OBEC

One Block for Educational Credentials (OBEC)

GUIDING THE ROAD TO THE FUTURE

ABOUT THE PROJECT

OBEC (2020-1-SE01-KA204-077803) is a KA2 Strategic Partnership co-funded by the Erasmus+ of the European Union. Led by SwIdeas in Sweden, the project gathers partners in Croatia (Regional Develpment Agency of Sisak-Moslavina County - SIMORA), Italy (LAI-MOMO Società Cooperativa Sociale & Università degli studi di Urbino Carlo Bo), Belgium (EURADA - Association Europeenne Des Agences Developpement).

OBEC is an innovative project that aims to explore the potentials of Blockchain technology to promote competency development and recognition of skills and qualifications by creating an innovative system to issue and validate learning credentials on a trial basis. Through this effort, the project's goal is to encourage the professional and academic integration of migrants, exchange students, and individuals with informal and non-formal learning backgrounds.

By contributing to the educational and economic integration of these targeted groups, OBEC envisions to benefit individuals with migrant background, students, teachers, education institutions, and employers. Focusing on the key issue of lack of uniformity and transparency in systems of validation of credentials, it is expected that this effort will result in positive effects in the working context, promoting employability, empowerment, and accessibility to the labour market.

One Block for Educational Credentials (OBEC) Project

September 2022

4. BLOCKCHAIN IN PRACTICE

The OBEC guiding material gathers case studies portraying inspirational ideas for the uses of Blockchain technology across several sectors. The case studies will be presented in this chapter which seeks to:

1. Inform about tools and methods that can be resourceful in overcoming the issue of validation and recognition of skills and competences.
2. Share success stories and investigate challenges and opportunities around Blockchain technology

This case studies within this chapter will be organized as follows:

1. **Educational Sector**
   a. European Union
   b. International
2. **Inspirational case studies for the use of Blockchain in other sectors**
   a. European Union
   b. International

BLOCKCHAIN IN PRACTICE

Educational Sector

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European Union

EDUCATIONAL SECTOR

EUROPEAN UNION

ECTA for Educational Institutions (EDUS)

COUNTRY: SLOVENIA
SECTOR: EDUCATION

Innovation: ECTA offers a platform in which both educational institutions and students can create profiles and interact to verify education and competences that are directly made available on the student's profile.

Blockchain use: With ECTA we can embed various competencies or references (certificates, education, grades, work history, projects, experience) into blockchain: this means that competences will be transparent, credible, immutable, and non-fungible – a minted competency is an NFT token (non-fungible token), which offers the holder digital rights of ownership and credibility. The blockchain could potentially be other than Ethereum, should they support the required functionalities.

The platform has been used during the OBEC project to test the potentials of blockchain in certification recognition.

Source: https://obec.ecta.si/help

ECTA is a platform for standardization and simplified issuance of competencies that can be used in different ways for different levels of integration, with ECTA portal being only one of the ways of integration. Through ECTA, the issuance of competences in the blockchain can be used by the institutions that issue competences/certificates etc. In addition to that, the following can also be achieved through ECTA:

- companies can monitor the development of their employees,
- leading partners can monitor the development of their stakeholders,
- schools can monitor the educational process and progress of their students
- and in general, institutions can keep track of the development of any recipients of competencies.

The main upfront time investment for the institution is to translate all their available courses into a ECTA friendly format. Their students or alumni can, from their freelancer account on the platform find their institution and ask them to verify their completed education.

Within the ECTA platform, the concept of directory and assignment of competencies has been developed for the purpose of establishing qualified users. As such, the concept is also a solution proposal for establishing a global directory of competencies for the future, creating them, assigning them to users, independent verification and, in borderline cases, deprivation of competencies to users.

Cineca Blockchain Lab

COUNTRY: ITALY
SECTOR: EDUCATION

Innovation: In December the Blockcerts project, presented by the Universities of Padua and Milan-Bicocca with the technological collaboration of Cineca, was awarded the silver medal at the prestigious QS Reimagine Education Awards in the "Best Innovation in Blockchain Technology" category.

Sources:
Cineca webpage:
https://www.cineca.it/temi/blockchain

Interview with the Aldini Valeriani Foundation, which is a training professional institution that used the training badge system recognized by the blochchain platform developed by Cineca.
See their website:
https://www.fav.it/imprese/corso/form azione-generale-lavoratori/

Cineca develops tools to support digital learning and teaching in universities and professional schools, which cover the entire process of digital content production and certification of skills.

Cineca thinks blockchain technology is useful to be used in the educational sector because:
-Several entities in an equal relationship must provide and access data or resources (no middleman).
-The trace of the operations must be enforceable against third parties, with the certainty that nothing has been canceled or modified (trust).

Blockchain use: The evolution of Bestr as a digital Credentialing platform was announced in January 2019, with the Universities of Milan-Bicocca and Padua.

In June 2019 the first Blockcerts degrees for Italian graduates were released.

Cineca launched a Blockchain Lab at the beginning of 2017, to investigate the opportunities offered by technology and identify – beyond the hype – the possible points of utility for consortium members and for the country.

