

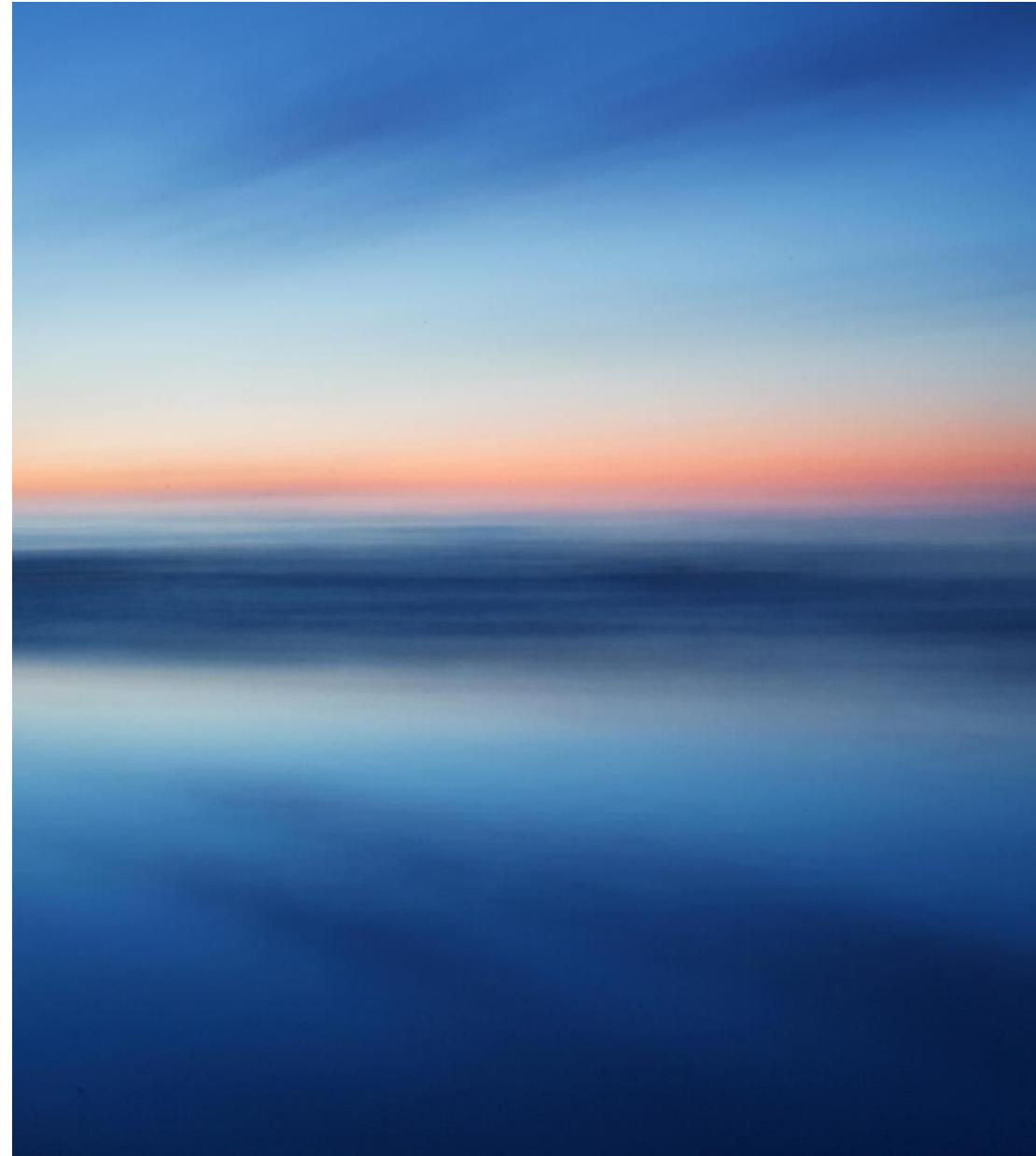
Proof-of-Concept

A guide for those who want to join EMREX

2024

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Executive summary

This guide is designed for educational institutions, decision-makers, and stakeholders interested in implementing EMREX, an electronic data exchange solution while primarily focused on the educational data transfer in European context, the insights are applicable to various digital service developments globally.

- 1 EMREX in a Nutshell:** EMREX enables secure and efficient transfer of educational records, benefiting mobile students, applicants for education abroad, and individuals sharing their achievements with potential employers.
- 2 Interoperability and EMREX:** The guide discusses the increasing demand for reliable educational data exchange within the framework of the European Interoperability Framework (EIF). It highlights the benefits of interoperability, including reduced costs and administrative burdens, and outlines initiatives like the Interoperable Europe Act aimed at enhancing public sector cooperation.
- 3 Organizational Requirements:** Institutions must assess their current practices and clarify use cases before implementing EMREX. Key considerations include data management, legal compliance, stakeholder engagement, and understanding related initiatives.
- 4 EMREX Implementation: Riga Stradiņš University (RSU):** Focused on course recognition, emphasizing the importance of structured data and international collaboration. **SISU Student Information System:** Developed in Finland, illustrating the integration of EMREX into an existing system, highlighting challenges and success factors.
- 5 Further Considerations:** Recommendations are provided to anticipate long-term development needs and scenarios related to EMREX utilisation.



About terminology and concepts

ELM – European Learning Model (data model for EDC). It is aligned with the W3CVC data model and with ELMO standard within EMREX.

ELMO – Data standard applied by the EMREX network.

EMREX – An electronic data exchange solution for the international transfer of student and employee data between higher education institutions. Developed by the EMREX User Group.

EIF – The European interoperability framework is a commonly agreed approach to the delivery of European public services in an interoperable manner. It defines basic interoperability guidelines in the form of common principles, models and recommendations.

DC4EU – Digital Credentials for Europe. DC4EU will support cross-border, large-scale piloting of the European Digital Identity Wallet in compliance with the EU Toolbox process. DC4EU will develop four (4) use cases where we test interoperability and scalability in the national domain and multiple cross-border contexts to provide feedback to the European Commission and Member States for iterative updates.

OOTS – Once Only Technical System. (i.e. system currently being developed by the European Commission and Member States to make the OOP a reality at European level). The initiative stems from the Single Digital Gateway Regulation (> SDGR).

SDGR – Single Digital Gateway Regulation; refers to Council Regulation of 2 October 2018 establishing a single digital gateway to provide access to information, to procedures and to assistance and problem-solving services.



Source: European Digital Identity and digitalisation of educational and professional credentials (European Commission), <https://www.dc4eu.eu/>

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EMREX IN A NUTSHELL



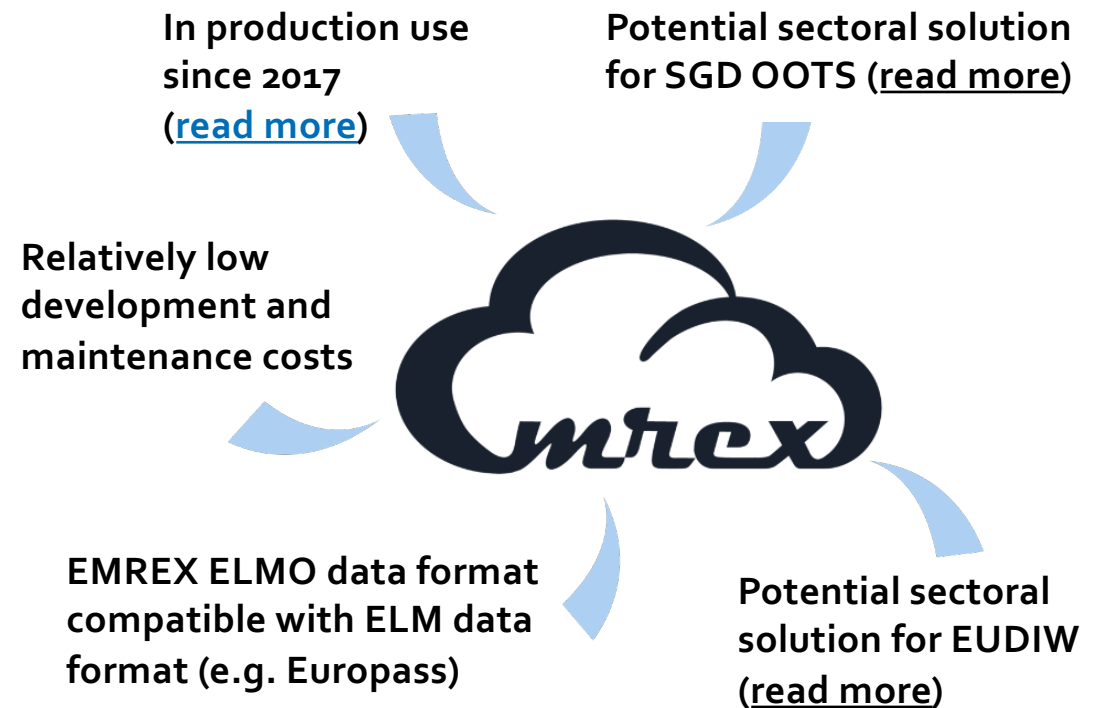
EMREX in a nutshell

EMREX – an electronic data exchange solution can be used in several ways, for example:

- By mobile students who want a fast, secure and digital transfer of their achievement records from abroad
- By individuals applying for education in other countries
- By individuals who want to share their achievement records with others – future potential employers etc.

More information:

[EMREX · GitHub](#) & <https://emrex.eu/>



User journey – how EMREX works

1. IDENTIFICATION

Learner logs in to the system of home organisation (local or national).



2. DATA TRANSFER

Learner fetches previous study record data by using EMREX as an electronic data transfer solution.



3. THE USE OF DATA

Learner uses the received data in local student information system (SIS) e.g. in recognition of prior learning process or admission process.

