blockchain skills for Europe

D4.1.1: Study on the EU Blockchain Growth Strategy

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CHAISE Consortium			
Partner Number	**Participant organisation name**	**Short name**	**Country**
1	Université Claude Bernard Lyon 1	UCBL	FR
2	International Association of Trusted Blockchain Applications	INATBA	BE
3	Fujitsu Technology Solutions NV	FUJITSU	BE
4	Ministry of Education and Religious Affairs	YPEPTH	GR
5	ECQA GmbH	ECQA	AT
6	DIGITALEUROPE AISBL	DIGITALEUROPE	BE
7	IOTA Stiftung	IOTA	DE
8	Universitat Politècnica de Catalunya	UPC	ES
9	Duale Hochschule Baden-Württemberg	DHBW	DE
10	Associazione CIMEA	CIMEA	IT
11	INTRASOFT International S.A.	INTRASOFT	LU
12	Institute of the Republic of Slovenia for Vocational Education and Training	CPI	SI
13	European DIGITAL SME Alliance	DIGITAL SME	BE
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15	Univerza V Ljubljani	UL	SI
16	BerChain e.V.	BERCHAIN	DE
17	ITALIA4BLOCKCHAIN	ITALIA4BLOCKCHAIN	IT
18	Autoritatea Națională Pentru Calificări	ANC	RO
19	Akkreditierungs, Certifizierungs- und Qualitätssicherungs- Institut e.V.	ACQUIN	DE
20	EXELIA	EXELIA	GR
21	INDUSTRIA Technology Ltd	INDUSTRIA	BG
22	Crypto4all	C4A	FR
23	Economic and Social Research Institute	ESRI	IE

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Abbreviations

BC	Blockchain
D	Deliverable
DG	Directorate General
DG CONNECT	Directorate-General for Communications Networks, Content and Technology
DG EAC	Directorate-General for Education, Youth, Sport and Culture
DG ECFIN	Directorate-General for Economic and Financial Affairs
DG GROW	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
DLT	Distributed Ledger Technologies
EACEA	Education, Audiovisual and Culture Executive Agency
EC	European Commission
EP	European Parliament
EU	European Union
ICT	Information and Communications Technology
M	Month
SME	Small and Medium-sized Enterprise
SSA	Sector Skill Alliance
T	Task
VC	Venture Capital
VET	Vocational Education and Training
WP	Work Package

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1. Introduction

This Study on the EU Blockchain Growth Strategy analyses the EU's approach to the uptake of blockchain and ledger technologies and aims to provide an extensive overview on past, current and upcoming EU initiatives related to blockchain. Thus, the study will serve as a building block for the upcoming development of a European Blockchain Skills Strategy by the CHAISE project.

Therefore, the purpose of this document is to:

- analyse the EU approach to Blockchain uptake,
- outline the vision and strategic objectives,
- list ongoing initiatives & actions serving these goals,
- analyse future trends and expected developments,
- discuss how cooperation on skills can help to overcome the prevailing challenges and achieve the growth goals.

The study is based on a preliminary desk research reviewing official EU documents, carried out by CHAISE consortium member DIGITAL SME, which consisted in mapping and analysing blockchain-related data published by the European Commission, the European Parliament, and other relevant EU bodies. The main resource used for this research is the website of the Publications Office of the European Union[1], which is an interinstitutional office responsible for publishing all the publications of the institutions of the European Union, as well as the website of the European Commission[2].

Upon completion of the desk research, the findings were complemented by interviews with staff members from different Directorate General and units of the European Commission working on blockchain and digital skills. The interviews, organized by CHAISE consortium member INATBA, aimed at gaining further insights on the EU's strategic approach towards blockchain, notably on recent developments, upcoming trends and initiatives, as well as the value of sectoral cooperation on blockchain skill development.

In total, 5 interviews were carried out with 8 staff members of the European Commission who are focusing on blockchain, digital skills and digital education, coming from DG CONNECT, DG GROW and DG EAC.

Important note: while all the interviewees accurately describe the Commission's work on blockchain and skills, some of the statements reflect their personal opinion and personal perception and can under no circumstances be interpreted as an official position of the European Commission.

[1] Available at https://op.europa.eu/en/
[2] Available at https://ec.europa.eu/info/index_en

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2. Opportunities and challenges presented by blockchain

This section gives a brief overview on the opportunities and challenges that blockchain and ledger technologies bring about for Europe, as identified by the EU. Indeed, the Commission's perception of the benefits and risks of blockchain constitutes the basis for any initiative, legislation or strategy at the EU-level.

2.1 Opportunities

The European regulators identified early on the potential opportunities of blockchain. In a 2016 Commission Staff Working Document on "Advancing the Internet of Things in Europe", the Commission remarks that the potential of technologies such as blockchains in the field of IoT could be further explored. Indeed, "such distributed architectures could offer alternative and more efficient ways to meet the challenges of interoperability but also of trust and data ownership/usage."[3] In 2017, in a communication on the Mid-Term Review on the implementation of the Digital Single Market Strategy, the European Commission stressed that blockchain is one of the breakthrough technologies which can have a huge potential impact in the financial sector, but also far beyond[4]. These opportunities will be further detailed into section 3 on the history of EU blockchain strategy and regulation.

2.2 Challenges

Along with the development of blockchain, some threats and challenges emerged, that were also identified by the EU regulators.

- **Regulatory challenges**

In a resolution of the European Parliament (EP) from 2018 on "Distributed ledger technologies and blockchains: building trust with disintermediation", the majority of Members of the European Parliament (MEPs) seem to agree that the regulatory approach towards Distributed and Ledger Technologies (DLT)

[3] European Commission (2016) *Advancing the Internet of Things in Europe*, Commission staff working document accompanying the document Communication from the Commission to the European Parliament, the Council, the European Economic And Social Committee and The Committee Of The Regions *Digitising European Industry Reaping the full benefits of a Digital Single Market.* Available at: https://op.europa.eu/en/publication-detail/-/publication/72469e0f-0611-11e6-b713-01aa75ed71a1/language-en/format-PDF/

[4] European Commission (2018) Communication From The Commission To The European Parliament, The Council, The European Central Bank, The European Economic And Social Committee and the Committee of The Regions on a *FinTech Action plan: For a more competitive and innovative European financial sector*. COM/2018/0109 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0109

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should be innovation-friendly, i.e. no regulation "per se", but rather trying to remove "existing barriers to implementing blockchain[5]".

On the other hand, regulatory uncertainty leads to a decreased innovation. Indeed, according to the "Proposal for a regulation on a pilot regime for market infrastructures based on distributed ledger technology", "Regulatory obstacles and legal uncertainty are most often cited as the main reasons for the limited uptake of this potentially transformational technology in market infrastructures".[6]

- **Fraudulent and criminal activities linked to blockchain**

One issue posed by blockchain is the risk of using cryptocurrencies for money laundering. Already in 2017, the European Parliament wrote in its resolution on "FinTech: the influence of technology on the future of the financial sector", that it is "concerned by the increased use of unpermissioned blockchain applications for criminal activities, tax evasion, tax avoidance and money laundering"[7]. In a resolution from 2018 on "Distributed ledger technologies and blockchains: building trust with disintermediation", the European Parliament called on the Commission to assess and develop a European legal framework, in order to solve any jurisdictional problems that may arise in the event of fraudulent or criminal cases of DLT exchange.[8] However, during the interviews with Commission staff members, their perception showed that blockchain is a technology with limited , for instance when compared with Artificial Intelligence.

