overlap or lead to **ambiguity** and a **lack of transparency** in the interoperability landscape. For example, in the use case on micro-credentials, there are major European initiatives (e.g. EDCl, EBSI), while in parallel, some Member States are developing national solutions (e.g. Micro-credentials pilot in the Netherlands<sup>91</sup>). In addition, there can also be different developments within a single country, such as in the federal system in Germany: While some *Bundesländer* have initiated programmes furthering interoperable solutions such as the setting up of joint learning platforms (e.g. in North Rhine-Westphalia, Baden-Wuerttemberg), others focus on individual solutions chosen by the universities.



“At the moment, the political trend is towards creating more standards instead of consolidating them”  
- expert interviewee

At the same time, not only is the landscape of education initiatives complex, there are also **countless actors and stakeholders** in the field with their own specific interests and preferences: from EU, national and international authorities and initiatives, university networks and intermediaries, commercial EdTech providers, to standardisation bodies and the universities themselves.

**In short, there is an overall high level of complexity in the interoperability eco-system in the education sector.** At the same time, there are rarely adequate resources at university level for involved staff to get a full overview on interoperability stakeholders, options and solutions. A mapping study (EduXS.eu) displaying all relevant projects, organisations, standards and other aspects is currently underway, but not completed yet; such endeavours can contribute to creating much needed transparency.

<sup>91</sup> See Versnellingsplan, 2022: Micro-Credentials Pilot. <https://www.versnellingsplan.nl/en/Kennisbank/pilot-microcredentials-2/>.



An even greater challenge than the lack of transparency is the lack of (high-level) governance [i.e. coordination, processual clarity, directionality], according to almost all interviewed experts. The current overall interoperability governance in Europe is largely perceived as uncoordinated. As of now (spring 2023), according to the interviewees, **no organisation or policy making body is taking sufficient responsibility or assuming a leadership position** to effectively improve the interoperability landscape in its various shapes. Some interviewees have pointed out that there are also too few stakeholders lobbying for increased action on interoperability in the European ecosystem. For example, many EdTech enterprises come from the US, while there are few European champions lobbying for interoperability specifically in Europe. Thus, assuming leadership is a requirement to coordinate and consolidate the interoperability landscape.

As a result of the current situation, many universities are reluctant to take **decisions with a long-term impact**, for example when it comes to replacing their systems or standards in use. To them, it is unclear which approaches and solutions will remain or become relevant in the future. It is therefore difficult for them to take sound decisions. Clearer guidance or coordination on specific interoperability paths would be needed for them.

“Interoperability will not arise naturally, it needs political incentive to enforce interoperability”

Some interviewees have also pointed out that there is a **lack of concrete political incentives to enforce interoperability**. Initiatives such as PIM in Germany have, according to some interviewed experts, not reached their full potential as the respective standards (e.g. EMREX/ELMO) are not binding. Instead, actors and stakeholders on the regional, national and EU level are free to develop new solutions. All in all, strong coordination and leadership could greatly advance the interoperability landscape in Europe, and, as a result, significantly facilitate cooperation in higher education.

## 6 Implications and recommendations

Comparing the relative importance of interoperability challenges, our study findings show that technical interoperability between universities is indeed often difficult to achieve. However, **technology is not the core problem** of the disconnect in university cooperation activities. In many cases technical approaches, perhaps even too many, exist or are in development. In principle, skilled IT staff can implement those existing solutions.

Our study results also confirm the common finding that bringing together existing institutions is a huge **organisational challenge**. Different processes, traditions and cultures need to be aligned. Well-established routines have to be scrutinised and might need to be stopped. However, these organisational challenges can be addressed by universities themselves, with a clear commitment to the cooperation, mandating competent project managers and sufficient means to establish the cooperation.

Various pressing problems of interoperability, however, cannot be solved by individual stakeholders alone. Instead, **key interoperability challenges in the cooperation of European universities are “systemic”**. They are related to the governance of the European higher education landscape. This concerns the governance of the technical landscape, but also in a wider, political sense.



Essentially, the issue is rooted in the multi-level governance in the EHEA: largely autonomous higher education institutions (governance level 1) act within legal and policy frameworks defined by authorities and societies in Member States (governance level 2), in accordance with the principle of subsidiarity. EU policy making adds another influential layer (level 3), for example by driving key educational initiatives (like Erasmus+ or the European University initiative) and defining long-term strategies for the EHEA.

Universities in Europe – and especially members of European University alliances – need to react and adapt to each of these governance layers. In the European University alliances, there is a need to define new processes (like student enrolment) and organisational structures that fit both the alliance and its individual members. In fact, the use cases covered in this study have clearly shown that the alliances – as testbeds and drivers of key future developments in the EHEA – are well underway to tackle these challenges. However, the institutional needs triggered by the **different governance layers often contradict or hinder another**. An example is a situation in which a university wants to introduce a digital platform that is commonly used in their national system but not compatible with universities outside the country. Another example concerns the exchange of student information in the context of a joint virtual campus: often institutional data security policies (and interpretations thereof) of different alliance members prevent an efficient data exchange, even with largely harmonised European data protection rules defined in the GDPR (see section 5.4. on legal interoperability).

