Scoping Paper on the Potential of Blockchain to Promote Trust in Public Institutions and Policy Making

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This scoping paper reviews the current landscape for the use of blockchain technologies to improve public procurement processes and focuses in particular on options for the Slovak Republic. It was jointly prepared by the Slovak University of Technology and the OECD in cooperation with the Office of the Deputy Prime Minister of the Slovak Republic and serves to inform discussions taking place within the programme of work for the OECD Blockchain Policy Centre and at the annual OECD Global Blockchain Policy Forum.

The opinions expressed and arguments employed herein are those of the authors and do not necessarily reflect the official views of OECD member countries, the Office of the Deputy Prime Minister of the Slovak Republic or the Slovak University of Technology.

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Blockchain and Trust

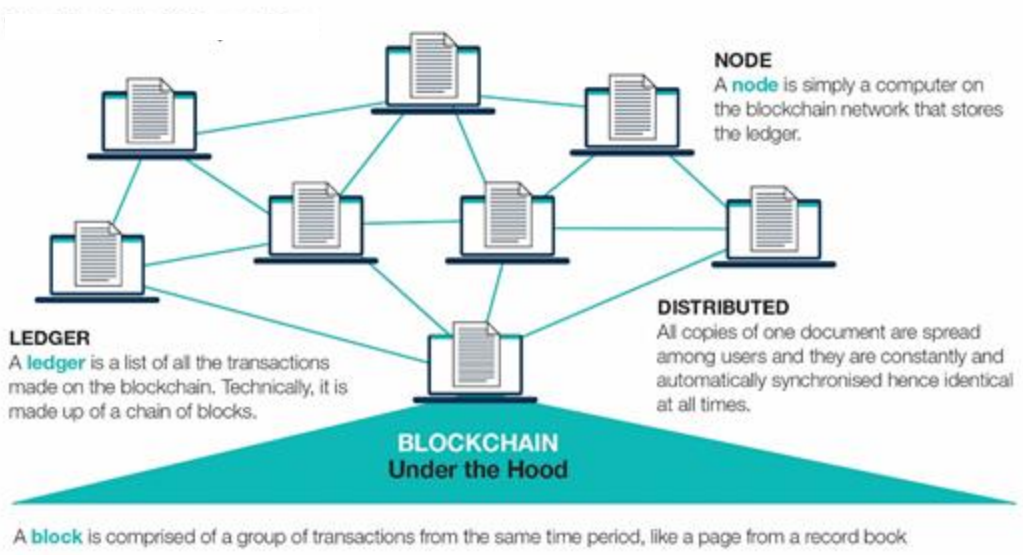
Introduction to Distributed Ledger Technology (DLT)

Distributed ledger technology (DLT), and blockchain more specifically, is often referred to as the 'trust machine' due to its ability to facilitate peer-to-peer transactions without requiring a third party or a pre-existing trust-based relationship (Economist, 2015). It offers a decentralised database that is managed by and accessible to various participants. By creating a distributed ledger of transactions and other information, it provides greater transparency and increased security against fraud or manipulation.

Blockchain is currently the most common type of DLT and although each type of blockchain is different, they share a specific set of features. Blockchain offers a shared database, where the information is maintained by means of a sequence of 'blocks' that are immutably sealed by a cryptographic signature called a hash.

By beginning the next block of transactions with the hash of the previous block, participants are able to verify that the information within the block has not been manipulated. It establishes trust by recording all transactions on a ledger, which is distributed to all users of the network (called nodes). These nodes periodically update the distributed ledger by mutually voting on the validity of a transaction (known as the consensus mechanism), and updating the ledgers of all participants so that false or fraudulent transactions cannot be validated. This process removes the need for a central, verifying authority by creating an immutable distributed ledger of transactions, which can be trusted and easily accessed by all members.

Infographic 1. Blockchain in practice



It is important to emphasise that there are different types of blockchain, which have various benefits and limitations depending on their features. Two of the most important considerations are whether the blockchain is public or private, and permissioned or permission-less. Public blockchains are open for anyone to access, while private blockchains can only be viewed by invited members of the network. Similarly,

permissioned blockchains only allow a select group of users to generate transactions (write) and verify new blocks (commit), while permission-less blockchains may be updated by anyone. Many, if not most government applications of distributed ledger technology use permissioned blockchains in order to allow public officials the ability to control access (Berryhill, Bourgery and Hanson, 2018[1]).