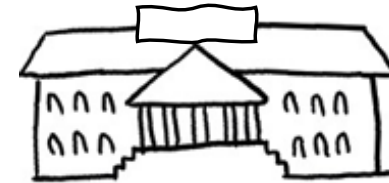


Benefits of smooth digital services

Better student experience and the streamlined administrative processes



€ The learner saves time



€ The working time of the study administration and teaching staff is saved
€ The working time of the officials responsible for recognition of qualifications is saved



✓ The learner's customer experience of digital service (transferring study records) is more pleasant

✓ Faster process of recognition of prior learning among educational institutions and universities using the EMREX data transfer solution
✓ Speeding up the process of recognition of qualifications
✓ Strengthening of international networks and cooperation



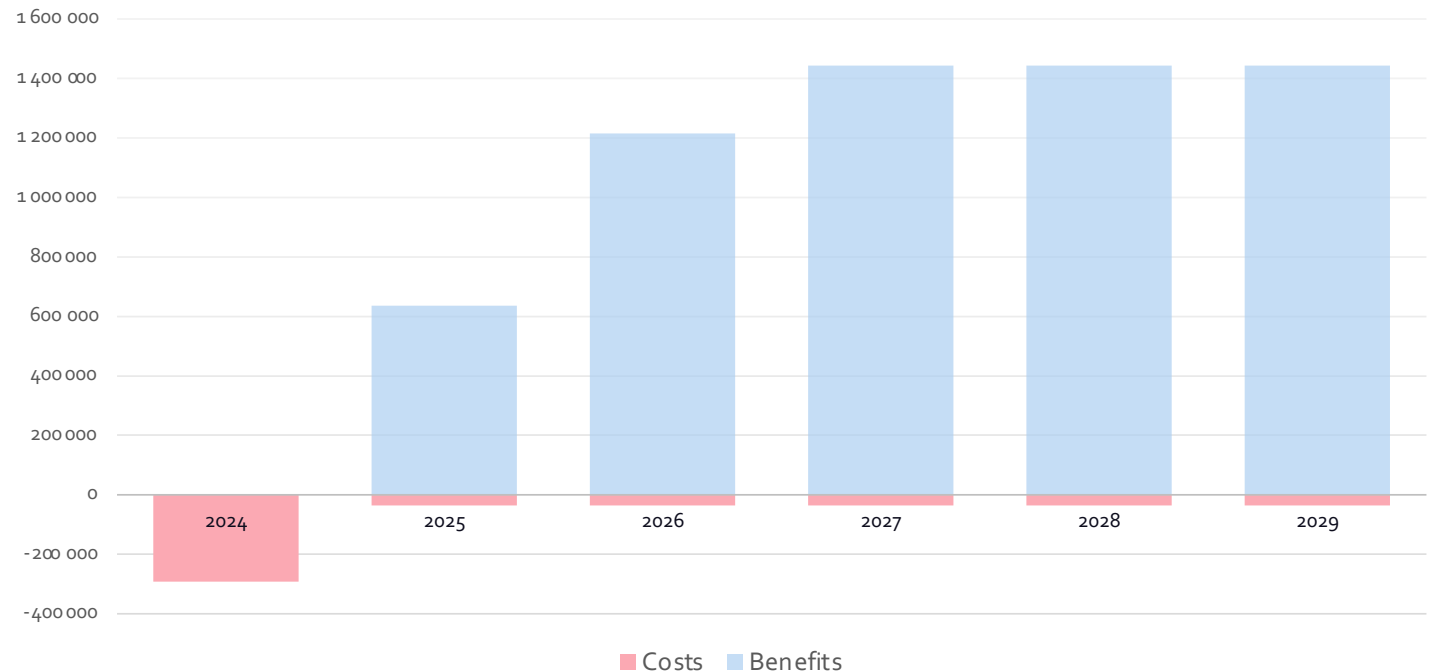


Potential profitability when implementing EMREX

A rough example of potential profitability when implementing EMREX to use data from all higher education institutions of a country. In this example, cutover is in the beginning of year 2025.

The calculation is based on the estimated savings on working time of study administration staff. The calculation is using Finnish payrate, estimation of savings, and Norwegian number of data transfers via EMREX.

COSTS AND BENEFITS ON AN ANNUAL BASIS



2

INTEROPERABILITY AND EMREX



The landscape of interoperability

EMREX is part of the landscape of digitalisation and one answer to the growing demand for smooth and reliable ways to exchange educational data, especially from the perspective of Interoperable Europe and European Interoperability Framework (EIF).





The range of benefits from improved interoperability and public sector cooperation is extensive: There is an obvious reduction in cost, time, energy and unnecessary administrative burden for citizens, businesses and the public sector itself.

Interoperable Europe Act



interoperable europe

Interoperable Europe is the initiative of the European Commission for a reinforced public sector interoperability policy. To strengthen the initiative, *The Interoperable Europe Act* proposes a strategic interoperability cooperation mechanism across the European Union.

The act has four pillars:

1. Governance Framework for Interoperability
2. Mandatory Interoperability Assessments
3. Sharing and Reusing Interoperability Solutions
4. Support for Innovation and Policy

Source: <https://joinup.ec.europa.eu/interoperable-europe>



European Interoperability Framework (EIF) gives specific guidance on how to set up interoperable digital public services.

- 47 concrete recommendations
- The implementation of the EIF will improve the quality of European public services and will create an environment where public administrations can collaborate digitally.
- **Emrex** utilizes the principles and standards of EIF to enable seamless digital exchange of educational data across European higher education institutions, supporting mobility and recognition of qualifications within the EU.

Source: [The New European Interoperability Framework | ISA² \(europa.eu\)](#)

Cross-border data exchange in education through EIF

Some general challenges have been identified in the cross-border exchange of educational data when looking through the lenses of all four aspects of EIF model



Varied School Systems and Investment: Countries differ in their school systems and their willingness to invest in joint solutions.

Outdated Processes: Outdated organisational processes in many countries hinder automated cross-border data exchange.

Decentralized Information Management: Decentralised information management within countries leads to unclear responsibilities.

Organizational interoperability refers to the way in which public administrations align their business processes, responsibilities and expectations to achieve commonly agreed and mutually beneficial goals.



Language Barriers: A lack of understanding other languages, translations, and shared vocabulary.

Inconsistent Standards: This covers the lack of agreed formats, standards, and descriptive data.

Conceptual Differences: Different concepts and meanings across countries.

Semantic interoperability ensures that the precise format and meaning of exchanged data and information is preserved and understood throughout exchanges between parties.



Digital Maturity: Varying levels of digital maturity.

System Diversity: Different systems, data models, formats, solutions, and database structures.

Data Availability: Digital data is either non-existent or not in a machine-readable format.

Technical Knowledge: Lack of technical knowledge or competencies

Technical interoperability factors cover the applications and infrastructures linking systems and services.



Data Transfer Regulations: Regulations that limit data transfer and define data ownership.

Legislative Changes: Need for changes in legislation.

Qualification Recognition: Different recognition of qualifications.

Legal interoperability is about ensuring that organisations operating under different legal frameworks, policies and strategies are able to work together.



To support student mobility and especially the digital services for citizens studying abroad, there are already projects and plans on the EU level. EMREX, Europass Digital Credentials, and Erasmus Without Paper are examples of international actions that have been implemented to develop digital services for students.

– Baseline study of cross-border data exchange in the Nordic and Baltic countries, final report



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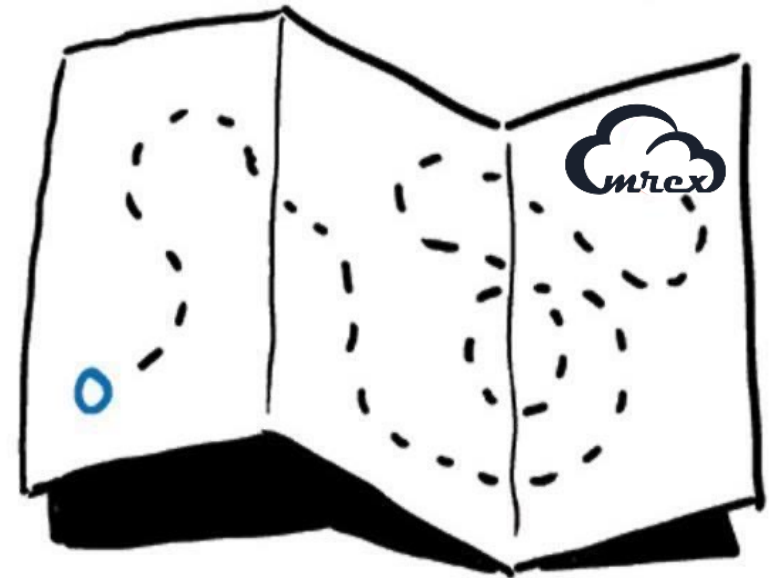
ORGANISATIONAL REQUIREMENTS



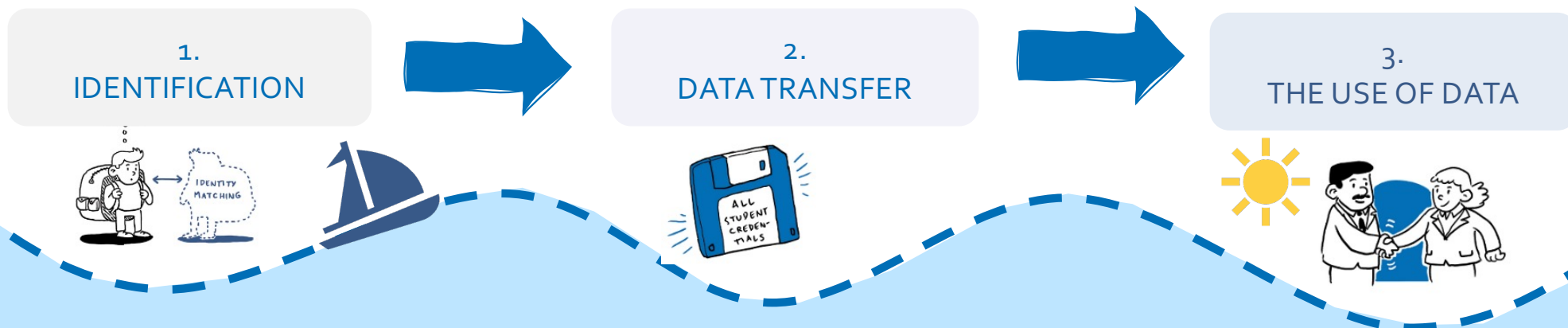
Know your starting point

Before decision making leading to the EMREX implementation, it is essential to get an overview of what EMREX is, what is needed and what can be expected from the EMREX and what not.

Being clear with existing practices, processes and solutions in the local context is important, not only from a technical point of view, but also from organisational, semantic and legal aspects.