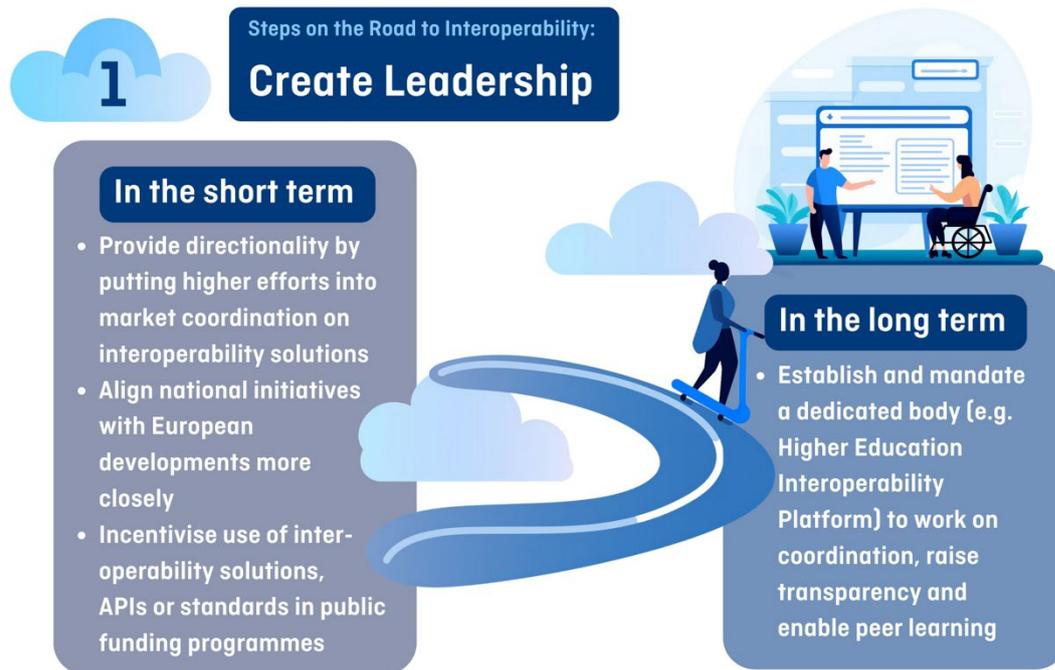
The complexities described trigger a **deep disorientation** among European Universities on the question of which technical and organisational paths to choose to eventually reach interoperability in higher education, or at least in their individual cooperation. The status quo is connected to a high level of uncertainty among stakeholders. This **“systemic” disorientation in turn leads to organisational barriers** (for example insufficient buy-in from stakeholders) to efficiently work towards “making interoperability work” in Europe.

**In the view of the study team, the described disorientation and systemic uncertainty can only be improved by looking at the governance of the European and national higher education system.** Following the principle of subsidiarity, efforts by individual institutions are of course needed. However, they are not as effective as they could be when the systemic governance fails.

In the following, the study team presents **recommendations** to improve the situation, **focusing on the governance of interoperability**. The ideas logically follow from the identified challenges in the selected use cases and the subsequent analysis of the study team.

### 6.1 Steps on the Road to Interoperability

**1. Create “interoperability leadership” from policy makers or mandated stakeholder organisations to reduce systemic uncertainty, generate (technical) directionality, and define a clearer trajectory towards an interoperable higher education system.**



Many of our interviewees point out that there is no lack of technical solutions per se to reach interoperability. However, a lack of orientation on the future developments in the higher education landscape, coupled with insufficient coordination of institutions working on technical standards, leads to uncertainty – raising the question for individual universities and European University alliances in which standard or technical path to invest.

To make interoperability work,

The **European Commission** – in synergy with the Member States – could put more attention into providing guidance and orientation for universities (especially the alliance members) on the most promising technical paths for digital education infrastructures of the future. This would have the huge benefit of providing **market coordination in an extremely heterogenous technical and organisational interoperability environment**. This is not a trivial task. However, it seems to be crucial to avoid situations in which – for example with respect to standards for joint course displays or with respect to the work in micro-credentials – parallel developments occurred in the past. Key initiatives such as EWP have put an “interoperability reinforcement plan”<sup>92</sup> in action, but coordination with other initiatives is still not in place. This

<sup>92</sup> See European Commission, 2022h: Seamless data exchanges for Erasmus Without Paper for 2022. <https://erasmus-plus.ec.europa.eu/news/seamless-data-exchanges-for-erasmus-without-paper-for-2022>.

doubles workloads, is an inefficient usage of resources and jeopardises interoperability. Thus, a clear indication from policy makers on the interoperability path which European policy makers and/or funding organisations see as the most promising way forward in the future would help to provide coordination and clarity for universities. It should be noted that this coordinator does not necessarily need to be the European Commission. Other mandated institutions (for example the EDEH or a newly created “Higher Education Interoperability Platform” in the spirit of the “Interoperable Europe Portal” discussed in the context of the Interoperable Europe Policy<sup>93</sup>) or stakeholder organisations can also fulfil this role – and due to their proximity to the higher education community may do so even more effectively.