See the video at the end of this link:
https://www.cineca.it/temi/blockchain

EDUCATIONAL SECTOR

EUROPEAN UNION
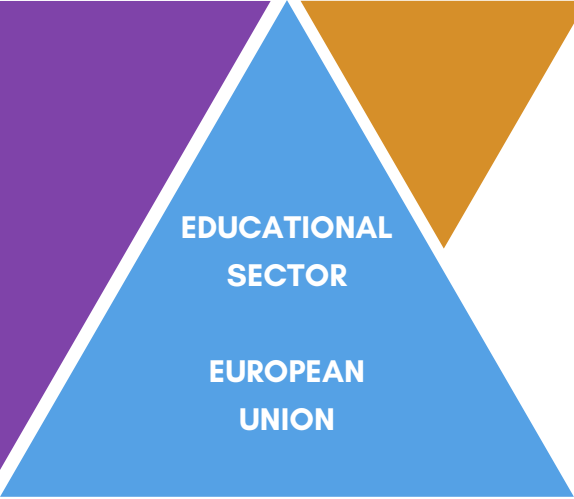
Buck-e

COUNTRY: BELGIUM
SECTOR: MOBILITY/EDUCATION

Innovation: The Buck-e project is innovative in the sense that it directly targets pupils instead of their parents. Furthermore, the rewards provided to students encourage them to spend them on local initiatives that have a positive impact on the community.

Blockchain use: The project applies a so-called private blockchain which is a "network of duplicated databases" that can be duplicated for each municipality that participates in the project. This way the platform can be shared by multiple municipalities simultaneously by sharing and processing data. Stakeholders may also decide on the redeemability of rewards awarded in other participating municipalities (Pommée, 2018).

The Belgium IT consultancy Fairville together with the innovation lab of Belgian bank Belfius developed a platform that local governments can use to encourage citizens to make sustainable mobility solutions (Buck-e, 2022). In the Flemish communities of Bonheiden, Peer and Crisnée, school children were encouraged to commute to school by bicycle or foot. Every time a student walked or cycled to school, a digital currency is awarded. This reward can then be spent at local partners such as "libraries" or "swimming pools" (Beenen, 2018).

Buck-e uses an application for both the pupils as schools and authorities that have access to a dashboard that outlines the number of km walked or cycled by pupils and the amount of CO_2 emissions saved that would have otherwise been produced by parents driving their children to school (Pommée, 2018). This is calculated by a sensor on the bicycle or backpack that registers the movement of the pupil determining the rewards awarded to pupils.

Blockchain technology ensures safety, privacy and integrity of the use of the data such as the number of km spent walking or cycling and the quantity of CO_2 emissions that were saved doing so (Beenen, 2018).

A significant decrease in traffic accidents has been reported in the areas of participating schools since the project started. Moreover, 30 tons of CO_2 emissions were saved by pupils walking or cycling to participating schools (Beenen, 2018).

The currency rewarded to pupils also boosts local companies and is directly transferred into euros.

Sources:
Beenen, W. (9 de October de 2018)
Buck-e. (2022)
Pommée, U. (2018)

BEC

COUNTRY: SWEDEN
SECTOR: EDUCATION

The one technology that let trusted organisations issue animated, blockchain-secured Diplomas, Certificates, Awards and Badges.

Innovation: TRUE is the only platform that currently allows institutions to create customized documents that can be issued using Blockchain technology.

Source: https://trueoriginal.com/

TRUE original has been active since 2020, offering a new document standard, which can be validated and proven as real originals. Through TRUE, institutions and organisation can generate and issue customised documents, badges and credentials that are secure, verifiable, and transparent. After being issued a certification through TRUE, the recipient gains full control over their credentials, being able to password protect the document, share it with third parties, and directly add the document to their certifications on LinkedIn.

Blockchain use: Blockchain technology secures, protects, and allows the documents to become easily verified and trusted.

Università di Milano Bicocca & Università di Padova

COUNTRY: ITALY

SECTOR: HIGHER EDUCATION

Innovation: The case study is innovative because it was one of the first application of Blockchain technologies for the production of educational credentials at the University level in Europe.

Blockchain use: The project utilizes Blockchain technologies to produce University Degrees through the Bestr platform by Cineca. It utilizes the blockcert protocol and it allows students to get their titles checked by anybody around the world without any intervention by the Universities' offices.

Università di Milano Bicocca and Università di Padova are two italian universities which established in 2017 (testing phase) one of the first Blockchain certified University Degree in Europe. Such project helped such universities to win the silver medal at the International Oscars for Education (2019), in the category "Best Innovation in Blockchain technology". They were the only italian institutions which received a prize.

In order to set up the certification process, the two universities partnered with Cineca (see the other case studies in this report) and they employed the blockcert protocol by M.I.T. Media Labs (see the other case studies in this report). The idea was to provide to the students university degrees which were portable and completely safe from falsification and modification.

