Blockchain in Practice

Promoting blockchain and DLTs in European SMEs

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INTRODUCTION

Blockchain is a technology to record information in a decentralized way. It has the potential to revolutionise the way we think about data, security and even money. Most people know blockchain as the underlying technology for bitcoin, but the technology is much older and much more broadly applicable than that (Satoshi, 2008; Narayanan et al., 2017; Genov, 2018).

Europe houses high-quality research communities and a vibrant industry, which are both increasingly relying on digital technologies. Therefore, it is crucial that we build up an ecosystem that supports the development of such technologies, including blockchain. This will ensure the future competitiveness and resilience of our industrial and service-sectors. It will help make the shift towards a greener and more sustainable economy[i] and increase our strategic independence. For those reasons, the European Commission is strongly supporting blockchain technologies on multiple fronts.

Among other EU initiatives, the Horizon 2020 Innovation Support Actions (Innosup) supported multiple blockchain related projects aiming at showing how policy makers and innovation agencies can support SMEs in their adoption of blockchain.

1. WHAT IS BLOCKCHAIN?

What exactly is a blockchain? Blockchain and other distributed ledger technologies (DLTs) are technologies enabling parties with no particular trust in each other to exchange any type of digital data on a peer-to-peer basis with fewer or no third parties or intermediaries (Nascimento et al., 2020, p.13).

In essence, a blockchain is a chain of blocks. Each block contains a piece of information. This information is summarised into a digital fingerprint, called a hash. Mining is the creation of a hash for a new block of information through a specific computation. When a new block is created, it includes the hash of the previous block and in that way, it forms a chain. This chain is immutable because blocks can only be added. When the information in a block changes, the hash changes. This causes the chain to break and become invalid. A copy of the chain is located in multiple places, and after verification, new blocks are added to all copies of the chain. This principle is called Distributed Ledger Technology and provides transparency and security, without the need for a central controlling authority.

There are two types of blockchains: permissioned and permissionless. Bitcoin is an example of a permissionless blockchain. This means that anybody can transact and join as a validator, the data (the blockchain) is publically available and copies of the chain (ledgers) are distributed across the globe. In the case of permissioned blockchains, only trusted users can access and append the blockchain. These are closed ecosystems controlled by selected partners[ii]. Permissioned blockchains are popular in cases where companies or national actors need to maintain control of the stored data. The underlying principle of linking blocks is the same in both types of blockchains.

A useful overview of Blockchain terminology can be found here (EUBOF, 2020, p.92).

2. WHERE CAN WE USE BLOCKCHAIN?

Most people know blockchain from Bitcoin and other crypto-currencies, but the possible applications go well beyond money and payments. Blockchain and DLTs offer the potential to simplify and make more secure any process that needs to record and verify information. Today, blockchain already has several real life applications (Marr, 2018). Companies are using blockchain to record the status and condition of every product in a supply chain. Insurers are testing the blockchain to issue proof of insurance and execute payments.

The flagship publication "Blockchain Now and Tomorrow" identified three possible axes of transformation (Nascimento et al., 2020).

First, **Transforming Financial Systems**. These include cryptocurrencies, tokens and Initial Coin Offerings (ICOs), Supported Financial Liabilities, Insurance and Payment systems.

Second, **Transformation of Industry**, **trade and markets**. Blockchain and DLTs have potential applications in Trade and Supply Chains, Smart Manufacturing, Energy Systems, Digital Content, Health and Biopharmaceuticals.

Third, **Transforming Government and the Public Sector**. Here, blockchain technologies could be applied to Land and Property Transactions (e-notaries), Identity Management, Allocation of Public Benefits, Intellectual Property rights and Certificates and Accreditation.

This list of possible applications is not exhaustive, but it shows the potential for the European economy and society.

If you are interested in Blockchain's potential, the European Union Blockchain Observatory and Forum published an extensive thematic overview of blockchain trends and use-cases in the EU between 2018 and 2020 (EUBOF, 2020).

3. WHAT DOES THE EU DO?

The EU strongly believes that blockchain technology, when properly used, can provide significant benefits to European industry, economy and society as a whole. Therefore, the European Commission supports blockchain on the policy, legal and regulatory, and funding fronts[iii]. The European Commission is working on a number of different initiatives to bring together and enhance Europe's leading role in blockchain technology[iv].

