



Open Education, Blockchain and Flexible Learning Pathways

Dr Andreia Inamorato dos Santos
**The New Student: Flexible
Learning Paths and Future
Learning Environments**
Vienna, Austria

**@aisantos #heflex18 #EU2018at
21st September 2018**



Joint Research Centre
the European Commission's
in-house science service



ec.europa.eu/jrc

The Joint Research Centre at a glance

around 3000
staff members

Almost 75% are
scientists
and researchers.
Headquarters in
Brussels
and research
facilities
located in 5
Member States

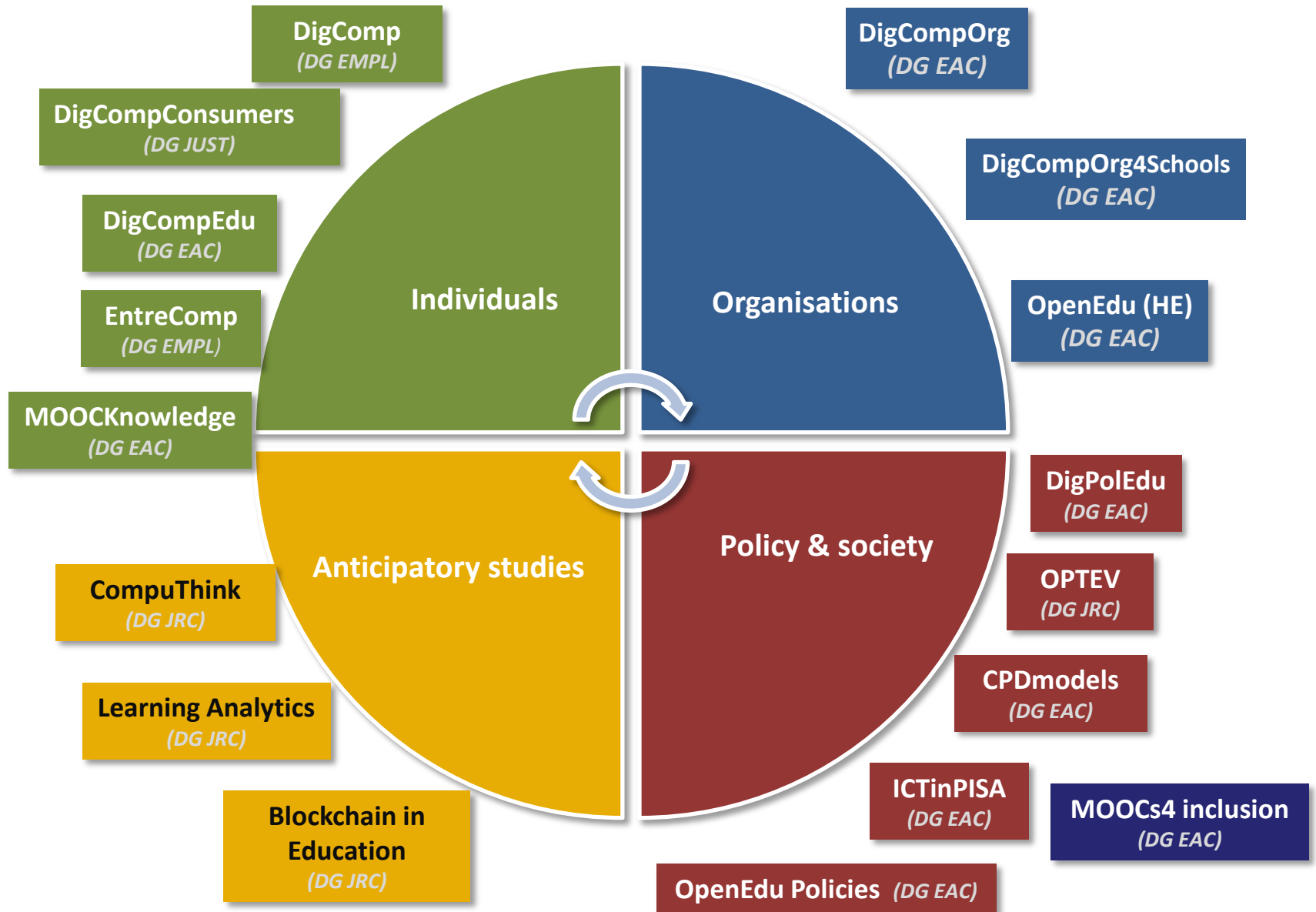


JOINT RESEARCH CENTRE

The JRC (Seville) is the **in-house science service** of the European Commission. Our main goal is to support policy making in Europe via **research evidence**. We have over 40 policy reports published in the field of **education**, to include reports on **Open Education**, area in which we locate our **blockchain** study.

