EMREX

1ST PLACE WINNER

FOR NETWORK TECHNOLOGY

– PESC 22ND ANNUAL BEST PRACTICES –

EMREX
1ST PLACE AWARD
NETWORK TECHNOLOGY
22ND ANNUAL BEST PRACTICES

EMREX AWARDED 1ST PLACE

FOR 'NETWORK TECHNOLOGY' IN 22ND BEST PRACTICES

EMREX IMPLEMENTATIONS EXPANDING ACROSS EUROPE

Washington, D.C. ~ The Board of Directors of the Postsecondary Electronic Standards Council (PESC) is pleased to announce **EMREX** of the EMREX Executive Committee as 1st Place Winner for *Network Technology* in PESC's 22nd Annual Best Practices Competition.

Over the last few years EMREX has developed itself into an organization committed to facilitating the exchange of educational data within and outside of Europe, with several countries having implemented EMREX into their national systems.

EMREX is a flexible solution for transferring student data internationally in a machine-readable, standardized way. It consists of two parts: the technical solution and the international network of partners (EMREX User Group – EUG). EMREX originated as a European Union (EU)-funded project in 2015-2017, aiming to simplify and increase the quality of the credit transfer process after a student exchange.

The EMREX service network went into production before the successful project ended and has been in production ever since, being one of EU projects maintaining itself and being able to grow after the project officially ended. EMREX is not limited to the EU as it can be used worldwide. At present, EMREX is operational in several countries in Europe and is being used as a technical solution used to securely exchange educational data between students and third parties, for example higher education institutions (HEIs) or potential employers.

"EMREX is not bound to the European borders and we are always looking to expand our network. It can be used before, during and after studies, from educational to employment purposes. It would be very interesting for us to explore the North American continent," states

Jan-Joost Norder, Product Owner International Services at DUO (NL) and Board Member of the EMREX Executive Committee.

"Looking at the growth of the network in the last few years we have a promising future ahead of us. More and more organizations are joining the network and exchanges double year after year. And the first German HEI's are joining as we speak," states Guido Bacharach, German representative and Board Member of the EMREX Executive Committee.

"The level of commitment and attention to detail, undertaken by the EMREX Executive Committee to build a multi-national, interoperable, digital network, is unparalleled," states Michael D. Sessa, PESC President & CEO. "The EMREX Executive Committee is a best practice itself in open, transparent software development and deployment. In being such a major achievement, EMREX serves as a best practice model in network technology for other countries, other networks and other communities. "

The award-winning submission made by the EMREX Executive Committee is posted on the PESC website with prior winners at www.pesc.org. An Awards Ceremony will be held during the General Sessions at PESC's October 2021 Data Summit being held virtually October 19-21, 2021.

For more information about EMREX and how to connect to the EMREX network, please visit https://www.emrex.eu/.

For more information about PESC and the Annual Best Practices Competition, please visit https://www.pesc.org/.

ABOUT EMREX
Launched in 2015, EMREX is the solution for electronic transfer of student records between higher education institutions in Europe. The Emrex User Group (EUG) is an independent, international network which unites various actors interested in enhancing student data portability. As such, the network will act as a global platform for connecting expertise, sharing knowledge and enhancing collaboration to expand the EMREX footprint and help unlock the full potential of student data and open up data flows globally.

ABOUT PESC ANNUAL BEST PRACTICES
PESC Annual Best Practices Competition recognizes, highlights and promotes innovation and ingenuity in the application and implementation of interoperable data standards for business needs. The Annual Best Competition is open to institutions (schools, colleges, universities), associations, organizations, government agencies and departments, districts, consortia, non-profit and commercial service providers and other education stakeholders that have collaborated

to design and/or adopt an electronic standardization initiative (e.g. published articles, white papers, pilots, demonstrations and implementations).

Submissions can/may include documentation, artifacts and descriptions of the scope of a project, participants and partners, types of standards employed, relevant dates and project milestones, copies of articles (if an article submission), outline of mission/objectives and any related statistics (# of transactions transmitted, estimated cost savings, etc.).

