

Blockchain – Building Trust by Targeting Digital Governance

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Executive Summary

- ▶ This policy brief examines blockchain's capabilities and increased involvement of entities such as the European Union and United Nations in the support and research of a blockchain-based projects. Overall, it will address how blockchain technology could become the trigger for rapid evolution of private and public services around the world.

Satoshi Nakamoto introduced blockchain, the type of distributed ledger technology (DLT), as a technology used behind [Bitcoin](#) in 2008 (*the first decentralized peer-to-peer electronic cash system*). Since 2008, the blockchain technology has advanced significantly. It is essential to mention that distributed ledger technology (DLT) and Blockchain technology are not the same; however, blockchain is often used as a synonym for DLT. A blockchain uses several technologies, including DLT, to enable blockchain applications. Its revolutionising potential could benefit healthcare, finance, supply chain, governance and much more.

Because of its useability throughout countless industries, there are many debates about the real impact and benefit of blockchain on digital governance. The European Commission has published the [European Blockchain Strategy](#) in which it stated the importance in building a citizen-centric, sustainable, transparent, and inclusive European digital society through [blockchain technology]. The solutions that are using blockchain technologies either complementary or only partial substitution for the existing online services. The focus of these technologies is on enhancing trust between parties and boost delivery. Imagine an inclusive and just

world where everyone can trust each other, and no one is left behind.

Blockchain's functionalities can make it a reality by enhancing different operational capacities of various government entities and be beneficial for interactions with the citizens and businesses. Moreover, there is a huge possibility of blockchain technology to enhance the delivery of development initiatives and modernize citizen interaction, financial transactions, and supply chain management. As a matter of fact, the World Economic Forum (WEF) estimates that, 10% of the global gross domestic product (GDP) is expected to be stored on Blockchain and other DLTs by 2027. In order to, better understand how blockchain impacts digital governance this article is divided into four main parts: (1) Key Types and Benefits of Blockchain; (2) Blockchain for Digital Governance; (3) European Union Funded Blockchain Project; (4) Common Challenges of Blockchain Implementation.

1. Key Types and Benefits of Blockchain

As Frederik Gregaard, the CEO of [Cardano Foundation](#) emphasized that the essence of using blockchain based on its purpose is truly understanding how it works, whether by someone who is a politician, a lawyer or regular citizen. (Online Interview. 2021).



Many relate blockchain as the technology behind Bitcoin and other cryptocurrencies. However, blockchain's functionality is wide ranging. The blockchain is a mechanism that retains an encryption method "known as cryptography and uses (a set of) specific mathematical algorithms to create and verify a continuously growing data structure – to which data can only be added and from which existing data cannot be removed – that takes the form of a chain of transaction blocks, which functions as a distributed ledger." ([World Bank](#), 2017) Simplified, the blockchain is digitized, encrypted, decentralized (at times that needed) database/ledger of transactions. The transactions are replicated across multiple computers and linked to one another to make any interfering of outside parties nearly impossible. This immutable way of managing records eliminates the need for any central entity managing transactions. But that's not all, there are more unique benefits to blockchain apart from immutability: security, transparency, resilience, and verifiability.

- Security is unprecedented since [cryptological law](#) is fundamental to blockchain.
- Transparency is given by the fact that all transactions are stored and shown on publicly accessible ledger. However, it does not mean that all data is accessible, the encrypted nature of transactions ensures privacy. In most cases, only accessible data are the wallet address of the sender and receiver, the amount, the time,
- Resilience of a blockchain is within its distributed and decentralized nature. Therefore, information on blockchain is accessible 24/7 even if some users are offline,
- Verifiability of the blockchain transactions is given in combination of transparency and immutability. The information must go through consensus verification and cannot be manipulated once added in the block.

These benefits strengthen management of privacy, accountability, and transparency.

One may distinguish four types of blockchain.

Public blockchain is where it all began; it's a blockchain that is available to all and where everyone can contribute to the "consensus process". On a public blockchain instead of using a central server to store data, the blockchain is secured by cryptographic verification supported by incentives for the miners (also known as verifiers). Whereas **private blockchain's** name speaks to itself – it has a

small and restrictive network. It requires the authentication of participant identities and authorization of participant's permission-level of access on the blockchain. Private blockchains have small circle of network since the level of security, authorizations, permissions, accessibility is in the hands of the controlling organization or entity. Currently, private blockchain networks are being deployed for voting and digital identity (part of digital governance), supply chain management, asset ownership, and much more.