The European Commission launched the European Blockchain Partnership to develop a common EU strategy for blockchain and the European Union Blockchain Observatory and Forum, which pools expertise to identify and monitor activities across Europe. The European Union Blockchain Observatory and Forum published a review of its activities and continues to produce quarterly trends reports. Reports on national strategies in the field of blockchain and AI are published by the EC funded project dt2Invest. Another important development is the European Blockchain Services Infrastructure, which is the

world's first cross-border blockchain initiative in the field of public administration[v]. The EU works on a comprehensive legal framework to create legal certainty and promote innovation in the areas of digital assets and smart contracts[vi]. Additionally, the European Commission is taking an active role the blockchain standards community. Standards are crucial for the success and adaptation of a novel technology. They ensure interoperability, generate trust and help ensure ease of use of the technology[vii].

Besides those high-level initiatives, the European Commission provides funding for blockchain start-ups, the development and dispersion of blockchain technologies, and its uptake by SMEs and industrial companies. For example, the B-hub blockchain for Europe project which aimed to bring blockchain technologies closer to the market and enables a knowledge transfer beneficial to all European economic players. This happened notably through Horizon 2020 and will continue under Horizon Europe.

The Commission created the 'Blockchain for Social Good EU Prize' (part of the EIC pilot) which awarded five million euro to six innovators[viii].

Together with the European Investment Fund, the European Commission created six Artificial Intelligence and Blockchain Technology funds with a total fund size of €700 million. The funds will deploy this new finance to target sectors in early and growth stage companies, including B2B software, data/analytics, Internet of Things (IoT), Smart Cities, automation, language and machine learning, Software as a Service (Saas), Fintech, cybersecurity and the future of work[ix]. Moreover, the European Commission is working to harness the possibilities of blockchain for fintech and increase standardization of DLTs[x].

Within Horizon 2020, the EU has so far funded 43 projects related to blockchain and DLTs in various sectors for a total grant amount of €172 m. Figure 1 provides an overview by sector[xi].

The Innovation Support Actions (Innosup), which were a part of Horizon 2020, supported an additional five projects. These projects focused on the development of blockchain and DLTs by start-ups and the uptake of those technologies by small and medium size enterprises (SMEs) in traditional sectors. SMEs often do not have sufficient personnel or the right skills to implement novel technologies. The Innosup projects aim to remove the barriers of uptake by matching service providers with possible adopters.

The projects presented in this document can serve as an inspiration for policy makers and innovation agencies on how to support the development and uptake of blockchain and DLTs by European SMEs.