Some blockchain platforms also allow for so-called "smart contracts", which are self-executing actions whose terms are written into code on the blockchain. These smart contracts can be useful as they allow for the instantaneous and efficient provision of payments for example, without the possibility of delay, censorship, corruption or third-party interference. Some examples of the implementation of smart contracts by governments are the distribution of payments for grants and social security, and the automated collection of tax (M. Staples, 2017[2]).

In this paper, we will use the terms "blockchain" and "distributed ledger technology (DLT)" interchangeably.

Blockchain applications in the public sector

Although the adoption of blockchain technology has been most extensive in the financial services sector, its ability to create trust and streamline administrative processes means that blockchain is also being tested and applied in the public sector (Berryhill, Bourgery and Hanson, 2018[1]). Governments around the world are rapidly expanding their exploration of blockchain technology for a variety of use cases, including:

- Identification
- Energy utilities
- Streamlining interagency processes
- Personal Records
- Land title registry
- Public procurement
- Tax administration
- Voting
- Benefits, entitlements and aid

In many instances, the application of blockchain in one area of the public sector can evolve to enable a number of the above use cases to interact, resulting in an even more efficient system. For example, registering a land title to someone's identity would allow them to easily substantiate ownership of that asset in order to get a loan at a bank. Another example would be the automation of social benefit payments using a smart contract that is activated once income has been paid or declared. In the case of the Slovak Republic and the realisation, for example, of a national open data infrastructure, the use of blockchain technology for one aspect of government services could organically evolve to include various interconnected services without the need for duplicative re-identification procedures. In this way, the use of blockchain will also align with the "once only" principle[1] outlined in the EU eGovernment Action Plan (European Commission, 2016[3]).

Considerations for using blockchain to promote trust in public institutions and policy making

Blockchain technology has the capacity to promote trust in public institutions and policy making in a variety of ways. It allows governments to manage and share information, while reducing the risk of that data being misused, stolen, or altered. By doing so, it promotes

[1] The "once only" principle is a core component of the Digital Single Market Strategy for Europe (DSM). Under this principle, governments reduce the administrative burden by ensuring that citizens and businesses provide the same information only once to government.

trust in public institutions by increasing transparency, and assisting in the protection of the privacy of citizens.

However, despite the breadth of the potential applications as shown above, it is important to note that blockchain is not a panacea for all government problems. Before deciding to implement distributed ledger technology in a public institution, governments must consider the technical features of different types of blockchain, which may have certain limitations, including (Berryhill, Bourgery and Hanson, 2018[1]):

- **Immutability** – the characteristic immutability of blockchain technology may prove unsuitable in instances where public data needs to be regularly amended or deleted.
- **Transparency, confidentiality and decentralisation** – as elaborated upon in Box 1. Blockchain and existing legal and regulatory frameworks – data privacy example below, storing personal information on a blockchain raises several concerns surrounding privacy and confidentiality, and is often restricted by existing national or international legislation. As such, governments must carefully consider what information is stored on the distributed ledger itself.
- **Data storage** – Blockchain is generally most appropriate as a way of maintaining a reliable record of transactions, rather than storing large amounts of data. Consequently, DLT may not in itself be the best fit for public institutions looking for data storage solutions.
- **Data quality** – As is the case in traditional information systems, the quality of the data and resulting analysis of information stored on a blockchain depends on the quality of the data that is input at the outset.
- **Coding and governance models** – The decentralisation of distributed ledger technology does not entirely eliminate the need for a central authority from all stages of the process. At minimum, blockchains must be built and coded with underlying decisions, including the governance models built in to the blockchain protocol.
- **Costs** – The higher short-term costs associated with implementing an emerging technology such as blockchain has prevented widespread adoption thus far. This is also influenced by a lack of long-term visibility, and analysis of the return of investment and running costs.
- **Challenges related to the 'Proof of Work' consensus model** – The original consensus technology employed by a number of blockchains, including the first blockchain to be deployed i.e. bitcoin, raises challenges surrounding energy consumption and scalability.

What is clear is that in the deployment of DLT, it is critical to consider the different types of DLT available and how their features may meet the specific needs of particular projects.