Remarks on EMREX and organisational requirements



- EMREX doesn't include an identification solution.
- Currently, a learner should have a user access in both sending and receiving organisation to successfully use EMREX.

- Technical solution and a service for application integration
- EMREX is a messenger that sends the data in ELMO XML format. EMREX does not include a centralised register for the data.

- You should have a clear picture where the incoming data is used in your business processes.

EMREX specific terminology and concepts



EMP Emrex Data Provider (previously NCP – National Contact Point) – Stands for EMREX Contact Point and is the point the EMREX client accesses to get results from the host institution. There can be several EMP's in a network and this EMP can represent either one or several host institutions. The most usual solution is that an EMP represents all the institutions in one country. The EMP's implementation may vary from country to country.

EMC Emrex Client (previously SMP – Student Mobility Plugin) – Stands for EMREX Client. An EMC is an application at the home institution that initiates the transfer of results from host institution to the home institution. This is most usually a web application, but again, the implementations may vary from country to country.

EWP Registry – The only central component in the EMREX network, meaning there is only one. The registry holds a list of all approved EMP's in the EMREX network. The EMREX clients can query the registry to display available EMP's to the student who wishes to select their host institution EMREG.

EMREG – Registry of EMP's that participate in the EMREX network. Part of the EWP (Erasmus Without Paper) registry.



Source: <https://github.com/emrex-eu/standard>; [GitHub - emrex-eu/glossary: EMREX technical terminology glossary](#)

Clarify use cases and business processes

What are the processes related to educational credentials that would benefit from utilising Emrex in your organisation? Who owns the processes?

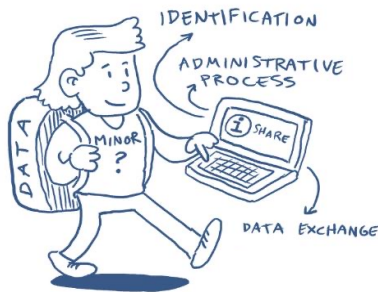
Possible use case scenarios

1. Learner applies for studies through the application system
2. Learners shares their previous study record data



Local business processes, e.g.

1. Student admission process
2. Recognition of prior learning process

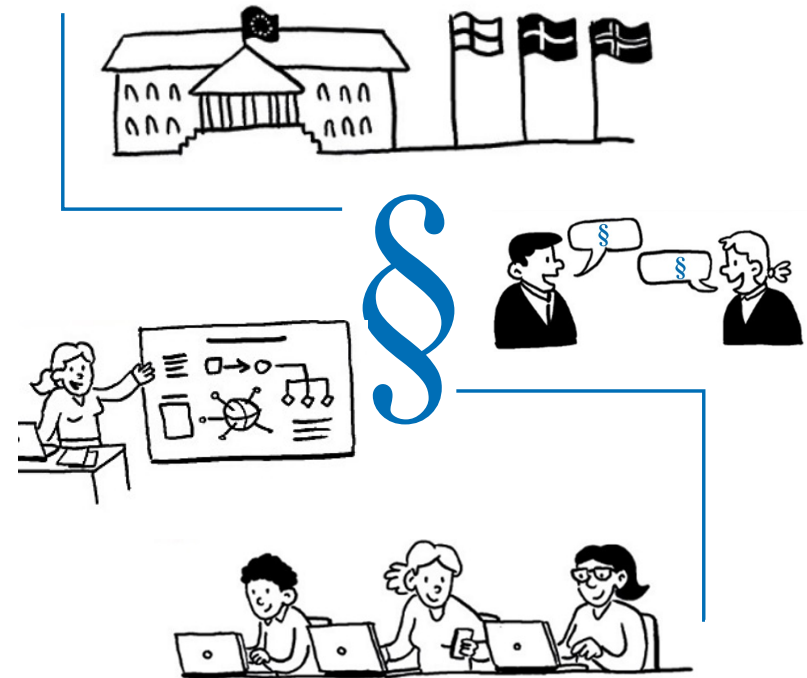


Make legal compliance a base for development

Understanding the legal implications of data sharing, including privacy laws and data protection regulations, is essential.

Keep these in mind:

- [European Data Strategy](#) and data related acts
- General Data Protection Regulation's [GDPR article 20](#) about the person's right to transfer his/her data
- [My data principle](#)
- National legislation
- Data requirements of local processes
- *The use of Emrex requires the student's consent and action*



Engage relevant actors in your organisation

It is fundamental to find the right people within organisations or networks in the scope of EMREX implementation.

IT Services

E.g. IT Developers, Security Team, Support and Maintenance Team also for Student Information System, Testing Team.



Business Processes

E.g. SIS Administrators, International Relations Offices, Study Administration, Process Owners, Academic and Teaching Personnel.



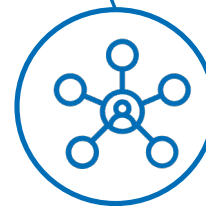
Supporting Processes

E.g. Procurement and Vendor Management, Change Management, Customer Experience Management, Legal Specialists, Finance Team.



Stakeholders

E.g. end-users (students, student counsellors, and administrative personnel), department heads.



Decision Makers

Find out who is making decisions in your organisation and about what (mandate).



Communications

Engage your communication personnel to ensure smooth internal and external communication before, during, and after the implementation process.



IMPLEMENTATION



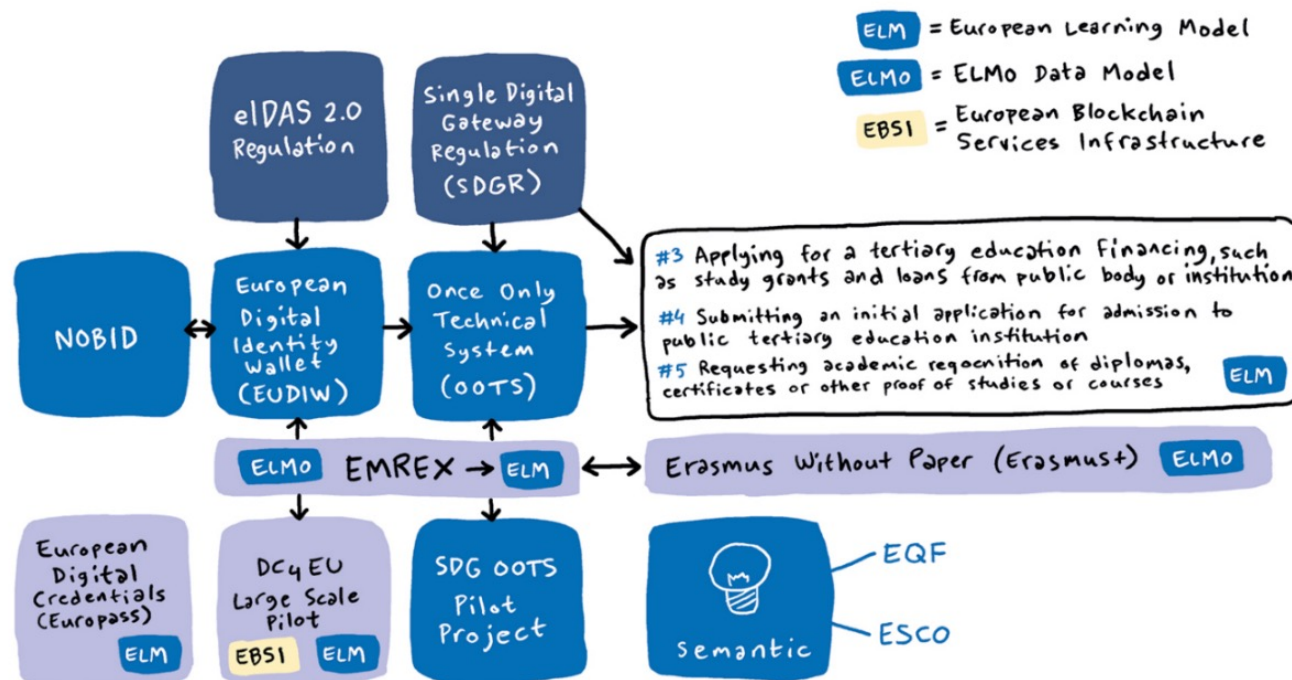
Get to know related initiatives & concepts

It is highly recommended to get an overview of the connections between standards, data models and topical projects related to cross-border exchange of educational data, both nationally and in EU and international context.



We believe we have reason to state that while one standard would always be the best option different standards can coexist. There is always different scope for the different initiatives going on, and with that also at least partly different needs for data formats.

– Fridell et al. 2022. Interoperability of educational data demands standards



Analyse data development needs

When the use case involves transferring student exchange data according to local processes, conduct an analysis to identify which data the student should be able to transfer and how .



- What data and for what purposes is it used in local processes?
- Who owns and who all are using or modifying data in local processes?
- What are information flows within and between local processes?



- What is data content in information flows?
- Does data used in local processes match data available in ELMO scheme (Europass Learning Model Ontology*) or is there variation?
- Does same data mean same thing between sending and receiving organisation?



- In which systems data is available or will be used during its life cycle?
- In which format data is available in different process stages?
- Which components, converters or new systems are needed for integrating data content into existing systems?



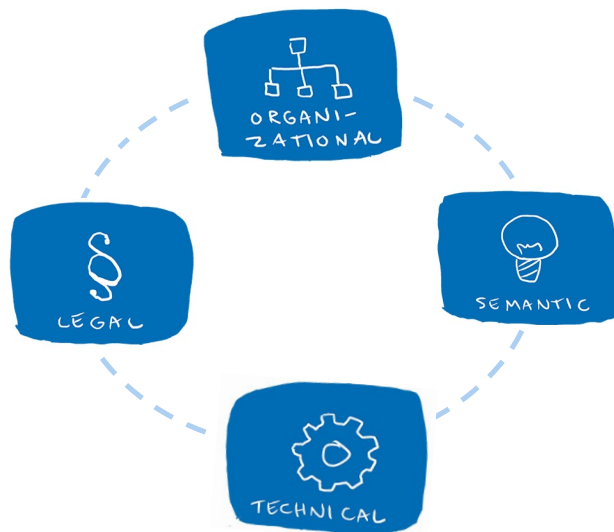
- Are there data regulations linked to data transfer, ownership, consent management?
- Are there need for changes in local or national regulation?