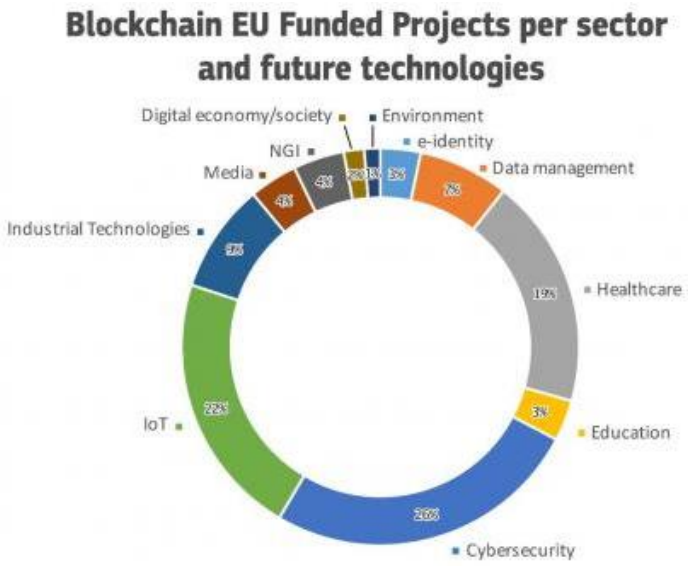


Figure 1 Source: European Commission

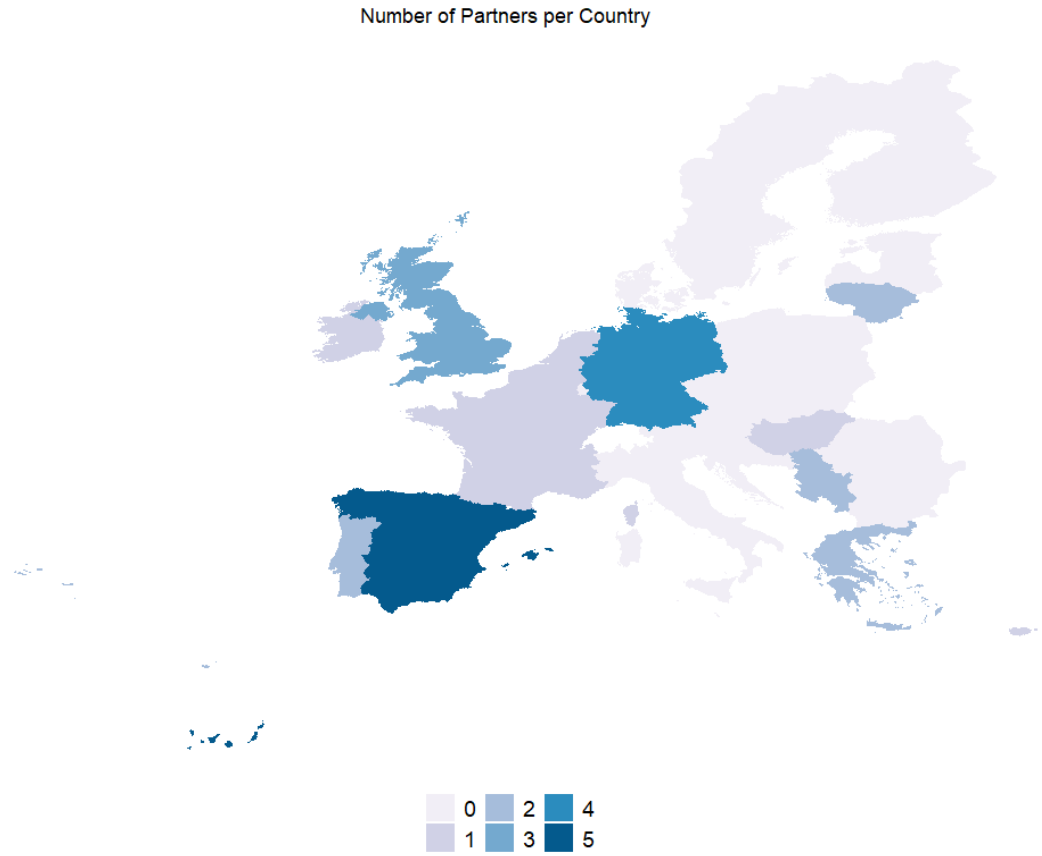
4. H2020 INNOVATION SUPPORT EXAMPLES

The Innosup Actions aim to support SMEs via intermediaries. In total, Innosup funded five projects through three different Actions. Each Action has its own focus, but together they cover a broad spectrum.

INNOSUP 3: Blockchain and DLTs for SMEs, aimed to accelerate the uptake of those technologies by SMEs in traditional sectors and improve the provision of B2B blockchain services and consultancy. Three projects were funded through this action (Blockchers, Blockstart and Blockpool). The budget per project was €1.5 m of which €750,000 provided direct funding to SMEs.

INNOSUP 1: Cluster facilitated projects for new industrial value chains, set as a goal to improve cross-border and cross-sectoral collaboration, innovation and entrepreneurship across regions and value chains. Within this Action, one project focused on blockchain (Block.IS). The project's budget was €5.4 m of which €2.8 m went directly to SMEs.

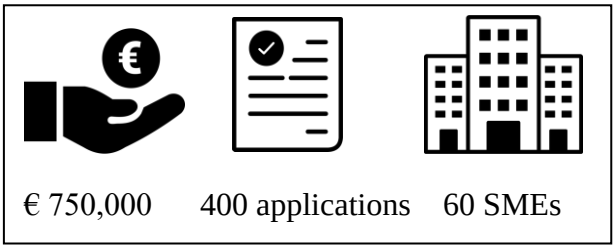
INNOSUP 5: Peer learning of innovation agencies, set out to improve the innovation support services of Innovation Agencies through peer learning methods. One project (Peers2Blockchain) used blockchain uptake by SMEs as a practice case on how to improve innovation support by Innovation Agencies. The budget per project was €50,000.



4.1. Blockchers: Blockchain Technologies for SMEs (INNOSUP3)

Partners: Zabala Innovation Consulting (ES), Innomine Group (HU), Frankfurt School of Finance and Management (DE), Consorcio Red Alastria (ES)

When: 1 February 2019 – 31 January 2021



Website: www.blockchers.eu

Blockchers helped SMEs to take up DLTs by funding use-cases involving technology suppliers. Moreover, Blockchers offered direct funding (up to €50 000) to cover the implementation of DLTs use-cases. The project's total budget was €1.5 m of which € 750 000 provided funding to SMEs.

