



D3.2 Credit / Module Supplement

MicroHE's standard documentation format for describing ECTS and/or modules, using elements from the EQF, diploma supplement, and ECTS Guide

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The MicroHe Consortium

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1 Goal Setting

The MicroHE consortium has already identified that while a diploma supplement is widely used to describe degree-level qualifications, nothing similar exists for sub-degree qualifications, especially for those in the area of 5 ECTS. Therefore, the MicroHE project proposes a tool based on the diploma supplement and on credit mobility tools to fill this gap, for the purpose of facilitating micro-credential recognition and portability.

2 OEPass Legacy


One of the main objectives of the Erasmus+ funded Open Education Passport (OEPass)¹ project was to enhance transparency of quality credentials by creating a so-called Learning Passport. Learning Passports describe credentials by applying a composition formula for gained individual credits or modules, modelled on the European Diploma Supplement. It is important to highlight that when an institution issues an individual credential, the following information is recorded:

- **Awarding body**, that is the institution recognising the achievement and not necessarily the institution offering the learning experience
- **Credential**, a documented statement that acknowledges a learner's learning outcomes or achievements. The term credential can be used to refer to a qualification, that is an official completion of a course or programme of courses (e.g., any degree, diploma, or other certificate issued by a competent authority attesting to the successful completion of a higher education programme). The Learning Passport supports the detailed and transparent documentation of sub-units of such credentials, i.e., micro-, meso-, and mini-credentials. These credentials can then be accumulated into larger credentials or be included as part of a portfolio. As a result, each credential has a thoroughly documented **credential type** that can be a degree or diploma at the top level of qualifications or an ECTS or ECVET at the micro-level.
- **Holder** of the educational credential and his/her individual accomplishment. This includes data about the learner's identity and the grade achieved.
- **Evidence** of the achievement, both in terms of administration (i.e., publication date of the credential) and – optionally – outputs of the learning experience, such as published papers, essays, projects, test results, or links to public discussion fora.

¹ <https://oepass.eu/>

2.1 Data and Software Business Credential

Tampere University's **Data and Software Business** credential is publicly shared in OEPass Learning Passport format² (Figure 1 and Figure 2).



Data and Software Business

17/11/2020 / in Uncategorized / by ahmed.hanafy

Information about the awarding body

Full name of the institution issuing the credential:

Tampere University

Accreditation of the institution:

Opetus- ja kulttuuriministeriö, Suomi
Ministry of Education and Culture, Finland

Kansallinen koulutuksen arviointikeskus (Karvi)
The Finnish Higher Education Evaluation Council (FINEEC)

Website/URL: <https://karvi.fi/>

Information about the credential

Official title of the credential: Data and Software Business

Description of the credential:

5 ECTS (op)

- Consists of lectures, guest lectures, Individual exercise, course exercise + presentations in the final event
- Two main tasks:
 - Individual exercise (40% of the final grade)
 - Course exercise (60% of the final grade)
- Lecture recordings available through Moodle / Panopto
- Lectures online through Zoom

Subject: 061 – Information and Communication Technologies

Credential type: European Credit Transfer and Accumulation System (ECTS)

Learning outcome description:

Basic principles of data and software business: Student understands the basic

Figure 1. Data and Software Business Learning Passport (page 1)

² <https://oepass.eu/data-and-software-business/#/>

Ways to acquire the credential:

Validation of formal learning

Grading Scheme: 0 (fail) to 5 (excellent) grade scale

Mode(s) of study: Online, Face to Face, Full-time, Usually done as a combination of face to face and online

Duration of learning: 135 Hours

Assessment method(s): Online assessment with ID verification

Cheating prevention by: ID verification with secure login+password in LMS, URKUND Plagiarism Moodle plugin

Format(s) of assessment: Manual grading by instructor

What is being assessed: Learning diaries (testing reflection skills), Problem based learning (testing practical problem solving skills)

Level of learning: level on EQF and level 7 on NQF <https://www.oph.fi/en/education-and-qualifications/qualifications-frameworks>

Number of Credit Points: 5

Accreditation of the credential:

The course after preparation has to be approved by the programme coordinator, Faculty Board, Dean and Steering committee and assessed for course application for online studies.