Important features of such a coordinating body are the competences represented in the body: not only should experts with a technical or policy background be involved, but also experts in university administration, teaching and learning, and internationalisation. Furthermore, it is crucial to establish or mandate an institution with political backing, broadly accepted by the community.

The coordinating body should not aim to add new standards and approaches to the variety of already existing options, but instead enhance transparency, give direction and enforce standards in the field. For example, the use of European applications such as EDCl could be incentivised, or practical guidance on how to handle data hosting and security in compliance with GDPR could be given<sup>94</sup>. As a basis for the task ahead, a comprehensive mapping of technical approaches and their respective pros and cons for the higher education system would help to raise transparency about the existing landscape. In the long run, a **higher education sector-specific adaptation of the European Interoperability Framework** could be created (inspired by the proposed European Interoperability Framework for Smart Cities and Communities – EIF4SCC)<sup>95</sup>.

- To create technical directionality, **Member States** should pay more attention to avoiding funding projects which create national silos in digital higher education. Projects like CampusConnect in Germany (primarily used in the state of Baden-Wuerttemberg, but increasingly also in other *Bundesländer*) or the initiatives of the network SURF in the Netherlands can have an important function in driving developments nationally. However, interoperability with European developments should always be taken into account – for example by mapping internationally compatible solutions or by being involved in coordination activities on the European level.
- **Member States** could also make it obligatory for recipients of public project funds to use accepted European interoperability standards. An example of such a standard to be explicitly promoted could be the European Learning Model as a foundation for learning data exchange. This way the “market power of public money” could be

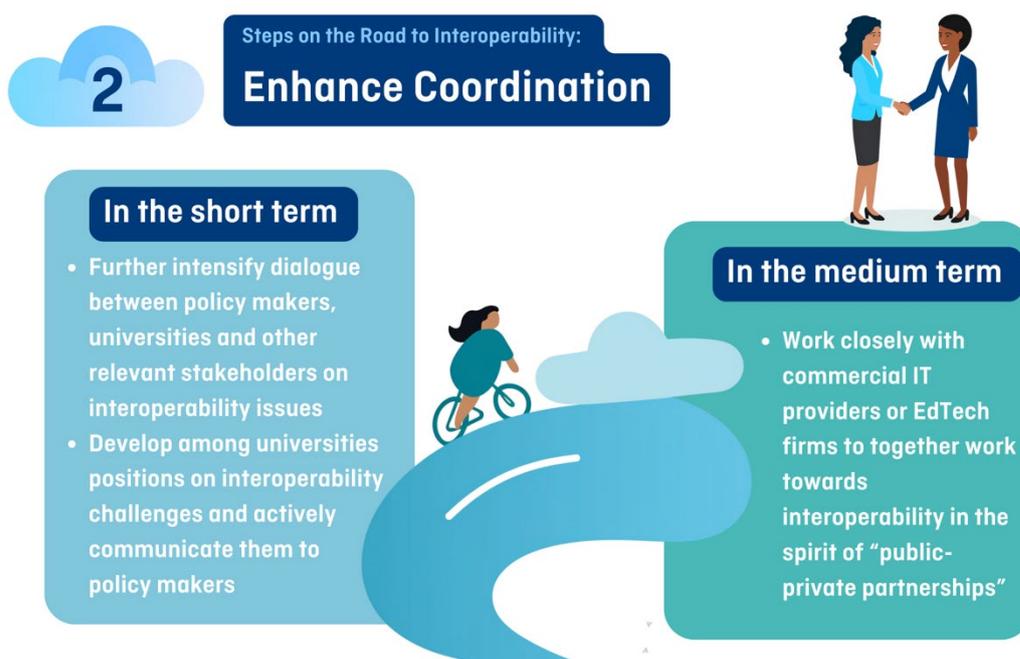
<sup>93</sup> See European Commission, 2022g: Interoperable Europe. Policy. <https://joinup.ec.europa.eu/interoperable-europe/policy>.

<sup>94</sup> See also FOREU1, n.d.: Digital Transformation. Challenge and opportunity for the European Higher Education Sector: the case for European Universities. Position Paper.

<sup>95</sup> European Commission, 2021b: Proposal for a European Interoperability Framework for Smart Cities and Communities (EIF4SCC). <https://digital-strategy.ec.europa.eu/en/news/proposal-european-interoperability-framework-smart-cities-and-communities-eif4sc>.

leveraged for promoting interoperability. In Germany, for example, BMBF could integrate explicit requirements on this regard for funding lines directed at cooperation between German universities (*Verbundförderung*). DAAD could do the same for funding cooperation with international partners.