HALLMARKS OF BEST PRACTICES: While innovation and meeting customer needs will continue to ensure the rapid evolution of systems, applications, networks, products and services, those PESC recognizes as 'Best Practice' all share the use and inclusion of: Common Data Standards; Unique Identifiers and Standardized Code Sets; Quality Control Measures; Controlled Access and Security; Comprehensive Management Support; Flexibility and Scalability; Student/Learner-Centric; Formal Data Governance

EXPANSION OF BEST PRACTICES IN 2021: The Annual Best Practices expanded in 2021 into three separate categories: by region, by role, by technology. Awards may be made each year for each of the three separate categories; and multiple awards may be made each year under each category. The PESC Board Review Committee makes all awards and may determine that no award be made in a given year under one or more categories.

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PESC®

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– PESC 22ND ANNUAL BEST PRACTICES –

September 23, 2021

Jan-Joost Norder
Executive Committee
EMREX
https://emrex.eu/

Dear Jan-Joost:

On behalf of PESC and the PESC Board of Directors, I am pleased to notify you that your submission EMREX in PESC's 22nd Annual Best Practices Competition has been awarded 1st Place Winner for "Network Technology."

A multi-media press release will be issued by PESC announcing this 1st Place Award with this notification letter and your winning submission attached. An Awards Ceremony is planned for the opening session of PESC's upcoming October 2021 Data Summit (Tuesday, October 19, 2021). I hope you are available at this time to provide brief remarks.

Session time has also been allocated on the Summit program agenda for you to present your winning submission. Your winning submission will also be posted prominently on the Annual Best Practices page of PESC's website along with all previous 1st Place Award Winners. Please note the actual award will be held and delivered to you personally.

Congratulations from PESC and the PESC Board of Directors! Thank you and please extend warm thanks and gratitude to the EMREX Executive Committee and the entire EMREX team!

My best regards,

Michael D. Sessa
President & CEO
PESC

cc: PESC Board of Directors

EMREX

Submission to the PESC 2021 Best Practices
Competition

1   Content

2   Introduction

Over the last few years EMREX has developed itself into an organization committed to facilitating the exchange of educational data within and outside of Europe. Several countries have implemented EMREX into their national systems over the last few years. This document describes EMREX in short, the opportunities and different use-cases that explain the use of EMREX. And it ends with a view in EMREX's future strategy.

3   What is EMREX?

EMREX is a solution for transferring student data internationally in a machine-readable way. It consists of two parts: the technical solution and the international network of partners (EMREX User Group – EUG). It originated as an EU-funded project 2015-2017, aiming to simplify and increase the quality of the credit transfer process after a student exchange. The EMREX service network went into production before the successful project ended and has been in production ever since, being one of EU projects maintaining itself and being able to grow after the project officially ended. EMREX is not limited to the EU i.e. it can be used worldwide. At present, EMREX is operational in a number of countries in Europe. It is a technical solution used to securely exchange educational data between students and third parties, for example higher education institutions (HEIs) or potential employers.
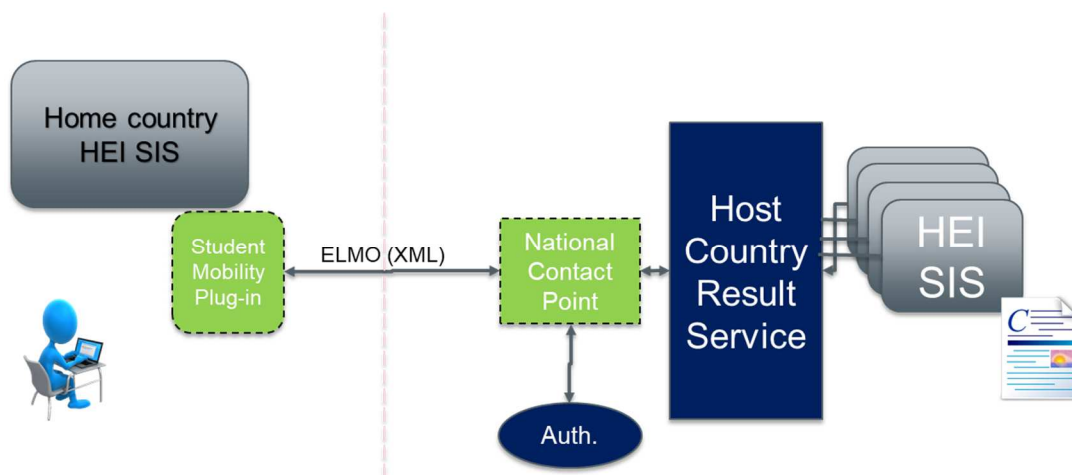