Homepage of credential: <https://www.tuni.fi/studentguide/curriculum/course-units/tut-cu-g-48459?year=2020&q=null>

The credential can be a building block of: <https://www.tuni.fi/studentguide/curriculum/course-units/tut-cu-g-48459?year=2020&q=null>

Information about the (test) credential holder

- **Name:** Erik Erik
- **Date of birth:** 11-01-2000
- **Student ID:** H172568

Credential awarded to holder on: 09-11-2020

Grade achieved: 5

Credits awarded: 5

Figure 2. Data and Software Business Learning Passport (page 2)

While OEPass fulfilled its contractual obligations and successfully identified and verified an optimised range of credential properties to describe micro-credentials, the OEPass partnership learned an important lesson: no matter how well-structured the Learning Passport template or how user-friendly the online Learning Passport form was, users still reported that the effort to complete the form was time consuming with no affordance to semi-automate or to scale up the documentation process.

The limitations of OEPass were subsequently addressed by the MicroHE project. These limitations included:

- The online form utilised by OEPass (WordPress Formidable) did not allow for the reuse of existing Learning Passports to describe the learning outcomes of multiple credential holders. This could not be done in a straightforward way, for example, by only changing the data documented in the credential holder section.
- The Learning Passport template was not particularly user friendly, and it evolved from a rigid MS Word document into a more user-friendly online form. The WordPress form was designed to convert as many free-text descriptors into radio button and multiple-choice questions as possible, as well as suggested the use of standard vocabularies to describe credentials of various sizes. However, the template still had certain limitations and lacked full comprehensiveness.

Ultimately, OEPass concluded that to facilitate easy credential recognition, it was not enough to identify the credential properties that would have to be assessed by third party credential consumers. It is also essential to provide, wherever possible, standard vocabularies to describe these properties so that the value of the documented credentials can be easily determined not only by human readers, but also by machines.

3 The MicroHE Credit / Module Supplement

In order to recognise MOOCs and other non-traditional learning as ECTS credits toward a degree program, Higher Education Institutions (HEIs) need sufficient information about the content, quality, and quantity of a micro-credential. Furthermore, educational providers who want to make their micro-credentials easily recognisable and stackable need to know which information they should provide, and which formal requirements exist regarding assessment, identity verification, workload, etc.

MicroHE took into account the lessons learned by OEPass and drafted and published an open meta-data standard³ that enabled the description of (micro-)credentials in a standardised and machine-readable format. This extended data model was based on the Qualifications metadata schema and ESCO data schema. The data model was further extended with MicroHE components and provided the technological foundation of both the

³ https://github.com/MicroCredentials/MicroHE/blob/master/meta_data_standard_draft.md

MicroHE Credit/Module Supplement template and, partially, the Credentials Clearinghouse, aka Credentify⁴ (Figure 3).

Module										Descriptive			Structural			Administrative		
1	Module Code	Degree Program Target Group(s)	Assessment	Starts in the Degree Text (Section 1)	Duration	Module Type	Module ID	ECTS Credits		Title	Identifier	Homepage		Identifier		Homepage		
2	Character	Type of Instruction / Type of Learning	Language of Instruction	Content Text (Section 2)	ECTS Credits					Alternative label	Reference language	Landing page						
3	Definition									Definition	EQF level	Release/publication date						
4	Learning outcome description									Learning outcome description	NQF Level	Update/modification date						
5	Learning outcome									Learning outcome	Credit / Token System	Change note						
6	Field									Field	Number of Credit Points	History note						
7	Is partial qualification									Is partial qualification	ECTS credit points	Additional note						
8	Is made up of									Is made up of	Volume of learning	Status						
9	Ways to acquire									Ways to acquire	Entry requirement	Replaces						
10	Related occupation									Related occupation	Expiry period	Replaced by						
11	Awarding activity									Awarding activity	Accreditation	Owner						
12	Awarding method									Awarding method	Supplementary document	Provenance Agent						
13	Recognition									Recognition		Publisher						
14	Mode of Study									Mode of Study								
15	Assessment_method									Assessment_method								
16	Grade_scheme									Grade_scheme								

Figure 3. Credit/Module Supplement with a standard format for describing ECTS and/or modules