## 2. Enhance coordination between policy makers and stakeholders in higher education – in consultation with the broad higher education community and the private sector



Reducing uncertainty and creating technical directionality for the higher education community is an important factor to reach interoperable solutions. This, however, cannot work without the **close cooperation of all stakeholders** involved, especially those who know what the implementation of a solution means “on the ground”, i.e. the universities that work on interoperability daily.

To make interoperability work,

- The **European Commission** and **Member States** should engage in even closer consultations and formal and informal information exchanges in order to integrate all views needed for a [technical, legal and organisational] interoperability path of the future. There are many formats that could be used for this on the European level: be it in the context of the European Digital Education Hub, platforms provided by organisations such as GÉANT or EUNIS or in the context of initiatives like EBSI, EDCI or EOOSC. On the national level, the *Nationale Bildungsplattform* or HFD could facilitate cooperation in Germany, with their counterparts (and national research and education networks [NREN]) assuming this role in other Member States.
- **Universities** should seek constant exchange with policy makers in order to actively transfer the “wisdom of the crowd” to decision makers. They should play active roles as sparring partners and “co-designers” of interoperability instruments.

- **Universities** should also pool their expertise among themselves on technical, legal, organisational interoperability issues in order to increase awareness of the complexity of the issue. They should proactively organise information exchanges among themselves in order to form positions on specific interoperability questions. This position could then be communicated effectively towards policy makers to help them create directionality by the means described above. On the European level, the FOREU rounds among European University alliances already perform such a function. For example, FOREU 2 has drafted a position paper on an integrated European Higher Education Area digital space. These efforts should be further encouraged, and universities should actively take part in the FOREU groups. Working groups of the Hochschulrektorenkonferenz (HRK) or the DAAD and its sister organisations in other Member States could also play an important role here. The same applies to stakeholder organisations like HFD and Stifterverband in Germany.
- **Universities and the private sector**, especially organisations providing IT solutions to universities, should work hand in hand to analyse the interoperability needs in university cooperation activities. Given the financial and IT staffing situation of many universities, they certainly do not have sufficient means to develop interoperable technical solutions themselves. Cooperation is therefore needed. It would also be helpful for universities to negotiate with software providers to work towards arrangements that make it possible for alliance partners to use licensed software for testing it in the partner universities. A public-private partnership approach of close cooperation between universities and IT providers would seem to be an efficient way forward.

### 3. Promote interoperability experimentation by universities – and knowledge sharing of what works (and what not)



Establishing directionality (Recommendation 1) and stronger coordination of stakeholders (Recommendation 2) is more effective if more knowledge on promising strategies is created. This knowledge, however, can only be created when different strategies are tested and continuously evaluated.

To make interoperability work,

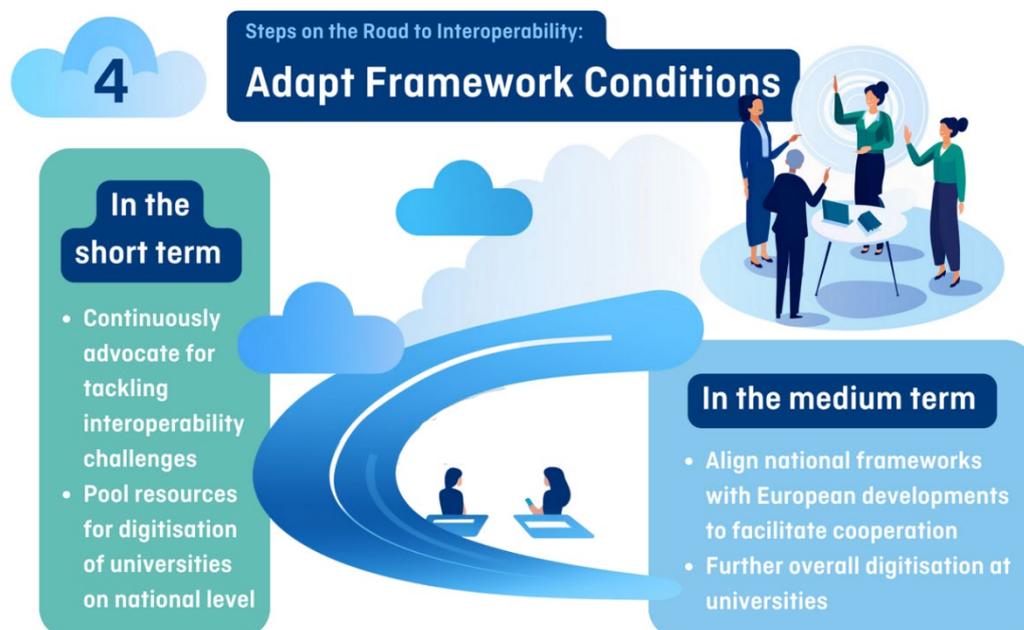
- **Universities** should continue to **experiment with existing interoperability solutions** and clearly **communicate** their experience in relevant fora like the FOREU or the EDEH. While this experimentation is costly in terms of money and time, there is no alternative to this trial-and-error process: Progress in interoperability can only be made if strategies are tested, improved or, should they not work, explicitly stopped. The concept of “**sandboxing**”, where a specific approach is tested within a clearly defined environment (e.g. only for specific selected courses of the European University alliance), could be practical way to experiment with different solutions. Similarly, even small **pilot projects** are invaluable, because they contribute step by step to the advancement of knowledge on interoperability.
- Based on the experimentation described above, the **universities** should more actively communicate their learnings. For this purpose, the FOREU exchange rounds do exist. Information exchange between the alliances of the different funding calls of the initiative (as well as with other universities not part of the alliance) could be further pushed; alliances from the latest generations could more effectively learn from previous generations by combining the exchanges (e.g. within digital subgroups). A **peer counselling** format among universities on how to reach interoperable solutions could also be an important concrete instrument, supplementing the knowledge exchange in FOREU.
- **University leaders** should actively promote an organisational culture in which work on interoperability (e.g. in the context of the European University alliances) is valued and supported and adequate resources assigned to the task. From our study we have identified various enabling factors which help to create an organisation that can work effectively on interoperability issues. These include mandating and supporting a dedicated project manager who has an awareness of the various interoperability dimensions and challenges and equipping this project manager with resources. It is crucial to bring the project manager into close contact with the university strategic level. Close coordination with the university leadership or an institutional strategic sounding board can be important processual elements to create institutional framework conditions favourable for creating an interoperable organisation.
- **The European Commission, Member States** and potentially other **higher education funding organisations** should provide sufficient financial means to the alliances for tackling interoperability issues. Different purposes can be beneficial:
  - Experimentation on interoperability issues could be funded through an **innovation fund** targeting a specific interoperability challenge with a particular focus on interoperability across alliances. This could be designed as an “interoperability challenge” where various teams aim to solve the challenge, with the winner being awarded an “interoperability award”. This approach has the benefit of