Figure 1: Student returning home can retrieve his achievement data electronically

3.1   How does EMREX work?

The technical solution is extremely flexible, the only requirement is that participating clients (EMREX Client - EMC) and EMREX Contact Points (EMP) follow the ELMO standard. ELMO, more in chapter 4, is the data standard used in the EMREX network to describe student achievements and supporting data. It is used also by other projects and organizations (such as "Erasmus Without Paper"[1]). Any actor can be behind an EMP, for instance a single HEI, an organization or a national level data provider. The requirements for participation for data providers and consumers are low – anyone can build an EMREX client and any local system that delivers data upon request can be connected to an EMP. Security is maintained in an adaptive manner, from initially a

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[1] www.erasmuswithoutpaper.eu

basic solution to coming technologies. More information on this can be found at www.emrex.eu[2]. All specifications and software are open source and can be found in Github[3]. It is an easy and cost-efficient solution for implementing transfer of student records between institutions.

3.2   Current position EMREX

Currently, EMREX is operational in a number of countries in Europe. It is a technical solution used to securely exchange educational data between students and third parties, for example higher education institutions or future employees. In this way, it can facilitate student mobility and decrease the administrative burden of student exchanges for the institutions. EMREX uses an open source technical solution through which different kinds of data can be transferred, be it transcript of records or entire diplomas. Because of the diverse nature of the data that can be transferred via EMREX, it can be used for multiple purposes. For temporary exchange programmes, transcripts of records are needed, whereas for following an entire degree abroad, full (high school) diplomas are needed. Full diplomas are also needed for future employers. Whereas it started as mostly an Erasmus driven solution, it has evolved to encompass a broader scope of data exchanges.

3.3   EMREX as a technical solution

EMREX has some clear advantages. First, the system is a safe way to ensure that student data can be transferred between trusted parties, and that the data that is being transferred is reliable. Second, the student is in control of the data, and can decide whom to transfer it to. Third, it is easy to implement.

3.4   EMREX as an organization

Over the past few years EMREX has evolved from a network of cooperating countries to an organization. Currently, EMREX consists of an Executive Broad and a General Assembly. The Executive Board is made up of seven members from seven different partner countries. All these partner countries are represented by someone from an organization that is a NCP.

3.5   Use of EMREX

Recently, new statistics have been collected by all partner countries. This show to what extent EMREX has been used in all of these countries. There are quite significant differences in the extent to which it has been used. Most striking is Norway, where EMREX is fully operational and is used the most. This can be explained because of the fact that Norway uses the system for exchanges within Norway. Many other partner countries have other national systems in place that are used to exchange data between individual universities. For example, the Netherlands has used EMREX for 21 (international) exchanges so far in 2018, but has had a growth to 479 in 2019. Clearly, this is still a very small part of the total number of exchanges of educational data from and to the Netherlands. But more importantly, it is also a very small part of exchanges between the Netherlands and other partner countries (these are the exchanges that EMREX *could* be used for). The same goes for Poland, which had 90 exchanges through EMREX between different Polish universities in 2019. So, we can conclude that EMREX is not reaching its full potential in most countries.

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[2] https://www.emrex.eu
[3] https://github.com/emrex-eu/

The organization has not existed for a very long time yet, so it makes sense that it still needs some time to grow. However, it is important to evaluate to what extent the use of EMREX has been growing in the different partner countries over the past few years. When looking at the statistics they give a promising view for the future, knowing that there were only 436 exchanges in 2017 within the network.

	CRO	NL	NO	PL	SE	Total
Number of connections	2358	479	57242	90	1387	61556
Change from 2019	93%	1228%	199%	74%	205%	192%

Table 2: Exchanges EMREX network 2020

3.6   Stakeholders

This table in this paragraph gives on overview of the countries were EMP's are installed together with available educational data.