- **Investment gap**

The lack of investment into blockchain projects is another crucial issue hampering the uptake of blockchain. Indeed, a recent report from the European Investment Bank, published in June 2021, identified a € 10 billion investment gap in artificial intelligence and blockchain technologies. According

[5] European Parliament (2018), *Resolution of 3 October 2018 on distributed ledger technologies and blockchains: building trust with disintermediation* (2017/2772(RSP)). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018IP0373

[6] European Commission (2020) *Proposal for a regulation of the European Parliament and of the Council on a pilot regime for market infrastructures based on distributed ledger technology*. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=COM:2020:594:FIN

[7] European Parliament (2017), *Resolution of 17 May 2017 on FinTech: the influence of technology on the future of the financial sector*. Available at: https://op.europa.eu/en/publication-detail/-/publication/5b8e2da5-ac22-11e8-99ee-01aa75ed71a1/language-en

[8] European Parliament (2018), *Resolution of 3 October 2018 on distributed ledger technologies and blockchains: building trust with disintermediation* (2017/2772(RSP)). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018IP0373

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to this report, the investment gap is "holding back development and deployment of artificial intelligence and blockchain technologies in the EU".[9]

- **Skills shortage**

Finally, one of the biggest hurdles to Europe's competitiveness and the reason behind the CHAISE project is the lack of a competent and skilled workforce as regards some emerging technologies, such as blokchain. In January 2018, the European Commission published a "Communication on the Digital Education Action Plan"[10], where it highlighted challenges and opportunities of emerging technologies, among them blockchain, for education and the future of work. According to the document, "the biggest risk today is of a society ill-prepared for the future". Therefore, it is essential to provide citizens with the needed skills to "make the most of the opportunities and meet the challenges of a fast-moving, globalised and interconnected world". Still in 2018, a European Parliament "Resolution on distributed ledger technologies and blockchains" called on the Commission and the Member States to develop digital skills training and upskilling strategies, such as to increase the awareness and understanding of this technology and ensure that nobody is left behind in the digital transformation[11].

3. History of EU blockchain strategy and regulation

This section focuses on the history of the EU initiatives around blockchain, which contributed to the current state-of-play of blockchain uptake in Europe. The European Institutions started developing an interest in, and a focus on blockchain as of 2015. Numerous initiatives, including resolutions by the European Parliament or the European Council, funding, regulatory initiatives have been initiated since. In this section, some of the most decisive activities are presented.

3.1 Blockchain and digital finance

Broader application of blockchain and DLT technologies first became visible in the finance sector. In 2015, building on previous actions in the digital finance sector, such as consultations, the European

[9] Verbeek, A., Lundqvist, M. (2021) *Artificial intelligence, blockchain and the future of Europe: How disruptive technologies create opportunities for a green and digital economy.* Available at: https://www.eib.org/en/products/advising/innovfin-advisory/ai-blockchain-and-future-of-europe-report

[10] European Commission (2018) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the Digital Education Action Plan COM/2018/022 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2018%3A22%3AFIN

[11] European Parliament (2018) *Resolution of 3 October 2018 on distributed ledger technologies and blockchains: building trust with disintermediation* (2017/2772(RSP)). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018IP0373

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Commission introduced new players and technologies in the retail financial services sector in a "Green paper on Retail financial services" [12]. The green paper observes that new financial technology companies (fintech) have started entering the market next to traditional financial services providers. It states that technologies such as distributed ledgers and blockchains can enable new processes and allow customers to benefit from a wider range of services to a lower cost. This green paper shows the Commission's interest in the blockchain topic, as green papers are "document published by the European Commission to stimulate discussion on given topics at European level[13]". Thus, it may lead to more concrete actions, such as a communication and finally a regulation or directive.

The European Parliament has been closely following these developments as well. In a resolution published on 26 May 2016[14], the European Parliament defined Virtual Currencies and DLTs and listed opportunities (lower transaction and operational costs, higher privacy, secure online payments), risks (legal uncertainty, no governance structure, missing regulation), as well as the potential of blockchain DLT beyond payments. Further, the European Parliament calls "for a proportionate regulatory approach at EU level so as not to stifle innovation or add superfluous costs to it at this early stage, while taking seriously the regulatory challenges that the widespread use of VCs and DLT might pose."

Following these developments, the European Commission launched in 2017 a "Public consultation on FinTech: a more competitive and innovative European financial sector", to gather insights about technological information in financial services that would feed into the Commission's policy approach. [15]

This same year, the European Parliament published a resolution on "FinTech: the influence of technology on the future of the financial sector" [16], mentioning the opportunities of a blockchain-based Central Bank Digital Currency (CBDC), but also highlighting the risks of blockchain in the finance sector, such as the difficult to regulate and the risks for criminal activities. The parliament stated that regulation of financial services legislation should be "innovation-friendly, so that a level playing field between actors can be achieved and maintained", and that the Commission should look into possible risks and benefits of a blockchain-based CBDC, taking into account consumer protection and transparency. In addition, it

12 European Commission (2015), GREEN PAPER from the EC on Retail financial services - Better products, more choice, and greater opportunities for consumers and businesses. Available at: https://op.europa.eu/en/publication-detail/-/publication/8dd2b8c1-9f2d-11e5-8781-01aa75ed71a1/language-en/format-PDF/

13 Green Paper in the EU Glossary, retrieved from: https://eur-lex.europa.eu/summary/glossary/green_paper.html

14 European Parliament (2016) *Resolution of 26 May 2016 on ncies* (2016/2007(INI)). Available at: https://www.europarl.europa.eu/doceo/document/TA-8-2016-0228_EN.html

15 Public consultation on FinTech: a more competitive and innovative European financial sector. Retrieved from the European Commission's website at: https://ec.europa.eu/info/consultations/finance-2017-fintech_en

16 European Parliament (2017) *Resolution of 17 May 2017 on FinTech: the influence of technology on the future of the financial sector* (2016/2243(INI)). Available at: https://op.europa.eu/en/publication-detail/-/publication/5b8e2da5-ac22-11e8-99ee-01aa75ed71a1/language-en

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highlighted the increasing use of blockchain applications for criminal activities, tax evasion, tax avoidance and money laundering and recommended the Commission to address and assess these risks in a report.

As an answer to these identified risks, European legislators agreed in December 2019 to extend the scope of the Anti-Money Laundering Directive to virtual currency exchanges and wallet providers.

In March 2018, the European Commission published a "Communication on the FinTech Action plan: For a more competitive and innovative European financial sector"[17]. According to the Commission, crypto-assets and the underlying blockchain technology have a high potential for financial markets and infrastructures. Their use also presents risks (strong volatility of crypto-assets, fraud, operational weaknesses, lack of market transparency). In the annex to the communication, the European Commission presents its way forward:

- Monitoring the developments of crypto-assets and Initial Coin Offerings and assessing the need for regulatory action at EU level;
- Liaising with standardisation bodies and foster common standards and interoperability of blockchain such as to increase cooperation and competition between market players.

3.2 Blockchain in other sectors

While the EU regulators' first initiatives for the blockchain sector focused on FinTech, the technology's potential has been unfolding across all sectors and industries, which led the regulators to start further projects and initiatives.

In 2017, in its "Communication on the Mid-Term Review on the implementation of the Digital Single Market Strategy"[18], the European Commission highlighted the potential of blockchain across all sector and industries and announced the creation of a European observatory on Blockchain technologies, in order to map and monitor blockchain developments, build expertise and promote use cases.

[17] European Commission (2018) Communication From The Commission To The European Parliament, The Council, The European Central Bank, The European Economic And Social Committee and the Committee of The Regions on a *FinTech Action plan: For a more competitive and innovative European financial sector*,. COM/2018/0109 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0109

[18] European Commission (2017) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on the *Mid-Term Review on the implementation of the Digital Single Market Strategy A Connected Digital Single Market for All*. COM/2017/0228 final. Available at: https://op.europa.eu/en/publication-detail/-/publication/a4215207-362b-11e7-a08e-01aa75ed71a1/language-en/format-PDF/

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In parallel, the European Commission started investigating the application of blockchain in sectors beyond finance, and launched a research project called, #Blockchain4EU: Blockchain for Industrial Transformations, which ran from March 2017 to May 2018. It was coordinated by the EU Policy Lab / Foresight, Behavioural Insights and Design for Policy Unit of the Joint Research Centre (JRC), in collaboration with the Innovation Policy and Investment for Growth Unit of the Directorate-General for Internal Market, Industry, Entrepreneurship & SMEs (DG GROW).[19]