Our work is driven by the Commission's policy priorities:

e.g. Communications and Council Recommendations



Current JRC research on Digital Age Learning and 21st Century Skills



1

**Open
Education**

2

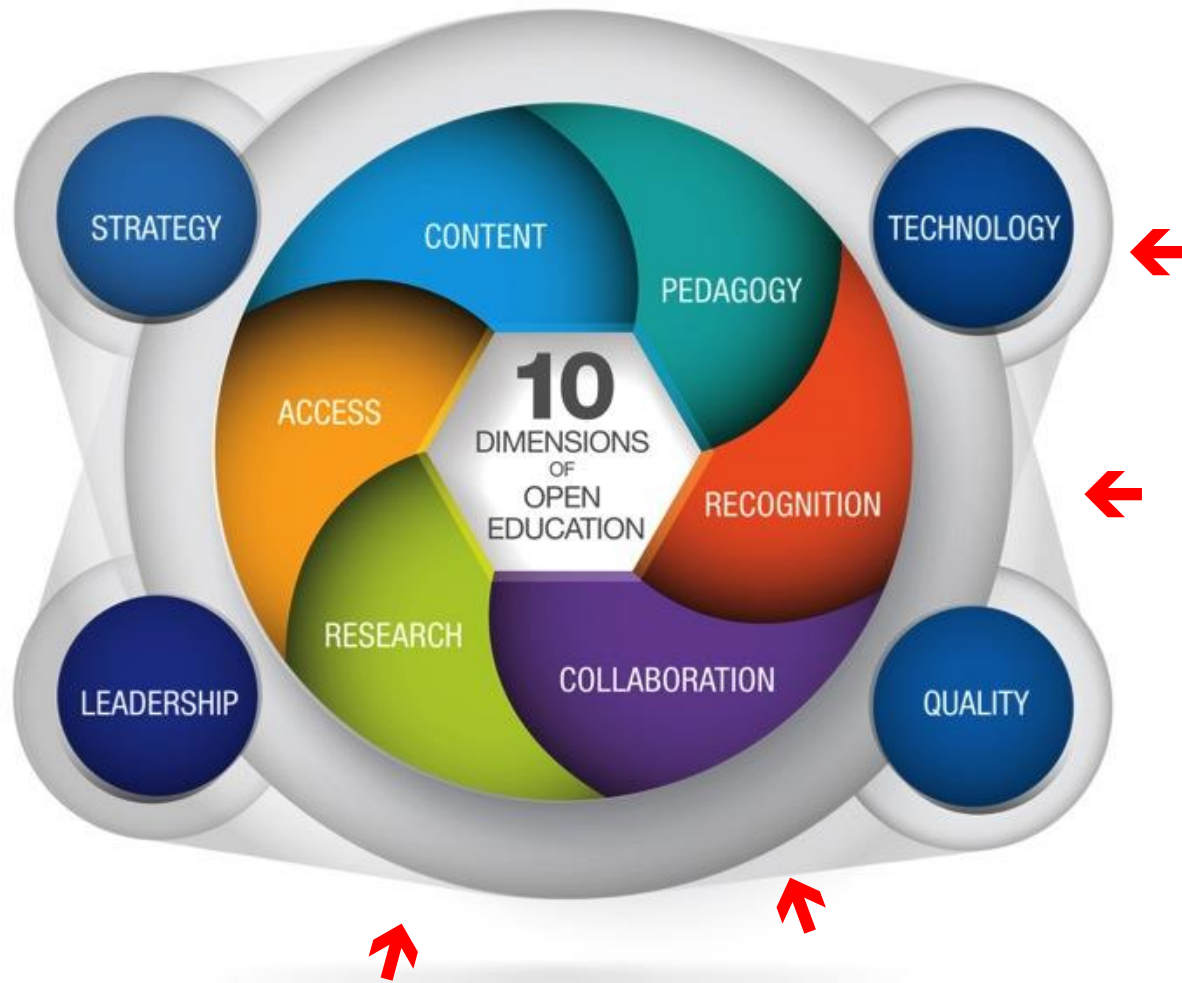
Blockchain

3

**Flexible
Learning