* <https://europa.eu/europass/elm-browser/documentation/rdf/ontology/documentation/elm.html#/>

Enable resources and organise the development

Simple, medium size or complex development case requires different resourcing and organising. Analyse what type of development work is needed and plan resources accordingly utilising four aspects of EIF model.

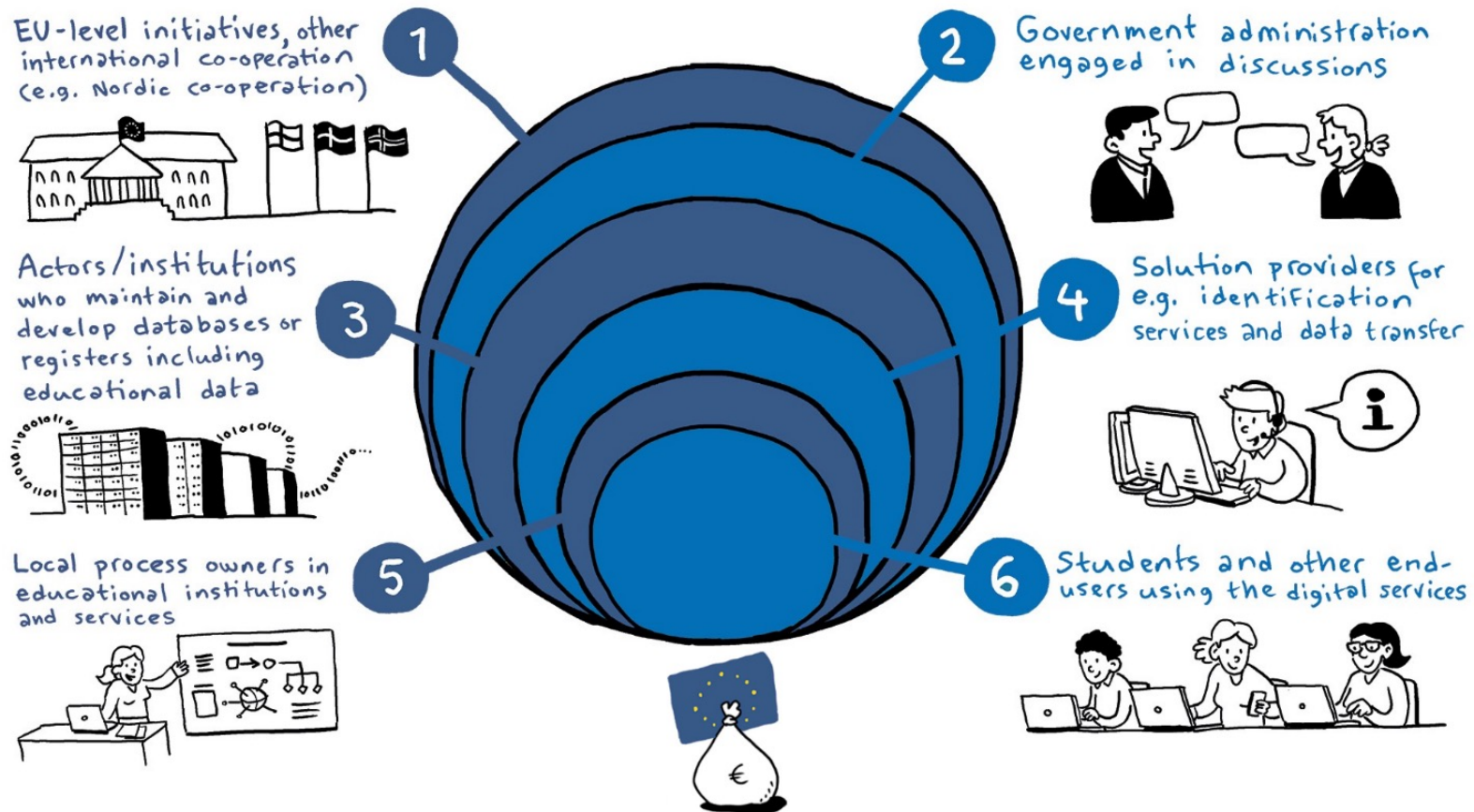


- What kind of **skills sets and resources** do we need, when identifying, understanding and implementing data development needs arising from local processes and related information flows?
- Who **make decisions and who are responsible** when organising the development (e.g. RACI responsibility assignment matrix)
- How to **balance resourcing in different phases** of whole development process (analysis, development, maintenance and upgrading)?
- Do we have enough and right kind of **internal resources** and do we need **outsourced resources**?
- What existing **technical solutions, components and tools** we already have and what we need to acquire elsewhere or create as new?
- What **legal** documents and agreements we have or need?



Keep stakeholders in mind

These six identified layers of stakeholders are important to keep in mind and be aware of in the digital development and decision making.



4

EMREX IMPLEMENTATION Case examples



The guide contains two different types of case examples of HOW EMREX has been implemented in practice.

- # The first describes the case of one university and EMREX integration into its own student information system.
- # The second example is the implementation process of EMREX in a centralised student information system, which is owned by a private company and used by several universities.



EMREX
implementation
in
Riga Stradiņš
University (RSU)
Latvia



Rīga Stradiņš University (RSU) in a nutshell



RĪGA STRADIŅŠ
UNIVERSITY

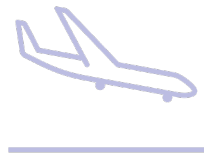
10 467

degree students



2 501

international
students



77

student source
countries



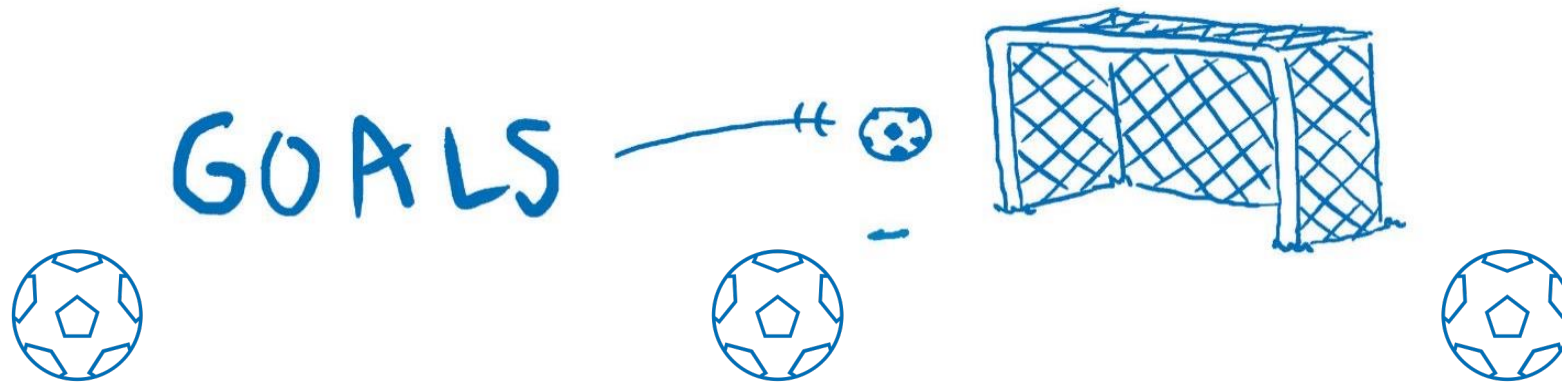
57

study programmes



Source: <https://www.rsu.lv/en/about-us>

EMREX implementation goals in RSU



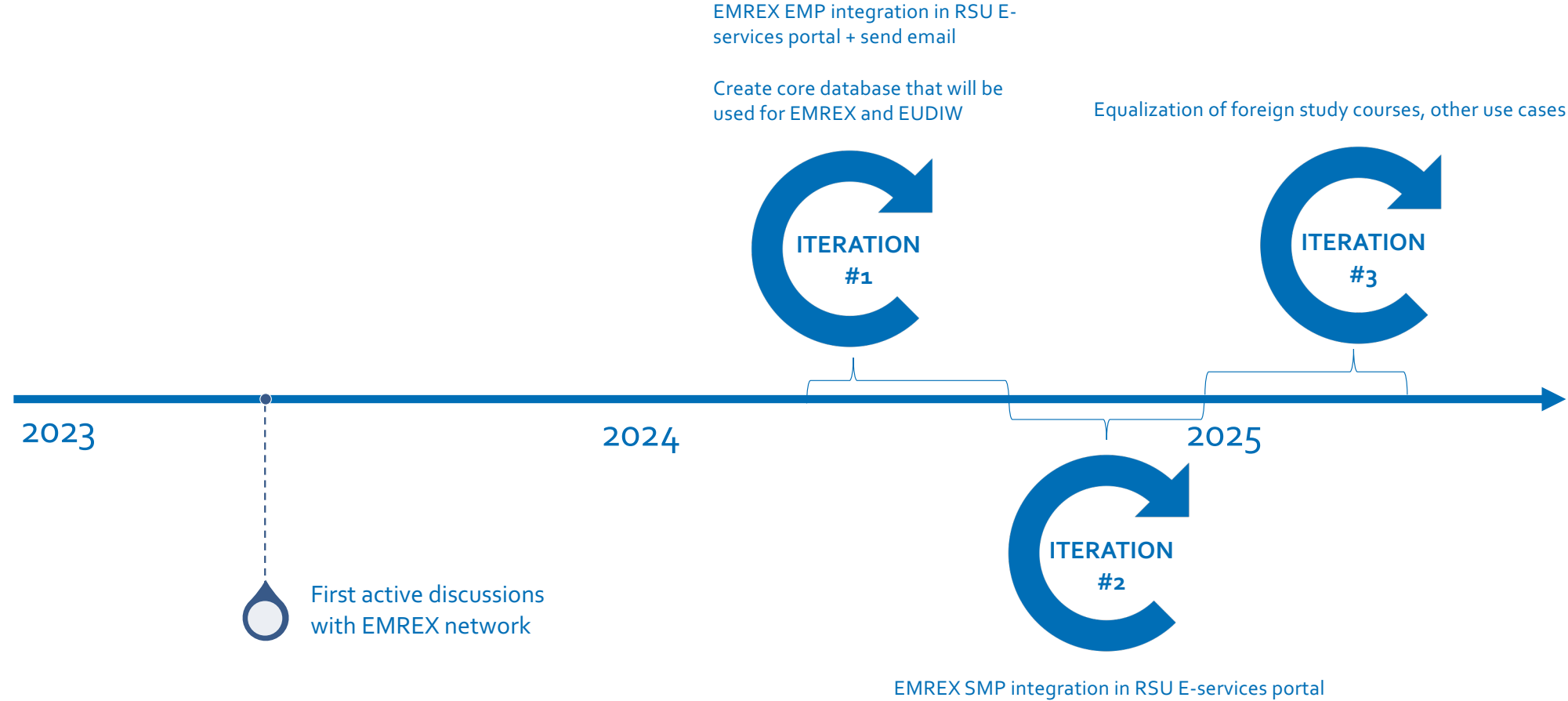
To support and enhance the student experience. This includes helping students with onboarding, ensuring they have access to the right study environments, and making them feel comfortable, especially for those coming from abroad.