The project's main goal was to assess the impact of Blockchain and other DLT within EU industrial and business sectors, and to identify opportunities for the development and uptake of Blockchain, with a particular focus on SMEs, innovation and competitiveness. In addition, the project explored regulatory, policy and funding aspects for both business and manufacturing levels. The methodology used desk research, interviews, surveys, as well as co-creation workshops. This led to the development of five prototypes to showcase how Blockchain could be applied in five sectors: energy, transports and logistics, creative industries, advanced manufacturing and health. In the project's final report[20], nine policy recommendations are presented:

1. Supporting experimentation and piloting with simplified requirements
2. Building upon other digitisation initiatives and programmes
3. Stimulating knowledge sharing and collaborations between projects
4. Fostering interoperability and open standards with wider engagement
5. Promoting adequate skills and training also beyond core blockchain spaces
6. Cultivating wider exchanges between policy and blockchain stakeholders
7. Funding blockchain interdisciplinary and problem-driven research
8. Designing stable regulatory frameworks for better policy preparedness
9. Championing blockchain in public and governmental sectors

[19] #Blockchain4EU: Blockchain for Industrial Transformations. Retrieved from: https://blogs.ec.europa.eu/eupolicylab/blockchain4eu/

[20] Nascimento S., Pólvora A., Sousa Lourenço J. (2018) *Blockchain4EU: Blockchain for Industrial Transformations*, EUR 29215 EN, Publications Office of the European Union, Luxembourg, 2018, ISBN 978-92-79-85719-5, doi:10.2760/204920, JRC111095. Available at: https://publications.jrc.ec.europa.eu/repository/handle/JRC111095

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3.3 EU-wide and international sectoral cooperation

As the potential of blockchain technologies was further unfolding, the EU continued building its strategy by engaging with the private sector, academia and the blockchain community across Europe and worldwide, launching ambitious collaborative initiatives.

In a resolution adopted in 2018, the European Parliament highlighted that the EU is in a good position to become "the global leader in the field of DLT and to be a credible actor in shaping its development and markets globally, in collaboration with our international partners". Against this background, the European Parliament recommended to the European Commission to communicate about the competitiveness of the EU in blockchain.[21]

3.3.1 European Blockchain Observatory and Forum (EUBOF)

In September 2017, the European Blockchain Observatory and Forum was launched by the European Commission with the objective to bring the benefits of blockchain to governments, European industry and citizens and to facilitate access to Blockchain, to ensure that services can be provided in a harmonised European market and to introduce respect for the values of trust, security, traceability, and disintermediation[22]. Thus, it should provide more visibility to blockchain technology and its applications, while consolidating related projects and applications, gathering information, monitoring and analysing trends, addressing challenges.

With the launch of the EUBOF, the European Commission made clear that it had identified the opportunities of blockchain for the EU economy and society as a whole. Mariya Gabriel, then Commissioner for the Digital Economy and Society, said: "I see blockchain as a game changer and I want Europe to be at the forefront of its development. We need to establish the right enabling environment - a Digital Single Market for blockchain so that all citizens can benefit, instead of a patchwork of initiatives. The EU Blockchain Observatory and Forum is an important step in that direction." [23] Following its successful research and community building activities, the European Blockchain Observatory and Forum was renewed and widened in 2019.[24]

[21] European Parliament (2018) *Resolution of 3 October 2018 on distributed ledger technologies and blockchains: building trust with disintermediation* (2017/2772(RSP)). Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52018IP0373

[22] European Commission (2018) "European Commission launches the EU Blockchain Observatory and Forum" Retrieved from: https://ec.europa.eu/commission/presscorner/detail/en/IP_18_521

[23] Ibid.

[24] European Commission ((2019) "Renewal of the European Blockchain Observatory and Forum" Retrieved from: https://digital-strategy.ec.europa.eu/en/funding/renewal-european-blockchain-observatory-and-forum

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3.3.2 The EBP and EBSI

The same year, in November 2017, the Commission launched a study for 250.000€ to assess the opportunity and feasibility of a EU Blockchain Infrastructure for the public sector.[25]

On 10 April 2018, 21 EU Member States and Norway created the European Blockchain Partnership (EBP) by signing a declaration. They decided to collectively build the European Blockchain Services Infrastructure (EBSI), a blockchain services infrastructure for the European public sector, to bring the benefits of blockchain to public administrations, such as to deliver digital public services across Europe while ensuring a high level of security and privacy.[26] Since then, eight further countries have joined the Partnership, thus reaching a number of 30 signatories.

3.3.3 INATBA

Such as to foster cooperation at a more global level as well as to gather feedback from the industry, the Commission supported the creation of the International Association for Trusted Blockchain Applications (INATBA), which was launched in April 2019.[27] This worldwide organisation aims to promote global adoption of blockchain and foster discussion at the global level.

3.3.4 Standardisation activities

Further building on international cooperation, the Commission is involved in the work standardisation processes like the ISO standardisation process for DLT (ISO TC 307)[28], with the aim to foster blockchain interoperability. An EU White Paper on Blockchain standardisation has been published by the European Committee for Standardisation (CEN), while ETSI, the EU Telecom Standards Institute, has launched working groups focusing on identity, security and trust for blockchain and DLT. In addition, the EU sends European experts to international standardisation via StandICT, an initiative funded by the EU.[29] Further, the European Commission is fostering the participation of SMEs in blockchain-related standardisation processes via Small Business Standards (SBS) a European non-profit association which was created

[25] European Commission (2017) "Study on opportunity and feasibility of a EU blockchain infrastructure" (2017) Retrieved from: https://digital-strategy.ec.europa.eu/en/funding/study-opportunity-and-feasibility-eu-blockchain-infrastructure
[26] European Commission (2018 "European countries join Blockchain Partnership" Retrieved from: https://digital-strategy.ec.europa.eu/en/news/european-countries-join-blockchain-partnership
[27] European Commission (2019) "Launch of the International Association of Trusted Blockchain Applications – INATBA", Retrieved from: https://digital-strategy.ec.europa.eu/en/events/launch-international-association-trusted-blockchain-applications-inatba
[28] European Commission (2021) "European Blockchain Strategy Brochure", retrieved from: https://digital-strategy.ec.europa.eu/en/library/european-blockchain-strategy-brochure
[29] StandICT website available at: https://2020.standict.eu/

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with the Commission's support and is co-funded by the Commission[30]. SBS has appointed SME expert Petko Karamotchev to participate in the committee meetings of ISO TC 307 and CEN-CENELEC/JTC 21, dedicated to blockchain and DLT, such as to represent blockchain SMEs[31].

3.4 Funding blockchain research & innovation

Between 2016 and 2020, the EU has supported blockchain and DLT projects through several funding frameworks, such as to foster blockchain innovation and reduce the investment gap. Overall, more than € 200 million funding for innovation in research in the blockchain sector have been invested via the Horizon 2020 programme[32] in more than 43 projects related to blockchain and DLTs[33] This includes €5 million awarded to six innovators as part of the European Innovation Council (EIC) Prize on Blockchains for Social Good launched in 2017[34], as well as €10 million awarded to 5 INNOSUP projects aimed at fostering the uptake of blockchain by European SMEs (Blockchers, Blockstart, Blockpool, Block.IS and Peers2Blockchain). €5.1 million from the €10million was directed to SMEs and their blockchain-based projects via cascade funding.[35]

Besides, the Commission, together with the European Investment Fund (EIF) has invested € 100 million to create the European AI/Blockchain Investment Fund, with the aim to close the investment gap and foster access to finance for innovative start-ups and SMEs. The AI/Blockchain Investment fund invests in venture capital funds for AI and blockchain start-ups, with a particular focus on equity finance. It is estimated that the total investment volume in the first phase (beginning of 2020 to the beginning of 2021) will reach 500-700 million.[36]

The review of blockchain-related EU initiatives shows that both the European Commission and the European Parliament attribute a strategic importance to blockchain technologies for Europe's economy. While the key focus has been on the financial sector, the potential of blockchain-based applications for other sectors, including public administration, has been recognised both by the European Commission