Pathways**

1

Open Education



OpenEdu Framework for HE institutions



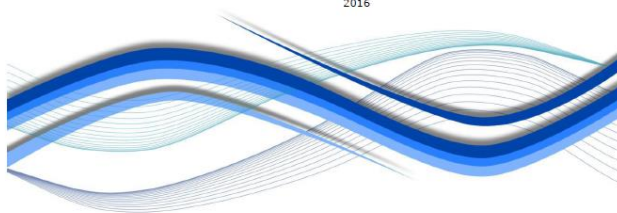
JRC SCIENCE FOR POLICY REPORT

Opening up Education

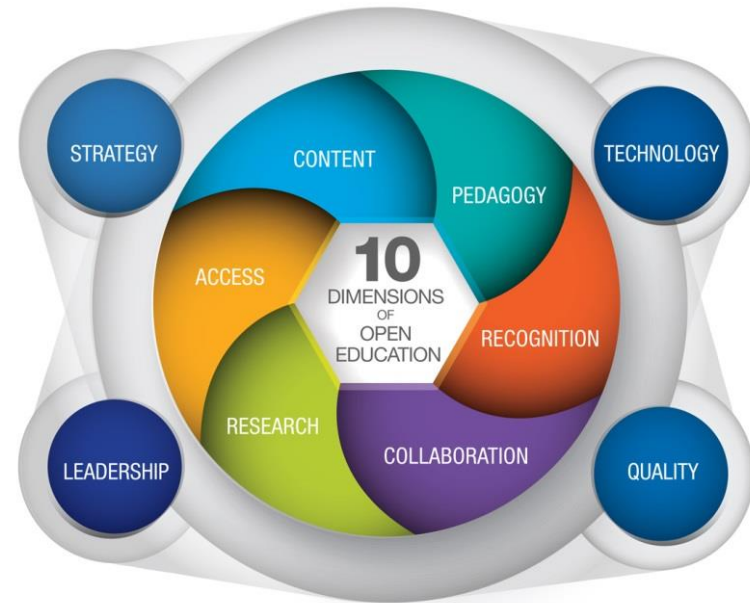
*A Support Framework for
Higher Education
Institutions*