To provide a streamlined system for both students and the university. The goal here is to enable students to transfer their academic data in a structured, machine-readable format that can be easily integrated into our university systems. This ensures a smooth recognition process for courses completed at other institutions.

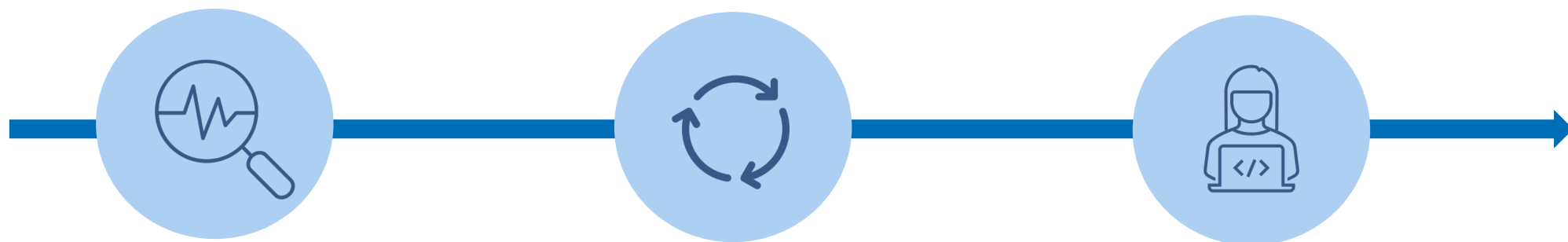
To execute a deep analysis of the data and business processes to determine the best integration points within our existing study environments.



EMREX implementation journey in RSU



Development phases in RSU



Analysis Phase

The first and longest part involved a working group made up of a business analyst, data architect alongside specialists from the study department. This group focused on discussions around all aspects of the implementation: data structures, use cases, and overall requirements. This phase took more than six months as it required deep analysis and careful planning before any development could begin.

Development Phase

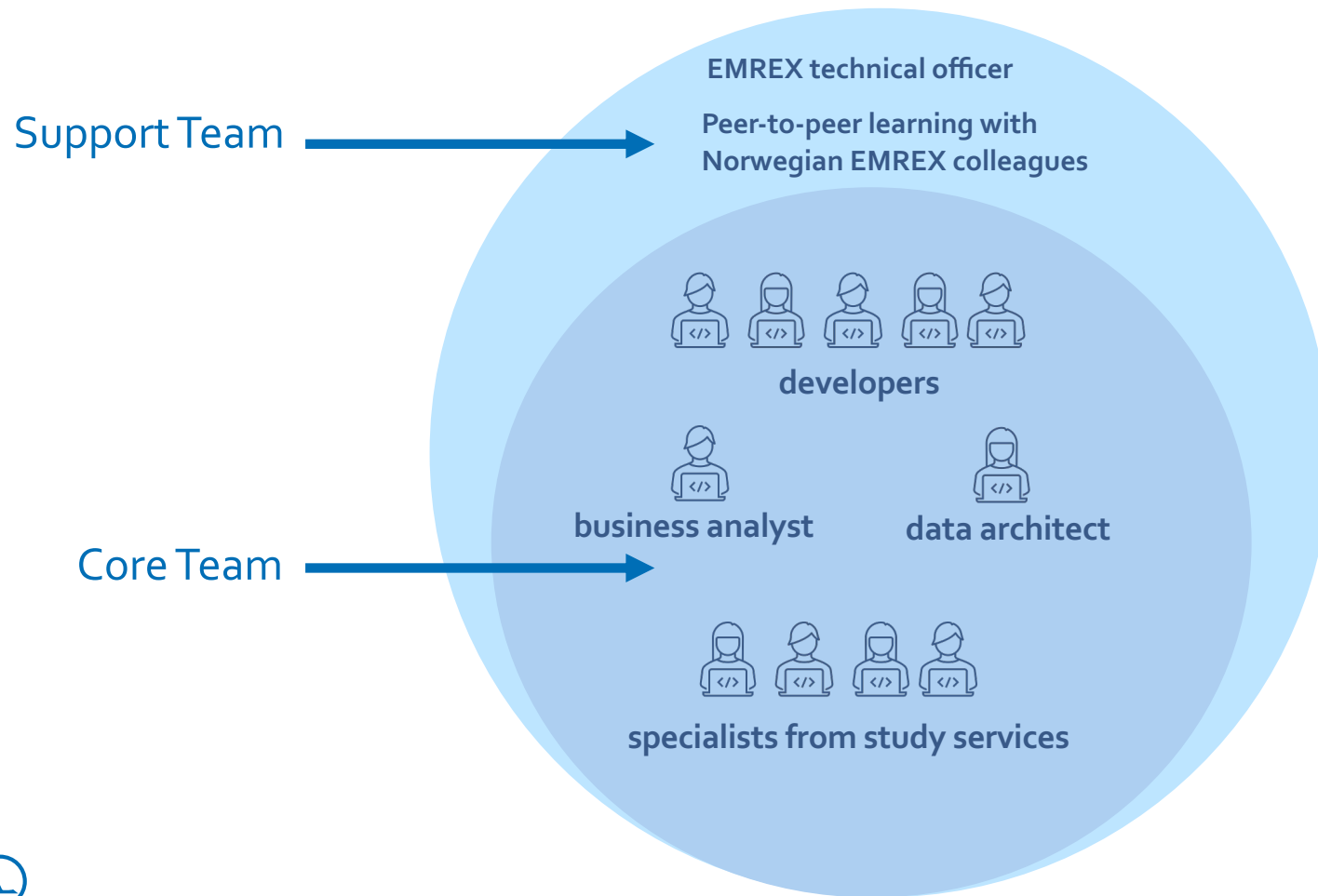
This was a more straightforward phase, where the focus was on translating the analysis into specific work items for the developers. It was essential to be precise in defining how EMREX should be integrated, detailing the features and limits of the model. While this stage was complex, it was highly structured and easier to manage, as the tasks were well-defined for the development team.

Maintenance and Upgrading

RSU is currently in this third phase, where the implementation is being maintained and continuously improved. This phase includes integrating not only the client-side of EMREX but also setting up the server-side, allowing us to act as a data provider for other universities within the network. This phase requires ongoing updates and adjustments as the system evolves.



Resources and development organisation

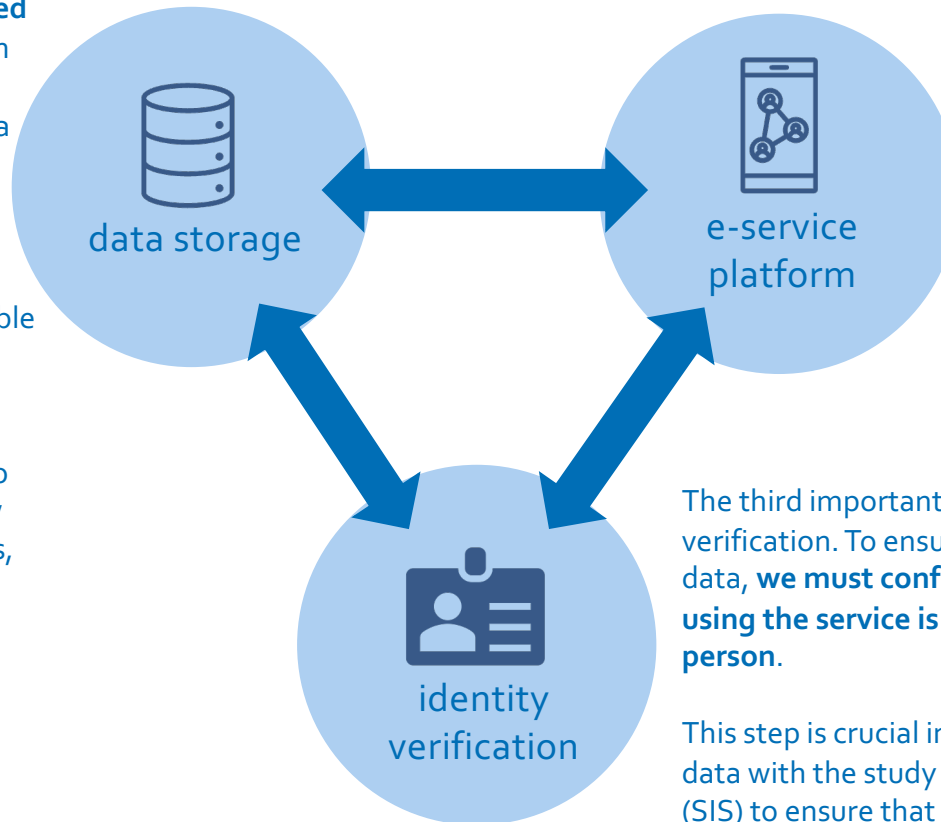


Three key components enabling EMREX implementation

The first essential element is a **dedicated future-proof data storage**. Rather than using the existing study information system or other resources, we created a new database specifically for EMREX-related data.

This storage houses all the necessary student data, ensuring that it is accessible for services both within the EMREX network and for other related services.

This specialized database is designed to securely store and handle the data flow between students and external services, ensuring that information can be easily retrieved and shared in a structured, machine-readable format.



The second key component is our **e-service platform, which already hosts over 20 different services for students**.

EMREX was integrated into this platform as an additional service. The platform is a crucial part of the implementation, serving as the interface through which students interact with the EMREX system and access various university services.