The validity of such degrees can be verified by anyone around the world without the requirement of intervention by the universities' offices, thus allowing potential employers to rapidly check whether a student they wish to employ does indeed possess the relevant certifications.

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University of Nicosia (UNIC)

COUNTRY: CYPRUS
SECTOR: EDUCATION

Innovation: UNIC claims to be the first university to explore the potential of Blockchain in education through several paths related to accepting cryptocurrency payments, developing educational material on topics connected to cryptocurrencies and Blockchain technology and issuing accredited academic certifications through Blockchain using Blockcerts as an open standard for Blockchain educational certificates.

The University of Nicosia was established in 1980 and its main campus is located in Nicosia, Cyprus. It also has study centres in Athens, New York and Bucharest. This university is a private institution offering more than 100 on-site and distance learning programs.

In 2014, UNIC started offering a Master of Science in Blockchain & Digital Currency and accepting Bitcoin for tuition payment. It was the first university in the world to do so. Besides, since 2017, UNIC is able to publish the diplomas of its graduating students on the Bitcoin Blockchain, offering instant online verification of degree authenticity.

Blockchain use: The university:

- accepts Bitcoin for tuition for any degree program
- teaches a university-level course on cryptocurrency, delivered as a MOOC called 'Introduction to Digital Currencies'
- offers an accredited academic degree program - a Master of Science in Digital Currency & Blockchain - taught online in English
- issues academic certificates onto the Bitcoin Blockchain, using its own in-house software platform.

Sources:
UNIC, n.d.   Wikipedia, n.d.
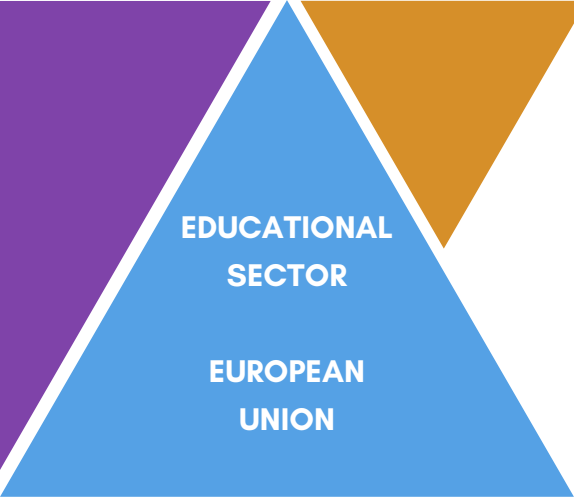UNIC, n.d.2   JCR Science for Policy Report, 2017

BEC

The first blockchain directed at the educational sector

COUNTRY: ESTONIA
SECTOR: EDUCATION

Innovation: DISCIPLINA is developing the first blockchain to create verified personal profiles based on academic and professional achievements. DISCIPLINA doesn't use any other blockchain, and is being developed for the demands of the educational and recruiting fields, taking into account the specificity of their activity.

Blockchain use: DISCIPLINA uses blockchain to maintain a unified register of academic achievement and qualifications for universities. The company's decentralized algorithm automatically assigns a score to someone based on his or her achievements and qualifications. Universities can use those scores to determine individualized learning plans based on what the student has or hasn't learned and achieved.

DISCIPLINA is a multifunctional blockchain for the projects in educational and recruiting spheres. It provides the transparency of work and creates conditions of maintaining confidentiality and reliability of information added by system participants

The DISCIPLINA platform released the Alpha version of its blockchain platform so universities and students can become familiarized with the app. The company's Student App enables students to view their educational history. The Educator App offers profiles on professors, teaching styles and course offerings.

On the platform, students will be able to create a single profile where users will store their verified data on both educational and professional achievements. DISCIPLINA will store the whole history of academic achievement of a person in blockchain, generating their personal score. It will allow recruiters to simplify the candidate search by their fields of expertise and skills required.

PoS Consensus Algorithm: to check the validity of transactions in public chain, so-called «Witnesses» will use a consensus algorithm based on Proof-of-Stake technology, which provides the high speed and low price of transaction. The Witnesses, as in other cryptocurrencies, will be rewarded for the launch of each block with commission fees from transactions made in that block. The probability that the Witness will become the block-leader is proportional to the number of tokens on his account.

Sources:
Alpha DISCIPLINA, 2018-2022
DISCIPLINA, n.d.1
DISCIPLINA, n.d.2
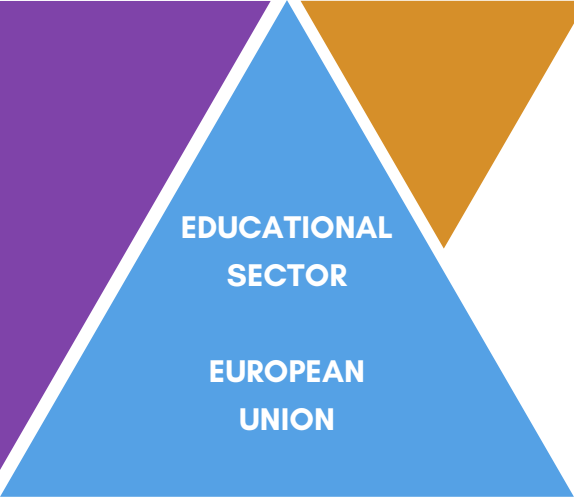**DISCIPLINA, n.d.3**
Daley, 2022