Andreia Inamorato dos Santos
Yves Punie
Jonatan Castaño Muñoz

2016

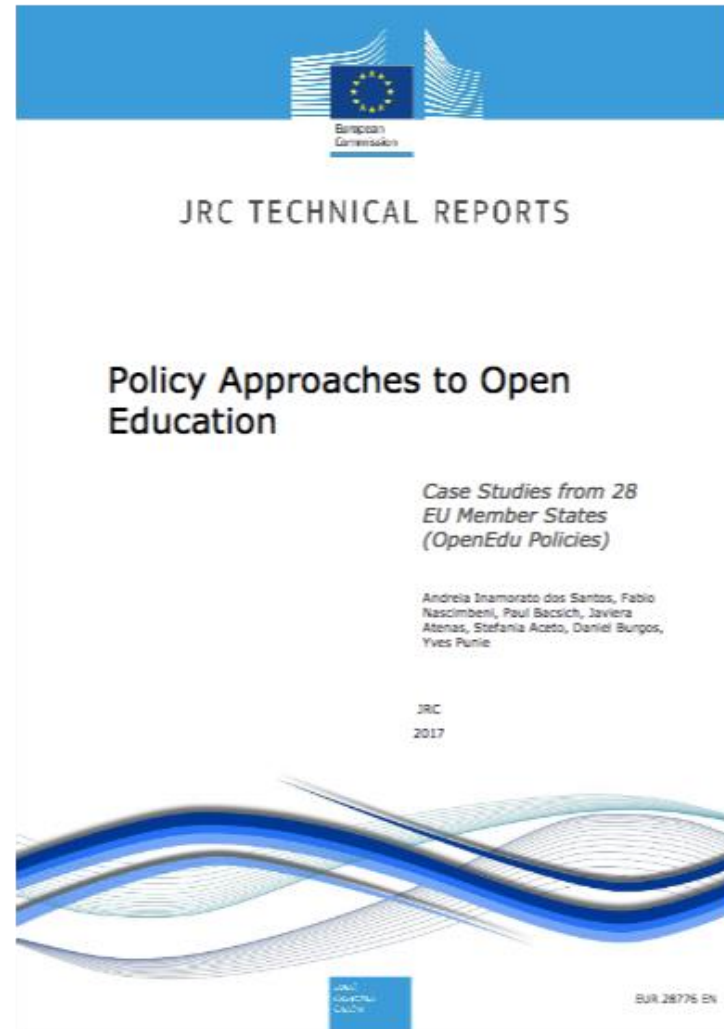


EUR 27938 EN



It can be downloaded from:
<http://bit.ly/openeduframework>

OpenEdu Policies Reports



Creating an open education ecosystem

The following areas for policy development were elicited in the research process. Together, these areas contribute to building 'an **open education ecosystem**':

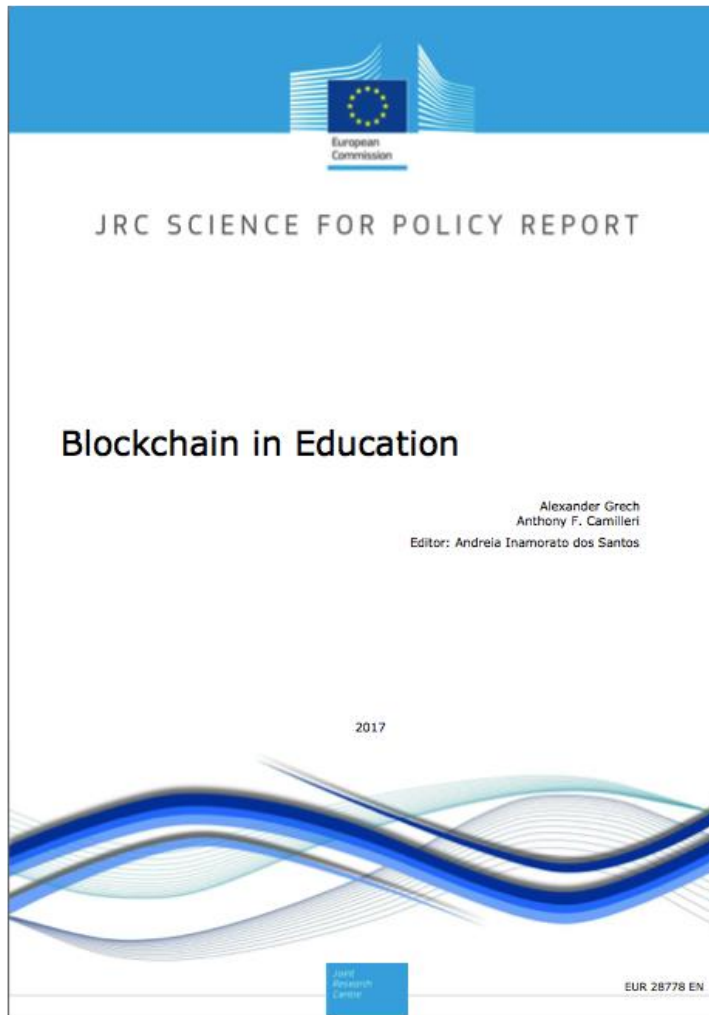
1. awareness raising
2. regulation, legislation and funding
3. partnerships
4. teachers' professional development
5. accreditation and recognition of learning
6. open educational resources (OER)
7. support and infrastructure
8. research and evaluation