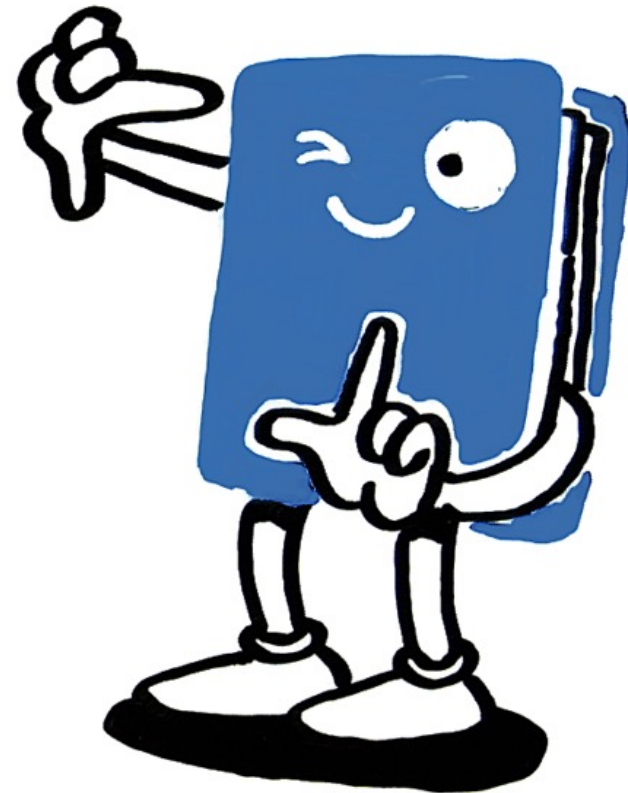
The third important element is identity verification. To ensure the integrity of the data, **we must confirm that the student using the service is indeed the correct person**.

This step is crucial in matching student data with the study information system (SIS) to ensure that the correct individual's information is being processed, preventing any data mismatch or identity errors.



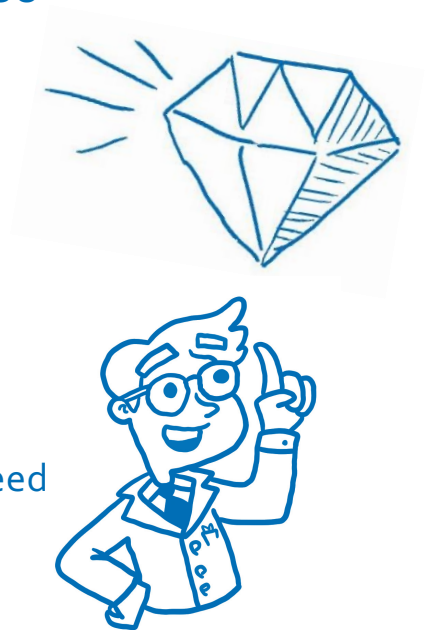
Key decisions made at the decision phase

- The most critical decision we made was to **narrow the scope of the project.**
- By narrowing the scope to **one specific business case—course recognition**—we were able to clearly define our goals and work towards tangible benefits.
- This focused approach has laid a strong foundation for success and might open the door for **future extensions once this core use case is fully operational.**



Lessons learned from RSU & EMREX

1. The most critical is to think of **the best use case scenario** of EMREX in Your university. RSU case is foreign (also ERASMUS) course recognition.
2. **Structured and reliable data is important.** Homework - clean up and normalize latest study data.
3. Considering to establish **an independent, trusty data source like student Portfolio** to store all information of study life cycle - diplomas with attachments, course grades, life-long learning certificates and skills recognitions.
4. **National procedures in recognition** of foreign study data (especially diplomas) might need reconsideration. Also, identifying foreign students can be challenging.
5. The **collaboration with colleagues from different countries** (e.g., Finland, Poland, Sweden, and Norway) proved essential, as we got advice, technical guidance, and best practices. Network could be a valuable source for concrete resources, such as code examples, structure models, and detailed use case scenarios.



EMREX
implementation
in
SISU student
information system
Finland



SISU in a nutshell

- Sisu is the Student Information System developed by Funidata Ltd in conjunction with Finnish universities.
- We serve around 100,000 monthly active users in Finland.

SISU



The goal was to focus on the students and make the recognition of prior learning process as easy and straightforward as possible for them.

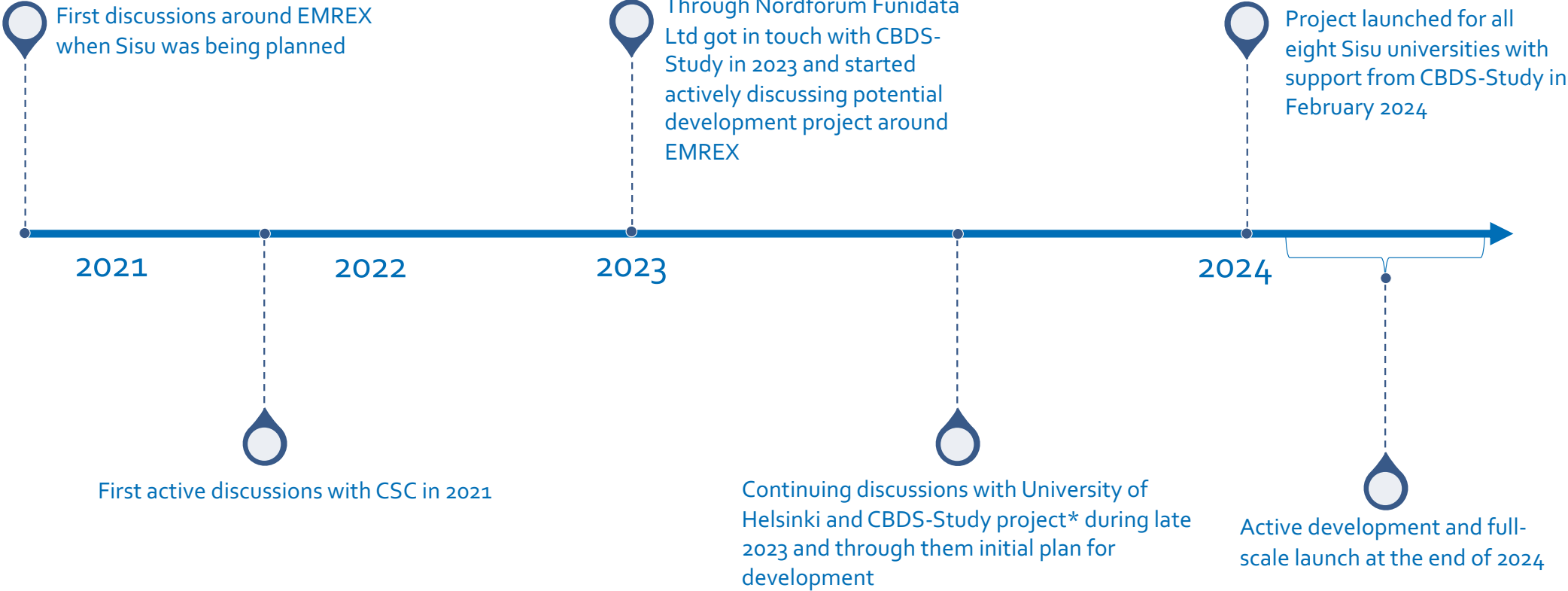


The goal was also to make sure that EMREX was as easily testable for the customers as possible.



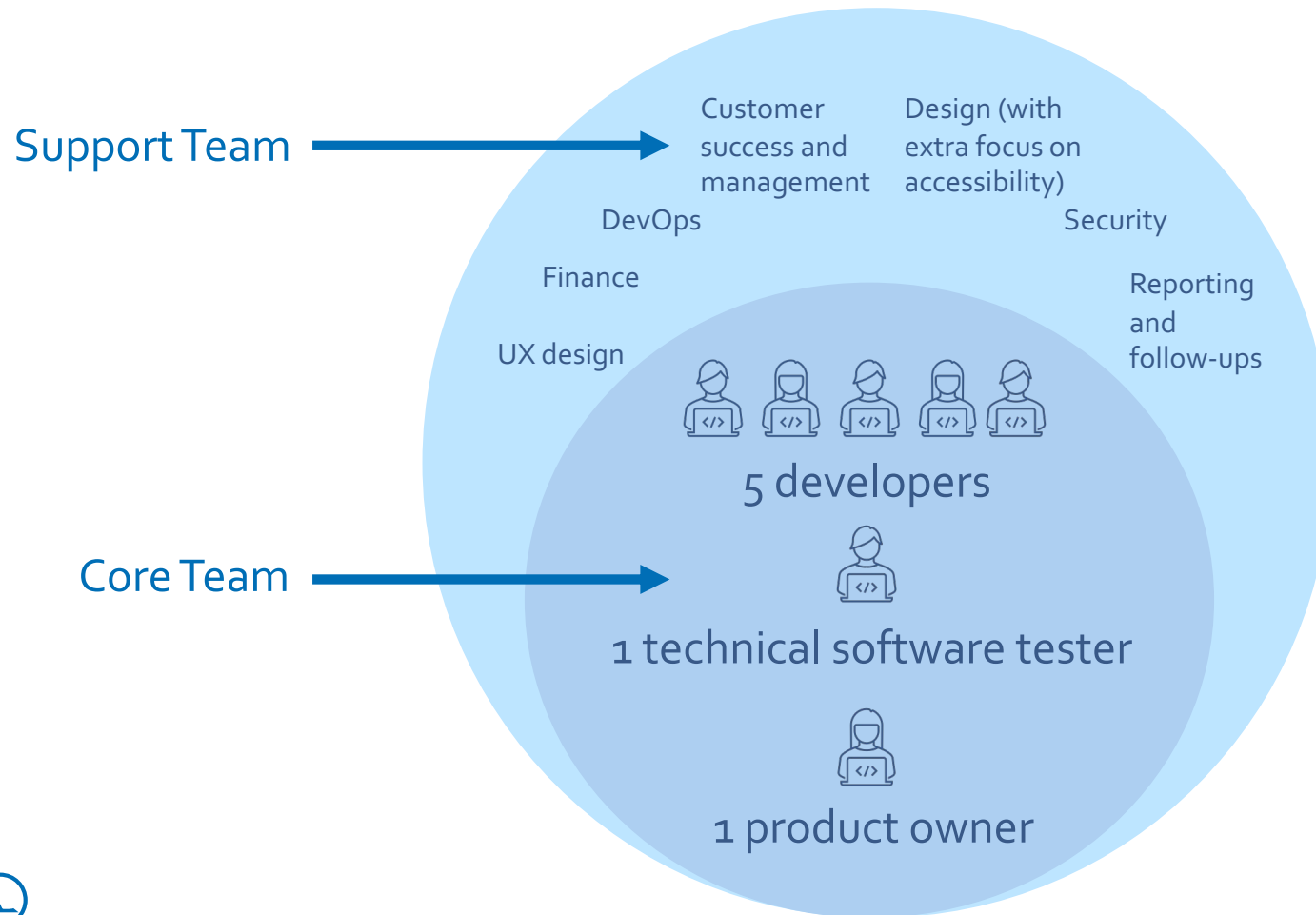
Source: Funidata Ltd: <https://www.funidata.fi/en/frontpage>

EMREX implementation journey SISU



** Studying in another Nordic and Baltic country project (CBDS-Study 2021-2024), funded by the Nordic Council of Ministers*

Resources and development organisation



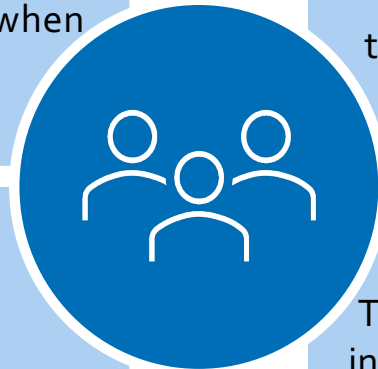
How did we manage our resources?