[30] European Commission, Standardisation and SMEs, Retrieved from: https://ec.europa.eu/growth/smes/sme-strategy/improving-smes-access-marktets/standardisation-and-smes_en
[31] Small Business Standards, Digital society, Retrieved from: https://www.sbs-sme.eu/sector/digital-society
[32] European Commission (2021) "European Blockchain Strategy Brochure", retrieved from: https://digital-strategy.ec.europa.eu/en/library/european-blockchain-strategy-brochure
[33] European Commission (2021) *Blockchain in Practice: Promoting blockchain and DLTs in European SMEs*, available at: https://eismea.ec.europa.eu/news/new-report-eu-support-blockchain-and-dlts-smes-2021-09-03_en
[34] European Commission (2017) "5M€ in prizes for social innovations using Blockchains for social good", retrieved from: https://digital-strategy.ec.europa.eu/en/news/5meu-prizes-social-innovations-using-blockchains-social-good
[35] European Commission (2021) *Blockchain in Practice: Promoting blockchain and DLTs in European SMEs*, available at: https://eismea.ec.europa.eu/news/new-report-eu-support-blockchain-and-dlts-smes-2021-09-03_en
[36] European Commission (2021) "European Blockchain Strategy Brochure", retrieved from: https://digital-strategy.ec.europa.eu/en/library/european-blockchain-strategy-brochure

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and the European Parliament, which becomes clear from the numerous activities in the area of standardisation, providing funding for research and innovation as well as capital funding for innovative start-ups and SMEs. While concrete regulatory initiatives have been limited to the financial sector, the EU has so far taken a light-touch approach to blockchain technologies in other sectors, focusing on observations (via the EU Blockchain Observatory and Forum) and support via the mentioned initiatives (such as standardisation and funding).

4. The current vision and strategic objectives

Following the overview on the history of EU blockchain initiatives, this section will focus on the current vision of the EU. Within this deliverable, the current EU blockchain strategy will be analysed starting at the end of 2019, when the current Commission started its 5-year term under leadership of President von der Leyen. The von der Leyen Commission took office in December 2019, putting "a Europe fit for the digital age" as one of its 6 key priorities for 2019-2024.

4.1 Blockchain among the European Comissions's vision for a digital future

Within its first four months of office, the Commission published several documents presenting its vision and strategy for the digital sector. While none of the publications focuses on blockchain exclusively, blockchain plays a key role within the European Commission's digital strategy.

- **Shaping Europe's digital future (February 2020)**

In this communication[37], the European Commission states that Europe "must invest more" such as to ensure innovation and interoperability of deep tech, including blockchain. Among the key actions of the Commission, there is the deployment of "cutting-edge joint digital capacities in the areas of AI, cyber, super and quantum computing, quantum communication and blockchain". In addition, the European Commission announces the upcoming "European Strategies on Quantum and blockchain", that are foreseen to be released by "Q2 2020". Following this communication, the Commission published two brochures on quantum and blockchain in 2021.

[37] European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: *Shaping Europe's digital future*. COM/2020/67 final. Available at: https://op.europa.eu/en/publication-detail/-/publication/b2caf445-2c4a-11ec-bd8e-01aa75ed71a1/language-en

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- **A European strategy for data (February 2020)**

The Commission's Communication on a European Data Strategy[38] aims to position the EU as a model and leader for a data-driven society. The strategy builds on four pillars:

1. establishing a cross-sectoral governance framework for data access and use, most notably by regulating data-sharing,
2. strengthening Europe's data spaces and cloud infrastructure,
3. empowering individuals to control their data, as well as investing in skills and capacity-building,
4. promoting the development of at least nine common European data spaces in strategic sectors and domains of public interest, such as manufacturing, Green Deal, health and finance

The Commission also highlights its commitment to work towards reducing the digital skills gap of Europeans and explore ways to give citizens more control over access to their machine-generated data. The EC's Data Strategy recognises blockchain, as a decentralised digital technology, which can enable companies and individuals to better control flows and usage of data. Thus, technologies such as blockchain will offer opportunities of "dynamic data portability in real time"[39].

- **White paper On Artificial Intelligence - A European approach to excellence and trust (February 2020)**

This White Paper[40] focuses on AI, which is "one of the most important applications of the data economy", according to the Commission. In this document, the Commission sets forward its approach on an AI regulatory framework. In addition, the Commission announces an upcoming investment programme, named InvestEU, that will build on the forthcoming pilot investment fund of €100 million in AI and blockchain.

[38] European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: *A European strategy for data*. COM/2020/66 final. Available at : https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1593073685620&uri=CELEX%3A52020DC0066

[39] European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: *A European strategy for data*. COM/2020/66 final. Available at : https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1593073685620&uri=CELEX%3A52020DC0066

[40] European Commission (2020) *White Paper On Artificial Intelligence - A European approach to excellence and trust.* Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0065

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- **An SME Strategy for a sustainable and digital Europe (March 2020)**

In this strategy[41], the EU presents how it will support European SMEs to strengthen their capacities to adapt to climate neutrality challenges, help them to reap the benefits of digitalisation, reduce the regulatory burden that SMEs face, and improve their opportunities to access finance. As concerns blockchain, the Commission states that advanced disruptive technologies, such as blockchain and Artificial Intelligence (AI), Cloud and High Performance Computing (HPC) can dramatically boost SME's competitiveness. With the support of the Digital Europe Programme, the Commission will develop Digital Crash Courses for SME employees to become proficient in areas such as AI, cybersecurity or blockchain, building on the experiences of the Digital Skills and Jobs Coalition platform. In addition, the Commission announces that it will launch a blockchain-based initiative enabling issuance and trading of SME bonds across Europe, using the European Blockchain Services Infrastructure.

- **A New Industrial Strategy for Europe (March 2020)**

As part of this strategy[42], the European Commission states that the EU will also support the development of key enabling technologies that are strategically important for Europe's industrial future. These include robotics, microelectronics, high performance computing and data cloud infrastructure, blockchain, quantum technologies, photonics, industrial biotechnology, biomedicine, nanotechnologies, pharmaceuticals, advanced materials and technologies.

- **A new Circular Economy Action Plan For a cleaner and more competitive Europe (March 2020)**

In this action plan, aligned with the European Green Deal objective, the European Commission stresses the potential of digital technologies for the circular economy: "Innovative models based on a closer relationship with customers, mass customisation, the sharing and collaborative economy, and powered by digital technologies, such as the internet of things, big data, blockchain and artificial intelligence, will not only accelerate circularity but also the dematerialisation of our economy and make Europe less dependent on primary materials."

[41] European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: *An SME Strategy for a sustainable and digital Europe.* Available at: https://ec.europa.eu/info/sites/default/files/communication-sme-strategy-march-2020_en.pdf
[42] European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: *A New Industrial Strategy for Europe*. Available at : https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1593086905382&uri=CELEX:52020DC0102

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To conclude this sub-section, it has to be noted that blockchain technology is mentioned in all strategic documents that are anchoring the Commission's vision for the digital sector. This shows that blockchain is a key technology for the European Commission. However, there is no official strategy focusing exclusively on blockchain at the highest Commission level, as it is the case for the strategies described above. The next sub-section will focus on the elements of a blockchain strategy on the Commission's digital strategy website.

4.2 An online blockchain strategy published beginning of 2021

As announced in the European Commission's Communication on *Shaping Europe's Digital Future*, the European Commission's next step was to draft a European blockchain strategy. This resulted in a section about the EU's strategy for blockchain on the European Commission's website[43]. Further, a 2-pages brochure on "Europe's Strategy For Blockchain"[44] was released in April 2021. The brochure is however more of a factsheet describing blockchain and the EU's approach than an official EU strategy.

4.2.1 The brochure "Europe's Strategy for blockchain"

The European Commission's approach as described in the 2-pages brochure on "Europe's Strategy For Blockchain" is to set a "gold standard" for blockchain, paying particular attention to its compatibility with Europe's values as well as its legal and regulatory framework.

Therefore, the Commission sets its blockchain strategy around 3 pillars:

1. **Policy:**

- Supporting blockchain interoperability and standards by participating in standardisation processes and cooperating with standardisation bodies.
- Fostering blockchain skills by supporting skills programs and educational resources for blockchain employees.