<p>open education activities. This could be done by:</p> <ul style="list-style-type: none"> • Creating and supporting technology infrastructures (by providing a common EC platform in which MS could access and publish OER, MOOCs, provide training and have communities of practices). It should observe being open source and interoperable with other formats, as well as based on the participatory web. The MS should have full responsibility over their share of the platform; common services and joint activities to be offered to all. • Supporting the approach for information tracking, making available and keeping up-to-date an open-licensed and open source platform which gathers information and results of all EC-funded projects (research and practice) on open education, OER, and digital technologies for education 	<p>technological infrastructure in which to build open education initiatives (based on the participatory web)</p> <ul style="list-style-type: none"> • Requesting that websites and new education platforms built with public funds by any organisation meet open source and interoperability standards • Encouraging and providing infrastructure for schools and universities to experiment with new types of digital certification, to include those based on the <u>blockchain</u> 	<ul style="list-style-type: none"> • Co-designing and co-sponsoring regional platforms/ databases of OER, based on the principle of the participatory web • Working in partnership with ministries, local governments, schools and universities to foster citizen's digital competence for open educational practices • Empowering individuals to be open learners (awareness raising, skills development), by working alongside other stakeholders in the development of the technological infrastructure and support which are necessary to reach the local community and wider audiences • Supporting open learners to use technologies as routes to developing their employability (e.g. via face-to-face adult learning courses, printed and digitised materials, open online courses or MOOCs)
<p>EU</p>	<p>National</p>	<p>Regional</p>

2

Blockchain in Education

Blockchain in Education – JRC report



It can be downloaded from:
<http://bit.ly/blockchain4edu>

BLOCKCHAIN'S SOCIAL VALUE PROPOSITION

Self-sovereignty: users are able to identify themselves while at the same time maintaining **control over the storage and management** of their personal data; **ownership of their data**

Trust: in a reliable **technical infrastructure** and in the validity of the transactions carried out in it

Transparency & Provenance: users to conduct transactions in knowledge that each party has the **capacity to enter** into that transaction (i.e. verification (signing) of credential by both issuer and recipient)

Immutability: records are **written and stored permanently**, without the possibility of modification; **reduction of fraud risk**

Disintermediation: the **removal of the need for a central controlling authority** to manage transactions or keep records;

Collaboration, i.e. the ability of parties to transact directly with each other **without the need for mediating third parties.**

WHY USING BLOCKCHAIN IN HE?

From the Open University UK's experience:

- to remain competitive and up-to-date, academic excellence and adaptive culture
- to constantly revise and re-shape higher education in order to fit the needs of the students
- The OU identifies a clear value in modular courses, and in smaller or 'bite-size' chunks of learning which gradually add credits towards full qualifications
- micro-credentials is perceived by the OU to be a better fit for lifelong learning (**badges**)

MIT: diplomas on the blockchain - added value for the learner

Master of Finance

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

UPON THE RECOMMENDATION OF THE FACULTY
HEREBY CONFERS ON

John Smith

THE DEGREE OF

MASTER OF FINANCE

IN RECOGNITION OF PROFICIENCY IN THE GENERAL AND THE SPECIAL
STUDIES AND EXERCISES PRESCRIBED BY SAID INSTITUTE FOR SUCH
DEGREE GIVEN THIS DAY UNDER THE SEAL OF THE INSTITUTE AT
CAMBRIDGE IN THE COMMONWEALTH OF MASSACHUSETTS

JUNE 9, 2017

R. Murray Meyer
SECRETARY

Rohit K. Kulkarni
PRESIDENT

Step 1 of 5
Computing local hash [DONE]

Step 2 of 5
Fetching remote hash [DONE]

Step 3 of 5
Comparing local and remote hashes [DONE]

Step 4 of 5
Checking Merkle root [DONE]