Malta
"Blockchain Island"

EDUCATIONAL SECTOR

EUROPEAN UNION

COUNTRY: REPUBLIC MALTA

SECTOR: EDUCATION & GOVERNMENT

Innovation: Although for now these Maltese project focuses on providing certified education to learners, Malta intends to do much more than that by expanding the use of Blockchain credentials to many other areas. Hence, Malta is using the education certification as a pilot for further developing a more holistic system later on, with the goal of becoming a "Blockchain island".

Blockchain use: Since July 2017, Malta has a Parliamentary Secretary within the Office of the Prime Minister (OPM) to develop national initiatives related to the digital economy. The pilots on education certification are part of this wider framework, as the first trials and examples of praxis. There are many potential e-government projects that would also benefit from the issuing of certificates on the Blockchain. The Maltese OPM identified the following areas to which Blockchain could be applied: Health Care; Land Registry; Notarial Acts; Life Events (Births, Marriages, Death Certificates); Address Points; Police Conduct; Court Case outcomes; Driving Licenses and e-Democracy Events.

Malta aspires to become a "Blockchain island". Nevertheless, they decided to start this path through the educational sector by allowing Maltese citizens to own their education certificates.

In January 2017, the Ministry for Education and Employment (MEDE) signed a Memorandum of Understanding (MOU) with the, back then, Learning Machine Group (LM), now named Hyland Credentials. The MOU coincided with the conclusion of a conference held on the 19th and 20th of January 2017 as part of Malta's Presidency of the Council of the EU.

The MOU signalled the intention to develop and implement a Malta pilot of LM's nation-state technology platform, which is based on the Blockcerts open standard.

MEDE believes that the strategic deployment of Blockchain technology signals Government's commitment to provide learners and workers with maximum ownership and portability of their own official records of learning achievement. The main objective of the pilot is self-sovereignty in order to empower Maltese citizens to own their credentials by levering on the affordances of the Blockchain, acknowledging them as fully contributing, skilled members of the 21st century workforce and as lifelong learners. The secondary objective is to continue with ongoing initiatives to internationalise and cross-reference credentials secured from Maltese institutions within EU frameworks.

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BLOCKCHAIN IN PRACTICE

Educational Sector

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International

MIT Media Lab

EDUCATIONAL SECTOR

INTERNATIONAL

COUNTRY: UNITED STATES

SECTOR: RESEARCH & EDUCATION

Innovation: In June 2017, MIT used Learning Machine Certificates (now known as Hyland Credentials). This is a commercial solution developed over Blockcerts through which diplomas for two cohorts of students at MIT's Media Arts and Sciences and the Sloan School of Business were issued. This is the first issuance of such certificates and the first example of recipient-owned diplomas.

Blockchain use: The MIT Media Lab utilized Blockchain technology for issuing diplomas to recognize the learning achievements of their students.

The MIT Media Lab is a research and academic organization that was founded in 1985 and it is part of the Massachusetts Institute of Technology. There, Media Lab designers, engineers, artists, and scientists aim to develop technologies and experiences that enable people to understand and transform their lives, communities, and environments.

MIT promotes and encourages an interdisciplinary research culture that brings together diverse areas of interest such as social robotics, physical and cognitive prostheses, new models and tools for learning, community bioengineering, and models for sustainable cities. Faculty, students, and researchers work together on hundreds of projects across the mentioned disciplines.

MIT strongly supports the idea of giving recipients more control over the certificates they earn, without having to rely on third-party intermediaries such as universities and employers to store, verify and validate credentials, often at an additional cost. They are now using Blockchain technology and cryptography together and they contributed to the development of Blockcerts.

As explained on their website blockcerts.org, "Blockcerts is an open standard for creating, issuing, viewing, and verifying Blockchain-based certificates. These digital records are registered on a Blockchain, cryptographically signed, tamper-proof, and shareable. The goal is to enable a wave of innovation that gives individuals the capacity to possess and share their own official records."

Sources:

MIT Media Lab, n.d.   **Wikipedia, n.d.**

Blockcerts, n.d.   **Hyland, n.d.**

BEC

EDUCATIONAL SECTOR

INTERNATIONAL

COUNTRY: UNITED STATES
SECTOR: EDUCATION

Innovation: Parchment offers services including district record services, transcripts, diplomas, verification. Learners can order transcript and other credentials, track delivery statuses and store them in a Credential Profile.

Blockchain use: Parchment offers digital credential services to students, academic institutions and employers. K–12 educators use the company's blockchain to upload any important developmental progress. Higher educational institutions use the platform to review academic merit, process applications and produce immutable diplomas. Additionally, students have full-time access to all educational information and can easily share academic achievements with future employers.