3.1 Data and Software Business Credential

Tampere University recorded its **Data and Software Business** course and learning achievement data in Credentify and issued a test credential to a fictional person in order to demonstrate the look, feel, and functioning of the credential in this new technical environment (Figure 4). The user feedback from the Tampere University representative, who recorded the credential data both in Credentify and on the OEPass website was described as follows:

Credentify is very user friendly when it comes to recording and categorizing course related information. Due to the 'tag' feature it provides wherein you can add skill and competence tags to each course, it offers an efficient method of building up on 21C skills that are in huge demand at the moment and will continue to be in the near future. The fact that it builds up on the existing ESCO standard adds another layer of authenticity to its usage. Speaking of the technical underbelly that it has been built over, non fungible tokens are one of the best available methods to be used for storing and verifying credentials using blockchain technology and the usage of open standards makes future development and adoption rather easy. Naturally, the questions of large scale adoption and scalability arise, but they will be sorted out in due time as more pilots are underway.

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⁴ <https://credentify.eu/>

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The screenshot shows the 'Achievement details' page in the Credentify system. The left sidebar contains navigation links: Credentify, Achievements, Credentials, Users, and Institutions. The main content area is titled 'Data and Software business' and includes a 'REQUESTED' status button. Below this, the 'ACHIEVEMENT DETAILS' section lists the following information:

- Date issued:** 2020-09-15
- Institution(s):** Tampere University
- Publisher:** 5ea92528e31f4b00083c2a8d
- Tag(s):** A collection of tags including 'BASIC PRINCIPLES OF DATA AND SOFTWARE BUSINESS', 'IDENTIFY OPPORTUNITIES', 'EVALUATE INFORMATION', 'BUSINESS KNOWLEDGE', 'PROPOSE ICT SOLUTIONS TO BUSINESS PROBLEMS', 'MONETIZING WITH DATA AND SOFTWARE', 'THINK CREATIVELY', 'COLLABORATIVELY DEVELOP A DATA OR SOFTWARE CONCEPT', 'WORK IN TEAMS', 'INTERACT WITH OTHERS', 'PERFORM BUSINESS ANALYSIS', and 'BUSINESS MANAGEMENT PRINCIPLES'.

An 'Update achievement' button is located below the tags. The 'ADDITIONAL INFORMATION' section follows, containing a table with the following data:

Definition	Masters level course run by information and knowledge management unit of Tampere University. The course gives an overview of data and software business. The learners work individually and together on developing a minimum viable product (MVP) for a new software start-up.
Learning outcome description	Basic principles of data and software business: Student understands the basic principles of data and software business, and the special characteristics of software industry Identify opportunities: Look
Awarding activity	Manual grading by instructor
Awarding method	Learning diaries (testing reflection skills), Problem based learning (testing practical problem solving skills)
Grade scheme	0 (fail) to 5 (excellent) grade scale
Mode of study	Online, Face to Face, Full-time, Usually done as a combination of face to face and online
Assessment method	Online assessment with ID verification
Accreditation	The course after preparation has to be approved by the programme coordinator, Faculty Board, Dean and Steering committee and assessed for course application for online studies.
Home page	https://www.tuni.fi/studentsguide/curriculum/course-units/tut-cu-g-48459?year=2020&q=null

Figure 4. Tampere University credential record

At the moment, Credentify does not support exporting credentials as pdfs – a standalone document that we could call the MicroHE Credit Supplement. Instead, it uses a scalable, technical alternative system of issuing and verifying tens of thousands of credentials in the clearinghouse, by this being able to encode, decode, show, and share a credential.

Although it does not support the download of credentials in pdf format, Credentify supports a digital ecosystem that enables technical interoperability between machines and systems. By following the steps of the below illustrated use case, users can generate their credentials in an interoperable and portable way.

3.1.1 Use Case Flow in Credentify

As a first step, our sample credential holder, Gina Lollobrigida, requests and receives approval for a digital credential called “Data and Software Business” offered by Tampere University (Figure 5).