Country	Organisation	Connected institutions	Available data	Degrees
Netherlands	DUO[4]	Central register (approx. 1000 institutions)	- Higher education - Vocational education - Secondary education	Approx. 10 million
Norway	Unit[5]	40	- Higher education	Approx. 1.3 million
Finland	IT center for Science[6]	38	- Higher education	n/a
Sweden	Ladok[7]	37	- Higher education	Approx.1 million
Poland	University of Warsaw[8]	8 universities (with own EMP)	- Higher education	n/a
Croatia	ASHE[9]	18	- Higher education	n/a
Germany	University of Göttingen[10]	1	- Higher education	n/a
Italy	University of Siena[11] University of Verona[12]	2	- Higher education	n/a
Denmark	Ministry of Higher Education and Science[13]	2	- Higher education	n/a

Table 3: overview EMP's

4   Standards

The EMREX network will use the ELMO [ELMO] format to exchange the results. The specification of ELMO was established by CEN Workshop for learner technology (CEN WSLT) to drive the implementation of the two new CEN standards:

- EN 15981 European Learner Mobility – Achievement information [EuroLMAI]
- EN 15982 Metadata for learner opportunities – Advertising [MLO-AD]

These two standards describe data models. EN 15982 is a data model for learner opportunities, like study program, course, module etc. EN 15981 is a data model for assessments, modelling the information to be found on diplomas, transcript of records and Diploma Supplements. These specifications were developed by CEN WSLT, and the standards were prepared by CEN/TC 353 Information and Communication Technologies for Learning, Education and Training.

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[4] www.duo.nl
[5] www.unit.no
[6] www.csc.nl
[7] https://ladok.se/
[8] https://en.uw.edu.pl/
[9] https://www.azvo.hr/en/
[10] https://www.uni-goettingen.de/en/1.html
[11] http://en.unisi.it/
[12] http://www.univr.it/jsp/index.jsp?lang=en
[13] https://ufm.dk/en

ELMO is still undergoing some changes to better support the result exchange in EMREX. The ELMO format is an XML format that has support for assessment information included in Diplomas, Transcripts of Records and Diploma Supplements. It also covers descriptions of the qualifications, programs, courses and modules for these assessments. This is information needed in admission and recognition processes.

5 Security

One of the important features of EMREX is the quality and reliability of the data. In order to ensure this, it is important that the transfer of data is done in a safe way. Several steps have to be taken into account towards securing the EMREX data transfer:

- Double login: The student must log in, using secure login, in both the EMREX client and the EMP.
- Enforcing HTTPS: EMREX will be enforcing the use of HTTPS to transfer data.
- Digitally signing the ELMO data: EMREX will use signatures for the ELMO data to ensure that the NCP is a valid one. The public keys are stored in EMREX register(EMREG).
- Verification of student: Since a student has to log in on both sides of the transfer, validation is possible whether it is indeed the same student. This is done on gender, date of birth and name. Since name can be written differently in different countries, a Levenshtein algorithm with threshold is used to check the name.
- In addition, the data is never "touched" by the student, meaning that the data cannot be tampered with.

6 Benefits

As described above, EMREX has some distinguishable features that can be used as selling points. Also, there are some external developments that could be very useful for the future of EMREX. This section will further elaborate on these opportunities. The most important ones are:

- Rising international student mobility
- Personal data management

6.1 Rising international student mobility

International student mobility is on the rise. The OECD predicts that by 2025, eight million students will study abroad. A recent report by the British Council offered an overview of projected postgraduate mobility trends to 2024. This report asserts that student mobility is largely driven by demographic and economic change.[14] The number of 18 to 22-year olds in a particular country relates directly to the number of tertiary enrolments. Therefore, changes in this demographic group are likely to influence patterns of student mobility.[15]

In many European countries the size of the elderly population is increasing faster than the birth-rates. As a consequence, European universities will be affected by the reduced numbers of their traditional target group (students aged 18-to-25 years) in the long term. It is projected that some higher education systems in Europe are

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[14] https://www.reimagine-education.com/wp-content/uploads/2018/01/RE_White-Paper_Student-Mobility-Demographic-Changes.pdf
[15] Ibid.

under high risk of closure or setback and others are under medium risk due to population decline.[16] One obvious solution to this problem is increased student mobility. This however comes with its own challenges. Universities will need to adjust to larger parts of their student population being foreign, which might prove to be difficult, both in practical and societal sense.

 The European Commission has agreed on a new ambition to increase the proportion of higher education students completing a study or training period abroad to 20% by 2020.[17] Students from outside the European Union are also more and more interested in studying in Europe. These developments are expected to continue over the coming years. Clearly, increased international student mobility comes with rising administrative burdens for institutions and students. EMREX could profile itself as the best solution to this problem.