Blockchain on educational credentials, transcripts, and diplomas

Parchment is a platform that offers digital credential services to students, academic institutions and employers. They provide learners, academic institutions and employers the ability to innovate, request, verify and share transcripts, diplomas, and other credentials in simple and secure ways.

Parchment recently partnered with x2VOL. The company creates immutable documents that include a log of service hours and students' personal reflections on their learning experience to give future universities and employers a holistic look at a student's academic and personal journey.

Our award-winning technological platform enables the issuance, sharing, collection and verification of authenticated academic credentials across a global network of high schools, universities, licensing boards, and employers.

Sources:
Parchment, n.d.
Parchment, n.d.2
Daley, 2022

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APPII

COUNTRY: UNITED KINGDOM
SECTOR: EDUCATION & WORK EXPERIENCE

Innovation: APPII's platform not only provides verification of credentials and experiences through blockchain, but also ensures the security of the users. Together with Applied Blockchain, they developed an application to integrate Know Your Customer (KYC) providers for verification, issuing and storing digital signatures, biometrics, and integrating Applied Blockchain's 'Privacy' component to ensure compliance with data protection and privacy standards.

Furthermore, the platform included a web and mobile version with an intuitive user experience for the ID verification process and storage and management of digital keys for educational institutions and employers to verify a user's experience.

APPII is a technology and verification software company that develops simple, trusted, and secure biometric applications and solutions suitable for use across different industries.

As for the education sector, APPII partnered with Applied Blockchain to make use of blockchain to verify credentials. They verify the academic credentials of students and professors by combining blockchain, smart contracts and machine learning. The system also works for collecting work experience, allowing employers and recruiters to quickly access verified information about the candidates.

Blockchain use: APPII's platform uses blockchain and digital signatures as a way to create a single immutable record of an individual's experience/certification.

In this way, educational institutions and employers that engage in the network can verify a user's experience with a digital signature that is stored against their record on the blockchain.

To utilize APPII and its platform, users have to create a profile and fill out their academic CV, including education history and transcripts. Then, through blockchain, APPII verifies the user's background and locks his or her information into its blockchain.

Sources:

APPII, n.d.   Daley, 2022

APPII, n.d.2   Builtin, n.d.

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EDUCATIONAL SECTOR

INTERNATIONAL

COUNTRY: JAPAN
SECTOR: EDUCATION

Sony Global Education

Innovation: One of the most innovative aspects of the Sony platform is its ability to keep students' information safely on ledger, once it is verified by the blockchain. Besides, its capacity to support the storage of students' experiences helps the education institutions to organise their data in a more efficient and effective way.

Blockchain use: Education and academic institutions can utilize the Sony platform to store their students' information safely and permanently on blockchain technology. They only need to add the student's information, credentials and achievements to the platform, which then verifies all the data and keeps it perpetually on blockchain. At the same time, the institutions can then access this information quickly from the ledgers where it is stored.

According to Sony "Our mission is to create a new educational infrastructure that goes beyond educational content or services, and becomes the foundation of human resources development so that everyone can compete and learn from one another.". Although it all started in Japan, Sony is expanding its business globally to provide platforms for a wide range of educational products, services and data.

One of the platforms that Sony developed was a blockchain platform that enables different institutions to add individual academic achievements, certifications and other student information on a ledger in order to maintain trustable, transparent, irrefutable records on students who have transferred or furthered their education.

Sources:
Daley, 2022
Sony Global Education, n.d.
Builtin, n.d.

BLOCKCHAIN IN PRACTICE

Other Sectors

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European Union

OTHER
SECTORS

EUROPEAN
UNION

Land registration in Sweden – a collaboration between the public and private sectors

COUNTRY: SWEDEN

SECTOR: LAND REGISTRATION

Innovation: The innovative aspect of this case study resides in the fact that it uses new Blockchain technology for processes (in this case land registration) that have always been conducted by humans and that now can be computerized. This will bring several advantages such as saving time, allowing more transparency or easing the access to certain titles/credentials.

Blockchain use: It utilizes Blockchain technology by registering land property through proof-of-concept and smart contracts, which will allow their verification and permanency on the chain.

In June 2016, ChromaWay announced a proof-of-concept Blockchain solution for land registration, in partnership with the Swedish National Land Survey (Lantmäteriet), the consulting firm Kairos Future and the telecommunications company Telia. Together, they demonstrated how Blockchain technology and smart contracts can make land registration (in this case in Sweden) more secure by minimizing the risk associated with manual handling and transferring of land documents or contracts. Telia developed the proof-of-concept using its identity verification technology on top of a new smart contract system developed by ChromaWay, compatible with both public and private Blockchain. Kairos Future, coordinated and managed the process and developed an accompanying report. Lantmäteriet provided sponsorship and feedback for the project.

The project could make an important impact to save time on land registration registry, which currently can take months from signing a contract to registering a sale in a real estate transaction. With blockchain, this could take only a few hours.