Blockchers matched DLT specialists with traditional SMEs as potential users of DLTs through the implementation of real use-case scenarios. The project selected the SMEs working with DLTs through two competitive open calls. Then Blockchers implemented a two-phase funding scheme and provided supporting services such as teamwork sessions and community building activities. Next, traditional SMEs were matched to potential technology providers (the group of SMEs working with DLTs). This group of 50 SMEs was sensitized about the benefits and opportunities of DLTs.

During this process, Blockchers created a dialogue around DLTs, connecting parties from business, academia and politics. The project wrote two guides to support the work of policy makers and facilitate the generation of a "smart" regulatory framework for DLTs in the EU.

A full list of all 60 beneficiary SMEs can be found here.

SAVING WATER IN AGRICULTURE

Vestigia is a great example of how blockchain technology can be applied in traditional sectors, such as agriculture. Vestigia created a certificate blockchain system that evaluates the water footprint of horticultural products such as strawberries and tomatoes. Specially designed IoT devices capture the relevant information during production, and this data is then stored in a blockchain. The blockchain ensures the visibility, traceability, and confidence of the entire supply chain.

This system allows all stakeholders to accurately trace the real water use of produce. In that way, farmers can become more sustainable and improve compliance, while retailers and consumer can make more sustainable choices.

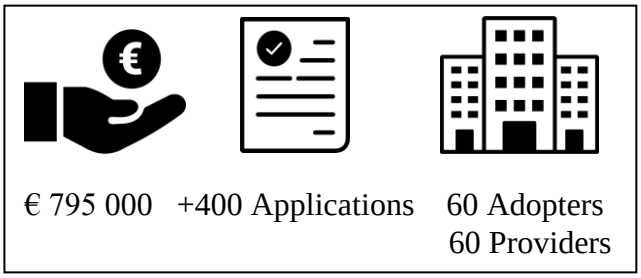
The company **received €50 000 during the Blockchers 2nd Open Call Competition**. €3 000 in the first round, €30 000 during the second round and €17 000 as the winner of the competition.

4.2. Blockstart: Helping SMEs take the first steps into the blockchain (Innosup03)

Partners: Bright Development Studio (PT), UAB CIVITTA (LT), F6S Network (UK)

When: 1 September 2019 – 28 February 2022

Website: www.blockstart.eu



BlockStart is a blockchain accelerator aiming to promote partnerships between blockchain developers and end-user SMEs in three sectors: fintech, ICT and retail. From the total budget of €1.5, €795 000 is directly devoted to beneficiary start-ups and SMEs. The calls attracted over 400 applications to date.

In the first 2 of 3 acceleration programmes, BlockStart supported 40 blockchain start-ups through funding (up to €20 000 for solution providers and €4 500 for solution adopters), mentoring (from business and technical experts), exposure at conferences and webinars (such as the Demo Day, European Blockchain Convention or EU-Startups Summit), matchmaking with investors and other partners and, above all, facilitating the piloting of blockchain technology in 34 potential clients.

Additional initiatives to elucidate intermediaries, policymakers and extended community include the organization of events, creation of reports and development of *Do you need blockchain?*, a tool allowing entities to assess, in less than 15 minutes, the applicability of blockchain to their activities and needs.

> "*The diversity of supported projects, ranging from supply chain and finance, to entertainment and agriculture, combined with the interest from over 100 potential clients, clearly showcase the versatility and relevancy of blockchain technology*",
>
> ***João Fernandes, Bright Pixel, BlockStart coordinator.***

You can find a full list of the 60 Providers and the 60 SME Adopters on the BlockStart website.

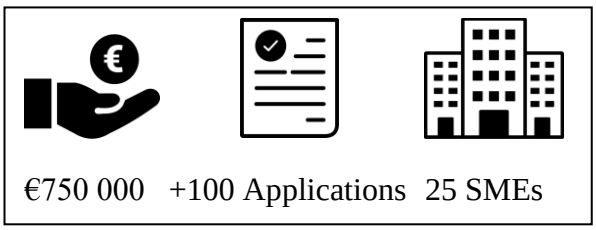
REAL TIME SUPPLY CHAIN MONITORING

Kedeon is a startup which allows verifiable real-time monitoring of last-mile cold-chain deliveries, requiring minimal changes in existing operations. The blockchain recording of data ensures the data's verifiability and enables to better prove liability in the case of breaches. From April to August 2020 Kedeon developed both its hardware (IoT sensor) and software components (dashboard and verification platform). This enables delivery service to monitor in real-time, while providing transparent delivery information to consumers and clients. In September and October, it piloted its solution in five SMEs, tracking hundreds of meat, fish and grocery shipments.