The **consortium blockchain** is as the U.S. Supreme Court, there is a consortium of nine financial/government entities and each of them operates a node. To validate the node at least five of these entities must sign every block. A consortium blockchain is a semi-decentralized type where more than one organization manages a blockchain network. Due to its useability factors the consortium blockchains have a great potential to improve the banking and government system. For instance, today government system lack transparency and filled with bureaucracy. There is no public trace of where citizens' private data is stored once submitted to any government entity. Moreover, there is a great potential that consortium blockchains could mitigate the increased rates of voter fraud and low rates of citizen participation in elections.

The **hybrid blockchain** is brought to us by the combination of public and private blockchains' features. The benefit of hybrid blockchain is that only selected part of data or records can be allowed to go public keeping the rest of it confidential. The hybrid system of blockchain is flexible because users can easily join a private blockchain with multiple public blockchains. The hybrid blockchains are potentially useful for digital governance, and development and humanitarian work.

Above mentioned blockchain in combination with the smart contract technology (a coded program that stored on a blockchain and executed when predetermined conditions are met), is revolutionising the way we track and mitigate different agreements and contracts; since, not all smart contracts are legal, and vice-versa. According to [UNDP's research](#) the significantly expanded functionality of smart contract technology has allowed developers to provide services for things like crowdfunding, censorship-resistant microblogging, and identity management.

As a result, its decentralised or even partially decentralised, secure, and transparent nature leads to new opportunities in digital governance through greater transparency, enhanced security, and easier traceability.



2. Blockchain for Digital Governance

The emergence of technological innovations is affecting our day-to-day lives ever since the computers were first introduced. According to World Economic Forum and PwC's joint report, we are at the beginning of a Fourth Industrial Revolution (4IR). Emerging technologies such as the Internet of Things (IoT), augmented reality/mixed reality/virtual reality (AR/MR/VR), robotics, novel human-machine interfaces (HMI), blockchain, distributed ledger technologies, artificial intelligence (AI), machine learning (ML), deep learning (DL), 5G/6G connectivity, and many other are all fading the boundaries between physical, digital and biological worlds. Today, as one of the 4IR technology applications, blockchain is shifting our lives toward new era of digitalisation, trust, and transparency. Digital governance is at the center of this revolution since inequality, security and identity are three subareas that are predicted to be affected the most by the rise of technological innovations. As a result, the challenges arising within are affecting governments and international organizations' trust in each other that delay them to come to a collective agreement. Secretary-General of the United Nations, António Guterres, stated that the world is experiencing the worst case of 'trust deficit disorder' that holds back the development objectives.

Today, blockchain directly tackles this main concern by creating a trust in data. Hence, blockchain's multi-functionality already considered by many international entities such as the United Nations, World Bank Group, European Parliament and European Commission. Blockchain's capabilities are valuable for various government entities and beneficial to improve the interactions not only between citizens and governments but also between international organizations and development projects across the globe. According to the 2021 report on [Harnessing blockchain for Sustainable Development: Prospects and Challenges](#), to the United Nations Economic and Social Council by Mr. Guterres, "blockchain technology could be a game changer, with the potential to revolutionize processes from finance to pharmaceutical industries, from government public services to humanitarian work and development aid." ([UNCTAD](#), 2021) With implementation of blockchain technologies, issues like human rights violations, identity thefts and modern slavery can be foreseen and eliminated by both parties at the early stages. Since, according to the [joint report by WEF and PwC](#) blockchain is "...transforming the way [we] can monitor and manage the data," it is important that everyone

leverages from these transformations. ([WEF](#), 2020).

3. European Union Funded Blockchain Project

As part of European Union's (EU) agenda to become a leader in Europe's transition to a new digital world the European Union begun funding for blockchain research and innovation. Funds are outright grants, prizes, and supporting investments to ensure that European entrepreneurs and start-ups don't seek support outside of the union. For instance, EU dedicated a Horizon Program specifically for grants for blockchain projects. The European Commission provided about EUR 180 million in prizes and grants through Horizon 2020, for projects dated from 2016-2019. Among these projects is Decentralized Citizens Owned Data Ecosystem (DECODE). Though such government approach already proves the importance of the blockchain technology toward digital governance objectives it is still important to review this start-up that was funded by EU to understand the benefits of blockchain utilization.