- Achievements
- Credentials**
- Users
- Institutions

Credential details

PARTICIPANT DETAILS

Gina Lollobrigida
humaneai@videolectures.net
Member since: 2020-05-10

SHOW BLOCKCHAIN

CREDENTIAL FOR ACHIEVEMNT

ACHIEVEMENT	INSTITUTION(S)	TYPE
Data and Software business	Tampere University	2. MONETIZING WITH AND SOFTWARE 1. BASIC PRINCIPLE: DATA AND SOFTWARE BUSINESS 3. COLLABORATIVES DEVELOP A DATA OF SOFTWARE CONCEP

CREDENTIAL RESULTS

Grade	9
Credits awarded	1
Expiry period	2021-05-28T00:00:00.000Z
Cheating	N/A

CREDENTIAL METADATA

Field	Value
identifier	5f608a78d4e4aa00073d5891
name	Data and Software business
title	Data and Software business
description	Masters level course run by information and knowledge management unit of Tampere Univer an overview of data and software business. The learners work individually and together on d viable product (MVP) for a new software start-up.
definition	Masters level course run by information and knowledge management unit of Tampere Univer an overview of data and software business. The learners work individually and together on d viable product (MVP) for a new software start-up.
creditSystem	ECTS
ECTSCreditPoints	5
awardingBody	5e8c6dc511ff84d6cd62cd6da
dateIssued	Thu Oct 29 2020 10:27:53 GMT+0000 (Coordinated Universal Time)
dateModified	Thu Oct 29 2020 10:27:53 GMT+0000 (Coordinated Universal Time)
publisher	5ea92528e31f4b00083c2a8d
holder	Gina Lollobrigida
studentId	5eb85acc96b7510008720656
uniqueId	5f9a9929fc49e800081ede52
credential	Data and Software business

VERIFY CREDENTIAL

- Achievements
- Credentials**
- Users
- Institutions

Powered by

- Achievements
- Credentials**
- Users
- Institutions

Powered by

Figure 5. Details of Gina Lollobrigida's digital credential **Data and Software Business** as displayed in Credentify

Gina then checks the encoded file on the blockchain (Figure 6).