After its participation in BlockStart, Kedeon was selected by the reputable Blockrocket and Techstars Smart Mobility accelerators, further developing their business.

4.3. BLOCKPOOL: Pooling SME adoption and deployment of blockchain and other DLTs (INNOSUP3)

Partners: Frankfurt School of Finance & Management (DE), European Regional Framework for Co-Cooperation (EL), European Crowdfunding Network (BE), EDEX (CY), Insomnia Consulting (ES), Fraunhofer (DE), N-Able (FR).



When: 1 July 2019 – 30 June 2021

Website: www.blockpool.eu

The Blockpool project aims to enhance innovation capacity in SMEs through an increased uptake of blockchain and distributed ledger technologies. Blockpool does this by demonstrating the use of these technologies in 25 SMEs. On top of that, the project provide trainings in the forms of Massive Online Open Courses (MOOC), webinars, and boot camps. Blockpool raises awareness and disseminates knowledge and best practices on blockchain and DLTs across Europe. The total budget is €1.5 m of which €750 000 provided funding to SMEs.

The ultimate goal is to become a sustainable portal for blockchain and DLTs for SMEs via a stronger research and training framework, increased research funding and support.

You can find all beneficiaries on the Blockpool website.

> *"The overwhelming number of cutting-edge ideas and applications generated during the Blockpool project is concrete evidence for the potential of the European tech industry. This innovative spirit needs to be fostered to ensure a competitive blockchain industry in the years to come."*
>
> ***Robert Richter, Frankfurt School Blockchain Centre, Blockpool***

A DIGITAL IDENTITY FOR MOTORCYCLES

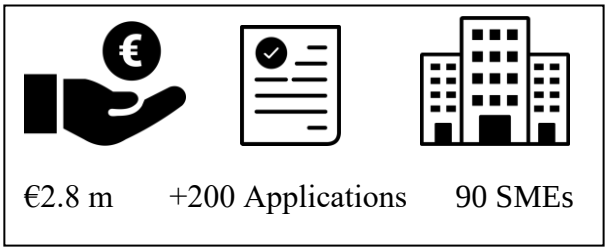
Motoblockchain is a **Motorcycle Digital Identity platform** based on privacy by design and DLTs: it collects documentation about the history of any motorcycle and stores the related fingerprint into a blockchain, while giving to the user full control over it in a fully GDPR compliant system.

Motoblockchain is a great example of how blockchain technologies can help overcome information asymmetries in markets and create trust between buyers and sellers. The platform stores all relevant information about the origins, maintenance and modifications of motorcycles in an unmodifiable manner, using a blockchain. This creates a trustworthy history of the motorcycle and increases the resale value of the motorcycle because its quality is attested.

During the Blockpool acceleration programme, Motoblockchain developed a dedicated website, smart phone applications, a blockchain API and an IoT product. Without the support from Blockpool, this would have not been possible.

coordinator.

4.4. Block.IS: Blockchain Innovation Spaces (INNOSUP 1)



Partners: F6S Network (UK), Inosens Doo Novi Sad (RS), Intrasoft International (LU), International Development Ireland (IR), Poslovno Udruzenje Vojvodjanskie IKT Klaster (RS), Federacion Empresarial de Agroalimentaicion de la comunidad Valenciana (ES), R-Tech (DE), European Digital SME Alliance (BE), Fintechstage (UK), UAB Civitta (LT), NWO (NL), Synelixis Lyseis Pliroforikis Automatismou &Tilepikoinonion Anonimi Etairia (EL).

When: 1 May 2019 – 31 December 2021

Website: www.blockis.eu

Block.IS is an acceleration project that aims to build a cross-border, cross-sectoral innovation ecosystem. It applies cutting-edge blockchain technology in three economic sectors: agrifood, logistics and finance. The total budget is €5.4 m of which €2.8 m provided funding to SMEs.