Decentralized Citizens Owned Data Ecosystem (DECODE)

Since the emergence of internet and other innovations that use it, such as computers and smartphones, people have lost the control over their personal information. Moreover, the people's personal data has become a commodity that only profit the internet companies and marketing industry. The Decentralized Citizens Owned Data Ecosystem (DECODE) wants to put people in control of their data and decide whether they want it to be available to public or not. DECODE was funded EUR 4,987,673.75 through the Horizon 2020 grant. There were four pilots, between 2017-2019, focused on digital democracy, citizen sensing, and collaborative economy. The pilots were designed to showcase the useability of the system in real world setting. DECODE will increase digital sovereignty of European citizens by enabling them to produce, access and control their data and exchange contextualized information in real-time, and in a confidential, and scalable manner.

DECODE developed a modular privacy-aware Internet of Things (IoT) hub with a free and open-source operating system backed by blockchain infrastructure supporting smart contracts and privacy protections. The main purpose of this experimental project was to create actionable legal and governance tool for European citizens, companies and cities running on a blockchain that enables disruptive commons-based business models fundamentally respect the privacy and digital sovereignty. The aim of DECODE is to



enable the foundations of a new approach to data, where in near future the innovators, startups, NGOs, SMEs, co-operatives, and local communities can take advantage of that data to build apps and services that respond to their needs and those of the wider community.

The first two pilots took place in Barcelona with Barcelona City Council and the city's digital democracy software Decidim.org (with more than 60K users). The DECODE has demonstrated its useability for the Digital Democracy and Data Commons that target major digital governance objectives. The Digital Democracy and Data Commons system was created and tested for anonymous petitions signing but still in line with authentication requirements, such as place of residence. It is essential to mention that DECODE's new system for citizen petitions gives people a necessary control over their data and security in participating in government related issues. Despite the tech gap challenge, given the infrastructure the DECODE built, it has a high potential to be implemented in developed as well as in developing countries. Since throughout the pilot stage, the project developed the DECODE app to enhance privacy, the BCNOW dashboard to allow data sharing and visualization and the DECODE distributed ledger for transparency and traceability. These additional platforms enhance user participation and ensure that anyone whether using just phone or computer has access to given services. It is essential to mention that DECODE team, also, implemented the newly developed cryptographic invention generated in the context of the project named Coconut. Such system allows the petition support needs with a use of Zero Knowledge Proof schema, which ensures secure share of specific data necessary for authentication.

Signing a petition is one of the oldest democratic traditions that is not given to people in some developing countries. The DECODE's Digital Democracy system gives an opportunity not only to people in developed countries but also in developing to add legitimacy to each campaign without disclosing their identity; as a result, control their privacy, security, and data. Such blockchain-based system has a huge prospective to increase citizens participation and bring greater credibility. Moreover, since the emergence of the internet, online petition signing is at rise as well as the online petition scams. Today, anyone can start a petition online concerning any issue. According to IdentityForce.com, "criminals like identity thieves can set up fraudulent sites to harvest email addresses and other information...

your details might be used directly for identity theft or sold to other scammers" ([IdentityForce](#), 2016). Hence, DECODE's Digital Democracy and Data Commons system can contribute greatly not only to emergence of digital democracy, but also to reducing criminal activities on the internet.

4. Common Challenges of Blockchain Implementation

Blockchain technology is one of the unique and promising solutions for digital governance objective. It has full potential to have an undeniable impact on various sectors of industry. However, there are several drawbacks that decelerate blockchain from becoming a main-stream technology that contributes to the related issues. There are three main challenges: maturity, environmental impact, and regulations. Unfortunately, the primary one is that the technology is quite immature since most of the projects related to its implementation are either in pilot or early launch stage. Blockchain technology's capabilities haven't been explored to its fullest yet. So, it is important to raise awareness by continuing encouragement of research and experiments on blockchain platforms. Since, one of the potential challenges underlying the immaturity of the technology is scalability. There is no evident data on how systems will perform to integration of legacy data or to the interconnection with existing IT infrastructure or other blockchains. However, there are solutions that could tackle blockchains scalability issue. For instance, the transaction speed on blockchain is still slow. According to the Deloitte, "blockchain's sluggish transaction speed is a major concern for enterprises that depend on high-performance legacy transaction processing systems" ([Deloitte Insights](#), 2018). However, there are some solutions that could tackle this issue. The Lightning Network which is created to add second layer to the main blockchain network when offered in conjunction with consensus protocol Proof-of-Stake (PoS) can scale up the application and increase the speed of transaction.