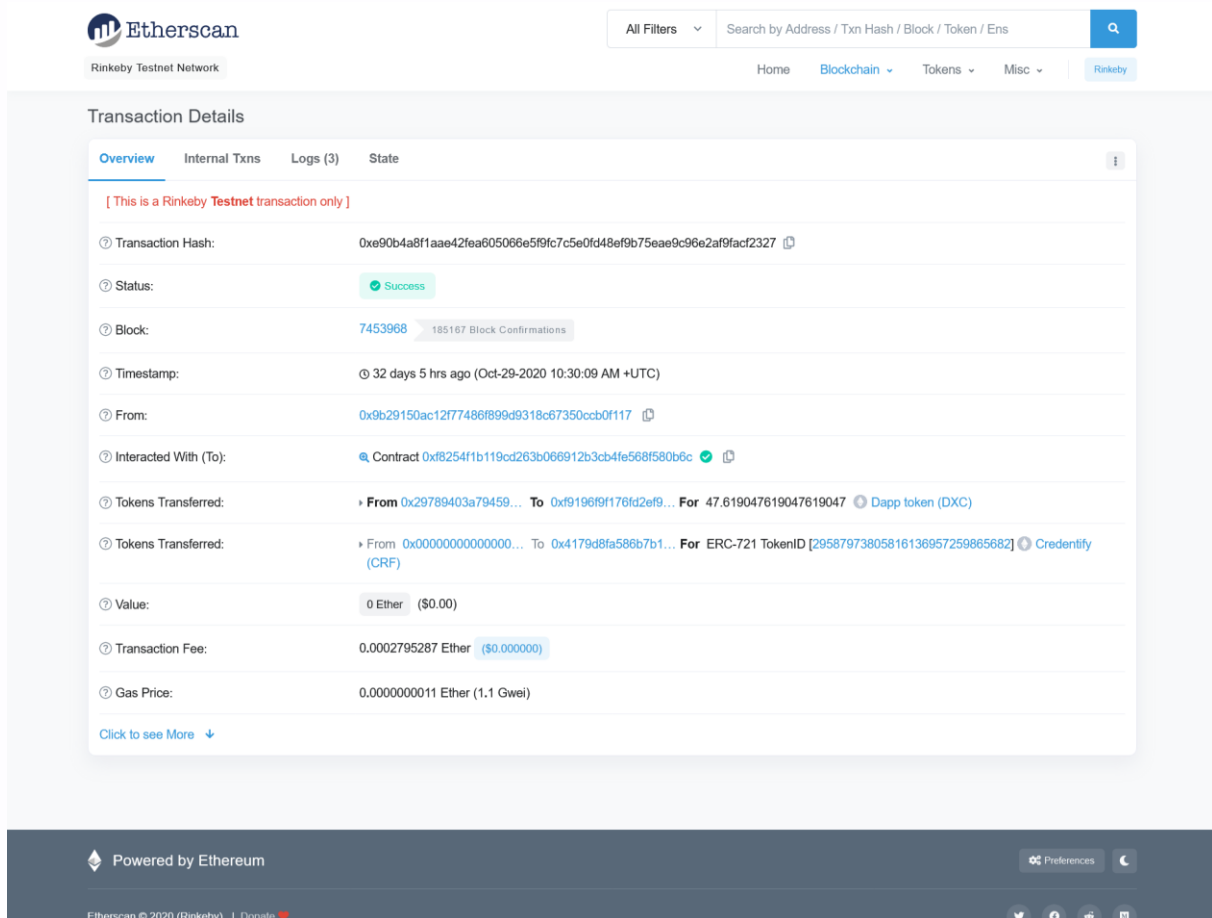


Figure 6. Transaction details from the Blockchain of Gina's credential

After the credential becomes a unique digital asset, Gina can verify it by pressing the “Verify Credential” at the bottom of the page and then again in the “Verify my credential” popup window (Figure 7).

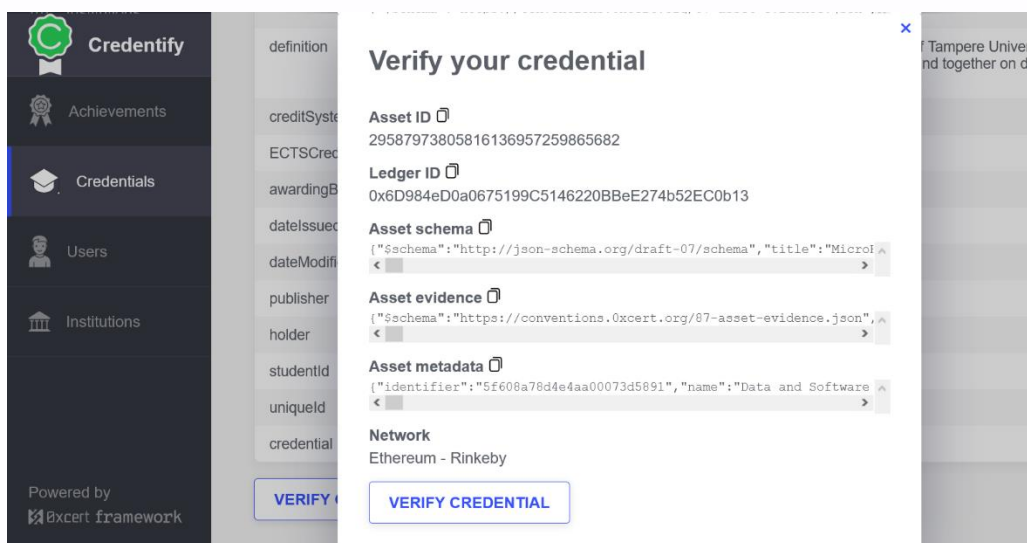




Figure 7. Credential verification buttons

This verification mechanism is technically also designed to be used by other third parties in the clearinghouse, such as universities and/or recruiting agencies, as it generates a presentation of the asset (Figure 8).






VERIFY

EMBED

The asset is valid.

This is the result of the Oxcert Verifier check. If the validity status of a field is ⚠, its values cannot be checked since it's set as private or does not exist within the asset.