In addition to these technical considerations, one of the most fundamental challenges governments face in implementing this emerging technology is the lack of understanding, and consequent distrust by public servants and citizens. Despite blockchain's fundamental ability to facilitate trust, many decision-makers and citizens are wary of entrusting their private data and the provision of government services to a relatively new technology. Consequently, one of the initial hurdles for governments considering adopting blockchain technology is to educate public servants and their constituents on the benefits of blockchain, and its ability to streamline government services and provide transparency, without jeopardising other important considerations.

Box 1. Blockchain and existing legal frameworks – data privacy example

It is also important to consider the interaction of a potential blockchain use case with existing regulations, rules and laws. For example, some commentators have raised concerns that the recently introduced General Data Protection Regulation (GPDR) in the European Union challenges the underlying characteristics of distributed ledger technology. GDPR compliance is not however about a particular technology, but rather how the technology is used: "Just like there is no GDPR-compliant Internet, or GDPR-compliant artificial intelligence algorithm, there is no such thing as a GDPR-compliant blockchain technology. There are only GDPR-compliant use cases and applications" (Lyons, Courcelas and Timsit, 2018[4])

Three issues in particular arise from GDPR and the nature of blockchains: 1) identifying the "data controller"; 2) the meaning of anonymisation of personal data; and 3) the right to be forgotten/right of erasure. While these issues have not yet been conclusively settled, some principles-based guidance does exist on how to consider the issue of GDPR compliance in blockchains (Lyons, Courcelas and Timsit, 2018[4]). It has also been suggested that this issue is easily resolved, and in fact, blockchain might be able to assist governments and organisations with GDPR compliance (Finck, 2019[5]).[2]

The digital landscape in the Slovak Republic and Europe Union

In considering how DLT may be deployed in the Slovak Republic to support trust in public institutions and policy-making, first we must consider the broader digital environment in which such an initiative would take place.

Current economic environment in the Slovak Republic

The Slovak economy is experiencing strong, broad-based expansion as a result of strong links with the world economy, new production capacity, and inflows of investment (OECD, 2019[6]). However as the Slovak government recognises, the technological innovation and global megatrends of the digital era have influenced an international shift from an industrial society to an information society. The 2019 European Innovation Scoreboard report categorised Slovakia as a moderate innovator performing at the EU standard in 2011, and highlighted the innovative sector and high-tech exports as two of the areas in which Slovakia scores particularly well (European Commission, 2019[7]). A 2018 study predicted that the potential economic and developmental benefits of digitalisation in the Slovak Republic could surpass EUR 16 billion p.a. in additional gross domestic product by 2025 (Novak et al., 2018[8]).

[2] The GDPR gives EU citizens the right to ask for their data to be deleted, except in circumstances where the data is being held as a legal obligation, public interest, or exercise of freedom of expression. In circumstances where personal data is being stored for a different reason, organisations and public institutions may store it 'off-chain' where it can be deleted without any evidence except a nonsensical cryptographic hash.

Government initiatives focusing on digital transformation in the Slovak Republic

In recent years, the Slovak Republic has introduced several initiatives to navigate the digital era. The most significant of these include the *2030 Strategy for the Digital Transformation of Slovakia*, the corresponding Action Plans (the most recent of which is the *Action Plan for the digital transformation of Slovakia for 2019-2022*) and the *Slovak Action Plan for Open Government Partnership for 2020-2021*.

The *2030 Strategy for Digital Transformation of Slovakia* (hereafter the Strategy) is a framework and cross-sectional government strategy that defines the policy and particular priorities of Slovakia. The Strategy recognises blockchain as one of six current innovative technologies, and is committed to exploring opportunities for its implementation.

While there are potential opportunities for the implementation of distributed ledger technology to support a number of the objectives in the Strategy, the accompanying *Action Plan of the digital transformation of Slovakia 2019-2022* (hereafter the Action Plan) specifically acknowledges the use of blockchain for public administration in the EU, and beyond. Further, the Action Plan includes a commitment to testing of the utilisation of blockchain technology in public administration, and gradually implementing beneficial use cases provided they also reflect value for money.