The current phases of the project are:

- Phase 1: developing a theoretical understanding of what blockchain technology is, how it works, and why it would be relevant in the context of the Land Registry Authority.
- Phase 2: responding to the needs and demands of title owners and the Government by developing appropriate technology.
- Phase 3: conducting experimentation, with the goal of developing a working and efficient Proof of Concept

An important challenge that might be raised is how the transition to adopt blockchain technology would involve changes to the Swedish regulatory landscape as digital signatures for registering or purchasing properties are currently illegal.

Sources:
GovChain, n.d.
Entreprenörskapsforum, 2016
Bitcoin Trending, n.d.

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The world's first decentralized photography platform

OTHER SECTORS

EUROPEAN UNION

COUNTRY: SWEDEN

SECTOR: PHOTOGRAPHY & COPYRIGHT

Innovation: YouPic ensures photo ownership by attributing rights on the blockchain. Users can attach a usage license to allow others to buy their photos, or to make their content completely private. YouPic used lattice of blockchain, meaning that each account has its unique blockchain and only that account can create blocks on its chain.

Blockchain use: YouPic utilizes blockchain to secure photo ownership and copyrights, to create smart contracts to define licensing terms and facilitate sale transactions, and to track how the creators' work is used to track unauthorised usage. It therefore explores the decentralization and transparency offered by the Blockchain Technology.

YouPic was funded in 2012 in Gothenburg, Sweden, and has over 3 million users worldwide. Branded as an alternative photography platform to Instagram, photographers and photo enthusiasts are able to sell photo licenses directly to the media houses through the use of blockchain. Sales and contract agreements occur through the use of YouPic's token, YouPic-Coin.

Its interface is a combination of Twitter and Instagram, and it is easy to use. Its primary purpose it to share and repost photos, while including some social functions such as critiquing, resharing, favouriting, and exploring.

The platform utilises blockchain from the creation of the license of the photo, to tracking its usage, ensuring compliance with licensing terms and guaranteeing transparency and decentralization with lower transaction fees. According to their website, "Everything from media registration to copyright dispute handling is decentralized, allowing anyone to integrate existing or new services and platforms with the blockchain. By using a lattice of blockchains together with proof of stake, the network can operate without mining and constantly low transaction fees."

The platform thus connects content creators with consumers in an open, decentralised way, with no royalties or feed for licensing transactions. Transparency is also ensured by easily accessible signatures regarding copyright that are stored on blockchain, which allow anyone to view and use licensing information. In case of disputes regarding the ownership of a photo, YouPic support a decentralised jury composed of people and AI work who work together.

Sources:

Phililips, 2018.

Billing, 2018

Maiorca, 2021

Sam, 2021

YouPic, n.d.

Estonia – the world's most digital country, secured by Blockchain

OTHER SECTORS

EUROPEAN UNION

COUNTRY: ESTONIA

SECTOR: GOVERNMENT & PUBLIC SPHERE

Innovation: Estonia was the first country in the world to use Blockchain in production systems and has become more digitalized country in the world. The extent to which Blockchain and digital technologies in general are used in the country are both innovative and inspirational.

Blockchain use: Blockchain is used to secure data from national registries in the country, enforcing the integrity of government data and systems.

Since 1997, Estonia has highly invested in digital technologies provide public services online, creating the e-Governance. The goal was to deliver services better and faster, improving outcomes and reducing costs. Today, 99% of public services are available to citizens as e-services.

The country has started using blockchain back in 2008 and was the first Nation-State in the world to use blockchain technology in production systems in 2012 with the Succession Registry kept by the Ministry of Justice. The technology used in Estonia is KSI Blockchain, also used by NATO and the U.S. Department of Defence. The technology today backs several e-services in Estonia, such as the e-Health Record, e-Prescription database, e-Law and e-Court systems, e-Police data, e-Banking , e-Business Register and e-Land Registry. For instance, in the health system, the e-Heath Record uses an electronic ID-card system based on blockchain technology to ensure data integrity and mitigate internal threats to the data. This allows misuse of data to be detected and to prevent major damages to a person's health.

Estonia has also developed expertise in the cybersecurity infrastructure. While data breaches are discovered in an average of seven months, KSI Blockchain can detect them instantly.

On KSI, data never leaves the system, and only hash is sent to blockchain service. No data is stored on the KSI Blockchain, which can provide immutability for the data. Finally, it protects data with a "digital defence dust" that allows the system to easily identify changes in the data based on the tracts left in the pattern of the defence dust.

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OTHER SECTORS

EUROPEAN UNION

Flype – Innovating in decentralised delivery of parcels by individuals

COUNTRY: SWEDEN

SECTOR: SUPPLY CHAIN & LOGISTICS

Innovation: Flype addresses the problem of international delivery by using blockchain technology and exploring peer-to-peer interactions to eliminate logistics and unnecessary costs and promote cheaper deliveries. This is secured by blockchain based smart contracts in order to overcome the lack of trust towards unknown individuals. Flype further provides decentralized peer-to-peer insurance, offering immediate compensation, and real time tracking.

Blockchain use: The technology is used to base smart contracts that create trust among the individuals involved in the international delivery. Through it, real-time tracking and peer-to-peer insurance is provided.