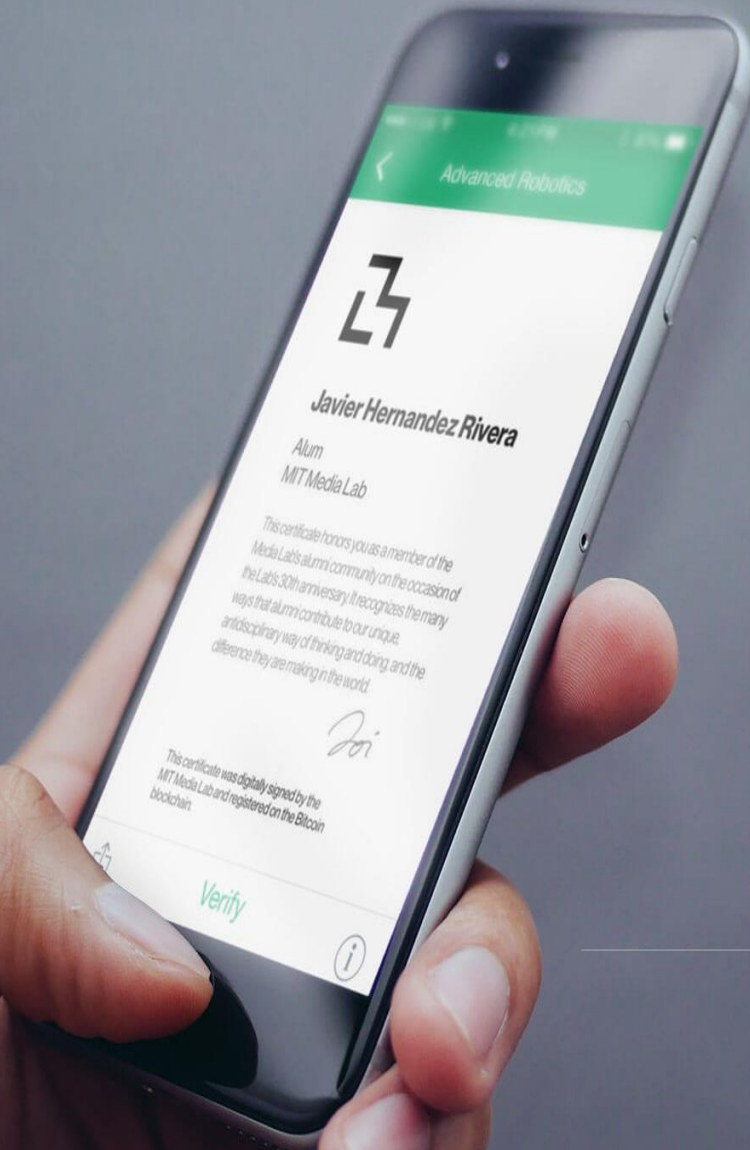
Step 5 of 5
Checking receipt [DONE]

VERIFIED

Public Key
1HYPitzbwR83M3Smw6Gws5XeQzBWoJAEes

Blockchain Address
4bf64ff1517554dac3496e9da0a28ca9ae492682b0898e384ea17e7f90ee1295

Recipient-owned credentials



Step 1 of 5

Computing SHA256 digest of local certificate [DONE]

Step 2 of 5

Fetching hash in OP_RETURN field [DONE]

Step 3 of 5

Comparing local and blockchain hashes [PASS]

Step 4 of 5

Checking MIT signature [PASS]

Step 5 of 5

Checking not revoked by issuer [PASS]



VERIFIED

Public Key

1HYPitzbwR83M3Smw6GWs5XeQzEwoJAEes

Blockchain Address

4bf64ff1517554dac3496e9da0a28ca9ae492682b0898e384ea17e7f90ee1295

COMMUNICATING 'BLOCKCHAIN' TO STUDENTS

VIDEO FROM THE GOVERNMENT OF MALTA

Self-sovereign Identity: recipient-owned credentials

Analytics: waiting for GDPR further conclusions

[Blockchain Records for Maltese Learners and Workers](#)

Other uses for blockchain in education...

Intellectual property management (scientific papers, research)

Funding tracking from higher level authorities

Students' payments, grants management, students' services (e.g. academic records, transcripts), credit transfer, learning portfolios

Pedagogical enhancement: anonymous marks/student performance comparison leading to personalised learning

Why do we need to further explore blockchain in education?

May not be a solution to everything (or the best solution)

Requires more pilots (cost efficiency, standards for certificates?) Public or private blockchains? Governance? Standards?

Need for more awareness raising, buying up in order to create trust in the system as well as a common understanding, general acceptance (mindset)