[43] European Commission, "Blockchain Strategy", available at: https://digital-strategy.ec.europa.eu/en/policies/blockchain-strategy
[44] European Commission (2021) *Europe's strategy for blockchain.* Available at: https://op.europa.eu/en/publication-detail/-/publication/4dbf54f2-a702-11eb-9585-01aa75ed71a1/language-en/format-PDF/

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2. **Legal and regulatory:** Supporting legal certainty for blockchain applications and platforms, by setting up an innovation-friendly legal framework in the areas of digital assets and smart contracts

3. **Funding:** Supporting innovation by providing funding for startups and blockchain-related research

Figure 1: A snippet of the brochure "Europe's Strategy for Blockchain"

For more information on the EU blockchain strategy, the brochure invites reader to consult the Commission's website: https://digital-strategy.ec.europa.eu/en/policies/blockchain-strategy

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4.2.2 The blockchain strategy further detailed on digital-strategy.ec.europa.eu

On its digital strategy website, the European Commission has a section dedicated to blockchain[45], where the Commission affirms its vision for Europe to be "a leader in blockchain technology" and become "an innovator in blockchain and a home to significant platforms, applications and companies". The EU blockchain strategy has been developed with a vision to unfold blockchain's potential for Europe, namely to "revolutionise how we share information and carry out transactions online."

The European Commission provides more information on its vision for a "gold standard" for blockchain, which encompasses the following elements:

- **Environmental sustainability:** A sustainable and energy-efficient technology.
- **Data protection:** Compatibility with Europe's data protection and privacy regulations.
- **Digital Identity:** Contribution to the European digital Identity framework. This means compatibility with e-signature regulations (e.g. eIDAS) as well as contributing to a decentralised and self-sovereign identity framework.
- **Cybersecurity:** Blockchain technology should support and enhance cybersecurity levels.
- **Interoperability:** Targeted interoperability between blockchains

The Commission also further details elements of its blockchain strategy, which is comprised of:

- **The European Blockchain Services Infrastructure:** The pan-European public services blockchain, as described in section 3 "will come into production in 2021". Within EBSI, the European Commission launched end of 2020 a pre-commercial procurement (PCP) action to prepare for future capacities of EBSI and to support new types of use cases.
- **Legal certainty and an innovation-friendly blockchain regulatory regime,** with a view to "avoid legal and regulatory fragmentation" and to "increase investments and to ensure consumer and investor protection".
- **Ambitious funding for innovation and research in the blockchain sector:** The EU Commission supports investment in blockchain start-ups and projects through the new artificial intelligence (AI) and blockchain investment fund, which invests in venture capital funds aimed at AI and blockchain start-ups. The first phase of this fund took place in 2020-2021. In a second

[45] European Commission (2021) "Blockchain Strategy". Retrieved from: https://digital-strategy.ec.europa.eu/en/policies/blockchain-strategy

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phase, the European Commission will “scale up” the AI/Blockchain Investment Fund under the InvestEU programme and the Recovery and Resilience Facility.

- **Blockchain for the European Green Deal:** The EU states that blockchain has a great potential for supporting sustainability, by fostering sustainable economic development, addressing climate change, and supporting the European Green New Deal.
- **Supporting blockchain skills development:** According to the EC, there are “planned initiatives focused on skills development to ensure the high-level skills that are needed are available.”
- **Interacting with the community:** The Commission interacts with the private sector, academia and the blockchain community, in particular via INATBA and the EUBOF.

4.2.3 Further insights on the strategy

Following the desk research on the EU blockchain strategy, the interviews with staff members of the European Commission allowed to gain additional insights and details on the current strategy for blockchain.

It has first to be noted that while DG CONNECT is the leading DG for blockchain-related policies and initiatives, the cross-cutting aspect of blockchain results in other Directorate Generals involved in blockchain, such as DG GROW, DG EAC, DG FISMA, DG ECFIN, the Joint Research Center of the European Commission, as well as EU agencies. Thus, the Commission has numerous work streams on blockchain and the available information is sometimes scattered. Further, the interviews sometimes showed some discrepancies on the best approach to handle blockchain regulation and education. However, the approach, i.e. an approach based on European values, prevails.

Commenting on the European Commission’s general approach towards blockchain, the Commission staff sees blockchain as a general purpose infrastructure for improving business processes and all areas of the economy and administration. An interviewee underlined the Commission’s view which is that blockchains have an important role to play to bring trust and to help track and trace data, which remains authentic and immutable. On the Commission’s regulatory approach, DG CONNECT staff members’ stated the Commission’s willingness not to “take the place of the market”, but rather to “shape a part of the market in the directions that reflect European values” and to take advantage of what is seen as clear efficiency gains that can be won via blockchain in public sector areas like document sharing and document identification and in private sector areas like supply chain or intellectual property.

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Concerning the blockchain strategy published on the digital strategy website, Commission staff members describe it a comprehensive summary of the policy initiatives carried out by the European Commission during the last 5 years in order to explore the potential of blockchain and promote European competitiveness in the sector. However, they acknowledge that it is not a Commission strategy in the technical sense, as usually the word "strategy" is reserved to political strategy documents which are forward-looking. These strategies are adopted at the level of the European Commission by the college of commissioners and published in the official journal, accompanied by staff working documents. This has indeed not been done for blockchain yet. While it is not excluded, there is no plan to release such a strategy in the near future, one of the reasons being that the COVID crisis has been taking the main focus.

In terms of regulation, the interviewed European Commission staff members recognize that AI has had a higher focus for the moment. This is mainly due to its very transformative characteristics and its higher risks of misuses or criminal uses which require more risk management and regulatory frames. Blockchain on the other hand presents less risks. However, the European Commission sees AI and Blockchain as two complementary technologies and is also looking into the convergence and combination of blockchain with other technologies, such as the Internet of Things, and data analysis in general. According to the interviewees, if we consider blockchain in an isolated way, we will probably miss on important developments and opportunities. Indeed, the blockchain paradigm is all about transparency and cooperation, not working in silos.

As regards blockchain adoption, the Commission staff notes that blockchain-based business models are existing in the EU, but that the problem is the dissemination of these business models. The issue is to bring the technology to performance models and practical applications which are concrete and working. In this regard, some DG Units take a very proactive approach and contact companies to discuss this issue with them. Indeed, if there are demonstrably efficient use case on the EBSI that people then want to expand into other areas, there will be more investment.

Concerning the topic of blockchain skills, the European Commission confirms that blockchain is one of its top priority areas in education. However, in the Digital Education Action Plan (2021-2027), which is an EU "policy initiative to support the sustainable and effective adaptation of the education and training systems of EU Member States to the digital age"[46] there is no mention of blockchain. The Commission's DG EAC staff answer to this remark is that this Action Plan is looking primarily at digital skills and

[46] European Commission (2021) "Digital Education Action Plan (2021-2027)", Retrieved from: https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en

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competencies in a horizontal manner, which is an approach driven by the overall levels of digital skills and competencies. Indeed, when looking into the curricula and the education training systems of the Member States as well as into the current level of digital skills in Europe, DG EAC decided to start with a "critical mass approach", meaning that the priority is to have as many people as possible that have at least basic digital skills and sufficient digital competencies. Therefore, the Education Action Plan doesn't address verticals for the time being, also because vertical skills are very industry driven.

Finally, there is a strategic vision to use blockchain for better skills management and for facilitating the exchange of diplomas or other education credentials, in particular via EBSI.

5. Ongoing initiatives serving these goals

After having outlined the EU's strategic vision towards blockchain and DLT, this section will present the current initiatives and actions carried out by EU regulators that aim to make this vision come true.

5.1 Regulation

In terms of regulation, several regulatory initiatives related to and affecting the blockchain sector have been launched in the last year.

5.1.1 Digital Finance Strategy & Package

In September 2020, the European Commission published a "Digital Finance Strategy for the EU", announcing its Digital Finance package. The strategy presents the European Commission's vision for facilitating the digital transformation of finance in the next four years, while regulating its risks. The strategy sets out four main priorities:[47]

- Address fragmentation in the Digital Single Market for financial services, such as to allow European consumers to access cross-border services and help European financial firms to scale up their digital operations,
- Ensure that the EU regulatory framework fosters digital innovation that benefits consumers and market efficiency,
- Set up a European financial data space to foster data-driven innovation, which will base on the European data strategy and facilitate access to data and data sharing within the financial sector,

[47] European Commission (2020) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on a *Digital Finance Strategy for the EU,* COM/2020/591 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0591

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- Tackle emerging challenges and threats due to digital transformation.