The project timeline allowed us to add a “reservation” for the project to our **development roadmap** in advance so we had sufficient development bandwidth ready when the project started.

Funidata is a software development house and we had all the **prerequisite resources already in-house** before the project so no recruitment was necessary and all the necessary structures (teams etc) were present.

Financially, the project was supported by a project funded by Nordic Council of Ministers and the universities using Sisu

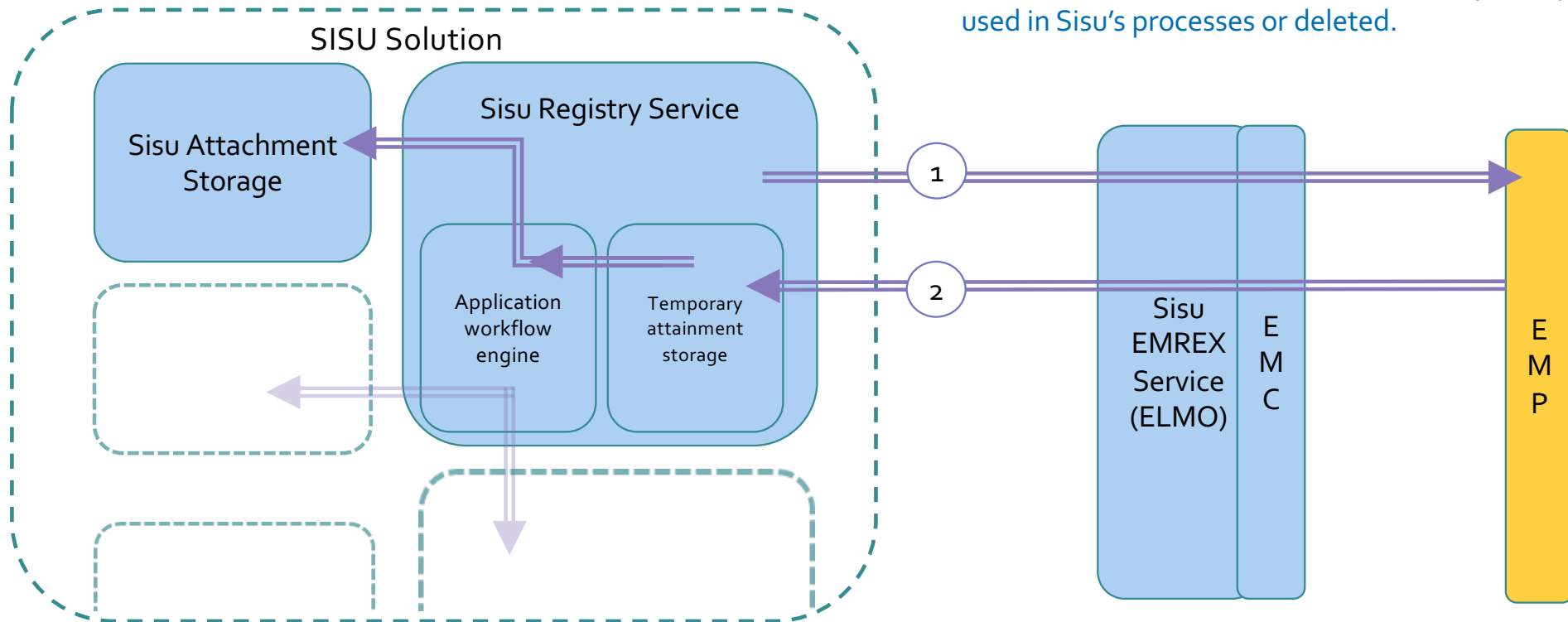
Through CBDS-Study project we got in touch **with necessary resources in the Emrex organisation** and got the examples and other information necessary for development



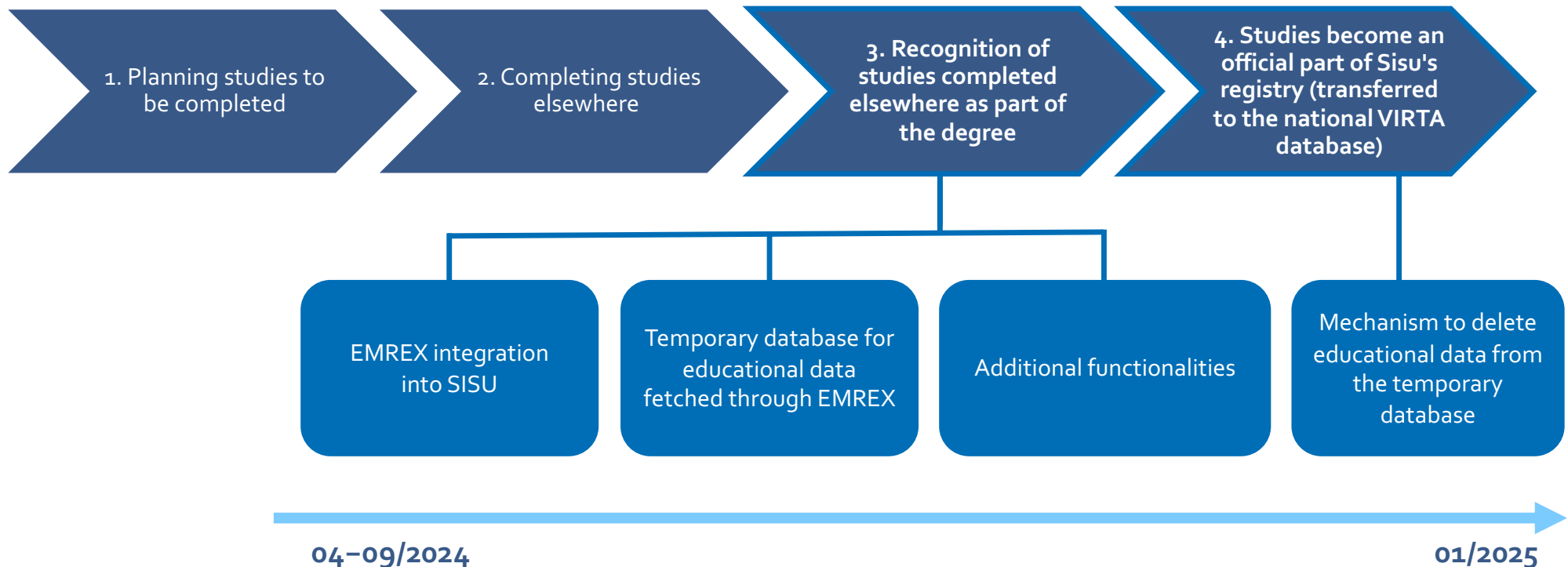
SISU Solution and EMREX integration – high level architecture

Sisu contains the Emrex Client (EMC) as part of the Emrex module (ELMO). It communicates with the main Sisu services with internal APIs.

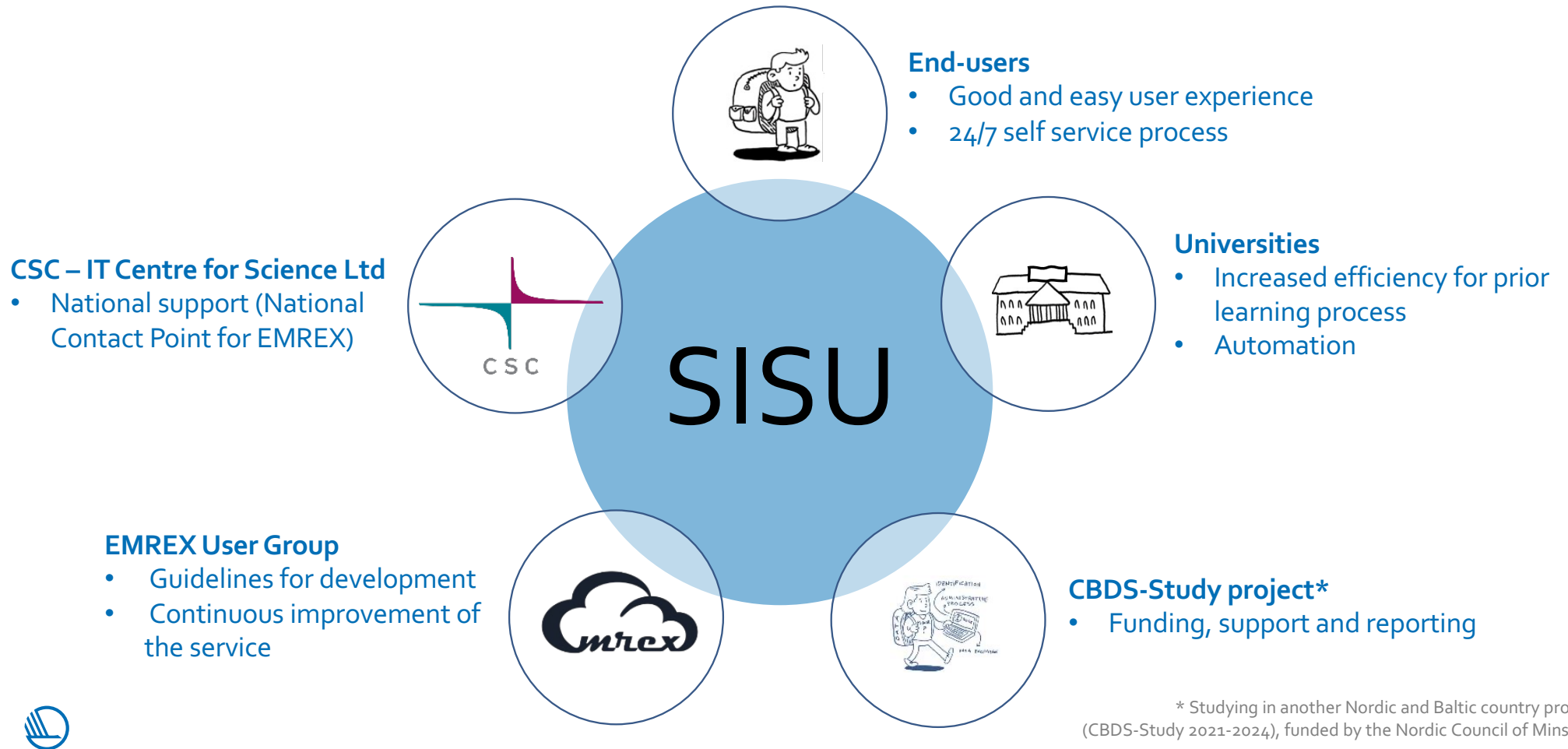
Inside Sisu the EMREX data is stored temporarily until used in Sisu's processes or deleted.