By implementing technological innovation such as blockchain into public institutions, Slovakia's ambition is to create a 'data-driven State' in which a significant improvement in the collection and analysis of data by public institutions could enable the provision of higher quality government services. This vision intersects with another initiative of the Slovak government, the *Slovak Action Plan for Open Government Partnership for 2020-2021* (hereafter OGP 2020-2021). The Slovak Republic has been a member of the multilateral Open Government Partnership initiative since its inception in 2011, and since then, has made significant strides towards a national open data infrastructure. Some examples are the adoption of the Law on the Register of Public Sector Partners, the creation of an Open Data Portal, and increasing availability of government datasets in open format. OGP 2020-2021 builds upon the previous three plans to implement an Open Government Partnership under the topics of open information, open education, open science and participation.

The Slovak Republic is also a key member of the China's 17 + 1 Initiative, aimed at intensifying and expanding cooperation between China and Europe. At the 2015 17+1 Summit, the Slovak Republic was appointed to lead collaboration in the field of innovation, technology transfer, and research and development (R & D). Slovak leadership culminated in the 2019 publication of the 'Dubrovnik Guidelines for Cooperation between China and Central and Eastern European Countries', which includes guidelines for the establishment of the 'China-CEEC Blockchain Centre of Excellence' in the Slovak Republic (China-CEEC, 2019[9]). This project symbolises the Slovak government's commitment to blockchain technology and technological innovation.

Box 2. Current blockchain ecosystem in the Slovak Republic

The emerging blockchain ecosystem in the Slovak Republic is supported by civic associations such as Blockchain Slovakia, the Slovak FinTech Association and the Slovak IT Association. There are also a number of private blockchain-based companies already established, some of whom are included below.

Bethereum is an innovative social betting solution that combines conventional betting with gamification and social media elements, and is built on blockchain technology for worldwide use. The entire process is fully decentralised, transparent, and uses smart contracts to protect funds and automatically distribute winnings. Bethereum hopes to expand to include a variety of content and third party games, and increase the value of its digital token, the 'Bether'.

DECENT is a multifaceted DLT company founded in 2015. It provides infrastructure to a variety of companies by way of its DCore blockchain protocol, and supports technological innovation through the DECENT Innovation Lab and Blockchain Incubator. The company began by harnessing the DCore blockchain protocol to develop a safe, transparent and fair way for content creators to publish their work without intermediary fees. It has since partnered with a variety of different projects to assist in the provision of smart energy, digital advertising, data tracking and audit, ticketing, certification and compliance, supply chain management, aerospace and defence. One of the use cases of DECENT's DCore blockchain protocol is the **3IPK** project to provide verifi1cation in the aviation industry and supply chain management. This project uses DLT and 'Smart Dust' fingerprinting to provide real-time tracking of aviation parts to improve transparency and safety, and eliminate unnecessary costs.

Another Slovakian company which uses blockchain technology is **Biotron**, which provides end-to-end data solutions in order to create and improve products, services and revenue streams. Biotron currently has two blockchain-based products: Petrolyze and Mobilyze. Petrolyze is currently being used by Shell Slovakia to optimise their retail chain. To do so, Biotron analyse data from mobile devices, road network geometry and open government data sets to identify potential areas for improvement. Mobilyze is a data-analysis system for smart cities. It collects and anonymises public data by way of an app, and provides analysis of people's movements in order to inform transport and city planning, and the provision of operations and services by governments.

The broader European context

The Slovak Republic's exploration of the use of blockchain technology to promote trust in public institutions and policy making accords with the broader European shift toward digital transformation. The wide-scale adoption of DLT across the EU has the potential to facilitate information sharing and the provision of services across-borders, simplify administrative processes, instil trust in citizens, and establish Europe's position at the forefront of the technological revolution (European Commission, 2019[10]).

The European Commission has a holistic approach to blockchain technology (European Commission, 2019[10]). It relies upon a number of partnerships to enable globally inclusive governance, reinforce cooperation and investments, support international standard setting and facilitate a dialogue between all relevant stakeholders. As part of this approach, the

European Blockchain Partnership (EBP), established in 2018, brings together government representatives from all members of the European Economic Area, with a commitment to realising the potential of blockchain-based services for the benefit of European citizens, society and economy. This includes the establishment of the European Blockchain Services Infrastructure (EBSI), which will deliver EU-wide cross-border services using DLT. The EBSI platform is a distributed network of interconnected nodes, which will be able to create and broadcast transactions and update the ledger accordingly. The European Commission has committed to operating a minimum number of nodes at the European level, with Member States being responsible for providing the relevant national infrastructure.