Second major challenge of the blockchain application is concerning the Peer-2-Peer blockchains based on Proof-of-Work (PoW). The PoW consensus protocols contribute the most to the CO2 emission and energy consumption. According to the analysis by Cambridge University, Bitcoin uses more electricity annually than the whole of Argentina. As a result, such blockchains as Cardano, were determined to overcome this challenge by developing more efficient consensus algorithms, that are also less energy taxing. The PoS protocols reduce the energy consumption since the



participants are not required to solve complex puzzles. Thus, blockchain can be energy efficient and sustainable; for now, it is matter of time and proper research.

And finally, last major challenge of the blockchain application is regulation. Blockchain regulations are uncertain and immature as blockchain itself. Some of regulators require adaptation of existing policies and administrative processes. However, each country reviews blockchain and under its own laws and guidelines separately. Certain countries, like China, are very critical; in 2019, China banned Bitcoin and other cryptocurrencies and instead begun handing out the Digital Yuan as part of government's pilot project of Central Bank Digital Currency (CBDC). Whereas, the United States of America and the European Union are still in search of a proper approach. However, either way unclear regulations cause doubts and careful usage of any innovation by businesses and public.

Recently, a new team and entity was created by the European Commission (EC), the EU Blockchain Observatory and Forum, which responsibility is to accelerate and define blockchain innovation and the development of the blockchain ecosystem within the EU. It issued a report "[EU Blockchain Ecosystem Developments](#)" that defines the regulatory maturity strategy for all 27 member-states. The strategy consists of three stages; stage one considered to involve zero government legislative and just some warnings in relation to crypto assets (assumed to be date from 2018-2020); stage two, the state begins to show some significant involvement in the field and adopts wider regulations [for ex. Know Your Customer (KYC)/ Anti Money Laundering (AML)] and/or begin government-sponsored studies (for example, taxonomies of virtual assets) and/or government-sponsored pilot applications of blockchain in the public sector (dated from 2020-2022); and stage three will consist of specific legislation for blockchain and will develop a regulatory sandboxes, innovation hubs and other initiatives that allow blockchain, fintech and other firms to pilot novel implementations (2022 and onwards). ([EU Blockchain Observatory and Forum](#),

2020).

Such regulatory approach gives the freedom to blockchain developers to continue exploring system's capacities but be aware of upcoming strengthening of regulations. The presented strategy for all 27 member states allows a harmonization of regulations across EU borders and ensure equal development of the innovations. It gives time to developers and researchers to crack the code to get blockchain close to its maturity, which will help the first challenge discussed earlier. However, going onwards, it is crucial to ensure that regulations are not too narrow or strict, as Mr. Thierry Arys Ruiz, CEO and Founder of [AgAu.io](#), emphasized the innovations often do not come from within the government but rather from constituency (Online Interview, 2021). If we want a change and improvement, we must make sure that technology is available across all sectors. Thus, there is a need for government to government, government to business, business to public – circular cooperation and harmonization of actions.

5. Conclusion and Recommendations

Overall, blockchain is a ground-breaking infrastructure that will be upgraded and improved tremendously over time. Based on this policy brief, most certainly, there is a huge opportunity to speed up the delivery of development initiatives, modernize citizen interaction and enhance trust between government entities. The EU funded blockchain-based projects are redefining the way we manage and view personal data. Implementation of DECODE application within government entities in real world setting proves the key role of blockchain-based applications toward achieving the digital governance objectives. Blockchain based applications seem to be the key to revive the long-lost trust between institutions, businesses, and constituencies. Blockchain is still quite new; it is being researched, experimented, and rediscovered every day. Government backing, business investments and scholarly support of blockchain research and experiments will assist tremendously in exploring its further capabilities.



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Takhmina Nasimova is currently Head of Development Projects in a fast-growing Swiss Commodity and FinTech/DLT organization, AgAu AG. She holds a master's degree in European and International Governance (MEIG Programme) from the University of Geneva and a bachelor's degree in International Affairs from the University of George Washington. She is experienced in policy research and strategic development with a demonstrated history of working with non-profit organizations, think tanks and international institutions by conducting research on financial impact, strategic innovation, enhancement of economic well-being and youth education. Takhmina has a special interest in youth education; FinTech innovations; community service; the European Union and international governance.



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