EMREX in recognition of prior learning process of SISU student information system



Relevant stakeholders



Challenges for EMREX implementation

"In planning phase we realised **EMREX requires the student to have access to the destination service**, typically either university credentials or some other form of credentials (ie. Banking) recognised in the target country."

"Every EMP is able to define their user flow differently, which makes it difficult to test and certify all them as working properly with Sisu."

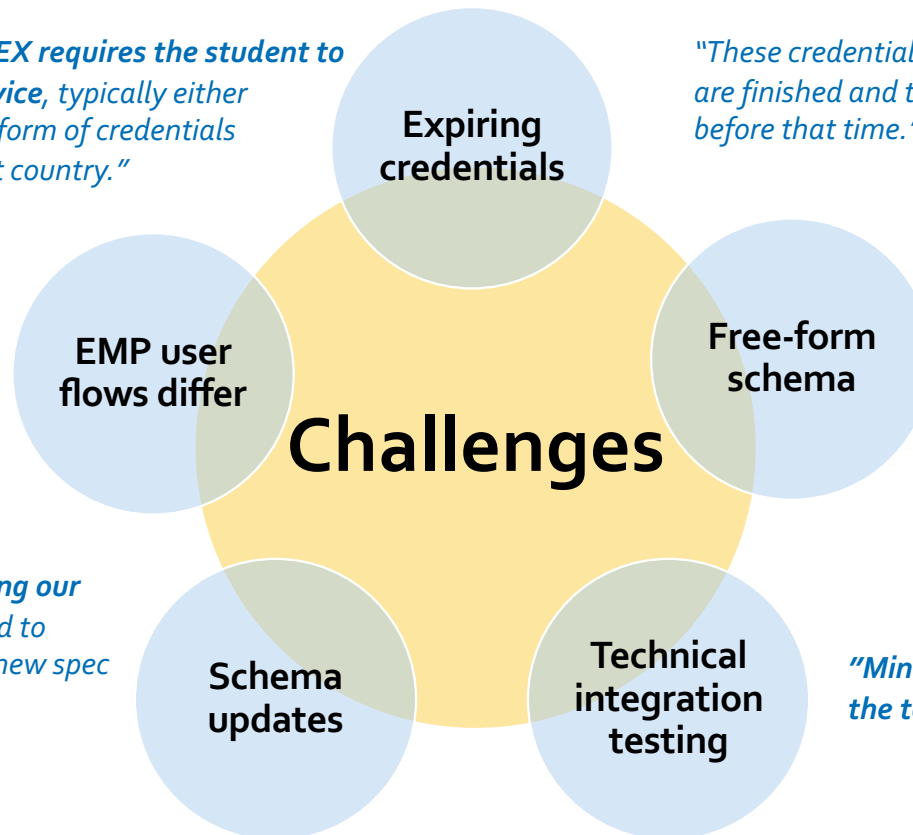
"**ELMO 2.0 was also released during our development** timeline. We managed to implement some features from the new spec in our solution, but not everything."

"These credentials are often **revoked quickly** after studies abroad are finished and the EMREX transfer needs to be completed before that time."

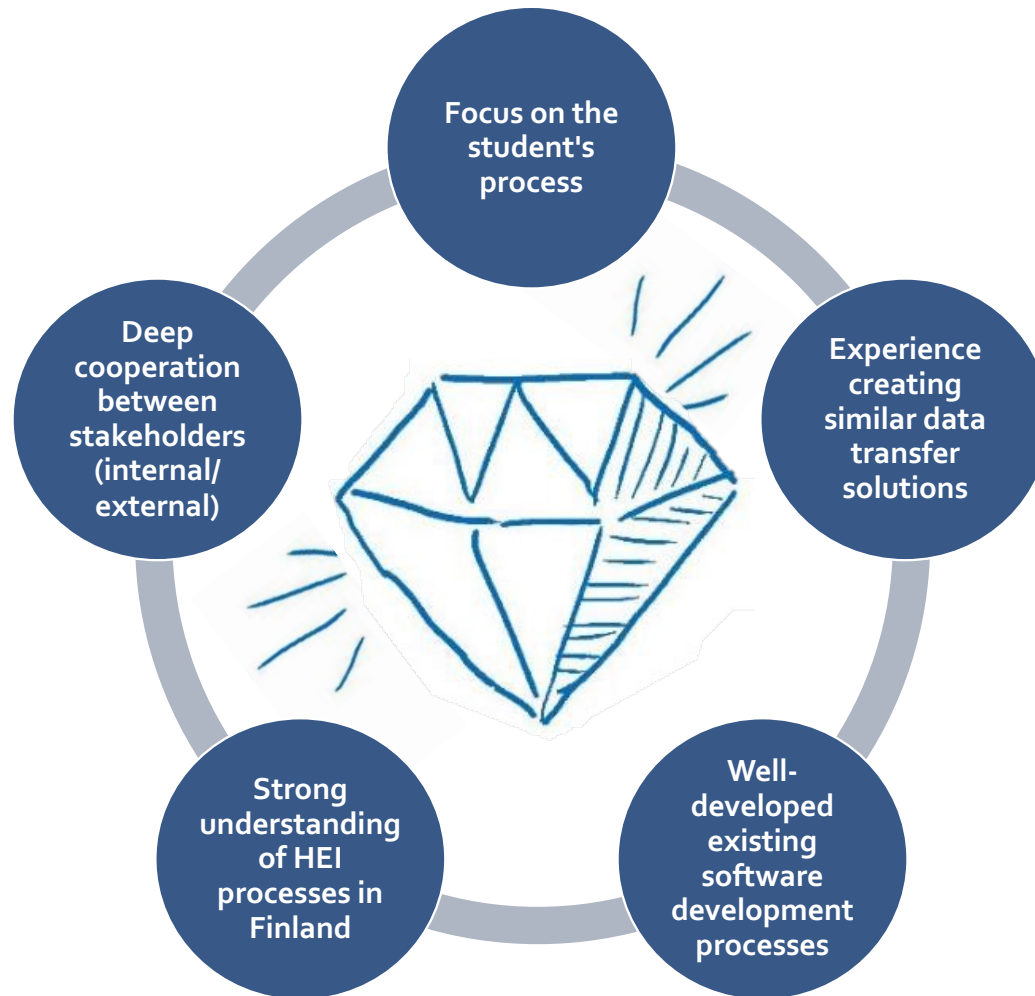
"The largest problems we faced with development were due to the fact that the **ELMO schema** used by EMREX, by design, is rather loose."

Only a small handful of fields are marked as mandatory which makes creating an integration or an effective UI difficult when you cannot be certain that you receive, for example, a name."

"Minor problems when starting development **with the test services** and their certificates."



Success factors for EMREX implementation



Lessons learned from SISU & EMREX

1. Implementing **EMREX** as a part of Sisu is **more than just creating a technical implementation** to transfer data from Emrex.
2. During planning and UX design we went through our designs with experts from Sisu universities to **make sure the changes to the process and their consequences were well understood**.
3. Development of the integration to Emrex was relatively straightforward, but we did encounter some **surprises with the specification** that we had to overcome.
4. **Development does not end with the release** of the full process. We need to monitor, improve and maintain the solution as a part of the life-cycle management for Sisu.



5

FURTHER CONSIDERATIONS



Further recommendations

To prepare for long-term development with EMREX, institutions can take several strategic steps.

Focus on Data Quality and Management

Prioritise the establishment of structured and reliable data management practices. This includes cleaning and normalising existing data and considering the creation of a centralised student portfolio to store comprehensive academic records.

Adapt to Regulatory Changes

Stay informed about evolving legal and regulatory frameworks related to data exchange and privacy. Institutions should be prepared to adapt their processes to ensure compliance and maintain trust among users.

Enhance Stakeholder Engagement

Actively involve all relevant stakeholders, including faculty, administrative staff, and students, in the planning and implementation phases. Their insights can help tailor the EMREX solution to meet specific institutional needs and improve user acceptance.

Ensure proper resources.

Make sure that resources are allocated for ongoing support and also anticipated for future development.

Foster International Collaboration

Collaborate with other institutions, both locally and internationally, to share best practices and resources. This can help address common challenges and enhance data exchange capabilities.

NEXT STEPS:



References

Publications of the CBDS-Study project

Baseline study of the cross-border data exchange in the Nordic and Baltic countries

<https://pub.norden.org/temanord2021-547/>

Handbook of cross-border data exchange within the Nordic and Baltic countries (chapter 3)

<https://pub.norden.org/temanord2023-542/3-findings-of-work-package-1-studying-in-another-nordic-or-baltic-country.html>