Key	Value	Status
Identifier of a qualification	5f608a78d4e4aa00073d5891	✓
A property that holds a name of an asset	Data and Software business	✓
Official title of the qualification	Data and Software business	✓
A property that holds a detailed description of an asset	Masters level course run by information and knowledge management unit of Tampere University. The course gives an overview of data and software business. The learners work individually and together on developing a minimum viable product (MVP) for a new software start-up.	✓
Short description of the qualification	Masters level course run by information and knowledge management unit of Tampere University. The course gives an overview of data and software business. The learners work individually and together on developing a minimum viable product (MVP) for a new software start-up.	✓
Name of the Credit system in use (e.g. ECTS)	ECTS	✓
Number of credit points assigned to the qualification following ECTS system	5	✓
Awarding body	5e8c6dc511ff84d6cd62cdda	✓
The date when the qualification was published and the metadata about the qualification was made available	Thu Oct 29 2020 10:27:53 GMT+0000 (Coordinated Universal Time)	✓
Agent responsible for making the information about the qualification available	5ea92528e31f4b00083c2a8d	✓
Automatically generated for each credential	5f9a9929fc49e800081ede52	✓
The credential which is being awarded to the student	Data and Software business	✓

VERIFY ANOTHER ASSET

NOTICE: The verification process is done automatically and in a completely decentralized way, with only your browser connecting directly to the blockchain. The checked data is not stored on any server storage, and the Verifier source code is published publicly on [GitHub](#). The Oxcert Verifier uses the [Infura](#) infrastructure to verify assets on the Ethereum network, and [Wandevs](#) infrastructure to verify assets on the Wanchain network.

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Figure 8. Verification screen of Gina's credential

When Gina accesses her digital credential's verification details (Figure 8), she can click on the “EMBED” tab at the top of the page (Figure 9) and requests to generate a “QR code” (Figure 10) or a “URL” (Figure 11), both of which can be shared via social media or any type of digital communication channel and which points back to the verifiable digital credential in Credentify.

The screenshot shows the 'EMBED' tab of the Oxcert Verifier interface. At the top left is the 'Oxcert VERIFIER' logo, and at the top right is a 'Powered by Oxcert Framework' badge. Below the navigation tabs 'VERIFY' and 'EMBED', the heading 'Embed asset verification' is displayed. A descriptive paragraph states: 'Here you can embed your asset verification to your website or generate unique QR code for download and print. With embedded widget or QR code anyone can verify that your asset is valid.' The form includes a 'Select network' dropdown menu currently set to 'Ethereum - Rinkeby'. Below this are two input fields: 'Enter asset ID' with the value '29587973805816136957259865682' and 'Enter ledger ID' with the value '0x6D984eD0a0675199C5146220BBE274b52EC0b13'. At the bottom of the form are two blue buttons: 'GENERATE QR CODE' and 'GENERATE URL'. A notice at the very bottom explains the decentralized verification process and mentions the use of GitHub, Infura, and Wanchain infrastructure.

Oxcert VERIFIER

Powered by Oxcert Framework

VERIFY EMBED

Embed asset verification

Here you can embed your asset verification to your website or generate unique QR code for download and print. With embedded widget or QR code anyone can verify that your asset is valid.

Select network
Ethereum - Rinkeby

Enter asset ID
29587973805816136957259865682


Enter ledger ID
0x6D984eD0a0675199C5146220BBE274b52EC0b13

GENERATE QR CODE GENERATE URL

NOTICE: The verification process is done automatically and in a completely decentralized way, with only your browser connecting directly to the blockchain. The checked data is not stored on any server storage, and the Verifier source code is published publicly on [GitHub](#). The Oxcert Verifier uses the [Infura](#) infrastructure to verify assets on the Ethereum network, and [Wanchain](#) infrastructure to verify assets on the Wanchain network.

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Figure 9. Content of the “EMBED” tab on the credential verification page



Powered by Oxcert Framework

VERIFY

EMBED

Embed asset verification

Here you can embed your asset verification to your website or generate unique QR code for download and print. With embedded widget or QR code anyone can verify that your asset is valid.

Select network

Ethereum - Rinkeby

Enter asset ID


29587973805816136957259865682

Enter ledger ID

0x6D984eD0a0675199C5146220BBE274b52EC0b13

GENERATE QR CODE

GENERATE URL




DOWNLOAD QR CODE

NOTICE: The verification process is done automatically and in a completely decentralized way, with only your browser connecting directly to the blockchain. The checked data is not stored on any server storage, and the Verifier source code is published publicly on [GitHub](#). The Oxcert Verifier uses the [Infura](#) infrastructure to verify assets on the Ethereum network, and [Wandevs](#) infrastructure to verify assets on the Wanchain network.