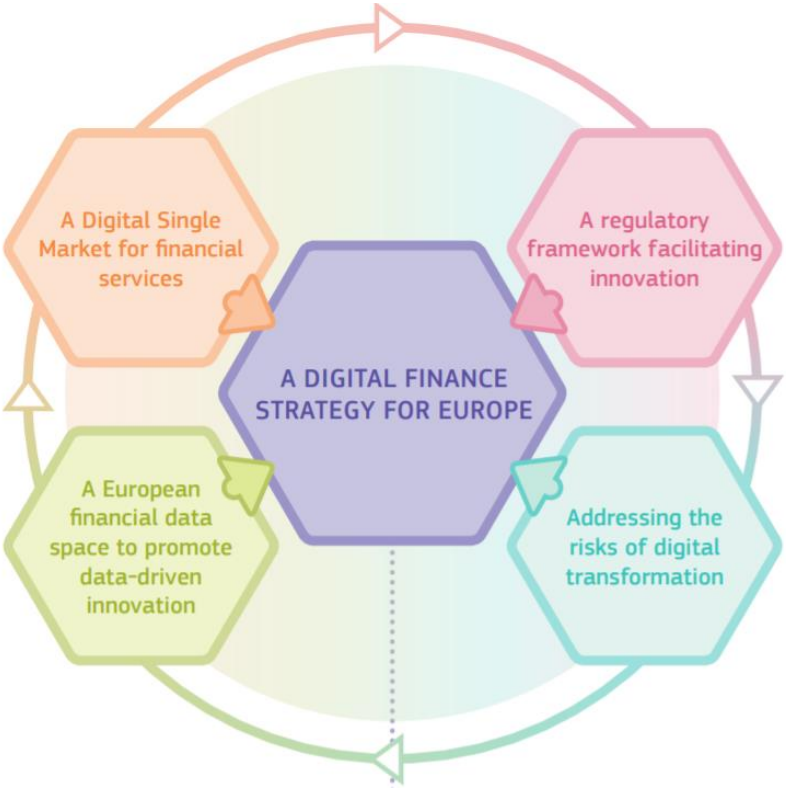

Figure 2: Snippet from the Factsheet: A digital finance strategy[48]

Key actions include the implementation of an interoperable cross-border framework for digital identities, the creation of a framework fostering the adoption of distributed ledger technology (DLT) and crypto-assets in the financial sector, the development of a legislative proposal for a new open finance framework by mid-2022.

To accompany this strategy, the Commission shared 3 legislative proposals:

- **Proposal for a Regulation of the European Parliament and of the Council on Markets in Crypto-assets and amending Directive (EU) 2019/1937**

The legislative proposal for a Markets in Crypto Assets (MiCA) aims at providing an innovation-friendly framework for crypto-assets not covered by existing EU financial services legislation. The harmonized

[48] European Commission (2020) Factsheet: A digital finance strategy. Available at: https://ec.europa.eu/info/files/200924-digital-finance-factsheet_en

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EU-wide approach will ensure more legal certainty, financial stability as well as consumer and investor protection.[49]

- **Proposal for a Regulation of the European Parliament and of the Council on a Pilot Regime for market infrastructures based on distributed ledger technology**

The introduction of this pilot regime will allow DLT market infrastructures to get exemptions from existing rules and allows regulators and companies to test innovative solutions utilising blockchain. This will work with so-called regulatory sandboxes, which would allow for derogations from existing rules as DLT solutions will operate in a controlled environment.[50]

- **Proposal for a Regulation on digital operational resilience for the financial sector and amending Regulations (EC) No 1060/2009, (EU) No 648/2012, (EU) No 600/2014 and (EU) No 909/2014**

This proposal for a Digital Operational Resilience Act (DORA) aims to mitigate cybersecurity threats in the financial sector: "Banks, stock exchanges, clearinghouses, as well as fintechs, will have to respect strict standards to prevent and limit the impact of ICT-related incidents"[51].

5.1.2 Pan-European blockchain regulatory sandbox

A sandbox is a "facility that brings together regulators, companies, and tech experts to test innovative solutions and identify obstacles that arise in deploying them."[52] A European regulatory sandbox is planned by the EBP in cooperation with the European Commission. It will allow use cases within EBSI and outside of EBSI, such as application for data portability, B2B data spaces, smart contracts, and digital identity. Expected sectors to be targeted are e.g. health, environment, mobility, energy. According to the European Commission, the sandbox is expected to become operational in 2021/2022.

[49] European Commission (2020) "Questions and Answers: Digital Finance Strategy, legislative proposals on crypto-assets and digital operational resilience, Retail Payments Strategy" Retrieved from: https://ec.europa.eu/commission/presscorner/detail/en/qanda_20_1685
[50] European Commission, "Legal and regulatory framework for blockchain", Retrieved from: https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-blockchain
[51] European Commission (2020) "Digital finance package". Retrieved from: https://ec.europa.eu/info/publications/200924-digital-finance-proposals_en
[52] European Commission, "Legal and regulatory framework for blockchain", Retrieved from: https://digital-strategy.ec.europa.eu/en/policies/regulatory-framework-blockchain

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5.1.3 A digital Euro

A digital Euro has been on the EU's agenda for several years, investigating into its possibility. In January 2021, the European Commission and the European Central Bank published a Joint statement on their cooperation on a digital euro, stating that "the ECB will consider whether to start a digital euro project towards mid-2021."[53]

5.1.4 Anti-Money Laundering Directive Review

In July 2021, the European Commission published its Anti Money Laundering (AML) legislative package, with the aim to improve its anti-money laundering and countering financing of terrorism (AML/CFT) framework. The European Commission plans to revise the Anti-Money Laundering Directive (AMLD), notably by adding all types and categories of Crypto-Asset Service Providers as entities obliged to implement procedures such as to assess and mitigate Money Laundering and Tax Fraud risks. Further, this proposal aims to setting up a new EU AML Authority with direct supervisory competence over financial institutions and to set up a coordination and support mechanism for Financial Intelligence Units (FIUs). The legislative package proposal will seek to transpose parts of the AMLD into a Regulation.[54]

5.1.5 European Digital Identity framework

On 3 June 2021, the Commission proposed a regulation for a framework for a European Digital identity as well as the revision of the rules on electronic identification and trust services for electronic transactions in the internal market, the eIDAS Regulation.[55] Previously, the Commission had launched an open consultation to gather feedback on this topic. The eIDAS Regulation, which entered in force in 2018, provides a cross-border legal framework for cross-border electronic identification, authentication and website certification within the EU.[56] Within the European Digital Identity Framework, "Member States will offer citizens and businesses digital wallets that will be able to link their national digital identities with proof of other personal attributes (e.g. driving licence, diplomas, bank account)."[57]

[53] European Commission (2021) *Joint statement by the European Commission and the European Central Bank on their cooperation on a digital euro*. Available at: https://ec.europa.eu/newsroom/fisma/items/700961

[54] European Commission (2021) "Anti-money laundering and countering the financing of terrorism legislative package". Retrieved from: https://ec.europa.eu/info/publications/210720-anti-money-laundering-countering-financing-terrorism_en

[55] European Commission (2021) *Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EU) No 910/2014 as regards establishing a framework for a European Digital Identity*. Available at: https://op.europa.eu/en/publication-detail/-/publication/5d88943a-c458-11eb-a925-01aa75ed71a1/language-en/format-PDF/

[56] European Commission (2020) "Digital identity and trust: Commission launches public consultation on the eIDAS Regulation". Retrieved from: https://digital-strategy.ec.europa.eu/en/news/digital-identity-and-trust-commission-launches-public-consultation-eidas-regulation

[57] European Commission (2021) "Commission proposes a trusted and secure Digital Identity for all Europeans". Retrieved from: https://ec.europa.eu/commission/presscorner/detail/en/ip_21_2663

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According to the Commission, Blockchain should "enhance Europe's evolving digital Identity framework".[58]

5.1.6 Data Act

The upcoming Data Act, on which the European Commission is currently carrying out a consultation, aims "to facilitate data sharing across the EU and between sectors by increasing trust in data intermediaries and strengthening data sharing mechanism"[59]. In addition, it will aim to ensure that the use of smart contracts is not fragmented across borders.