In 2020, EBSI will become a building block of the Connecting Europe Facility (CEF), providing multipurpose software, specifications and services to support the adoption of DLT by European institutions and public administrations. In its current exploration of the potential use of blockchain in the public sector, the Slovak Republic is well placed to align its national services with the open technical specifications of the EBSI platform. By doing so, the Slovak Republic would benefit from the creation and maintenance of an existing infrastructure, and enable cross-border expansion and exchange.

The European Commission also launched the European Blockchain Observatory and Forum in 2018 in partnership with the European Parliament. The Observatory and Forum is being run under the aegis of the European Commission's Directorate General for Communication Networks, Content and Technology (DG CONNECT), and acts as a stakeholder engagement platform to encourage and accelerate blockchain innovation and uptake It does so by monitoring European blockchain initiatives, producing educational materials, creating an accessible platform for collaboration and making recommendations on the role of the EU in the blockchain space.

In addition, there are a number of EU initiatives that support the development of blockchain as part of the broader digital environment, in the public and private sectors. As part of the 2021-2027 Multiannual Financial Framework, the European Commission has proposed the Digital Europe programme, which focuses on building digital capacities and the wide deployment of digital technologies. The Commission has proposed an overall investment of €9.2 billion; €1.3 billion of which is allocated to ensuring the use of digital technologies such as blockchain in and by the public sector. Digital innovation is also a specific objective of Horizon Europe 2021-2027, which proposes to invest €15 billion of its €100 billion budget in boosting key technologies. By developing opportunities for using blockchain technology to promote trust in public institutions and policy making, the Slovak Republic is well aligned with these broader European initiatives.

Using blockchain technology to promote trust in public institutions and policy making

In this section, we explore some of the potential applications of blockchain technology in line with the overarching strategic goals of the Slovak Republic and the broader European Union. Developing any of these proposals further requires, in the first instance, a process of sensitisation and capacity building regarding blockchain amongst officials in the public sector. Second, in order to strengthen knowledge capital in the Slovak Republic, opportunities to support and work with the local community – both academia and the private sector - as part of these projects should be prioritised. Thirdly, the Slovak legal framework should be considered to determine whether, and to what extent, it may currently inhibit the application of blockchain for public sector use.

Testing the utilisation of blockchain technology in public administration

The *2030 Strategy for the Digital Transformation of Slovakia* and its *Action Plan for the digital transformation of Slovakia for 2019-2022* acknowledge the potential benefits of blockchain technology in the public sector, and includes a specific commitment to testing the utilisation of blockchain technology in public administration (Slovak Republic, 2019[11]). Noting the potential of blockchain technology and its increasing exploration for public administration in the EU and beyond, the Action Plan recognises the importance of providing systemic support to the research, testing, deployment and subsequent monitoring of DLT. The Action Plan also suggests that the application of blockchain in the public sector is only beneficial in circumstances where the situation includes a large number of independent entities without explicit trust, the proposed solution changes the function of public institutions to remove intermediaries, and a value cycle occurs in the ecosystem which cannot currently be captured. Further, it acknowledges the necessity of considering the economic and administrative costs of applying blockchain, and requires justification for the deployment of this relatively young and untested technology.

Developing a national blockchain strategy and communities of practices

Development of a coherent national plan, supported by a community of practice, can help promote a whole of government approach in support of this priority, and integrate it across a broad-range of stakeholders.

Launching a national blockchain strategy

One of the first examples of a national blockchain plan is Slovenia's Action Plan (European Commission, 2019[12]) to enhance the implementation of blockchain technologies. Adopted in 2018, the Plan aims to accelerate and strengthen use of DLT solutions as well as create a regulatory framework for their adoption. Germany also released their strategy establishing a comprehensive framework for DLT innovation in September 2019, which announced priority measures to be launched in five main activity areas (Bundesministerium für Wirtschaft und Energie, 2019[13]).. As at January 2019, Australia and Italy were also in the process of preparing national blockchain strategies (Ubaldi et al., 2019[14]).