combining experimentation (through the approaches of the participants in the “interoperability challenge”) with clearly identifying a dominant solution (i.e. the winner of the challenge). It would thus create directionality towards a specific interoperability path, without ignoring the creativity of the community and the “wisdom of the crowd”.

- The funding mechanisms for the alliances should adequately consider **sufficient and sustainable means** to help improve interoperability. After all, the alliances need to invest in infrastructure that also has to be maintained (and adapted) in the long-term. These resources are not covered by the time-bound funding of the European University initiative. For this purpose, funding on the European (and/or national, regional) level should be mobilised. While the alliances have generally called for sustainable and holistic support for various purposes (European University alliances 2022)<sup>96</sup>, the study has specifically underlined the importance of long-term support for digital services.

The interviews have shown that the staff involved in the alliances rarely have the time and resources to take an in-depth look at other alliances’ solutions, let alone get a comprehensive overview on the interoperability landscape. At the same time, the competitive character of the European University initiative provides little incentive to fully disclose their own (technical) solutions. Thus, **dissemination and knowledge sharing** in the field of interoperability should be more explicitly underpinned by sufficient resources in the European University initiative so that not every university and alliance has to develop their own approach from scratch but can effectively and efficiently draw on existing experiences.

#### 4. Adapt framework conditions for universities to allow for European interoperability



<sup>96</sup> European University alliances, 2022: Call for sustainable and holistic support to European University alliances. Joint statement of all 41 European University alliances on the need for long-term sustainable funding that allows alliances to work across all their missions.

Given the multi-level governance of higher education in Europe and the current division of responsibilities between Member States and the European level, heterogeneity in the framework conditions for universities all over Europe is here to stay for the foreseeable future. This is all the more reason for universities and the organisations representing them to continuously put interoperability challenges on the (political) agenda in their countries. The **framework conditions in Member States have major influence** on interoperability in higher education. For a truly integrated EHEA, these framework conditions need to be adapted where necessary. Some exemplary suggestions are listed in the following list.

To make interoperability work,

- **Member States** should better align their national frameworks (e.g. national qualification frameworks) with European developments. Prominent successful initiatives such as the Bologna process have paved the way. However, system differences remain. Higher education institutions should have enough leeway to facilitate international cooperation by experimenting with solutions that are not currently foreseen in the national context. A concrete example would be more flexibility in recognising micro-credentials from an international partner university. Hereby, it is important to define requirements and processes as well as to find a balance between maintaining adequate quality assurance on the domestic level and facilitating international cooperation. A degree of flexibility, simplification or room for exceptions in national frameworks (sand-boxing, see above) can be beneficial in that regard. Furthermore, national (as well as European) frameworks need to be adapted to enable the establishment of legal entities for European University alliances; to explore related options, pilot EU projects have already been initiated<sup>97</sup>.
- The general state of digitalisation in the higher education sector across Member States drastically varies, with some countries being at the forefront while others are lagging. Thus, **comprehensive digitisation (including up-to-date infrastructure) as a fundamental basis** for modern higher education needs to be high on the political agenda in countries where digitisation is not yet far advanced. In the short term, pooling resources across universities can be helpful. In the long term, the sector needs to be provided with adequate means to realise the digital transformation. This also includes considering the costs of software over an entire life cycle (instead of opting for solutions that are less expensive in the short term) in the institution's budgets, especially the "non-monetary costs of non-interoperability" with other IT tools (e.g. when it is impossible or takes a long time to convince an external software provider to build in specific standards and interfaces).