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Figure 10. Shareable QR code of Gina's credential



Powered by Oxcert Framework

VERIFY

EMBED

Embed asset verification

Here you can embed your asset verification to your website or generate unique QR code for download and print. With embedded widget or QR code anyone can verify that your asset is valid.

Select network

Ethereum - Rinkeby

Enter asset ID

29587973805816136957259865682

Enter ledger ID


0x6D984eD0a0675199C5146220BBE274b52EC0b13

GENERATE QR CODE

GENERATE URL

Asset URL:

https://verify.0xcert.org?assetId=29587973805816136957259865682&ledgerId=0x6D984eD0a0675199C5146220BBE274b52EC0b13&network=2



DOWNLOAD QR CODE

NOTICE: The verification process is done automatically and in a completely decentralized way, with only your browser connecting directly to the blockchain. The checked data is not stored on any server storage, and the Verifier source code is published publicly on [GitHub](#). The Oxcert Verifier uses the [Infura](#) infrastructure to verify assets on the Ethereum network, and [Wandevs](#) infrastructure to verify assets on the Wanchain network.

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Figure 11. Shareable URL and QR code of Gina's credential

Credentify users that have participated in the public testing have also published their QR code and the embed code on their LinkedIn profiles (Figure 12).

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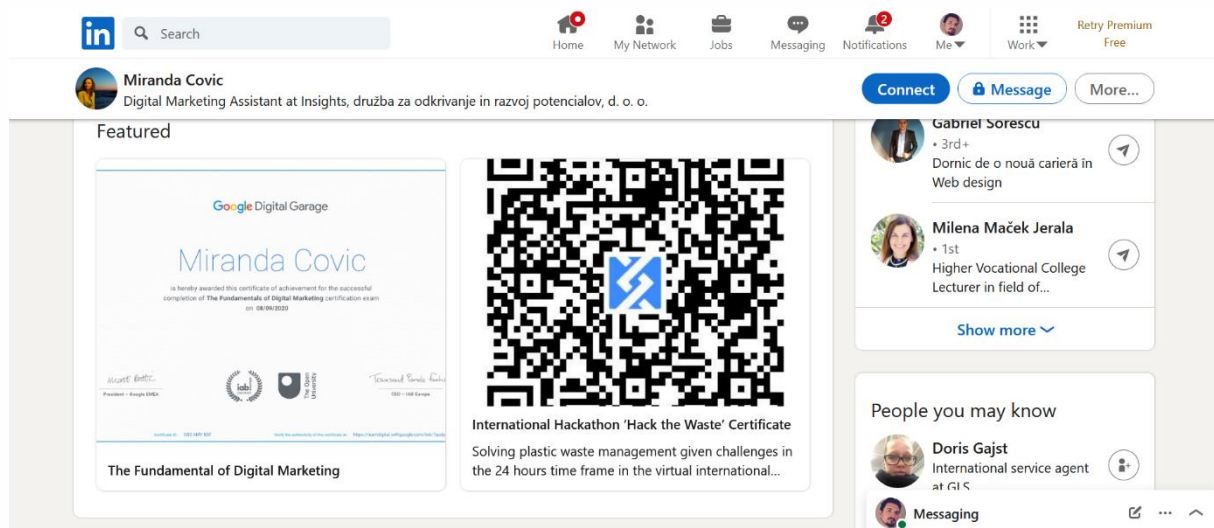


Figure 12. Credentify credential shared on LinkedIn

NB, the QR code, and the embed code could also display the logos of their issuing organisations, as well as other marketing items and data, if required.

4 Europass Digital Credentials

The successful dissemination, consultancy, and advocacy of the MicroHE meta-data standard eventually resulted in further extensions and finetuning of the data model. This led to the development and publication of the Europass Learning Model⁵ that supports the standardised description of learning opportunities, qualifications, and other formal and non-formal credentials. This single European data model, and the new Europass portal⁶ that built its learning opportunities database and digital credentials infrastructure⁷ upon it, has allowed the development of tools and services that support a growing number⁸ of European citizens to effectively plan and steer their lifelong learning pathways.