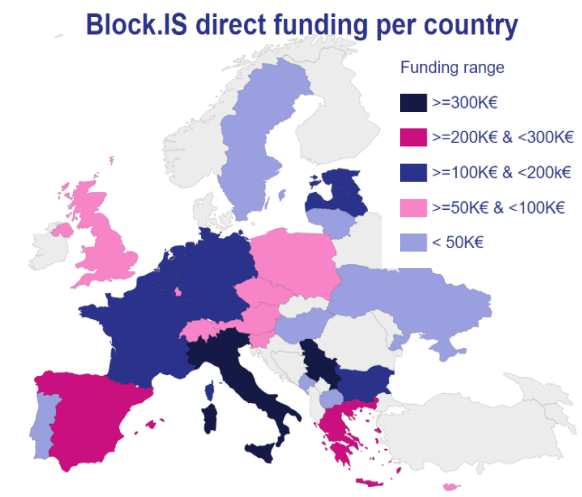
The project supported the creation of new blockchain-based solutions, from ideation to commercialisation. The acceleration took place in three phases: innovate, experiment, and commercialise. SMEs were selected through open calls and challenges. In each phase, the selected candidates were offered a set of tech & businesses services and financial support to develop their projects in close collaboration with relevant clusters networks, sector specialists and technology experts.

This structured holistic approach allowed the best and most promising concepts to accelerate, achieve growth and market uptake, while all SMEs received support and advice to improve their entrepreneurial skills and potential.

You can find a full list of the SMEs participating in the first and second open call.

COMMUNICATION IS KEY

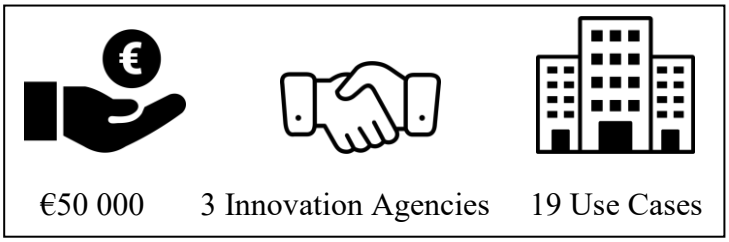
To maximise the visibility of the project's offerings and reach top-notch blockchain start-ups and SMEs across Europe, a unique Communication and Dissemination Strategy was crafted at the beginning of the project. The consortium partners carried into effect various activities – ranging from diverse social media campaigns, multiple events and webinars organisation and attendance, to **establishing thought leadership within the pan-European blockchain ecosystem** – which subsequently became a project's success story and good practice among similar initiatives.



4.5. Peers2blockchain (Innosup05)

Partners: Parque Tecnologico de Andalucia (ES), Technoport (LU), Universidade do Algarve (PT)

When: 15 April 2019 – 14 July 2020



Website: www.peers2blockchain.eu

Peers2blockchain (P2B) aimed to investigate and develop new topics and approaches in innovation support to SMEs related to blockchain, with an intention to put newly developed skills into practice. The total budget was €50 000 with no direct SME funding.

The project was a collaboration between partners from three different countries and with associate partners from Bulgaria, China, Estonia, France, Hungary, Italy, Palestine and Russia. It studied pilot projects and good practices at the local level. Their use-cases apply to many different sectors: public administration, retail & customers applications, industry value-chain applications, creative industries, and DLT Resources. P2B proposed new methodologies to enhance SME innovation, and to promote the use of blockchain technologies to both companies and innovation agencies and helped to put these newly developed skills into practice.

Furthermore, P2B contributed to the creation of a Blockchain Expert Course, coordinated by the Andalucía Technology Park and the University of Malaga. P2B has been present in the two previous editions of the course, and the third is currently being prepared. Additionally, it is worth highlighting the realization of two events focused on blockchain: Convergence, at European level, and a meeting on blockchain for the technology parks of Spain and Portugal.

P2B summarized their experiences in a useful handbook that collects good practices in various sectors.

BLOCKCHAIN FOR INDUSTRY 4.0

ByEvolution Creative Factory is a technology company that develops cybersecurity based on blockchain. ByEvolution has created Neural Distributed Ledgers (NDL), a blockchain technology designed to respond to the challenges posed by the new era of digitalization.

Based on NDL technology, ByEvolution has developed the BaaS (blockchain as a service) solution NDL Flowkeeper. This the **first Manufacturing Execution System on the market with blockchain certification**. NDL Flowkeeper helps industries join Industry 4.0 through digitization, automation and end-to-end certification of their industrial manufacturing processes. NDL Flowkeeper integrates IoT, AI and 3D printing with blockchain, providing greater added value to the production chain of industries.

Thanks to their NDL technology, ByEvolution has been able to develop other innovative blockchain-based Token App solutions such as NDL Dockeeper (digital files and certified intellectual property), NDL Mailkeeper (certified and cybersecure email), or NDL Token Suite (platform for the issuance and commercialization of security and utility tokens).

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6. ENDNOTES

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