The start-up Flype explores the concept of sharing economy to promote a decentralized delivery of parcels by individuals based on blockchain technology. Its promise is to provide a "seamless, low cost, same-next day delivery".

Flype utilizes a peer-to-peer structure for a marketplace which connects people who want to send packages internationally with travellers, who can use the platform to sell and perform deliveries to where they are travelling to. Anyone can thus perform an international delivery and earn money through it. The idea is that packages are picked up from their senders, and accurate and on-time deliveries are guaranteed thanks to their route optimization algorithm. With the goal of providing a delivery platform with zero logistics while being faster, cheaper, and more environmentally friendly.

Flype won the Top Idea Award at the 2018 Venture Cup in Sweden, a prestigious award to start-up companies in the country. It has already tested a prototype service with successful feedback.

Sources:
Flype, n.d.
Alexis, 2019
Touza, n.d.

OTHER SECTORS

EUROPEAN UNION

COUNTRY: CROATIA
SECTOR: PRIVATE & PUBLIC SECTOR (DIFFERENT FIELDS/USERS)

Innovation: COTRUGLI BaaS is based on HashNET which is an innovative blockchain based infrastructure for new business models, products, and services. It can be used by blockchain based organization, but also conventional businesses and public services on their way to digital transformation. Blockchain as a Service (BaaS) is a type of blockchain service that allows customers to use COTRUGLI Blockchain Infrastructure to develop, host, and adopt their own blockchain applications, smart contracts, and other relevant functions on the blockchain while the service provider manages all the required tasks and activities to keep the infrastructure running.

Blockchain use: It deploys essential resources and leverages the required technology and infrastructure to set up and maintain Blockchain connected nodes on behalf of the customer.

COTRUGLI Blockchain as a Service (BaaS)

COTRUGLI Blockchain as a Service (BaaS) is a service (under COTRUGLI Business School) that is offering organizations/institutions help to create its competitive advantage on a market through blockchain technology. COTRUGLI BaaS is a fully managed blockchain service that enables users to grow and operate blockchain networks with simplified network formation, management, and governance. This service eliminates the burden of building, managing, and growing the network so users can focus on things that are important to them.

Benefits of this service are: cost savings, easy to use, focus on customization, staff & resource optimization. Users (industries) of BaaS include for instance supply chain & logistics, government, and oil & gas industry.

COTRUGLI Business School also have "Blockchain Based Diploma Verification System", i.e. blockchain based platform for diploma verification that is secure, fast, and scalable by using blockchain technology to provide end-to-end system security. This system generates QR codes for easy check of digital certificates. It works in a way that person upload a document (diploma), confirm the upload, and click on "Add to blockchain" button which is going to deploy the document's digital signature to the smart contract. After (successful) deployment, there is a "Success notification" of the transaction by which person can locate the certificate and make a transaction on the blockchain. Final step is verification of the document and upload of the diploma so it can be validated.
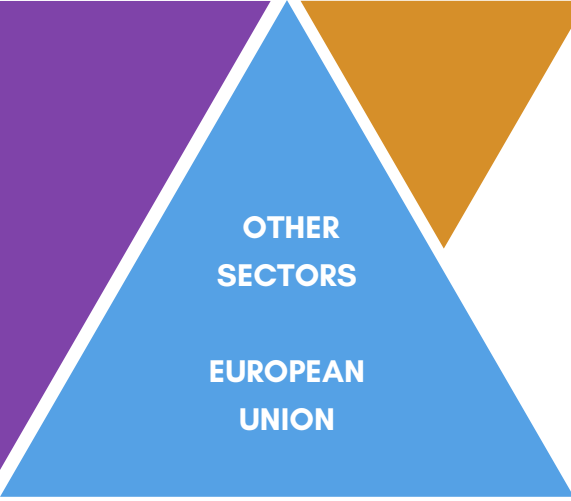
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Port of Antwerp

COUNTRY: BELGIUM
SECTOR: TRANSPORTATIONN

Innovation: This experience modernises a process that has been applied for decades. Instead of paper certificates, the trial aims to issue Blockchain certificates. This way, the importation process decreases bureaucracy for all stakeholders from importers, authorities and ultimately the customers.

Blockchain use: The project applies Ethereum Blockchain because this software is reliable and widely used (Aussems, 2017). The authorities in the country of origin of the products publish the certificate of origin and phytosanitary certificates on Blockchain. The receiving authorities can easily verify the information because of the safety of the technology.

The port of Antwerp and T-mining started a trial-based project using Blockchain for multiple purposes in handling freight in Antwerp's port.

First, the port of Antwerp has initiated a project testing the use of Blockchain to authenticate certificates of entry to the port of ships carrying fruits and vegetables. The use of Blockchain automates and digitalises the flow of certificates of origin and phytosanitary certificates. This guarantees the safety of fruit and vegetables to the forwarding partner (Port Technology, 2018).

Previously certificates were sent by courier which was very costly and poses a large bureaucratic burden. Because Blockchain technology is secure and impossible to tamper with, the process of import can be handled more quickly by the authorities. Furthermore, the technology guarantees the global authenticity of the certificate.