In complement to the 2030 Digital Transformation Strategy, the government could consider drafting a national strategy to facilitate blockchain implementation in the public sector. Developing such a framework early could both set a clear direction for the government's efforts and help position the Slovak Republic as a leader in national blockchain policy, giving them further opportunity to contribute to a so far under-analysed space.

Establishing communities of practices on blockchain technology

Knowledge transfer and collaboration within and across sectors are both vital components of successful blockchain innovation (Berryhill, Bourgery and Hanson, 2018[1]). In addition to a national blockchain strategy, the Slovak government may therefore consider convening a community of practice. Such a community would bring together blockchain experts from across the public sector (whole of government approach), as well as industry, academia and civil society, offering a platform through which to share best practices and experience as well as develop viable blockchain systems.

By way of example, the US Intergovernmental Emerging Citizen Technology Office (ECTO) launched a community of practice on blockchain technology in 2017. This community brought together government agencies in order to make knowledge of blockchain technology more accessible to civil servants. The government-wide community

of practice further helped officials make sense of the 200 public sector blockchain use cases gathered by ECTO. Through knowledge sharing, the community of practice helped public servants gain a clearer understanding of the technology and learn how to advance blockchain applications in a more proficient way (Berryhill, Bourgery and Hanson, 2018[1]).

Communities of practice can furthermore be convened using a multi-stakeholder approach. The government of Australia convened such a community of practice in order to begin drafting their national blockchain strategy. This group involves blockchain experts from across the private sector and academia, and takes into account guidance from CSIRO's Data61[3] (Andrews, 2019[15])

Using blockchain for public procurement

Fraud and corruption within public institutions is one of the key drivers of distrust in government (OECD, 2019[16]). Although the Slovak Republic has made progress in developing risk management frameworks, opportunities remain to improve fraud and corruption risks within public procurement procedures. Strengthening these processes has the additional benefits of promoting pubic trust, ensuring that investments are being directed at their intended goals, and demonstrating to citizens how investments are being utilised effectively.

Using blockchain for public procurement can assist in improving fraud and corruption risks by providing a transparent and immutable ledger. One example of the use of blockchain for public procurement is the HACKMX pilot project in Mexico. The project was developed to improve the existing complex public procurement process, including to prevent data from being modified or deleted, and promote public trust by allowing any person to evaluate the project or work that has been tendered in the system. Under the HACKMX model, public tenders are published on an electronic platform where registered companies can enter their proposals. Using smart contracts, HACKMX validates the proposals and sends them to the evaluator to verify that they meet the relevant criteria. Once all eligible proposals have been identified, the system selects the proposal that generates the greatest social benefit, and grants the tender. By using blockchain technology, every step in this process is recorded and available for review or audit if required.

The use of blockchain for public procurement is also being tested in Colombia. In partnership with the Inter-American Development Bank (IDB) and the World Economic Forum, the Colombian Inspector General's office is exploring opportunities for using DLT to enhance government transparency and accountability, and address corruption in public procurement. The initial project, commenced in 2019, will use blockchain to improve public transparency and integrity in school meal procurement. The outcome of this pilot will determine whether additional high-potential use cases are investigated, and inform a widely applicable policy framework for the use of blockchain to increase transparency in government processes (World Economic Forum, 2019[17]).

In light of the opportunities identified to continue to improve its public procurement processes, the Slovak Republic could consider the development of a blockchain-based system to promote trust in public procurement processes. This could be achieved in consultation with existing international examples and upon review of the existing regulatory framework.

[3] Data61 is the data sciences division of CSIRO, Australia's national science agency.

Using blockchain to verify public information being published on the Open Data Portal

In 2019, analysis from the OECD demonstrated that despite recent positive momentum, the Slovak Republic remained significantly below the OECD average for performance on open government data initiatives (OECD, 2019[18]). As recognised in the Slovak Action Plan for Open Government Partnership for 2020-2021, one of the fundamental goals of the Open Government Portal is to increase transparency, participation and innovation by opening up public administration to citizens. The application of blockchain technology could promote trust in the Slovak government by enabling citizens to verify public information being published on the Open Data Portal, while also enhancing security of the data.

One example of the use of DLT to verify and protect public data is the Open Government Data- Change Protocol and Notarisation pilot in Vienna. This project aims to ensure the integrity of open government data by enabling independent checks to be made on all digitised city records. It does so by storing hashes of all of the city's data on public blockchains, where they can be retrieved and independently verified by interested members of the public (Digitales Wien, 2018[19]).