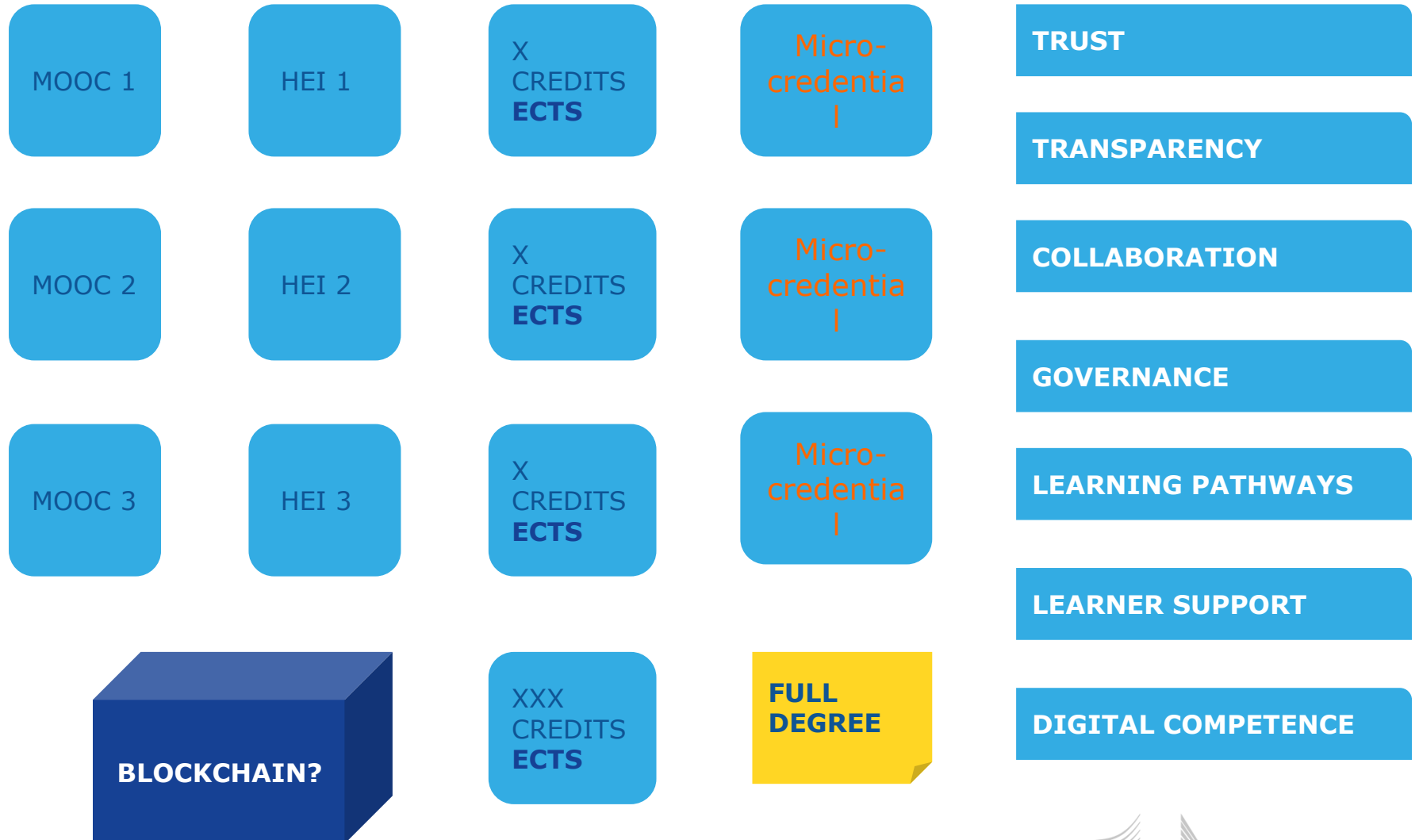
Users digital literacy / identity management (are they ready to use the technology/ control their wallets / keep their keys safe etc?) Do they want to do it?

How ready are the universities for this?

3

Flexible Learning Pathways

NON-FORMAL LEARNING → FORMAL LEARNING



In a world of blockchain technology ...

HEIs will need to consider:

- **Adapting to change** or being the drivers of this change (e.g. by exploring **unbundling** of certification/ accreditation/validation; micro-credentials, new roles for students' services)
- **Reinforcing collaboration** and increase trust in one another (new ways to operate, offer of joint degrees, offer of open degrees, take up of an **open education** proposition and **enhance networks**)
- **Focusing on the learner** by establishing **a number of routes for formal and non-formal learning** with individual pathways (greater use of ECTS, EQF in non-formal learning)

Thank you



andreaia-inamorato-dos.santos@ec.europa.eu

<https://ec.europa.eu/jrc/en/open-education>

Thanks to Blockerts and Learning Machine for slides on credential issuing on the Blockchain (16 and 17)