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<sup>97</sup> European Commission, 2023f: Joint European Degree label and a legal status for European universities alliances: 10 Erasmus+ projects to put them in place. [https://ec.europa.eu/commission/presscorner/detail/en/ip\\_23\\_422](https://ec.europa.eu/commission/presscorner/detail/en/ip_23_422).

## 5. Create adequate structures and processes, and a culture open to collaboration within the alliances



Organisation interoperability between alliance members proved to be a key challenge across all alliances. This stresses the need to find both a working mode facilitating cooperation between the universities as well as a cultural shift towards open-minded collaboration on an equal footing.

To make interoperability work,

- **Universities** should define common structures and processes in their alliances that allow for the regular exchange across all departments, ranging from the university leadership to IT staff, international offices, teaching experts and other administrative functions relevant to the specific use case. These structures can take many forms and need to be adapted to the respective alliance's needs and circumstances. Across all interviewed alliances, it proved to be beneficial to create a core team with a designated project lead, accompanied by an interdisciplinary task force both on the operational level as well as decision-makers on the strategic level. This project manager ideally has a specific skill set with strong communication and people skills in combination with a sufficient technical understanding. Key to organisational interoperability is close and regular communication, which enables the building of trust, helps create a common understanding of the alliance's objectives, and navigates both institutional interests and technical possibilities and limits.
- **Universities** also need to encourage a cultural shift towards an open mind for collaboration among their university members. After all, not only do universities see themselves as autonomous institutions, but the individual university members also value their autonomy, in particular research and teaching staff. For this reason, the benefits of collaboration within the alliance (and beyond) need to be communicated

clearly (and ideally showcased in pilot applications). This includes alliance members keeping an open mind towards alternative technical approaches. At the same time, autonomy is a valuable asset that should be respected as much as possible – for example, by creating hubs as joint digital platforms that connect the systems used locally without having to fully replace the platforms in use.

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## 6.2 Challenges and Recommendations for the German Higher Education Sector

### Specific challenges for the German higher education sector

In total, there are 38 European university alliances that include German universities (as of August 2023). These German members are also affected by many of the challenges (and driving solutions) outlined in the study. Still, they are also confronted with the following additional barriers inherent in the German higher education system.

- In Germany, **federalism in education** is widely considered a challenge for cooperation, both on the international and national level. The framework conditions vary (sometimes greatly) from Bundesland to Bundesland, complicating the interoperability landscape due to different systems, technologies and standards in use. There are a number of important actors in the field promoting digitisation and specifically digital transformation and internationalisation, such as HFD, DAAD, HRK, Stiftung Innovation in der Hochschullehre or initiatives on the state level (e.g. Digitale Hochschule NRW). They launch important initiatives such as the HRK recommendations for the improved virtual participation of international students or digital programmes implemented by DAAD that aim to improve digital international cooperation in teaching and learning. Still, they cannot overcome the challenges inherent in the system.
- Many interviewees highlighted that **digitisation in Germany** is not as far advanced in comparison with other European Member States. Further investments are surely needed. The significance of digitisation in higher education also varies from Bundesland to Bundesland.
- According to interviewees, the **GDPR** is handled more restrictively in Germany than in other Member States, often resulting in German universities blocking deeper integration. While other countries are moving forward with, for example, digital student cards, security and privacy concerns dominate in Germany.

### Specific recommendations for the German higher education sector

To tackle these challenges, the following aspects should be addressed by the Bund, the Bundesländer and lead higher education organisations.

- Similarly to what we have discussed above for the European level, there is the need for **joint federal government-Länder organisations** to strengthen and enforce coordination in the field of interoperability. While there are various initiatives underway (e.g. XHochschule, PIM), there is still a lack of coordinated efforts to advance interoperability. Thus an overarching initiative or mandated organisation needs to be a designated driver for interoperability in dialogue with relevant stakeholders in the German higher education landscape. As a good practice example, interviewees named the Deutsches Forschungsnetz (DFN). DFN is a network that managed to establish leading, widely-used standards for the research community (eduroam) and is considered a “prime example of standardisation and coordination” by some interviewees. A similar function should be performed for increased transparency and coordination in the field of interoperability in digital education.
- **A clear digitisation** push is necessary so that German universities do not lag behind their counterparts in the international context. Germany ranks 13th of 27 EU Member States in the 2022 Digital Economy and Society Index (DESI), performing with mixed results on the subject of digital services.<sup>98</sup> While there are some initiatives aiming to improve the status quo, a broad digital transformation has not been achieved yet. As universities fall under the jurisdiction of the Bundesländer, the **state governments** need to invest adequate resources to broadly modernise the digital infrastructure and services.
- Clear **recommendations or guidance** (ideally creating legal certainty) on how to handle GDPR in international cooperation in higher education provided on the **national level** can be beneficial for German universities. For example, the HRK Advance project could be a driver for this. At the same time, **German universities** should be cultivating a more open institutional culture, balancing data security needs with the benefits of cooperation.