5.2 EBSI – European Blockchain Services Infrastructure

Building on the work of the EBP, the European Blockchain Pre-Commercial Procurement (PCP) tender opened in November 2020, looking for novel blockchain solutions. The PCP, based on the conclusions of an open market consultation carried out by the European Commission, "focuses on the development of future capacities for EBSI in view of supporting new types of use cases that involve a high volume of transactions concerning physical or digital objects.[60]

While supporting public services at first, EBSI is expected to expand to cooperation with private sector or private applications. [61] This ambitious initiative of the Commission aims at strengthening EU leadership and autonomy in Blockchain, while corresponding to its core values: being GDPR compliant, secure, interoperable, sustainable.[62]

The initial set of EBSI use cases are:[63]

- **Traceability**: Leveraging the power of blockchain to create trusted digital audit trails, automate compliance checks in time-sensitive processes and prove data integrity;
- **Diplomas**: Facilitated and trusted exchange of accredited diplomas across Europe, "significantly reducing verification costs and improving authenticity trust";

[58] European Commission, "Blockchain Strategy" Retrieved from: https://digital-strategy.ec.europa.eu/en/policies/blockchain-strategy
[59] European Commission (2021) "Public consultation: Data Act". Retrieved from: https://data.europa.eu/en/news/public-consultation-data-act
[60] European Commission, "European Blockchain Services Infrastructure". Retrieved from: https://digital-strategy.ec.europa.eu/en/policies/european-blockchain-services-infrastructure
[61] European Commission, "CEF Digital EBSI". Retrieved from: https://ec.europa.eu/cefdigital/wiki/display/CEFDIGITAL/EBSI
[62] European Commission (2021) "European Blockchain Pre-Commercial Procurement". Retrieved from: https://digital-strategy.ec.europa.eu/en/news/european-blockchain-pre-commercial-procurement
[63] Ibid.

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- **Self-sovereign identity**: Deploying a European digital identity, "allowing users to create and control their own identity across borders without relying on centralised authorities, and enabling for compliance with the eIDAS regulatory framework";
- **Trusted data sharing**: via blockchain technology data can be shared in a secure and trusted way amongst authorities in the EU, e.g. amongst customs and tax authorities.

Further use cases will be added to EBSI within the next months. The EPB is working on the three following use cases:

- financing small and medium-sized enterprise (SME) through Blockchain via issuance and trading of SME bonds across Europe:
- deploying a European social security pass for an easy access to welfare services across Europe;
- allowing better management of asylum demand processes across Europe.

According to the interviews with European Commission staff, there will be a constant stream of new use cases that will be hopefully added to the EBSI, depending on the demand and the success of the current use cases. Further, around €50 million will be made available via EBSI for sandboxes that will help start-ups to deploy applications they want to sell across Europe, by allowing them to test their applications together with regulators in different areas to clarify the regulatory situation, and to adapt their solutions to make them compatible with the existing regulation.

5.3 Funding for blockchain

In order to boost the EU's competitiveness in the blockchain sector, the Commission continues to invest into blockchain research & innovation. The new period of the long-term budget of the EU (Multi-Annual Financial Framework) 2021-2027 as well as the NextGenerationEU instrument aimed at boosting the recovery following the pandemic both include tremendous funding opportunities for blockchain innovation and blockchain education.

5.3.1 European strategic investments

- **Investment programme and advisory services under InvestEU (2021-2027)**

Following the AI/Blockchain Investment Fund and Support Programme, which is introduced in section 1 of this deliverable, the second phase of the AI Blockchain fund, as of 2021, will focus on scaling up the fund to €1 - €2bn under the InvestEU Programme, via the development of an investment platform, which will also include services such as advisory services, matchmaking events between innovators and

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investors.[64] want to scale that up to cover all the other technology areas, but also to become a larger fund over the next seven years.

- **Digital Europe Programme**

With an overall budget of €7.5 billion, the programme will support investments in the following sectors[65]:

- Supercomputing:
- Artificial Intelligence
- Cybersecurity
- Advanced digital skills
- Wide use of digital technologies (amongst them blockchain) across the economy and society

According to an interview with European Commission staff members, €580 million will be made available for advanced digital skills during the seven years of the current MFF. Blockchain is one of the areas that will be targeted by investment in the skills pillar of the Digital Europe Programme. Three main types of measures will be supported: master courses, short term training courses and job placement, such as to tackle shortages in different areas. The first 2 years of the programme, most of the resources will go into the master courses by supporting consortia comprised of universities, vocational education training institutions, businesses, but also excellence and research centres to design together educational programme at the master's level. The objective is to attract more students to these disciplines, but also to deliver high quality offer in cutting edge digital areas. Further, the Commission will invest in short term training courses which are targeting people in need of upskilling to adapt to the latest technological developments. Finally, the job placement measures will build on the digital opportunity traineeship that have been implemented from 2018 to 2020, but with a stronger focus on advanced digital skills.

5.3.2 Horizon Europe Programme

The Horizon Europe Programme will run from 2021 to 2027, with an overall budget of €95.5 billion.[66] According to the EC's blockchain strategy, "Significant budget for further grants [in the blockchain field]

[64] European Commission, "Blockchain funding and investment". Retrieved from https://digital-strategy.ec.europa.eu/en/policies/blockchain-funding
[65] European Commission, "Digital Europe Programme", Retrieved from: https://hadea.ec.europa.eu/programmes/digital-europe-programme_en
[66] European Commission (2021) "Horizon Europe Work Programme 2021-2022 adopted". Retrieved from: https://ec.europa.eu/defence-industry-space/horizon-europe-work-programme-2021-2022-adopted-2021-06-29_en

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is expected in the follow-up Horizon programme, Horizon Europe." However, at this stage, there are no available figures on the total amount that will be dedicated to blockchain.

In the Horizon Europe *Work Programme 2021-2022 Digital, Industry and Space* published on 15 June 2021[67], the Commission puts blockchain as one of the 16 advanced technologies for the Advanced technologies projects, together with Advanced Manufacturing Technology, Advanced Materials, Artificial Intelligence, Augmented and Virtual Reality, Big Data, Cloud Computing, Connectivity, Industrial Biotechnology, Internet of Things, Micro- and Nanoelectronics, Mobility, Nanotechnology, Photonics, Robotics and Security. Several upcoming calls require use of blockchain technologies.

5.3.3 Recovery and Resilience Facility (RRF)

According to the information gained via the interviews, most of the countries have proposed digitalization of a section of the public sector in their Recovery and Resilience Plans but didn't state precisely how much would be spent on each technology. Thus, it is currently not possible to know how much will be invested in blockchain. European Commission staff estimate that it will reach at least € tens of billions, potentially even € 100 billion. Member states have at least € 130 billion available on the recovery funds for everything digital. Regarding digital skills, most of the spending will probably go into upskilling the labour force. But the Commission will try to convince member states to spend more on advanced skills trainings, because it is the area where the Commissions sees there is really a need.

6. Future trends and expected developments

According to European Commission staff working on blockchain policies, the current developments described above correspond to the vision that the Commission has on blockchain. For the moment, there are no further regulatory developments planned. But the European Commission will remain "reactive if there is any arising issue".

Regarding the Commission's planned initiatives for the coming years, one of the main objectives is to make the EBSI fully operational and to aggregate additional cross border use cases that will ease the life of EU citizens and enterprises. Indeed, according to Commission staff, the evolution of the EBSI infrastructure can be addressed properly by developing interoperability with other networks that will be provided by the industry.