Furthermore, there are other parts of the market that EMREX could focus on, most importantly the employment market. Employers often want access to diploma data in order to make a decision about a potential employee. This data needs to be reliable and easily obtainable. EMREX could be very useful in this instance. It could provide employers with diploma data in a secure and trustworthy manner, as well as give employees ownership over their own personal data.

6.2   Personal data management

This is another important manner in which EMREX is responding to current developments in the digital landscape. Personal data management is becoming increasingly important. When using EMREX, the user is always in control of his/her own data. Student data are not exchanged between institutions, but rather the student decides when and with whom to share personal data. EMREX is a user-driven approach to data management. This is also in line with the General Data Protection Regulation[18].

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[16] Fatma Mizikaci and Bernd Baumgartl, "Demographic Trends and Risks for European Higher Education", *International Higher Education* (2015), 15-16.

[17] https://ec.europa.eu/education/policies/higher-education/mobility-and-cooperation_en

[18] https://gdpr-info.eu/

7 Example of use cases

Below are some examples of different ways to put the data transported through EMREX to other uses than just recognition at the home university after an exchange period.

7.1 Self-sovereign data ownership

The Norwegian Diploma Registry (Vitnemålsportalen) has seen a large increase in sharing of educational results via EMREX in the last years, due to the growing number of web services connecting as EMREX clients to the Diploma Registry in the last couple of years, especially recruitment services. The main goal of the Diploma Registry is to help individuals collect their results from higher education and share them with potential employers, educational institutions and other relevant recipients. Since 2017 logins have nearly doubled each year, with almost 600 000 in 2020.

7.2 Digital certificates in Germany using EMREX

The first prototype for digitally authenticated and machine-readable certificates in Germany is running and successfully using EMREX. In cooperation with the ministries of the federal state of North Rhine-Westphalia (NRW), various German universities and the Stiftung für Hochschulzulassung (SfH), the German Bundesdruckerei (BDR) has succeeded in creating a first fully functional prototype for digitally authenticated and machine-readable certificates.

7.3 Data compatibility with other systems

No single system can solve all problems and different initiatives have different purposes. One example is EUROPASS4 which has a much wider scope than EMREX but where the data received from EMREX plays an important role. EMREX has a liaison with Europass concerning cooperation on the future format, to ensure the compatibility with ELMO.

7.4 Admission automation

NOKUT, the ENIC/NARIC organisation in Norway has implemented a connection to EMREX into NOKUT's applicant portal. That means that users from countries connected to EMREX can attach their diplomas and transcripts to their application. The first implementation is a pilot where only documents are added to the application. The plan is to retrieve diplomas as structured data, so the verification can be done automatically.

7.5 University alliances and partnerships

There are a number of existing alliances and partnerships between universities in Europe today. EMREX is a convenient way to share educational data. Several universities already use EMREX and the effort to create a client or a node is not that big. EMREX has support in the ELMO format for Transcript of Records and diplomas and micro credentials are about to be implemented.

8   Future EMREX

EMREX is future proofing, because EMREX is meant to be scalable meaning that each country joins the network through creating their own HEI clients and contributes to the network by providing their own NCPs. The idea behind EMREX is to have a system with as little central administration as possible. This means that the responsibility for the network falls on each participating country.

All communication in EMREX is peer-to-peer. Once an EMP is registered in the EMREX register, any HEI client can contact this EMP and establish a link. This way, there is no traffic through a central hub and therefore no bottleneck. EMREX will therefore easily scale as more EMPs and clients join the network.
In general, all code developed in the project, is open source.

One of the key features of EMREX is that the network will provide a way to transfer result data from a source (typically an institution) to a destination (also typically an institution) in a secure and trusted manner. However, as EMREX proved a viable solution, there is no reason why it cannot be applied to other processes that involve transfers of results, for example a potential employer or a diploma registry of some kind. EMREX can be used as a building block for many different processes (recognition of external studies, internal mobility within a country, verifying prior learning, verification of credentials, e.g. for degree mobility or employment needs). This has already been done in some countries. With growing numbers, attention and new members the future is looking bright.

And why not use EMREX, it works!