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<sup>98</sup> See European Commission, 2022f: Digital Economy and Society Index. <https://digital-strategy.ec.europa.eu/en/policies/desi>.

## Conclusion

Reaching interoperability in the cooperation activities of higher education institutions is not an easy task. The analysis of exemplary use cases among European University alliances in this study has shown many instances of concrete interoperability challenges that arise while bringing the alliances to life. The general findings confirm (and add to) various recent studies on cooperation challenges in higher education, like the European Commission report on “Progress of University Alliance Projects” published in April 2023<sup>100</sup> or the results of a workshop hosted by the German Academic Exchange Service (DAAD) in June 2023.

For this study we used the European Interoperability Framework (EIF) to systematically analyse interoperability challenges of selected European University alliances. To our knowledge this is the first study applying the EIF to cooperation in higher education. We looked at different dimensions such as semantic, organisational, legal and technical interoperability. Most importantly, we also assessed how the **overarching governance** in the European Higher Education Area affects interoperability – positively as well as negatively.

The study findings show: The **alliances have made substantial progress in improving collaboration and interoperability** in the respective use cases. This is not a given as became evident throughout the study. Clearly, there is still a long way to address the various pain points of interoperability between European Universities. Most likely, the aspects identified in this study are only the tip of the iceberg. It is a task of the universities to work hard on possible interoperability approaches wherever they can do so within the framework conditions set by policy makers and society. In particular, the user perspective (especially students) should be integral part of all cooperation activities. After all, the number of actual users and their level of satisfaction with a functional joint virtual campus and seamless mobility determines whether the collaboration can be considered successful.

The study also shows that interoperability cannot be solved by universities alone. It **urgently needs to be systematically addressed** if the EHEA is to become a future-proof, modern, and open education system. It shows various possible approaches in the governance of the higher education system in Europe, relevant in the short and medium term and differentiated by the stakeholder groups.

Interoperability is not an end in itself. It is rather a means to drive national and international cooperation of universities: only with cooperation in higher education can the modernisation of teaching and learning or the efficient and effective use of resources be achieved. It is important to always keep in mind this vision of an **open, highly international competitive education system enabled by increased interoperability**. By doing so, all stakeholders involved are reminded what overarching societal mission they are contributing to in their daily endeavours to work on interoperability in higher education.

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<sup>100</sup> European Research Executive Agency, 2023: Progress of University Alliance Projects – Projects funded under Horizon 2020.

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# Glossary

## A

Application Programming Interface (API) – Application Programming Interfaces allow two or more computer software to communicate with each other, thereby facilitating the exchange of data and information.

## C

Campus management system – Cf. **Student information system**.

Common course catalogue – A common course catalogue refers to the joint course offerings by different higher education institutions.

## D

Digital Open Badges – Digital Open Badges allow for the public display of course participation and achievements. In the absence of formal recognition by a higher education institution, they allow for the public documentation of learning achievements.

## E

Edu-API – The Edu-API is currently under development by the IEdTech-Consortium. It has been conceptualised as global standard for the exchange of data between **student information systems, learning management systems** and other university administrative systems. The design of the Edu-API relies on the work on other specifications, such as **OneRoster**. For more information see <https://www.imslobal.org/edu-api>.

eduGAIN – eduGain is an interfederation service connecting identity federations globally. It allows for the identification and authentication of users, thereby, facilitating their authorisation to content, services and resources.

eIDAS – eIDAS (electronic IDentification, Authentication and trust Services) is a regulatory framework for the secure and seamless electronic interactions between European organisations and individuals. For more information see <https://digital-strategy.ec.europa.eu/en/policies/eidas-regulation>.

ELMO – ELMO refers to an XML format for the exchange of result information based on the CEN standard EN 15981-2011 EuroLMAI. It is often mentioned in context with **EMREX**.

EMREX – EMREX refers to *easy mobility on recognition of external studies* and is a solution for the standardised electronic exchange of students' assessment data between higher education institutions. EMREX makes use of the **ELMO** XML format for the exchange of result information.

Erasmus Without Paper (EWP) – Erasmus Without Paper (EWP) provides digital solutions for the administration of the Erasmus+ programme. Higher education institutions connect their mobility management systems to the EWP network for simplifying the communication process between sending higher education institution and receiving higher education institution using EWP's APIs. For more information see <https://erasmus-plus.ec.europa.eu/european-student-card-initiative/ewp>.

European Blockchain Services Infrastructure (EBSI) – The European Blockchain Services Infrastructure (EBSI) is a pan-European blockchain initiative by the European Commission and the European Blockchain Partnership. It offers a technical infrastructure for interested stakeholders, including APIs for retrieving information from EBSI, smart contracts and the EBSI ledger, a decentralised database for keeping record of all transactions. For more information see <https://ec.europa.eu/digital-building-blocks/wikis/display/EBSI/What+is+ebsi>.