The Slovak Republic may wish to consider testing the use of DLT to automate and verify information being published on the Open Data Portal. This could be achieved by facilitating data sharing with international use cases in order to develop a blockchain pilot.

Using blockchain for financial administration

In 2019, the Slovak Republic Financial Administration announced its consideration of the use of blockchain technology for tax collection. This could assist in the realisation of one of the OECD's key recommendations in its 2019 *Economic Survey of Slovak Republic* to reduce tax evasion and fraud, and build upon the recent Slovak introduction of electronic invoice data matching processes (OECD, 2019[16]).

In the example, the implementation of a taxation system using blockchain-based ID may also assist in the gradual implementation of additional e-government services such as the management of public records in healthcare, land title registry and other fields beyond financial administration. Further, this application of DLT in the Slovak Republic could promote trust in public institutions by increasing transparency, streamlining tax collection and reducing compliance burdens, and enabling the provision of additional public services (OECD, 2018[20]).

The most integrated example of the use of blockchain for tax administration is the Estonian e-tax system. The Estonian tax administration was the first public institution to offer e-services, and lead to the digitisation of almost every government service in Estonia. The e-tax system allows citizens to use a secure blockchain-based identity to declare and file tax declarations with an average processing time of three to five minutes (e-Estonia, 2019[21]). As a result, 98% of Estonian tax declarations are now filed online, and the willingness of citizens to pay taxes has increased (Republic of Estonia Tax and Customs Board, 2019[22]). Further, a recent study of public opinion found that Estonians find the e-tax system comprehensible and fair, and are more likely to file accurate declarations (Republic of Estonia Tax and Customs Board, 2019[22]).

Using blockchain to streamline interagency processes

Sharing information between government agencies can be inefficient, particularly when institutions rely on centralised, traditional or paper-based information systems (Berryhill, Bourgery and Hanson, 2018[1]). These systems may require data to be entered into the

system multiple times, creating opportunities for error and inconsistencies (Berryhill, Bourgery and Hanson, 2018[1]).

Interoperability addresses these issues, greatly reducing time spent reconciling different sources of data and making it easier for public agencies to share information. Distributed ledger technology can provide the architecture of interoperable information systems that reduce friction between public agencies. Similarly, blockchain can support the "once only" principle mentioned above, which may help improve efficiency and eliminate redundant processes (European Commission, 2016[3]).

The Slovak government may consider implementing blockchain-based information systems that support this principle, allowing for more seamless data flow between public institutions. Such comprehensive digital transformation may take a considerable amount of time to carry out, far exceeding the scope of a pilot project. Therefore, it may be worthwhile to explore possibilities for the integration of blockchain solutions with existing legacy systems.

Additional opportunities for exploring the applications of blockchain technology in the Slovak Republic

Beyond the specific objective of enhancing trust in public administration and policymaking, there are other ways to support the development of new digital skills and businesses, in the Slovak Republic.

Supporting the deployment of blockchain technology by small to medium Enterprises (SMEs) and entrepreneurs

Small to medium enterprises (SMEs) and entrepreneurship are instrumental to ensuring that economies and societies adapt to major transformations such as digitalisation, globalisation, and environmental pressures. While Slovak investments in transport infrastructure are relatively high, information and communications technology investments are below the OECD standard. Further, affiliates of multinational companies in Slovakia favour technology import, while innovation and research and development (R & D) investments remain weak in local SMEs (OECD, 2019[23]).

The further development and investment by the government in the deployment of blockchain technology by SMEs and entrepreneurs may have significant economic and societal effects, including to strengthen the national economy, assist in the digital transformation of Slovakia, and increase progress toward European and OECD standards. Indirectly, it may also promote a stronger relationship between citizens and the government, by encouraging collaboration and communication between the public and private sectors, and demonstrating investment in the success and innovation of Slovak SMEs and entrepreneurs.

One example of a public institution initiative to support the deployment of DLT by SMEs and entrepreneurs is the LBChain protocol launched by the Bank of Lithuania. LBChain is a blockchain protocol that combines technological infrastructure with a regulatory sandbox to allow fintech start-ups to develop products based on the LBChain protocol and test their business models in a controlled environment. Although the project is in its final stages of testing (with a launch date of March 2020), six Fintech companies have already tested their products in LBChain prototypes, and international SMEs and entrepreneurs are being encouraged to apply for product testing (Bank of Lithuania, 2019[24]).