⁵ https://github.com/european-commission-europass/Europass-Learning-Model/blob/master/Europass_Learning_Model.md

⁶ <https://europa.eu/europass/>

⁷ <https://europa.eu/europass/digital-credentials/issuer/>

⁸ In November 2020, less than 5 months after the official launch of the new Europass portal, the number of registered accounts was 1.3 million.

4.1 Data and Software Business Credential

Tampere University recorded its **Data and Software Business** course and learning achievement data using the Europass Learning Model and issued a test credential⁹ that, compared to the OEPass Learning Passport and Credentify versions of the same credential, demonstrates both the OEPass and MicroHE legacies and the subsequent evolution of the documentation principles, mechanisms, and sophistication (Figure 13).

The screenshot shows the Europass Digital Credential interface. At the top, the Europass logo and 'European Union' are on the left, and 'English EN' is on the right. Below this is a navigation bar with links: 'europass', 'Learn in Europe', 'Work in Europe', 'About Europass', and 'Contact us'. A message states: 'This credential link will expire: 19/11/2021 00:00 GMT +0100'. The main content area is titled 'Certificate of Completion' and includes the Tampere University logo. It shows 'Valid From: 10/09/2020 00:00 GMT +0200' and 'Type: Generic'. Below this are buttons for 'Credential Preview', 'Export', 'Upload another credential', 'Share', and a language dropdown set to 'English'. The main content is divided into three sections: 'Issuing Organisation' (Tampere University), 'Credential Owner' (Individual assignment), and 'Achievements' (Group assignment). The 'Achievements' section is expanded, showing 'Data and software business' with 'Awarding Date: 02/11/2020 00:00 GMT +0100' and 'Awarding Body: Knowledge Innovation centre'. It also shows 'Proven by' with a table of 'Overall grade' (3) and 'Influenced by: Individual exercise, Course exercise, Zoom lectures'. The 'Sub-Achievements' section lists 'Individual assignment, Group assignment'. The 'Specification' section includes 'Course code identifier: TLO-35247', 'Learning Outcomes: Basic principles of data and software business', and 'Identify opportunities'.

europass European Union English EN

europass Learn in Europe Work in Europe About Europass Contact us

This credential link will expire: 19/11/2021 00:00 GMT +0100

Certificate of Completion Tampere University

Valid From: 10/09/2020 00:00 GMT +0200 | Type: Generic

Credential Preview Export Upload another credential Share English

Issuing Organisation

Credential Owner

Achievements

Activities

Data and software business

Individual assignment

Group assignment

Data and software business

Awarding Date: 02/11/2020 00:00 GMT +0100

Awarding Body: Knowledge Innovation centre

Proven by

Title	Grade
Overall grade	3

Influenced by: Individual exercise, Course exercise, Zoom lectures

Sub-Achievements

Individual assignment, Group assignment

Specification

Course code identifier: TLO-35247

Learning Outcomes:

Basic principles of data and software business

Identify opportunities

Figure 13. Screenshot illustration of the structure and data content of a Europass Digital Credential

⁹ <https://europa.eu/europass/digital-credentials/viewer/#/shareview/E9XS02RJRGDzE1vg>

The main objective of MicroHE was to provide a comprehensive policy analysis of the impact of modularisation, unbundling, and micro-credentialing in European Higher Education (EHE). To achieve its goals, the project conducted the following activities:

- Gathering the state of the art in micro-credentialing in EHE today, by organising the first European survey on micro-credentials in HE and surveying institutions across the continent, with the aim of understanding the current level of provision, the types of micro-credentials offered, and future trends in provision of micro-credentials
- Forecasting the impact of continued modularisation of Higher Education on EHE Institutions by using forward-scanning techniques, specifically through the use of DELPHI methodology
- Examining the adequacy of European recognition instruments for micro-credentials, in particular ECTS, the diploma supplement, and qualification frameworks
- Proposing a 'credit supplement' to give detailed information about micro-credentials that is compatible with ECTS, the diploma supplement, and qualification frameworks
- Developing a meta-data standard and an online clearinghouse to facilitate recognition, transfer, and portability of micro-credentials in Europe



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