European Digital Credentials for learning (EDC) – European Digital Credentials for learning (EDC) are statements issued by an organisation to a learner, documenting their learning, including diplomas, transcript of records and other certificates. They are signed with qualified electronic seals to safeguard their authenticity. For more information see <https://europa.eu/europass/en/europass-tools/digital-credentials>.

Europass Digital Credentials Infrastructure (EDCI) – The Europass Digital Credentials Infrastructure is a technical framework for issuing digital credentials developed by the European Union, including **eIDAS**, standards, services, and software. For more information see [https://ec.europa.eu/futurium/en/system/files/ged/edci\\_presentation.pdf](https://ec.europa.eu/futurium/en/system/files/ged/edci_presentation.pdf).

European Interoperability Framework (EIF) – The European Interoperability Framework (EIF) provides guidance for setting up interoperable digital public services. Its model consists of six elements: four interoperability dimensions (legal, organisational, semantic, technical), one cross-cutting component, the integrated public service governance, and a background layer, the interoperability governance. For more information see <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/3-interoperability-layers>.

European Learning Model (ELM) – The European Learning Model is a multilingual data model for learning by the European Commission. By providing a unified way to describe and refer to learning terms and concepts, it facilitates the data exchange between organisations in Europe and serves as a basis for the interoperability between EU activities, including the **European Blockchain Services Infrastructure**, **Erasmus Without Paper** and the European Student Card Initiative. For more information see <https://europa.eu/europass/en/node/2128>.

European Student Card (ESC) – The European Student Card (ESC) is an identity card for European higher education students. In case the sending institution is also part of the

ESC, institutions do not need to issue a new student card and can validate the student status for incoming mobility students securely. The European Student Identifier (ESI) is one of the features of the ESC.

European Student Identifier (ESI) – The European Student Identifier (ESI) is a digital identifier for the identification and authentication of European students. Students can identify themselves and access student mobility services online. It is one of the features of the European Student Card.

## I

Interoperability – Interoperability refers to the ability of higher education institutions to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between them (cf. **European Interoperability Framework**).

Interoperability Governance – Interoperability Governance refers to the framework for cooperation between higher education institutions, including coordination mechanisms for interoperability, the existing organisations supporting interoperability and the political processes contributing higher education institutions' interoperability by providing directionality.

## J

Joint course display – A joint course display is the implementation of a common, centralised overview of courses offered by different higher education institutions in a cooperation.

Joint enrolment – Joint enrolment refers to the establishment of joint admission and registration process to study offers provided by universities in a cooperation.

**Joint learning platform** – Joint learning platforms are platforms for the administration and delivery of educational courses, mainly in an online context.

## L

Learning Management System (**LMS**) – A Learning Management System (LMS) is a software programme for the organisation of educational offerings. It manages all content related to the delivery and assessment of education and provide services for educators, learners and administrators.

**Legal interoperability** – Legal interoperability refers to higher education institutions' abilities to cooperate across different legal frameworks, policies and strategies.

## M

**Micro-Credentials** – Micro-Credentials are a proof of learning outcomes from small, targeted, flexible and (sometimes) stackable study offers assessed by transparent standards complementing - and adding to - a learner's regular curriculum.

## O

**Open Course Catalogue API (OCCAPI)** – The Open Course Catalogue API is an interface developed by the European University Foundation for the exchange of course data between different IT systems of higher education institutions.

**Open Education API (OOAPI)** – The Open Education API, known in Dutch as Open Onderwijs API (OOAPI), is an interface developed by Dutch higher education institutions with the support of SURF for the exchange of educational data between different IT systems of higher education institutions.

**OneRoster** -One Roster is an API developed by the IEdTech Consortium for the management of enrolment, grades and resources. It enables the exchange of data and information between student information systems and learning management systems. OneRoster represents one of the foundations for the development of **Edu-API**. For more information see <https://www.imsglobal.org/activity/onerosterlis>.

**Organisational interoperability** – Organisational interoperability refers to the alignment of processes, responsibilities and expectations to achieve joint goals.

## S

**Semantic interoperability** – Semantic interoperability refers to the ability of higher education institutions to communicate with – and understand – each other (“what is sent is what is understood”). This includes the seamless exchange of data and information between universities' IT systems, and the mutual understanding of ideas and objectives.

**Student information System (SIS)** – Student Information Systems are management information systems for educational institutions. They allow for the exchange of educational data, such as student and administrative data, and provide services to university stakeholders, including students, teachers and administrators. An alternative term for SIS is **Campus Management System**.

## T

**Technical interoperability** – Technical interoperability refers to applications and infrastructures enabling the seamless communication between different organisations' IT systems.

## V

Verifiable Credentials – Cf. W3C Verifiable Credentials Data Model.

## W

W3C Verifiable Credentials Data Model – The W3C Verifiable Credentials Data Model is a data model for verifiable credentials recommended by the World Wide Web Consortium (W3C). For more information have a look at <https://www.w3.org/TR/vc-data-model/>.

# Imprint



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