[67] European Commission (2021) *Horizon Europe Work Programme 2021-2022 - 7. Digital, Industry and Space.* Available at: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-7-digital-industry-and-space_horizon-2021-2022_en.pdf

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In terms of trends, the Commission staff observed that during the five last years, Blockchain innovation has broken through in the financial sector. While the Commission had expected blockchain to break through in the many verticals of the economy to disintermediate players, some of the interviewees think that the big market capitalisation will remain in finance for the upcoming years. When looking at the current trends like decentralised finance and non-fungible tokens, the market is indeed advancing in the area of digital assets, which is where this technology started. On the other hand, this is just the beginning of innovation using digital assets, and blockchain will probably continue to revolutionise the way goods and services are priced on the Internet. Indeed, blockchains are creating value in areas where value was unthinkable before. However, it will take time for breakthrough applications to emerge in other verticals outside of finance, as it requires changes to the regulatory environment.

Another expected trend for the next two to three years is an increasing attention to the environmental cost of permissionless (i.e. open to all) blockchains. Political pressure will raise, e.g. coming from the European Parliament, such as to use all possible tools to ensure that blockchain applications move from non-sustainable forms of blockchain to more sustainable ones. This could be translated into regulatory initiatives, such as an eco-label for blockchains. In this regard, the Commission thinks the CHAISE project could contribute by raising awareness about environmental issues and creating skills sets to distinguish environmentally friendly from less environmentally friendly uses of blockchains.

Regarding Digital Skills, the European Commission will soon launch a flagship action, the Digital Education Hub, which was announced in the Digital education action plan. The Digital Education Hub will create a community around the digital education. It will allow practitioners in digital education to come together at the EU level to exchange with like-minded people from other countries, to define the important trends and the agenda when it comes to the future of digital education. This will allow to create a feedback loop between the policy level and the practitioner level. The Commission is committed to include the private sector into this community. Indeed, it terms of education, the Commission believes that the top-down decision making is not optimal and should be based on a more decentralised approach. Further, a staff member of the DG EAC announced that they are going to develop a council recommendation in 2022, which will be about improving the provision of digital skills in education and training.

In terms of legislation, one ambitious approach supported by an interviewed staff member would be to merge token legislation into a civil law framework, like certain very innovative countries are already doing, and to treat analogue and tokenised digitised assets in an identical manner. There are however no upcoming steps in this regard.

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7. The role of sectoral cooperation on skills

As stated in the section on risks and opportunities presented by blockchain, the European Commission identified early on that "the biggest risk today is of a society ill-prepared for the future". However, within the EU blockchain strategy (brochure and website), there is but one sentence about support to blockchain skills development: "There are planned initiatives focused on skills development to ensure the high-level skills that are needed are available".[68]

According to the insights gained in the interviews, with mention to these "planned initiatives", the European Commission sees CHAISE as a flagship action for blockchain skills and does not currently plan on launching additional initiatives for blockchain competences. Further feedback from Commission staff mentions CHAISE "as a useful addition to what [they] do" and stated its team's willingness to cooperate with all the means that they have. However, that particular staff member disagrees with exclusivity of one single initiative for blockchain skills, which "completely contradicts to the whole idea of blockchain and decentralization".

More importantly, the European Commission highlighted its willingness to have trainings based on EU values and EU own capacities. While relying on so called "big tech" platforms and their off-the-shelf training solutions would allow to close the skills gap in a much faster way, this is not the solution the Commission is looking for.

All the interviewees expressed the high expectation they have for the CHAISE project to assess the current blockchain skills needs from the industry, the available skills offers, analyse how they will both evolve, as well as to define the different kind of skills. They encouraged CHAISE's approach to look into all dimensions of blockchain skills for different types of occupational profiles, i.e., not limited to the IT profile. On this aspect, further collaboration could be carried out with DG GROW, which is currently mapping digital skills needed for cross-cutting technologies, among them blockchain.

Further, the Commission is expecting a strategy on what should be done for blockchain skills, comprised of a short-term vision for the next three years, corresponding to CHAISE's lifetime, as well as a long-term strategy and recommendations that could be translated into policy and strategic actions to be implemented at the European Commission level or by the European Commission in combination with Member States. They highlighted the importance not only to analyse what is the current offer for

[68] European Commission, "Blockchain Strategy" Retrieved from: https://digital-strategy.ec.europa.eu/en/policies/blockchain-strategy

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blockchain curricula by the formal education system, but also what is available through other initiatives and identify the gaps. On the long term, CHAISE recommendations could be used by the Commission to define specific actions within the Digital Europe Programme. All in all, the Commission hopes that CHAISE will contribute to draw the attention on blockchain skills of different players involved in digital skills.

Regarding upcoming initiatives for blockchain skills, they are not planned yet as CHAISE is seen as a first important step to help closing the skills gap. The project's outcomes will allow the Commission to draw conclusions and assess if there are still educational challenges that are specific to blockchain which require more targeted actions. One possibility would be to address blockchain in the context of a converging technology and address it in cross-cutting digital skills initiatives, like the Digital Skills and Jobs Platform.

8. Conclusion

The European Union and its regulators have identified early on that Blockchain and DLT are key technologies which present a high potential to benefit the economy and society by revolutionising the way we carry out transactions. At the same time, while investigating into blockchain and its developments, the issues posed by blockchain, such as possible fraudulent activities (primarily money laundering and tax fraud) as well as challenges that could hamper the uptake of blockchain, such as regulatory challenges, investment gap, and more importantly a skills shortage.

To make the most out of this technology and overcome its challenges, the European institutions launched numerous initiatives, including resolutions, funding, regulations since 2015. Following the blockchain development, the institutions' interest for blockchain first focused on the digital and finance sector, notably virtual currencies and crypto-assets, which led to Green Papers from the Commission and Resolutions from the European Parliament. As the technology's potential was unfolding, the EU institutions started investigating into the application of blockchain across all sectors and industries and launched several research projects. In addition, the European Institutions realised the need for fostering EU-wide and international sectoral cooperation, notably by creating the EU Blockchain Observatory and Forum, with the aim to map and monitor blockchain developments, build expertise and promote blockchain use cases, and the European Blockchain Partnership. In addition, as of 2016, the EU has been supporting blockchain and DLT projects through several funding frameworks, such as to foster blockchain innovation and reduce the investment gap, boosting the EU's competitiveness.

All these initiatives led the EU to refine its vision and strategic objectives for blockchain and DLT, first as a part of its broader strategy for the digital sector, "a Europe fit for the digital age", then via a dedicated

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section of the Commission's digital strategy website, the "Blockchain Strategy". These documents present the Commission's approach to blockchain, which is to set a "gold standard" for this technology, paying particular attention to its compatibility with Europe's values as well as its legal and regulatory framework. However, this strategy is rather a comprehensive summary of the initiatives carried out by the European Commission than a forward-looking policy document adopted at the level of the European Commission by the college of commissioners. According to the interviews carried out with the European Commission staff, there is no plan to release such a strategy in the near future.

Since the publication of these strategic documents, the Commission has initiated several initiatives such as to make the EU's ambitions for blockchain come true. Several regulatory initiatives related to and affecting the blockchain sector have been launched since 2020, such as the Digital Finance Package, the proposal for a European Digital Identity framework and the proposal for a Data Act. These regulatory developments aim to provide more legal certainty, e.g. for smart contracts and crypto-assets as well as to foster innovation by allowing companies to test blockchain solutions in so called regulatory sandboxes. In parallel, the European Commission is expanding the European Blockchain Services Infrastructures by adding new use cases and providing funding and investment for the blockchain sector via its budget (MFF) for the period 2021-2027, notably via the Horizon Europe Programme and the AI/Blockchain Investment fund.

Regarding future trends and expected developments, one of the main objectives of the Commission is to make the EBSI fully operational such as to ease the life of EU citizens and enterprises. In addition, the Commission is expecting an increasing attention to the environmental cost of permissionless blockchains. There are currently no further regulatory developments planned, but the Commission will closely monitor the technologies' evolution.

Finally, when it comes to achieving the blockchain growth goals, EU-wide cooperation plays a key role in supporting education to adapt to the digital transformation. In this regard, the European Commission confirms that blockchain is one of its top priority areas in education and sees CHAISE as a flagship initiative to address the blockchain skills gap and provide the Commission with a thorough analysis of blockchain skills needs and skills offers, a short-term and long-term strategy to close the skills gap as well as policy recommendations.

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