Second, the port of Antwerp started a trial related to the security of the imported containers on the port premises. Instead of providing all truckers with a standard code to pick up containers from the port, T-mining introduced a Blockchain secured system with specific entry codes. Lengthy customs processes and bureaucracy will be decreased. Finally, the use of Blockchain for entry to the port premises makes the process less vulnerable to security risks and corruption (Sluijs, 2017).

Both trials are based on automatisation and security transforming the sector into a more efficient and secure environment.

Sources: Aussems, M. (2017)
Port Technology. (2018)
Sluijs, C. (2017)

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BLOCKCHAIN IN PRACTICE

Other Sectors

-

International

One Block for Educational Credentials (OBEC) Project

September 2022

COUNTRY: SWITZERLAND

SECTOR: IT CONSULTANT AND RESEARCH INSTITUTION

Innovation: The case study is innovative because it tries to detach itself from traditional blockchain platforms (e.g., Ethereum and/or Bitcoin) while maintaining all the positive characteristics of a fully-public blockchain. This can help to reduce the costs (and maintaining it stable and away from the financial market fluctuations) of using Blockchain during the certification of educational credentials.

Quadrans Foundation

Quadrans Foundation is a company that developed the Quadrans blockchain platform. The aim of such company is to deploy resources to entities and initiatives that can help to ensure their long-term success. The main resource that they provide is their Blockchain platform, which could be employed for various aims.

Quadrans Foundation's main goal is to build a global, open, inclusive, public, decentralized and independent infrastructure. Thanks to their seven years (as of 2022) of research and development, Quadrans Foundation is in the position to support projects to empower the community and to develop open ecosystems.

Among the activities they carry out to achieve their goals there are: i) research support; ii) Blockchain education in schools around the world.

Blockchain use: The project built its-own Blockchain that improves the structure and performance of businesses, institutions and public organizations. Quadrans infrastructure runs on two elements designed to serve as utilities – Quadrans Coin and Quadrans Token.

The creation of new smart contracts requires the use of Tokens and Coins. The amount varies according to the storage capacity and computing power required to execute them. Quadrans protocol is designed to encourage an ethical and efficient use of the system.

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CHAINVINE

COUNTRY: UNITED KINGDOM

SECTOR: SUPPLY CHAIN/ LOGISTIC MANAGEMENT

Innovation: The case study is innovative because it was one of the first projects that employed BC technology in the supply chain and logistic sector, improving the quality of such sectors and making them more trustworthy and secure.

Blockchain use: Chainvine utilizes Blockchain in two distinct ways:
i) Blockchain is employed to track the events that are related to the transport of goods across different countries, securing that each step is transparent, safe and trustworthy.
ii) Blockchain is also employed to construct smart contracts that could track a company's operations.

Chainvine is a digital platform that manages supply chain data across different industries in a high secure manner. They allow suppliers to track their orders across borders and improve the trustworthiness of their business. They also support clients to set up and manage smart contract infrastructures in order to automatize and make every passage of a company's operations transparent and compliant to norms and regulations. This reduces the cost of trust for the company.

Chainvine was born from an idea by Oliver Oram in 2015, who thought about the idea behind the company after reading an article about a wine fraudster that managed to exploit the poor situation of the global supply chain infrastructure. The solution proposed by Oliver was to use Blockchain technology to track all movements related to supply chain, thus inhibiting the possibility of falsifying data and, in turn, to fraud the different stakeholders in the supply chain. The two years that followed, the idea behind Chainvine was tested and the platform on which it was based was refined. In 2018 Chainvine secured its first major investment. At the current moment, Chainvine is expanding its market and aims to scale the project through trial demos.

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Serpro

COUNTRY: BRAZIL

SECTOR: LAND REGISTRATION

Innovation: Serpro is the first company trying to collaborate with Brazil's governmental entities in order to solve a problem that has deep social and environmental consequences:

Fraud in land property registration enables companies to easily access the fertile Amazon Forest to destroy it and plant monocultures or extract natural resources, removing the right of autochthonous people to own and care for the land they live in while destroying natural habitats.

Blockchain use: This case study uses Blockchain technology to create, validate and recognise land property in Brazil in a way that is trustable and practically unhackable.

Serpro, based in Brazilia, is the largest Information Technology company providing services for the public and private sectors in the world.

In January 2018, Serpro launched a blockchain platform that regulates land titles. Currently, there is no centralized management of land purchasing in Brazil, leaving in charge over 3,400 private agencies to negotiate land titles across the large nation. Reuters estimates there are over 5 million landless families in Brazil, half of the country's population lack land property rights, and in the Para state, there is four times more land registered than land that exists.

The system is confusing and widely abused, experts say, with double allocations and corruption in the maintenance of records and transfer of title deeds fuelling land conflicts.

Blockchain technology could provide a solution to this fraud and corruption problem by developing land titles in a trustable, verifiable and transparent system that does not allow double allocations and enables people to own their land titles.

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