In the first instance, it would be important to undertake an in-depth study of the blockchain ecosystem in the Slovak Republic and how the existing policy and regulatory environment

is affecting its development. This would provide the basis through which, by drawing on global practices, it would be possible to consider what relevant and appropriate policy measures may help improve blockchain's diffusion amongst this important sector of the economy. The Slovak government may also consider the possibility of using DLT for the delivery of services to SMEs and an incremental approach to regulation including the introduction of a regulatory sandbox for blockchain-based SMEs and entrepreneurs.

Supporting blockchain innovation through Public-Private Partnerships

In addition to supporting blockchain deployment through SMEs, the Slovak Republic may consider partnering with private companies, who can provide technical assistance to civil servants in the design and implementation of blockchain-based solutions. Public-private partnerships (PPPs) can be an effective way for governments to benefit from the private sector's broad experience with the technology as well as address blockchain-related skills gaps within public administrations. It is important to note that PPPs are a rapidly growing trend and can be carried out through a variety of arrangements (Berryhill, Bourgery and Hanson, 2018[1]). For instance, governments can collaborate with the growing number of private companies who now provide blockchain-as-a-service (BaaS) offerings (Berryhill, Bourgery and Hanson, 2018[1]). Moving forward, the Slovak government may wish to explore these different opportunities for collaboration with private partners in the planning and implementation of pilot projects as well as for blockchain-based service provision.

Moving ahead

While the potential to apply blockchain technology to support enhanced trust in public administration and policy-making is clear, it is necessary to set out how best to move from identifying this potential to exploring its real-life application.

As identified in the section *Using blockchain technology to promote trust in public institutions and policy making*, the further assessment of any use cases requires a number of initial steps in order to supports its success. Namely:

a) Sensitisation and capacity building regarding distributed ledger technologies amongst officials in the public sector. Not only will such a process build an understanding of the technology, its benefits and risks, such officials are best placed to identify appropriate opportunities within the administration in which deployment of the technology could be most appropriate and useful.

b) Creation of a community of practice: engagement with the local academic community and private sector involved in distributed ledger technologies. As with engagement with public officials, this group of experts are well placed to identify opportunities to apply blockchain in the Slovak context. This phase further presents an opportunity to capitalise on the Slovak Republic's strengths in public consultation, as evidenced by the country's high scores on stakeholder engagement in the 2015 OECD Indicators of Regulatory Policy and Governance (iREG) (OECD, 2017[25]). In addition, however, such a project offers an excellent opportunity to build skills and capacity within the local community, supporting a virtuous circle of skills development and deployment that fosters greater readiness for the increased digitalisation of our economy and society at large.

c) Engagement with the international community. Many governments are currently in the process of exploring blockchain's applications and their policy implications, and there is significant opportunity to both draw from those experiences and

identify opportunities for collaboration on projects with cross-border implications. As such, it is important as part of their ongoing exploration of this area that the Slovak Republic is engaged with the international community of experts exploring these issues.

In light of the overall objective of enhancing trust in public institutions and policy-making through the use of blockchain and the expertise of the OECD's Blockchain Policy Centre[4], which is the global reference point on the policy implications of this technology, the next steps to progress this objective could include working with the Blockchain Policy Centre to:

1. Develop a specific National Blockchain Strategy (NBS) to promote blockchain innovation and identify priority areas for action. Drawing on the feedback and guidance of the community of practice through a series of workshops.
2. Based on the NBS, and keeping in mind the overall objective of enhancing trust and working with the public policymakers and community of practice, identify a small number of blockchain uses that would be most relevant and viable in the Slovak context, and develop these use cases in more detail. These use cases could draw from the examples in this report, such as public procurement, as well as insights from the community of practice.
3. Select one viable Blockchain use case to advance through a "proof of concept". Analyse results against the pre-established key performance indicators from the project. If found successful, advance into the pilot stage and subject to results, proceed to full-scale delivery.

[4] The OECD Blockchain Policy Centre is the global reference point for policy makers on blockchain and other distributed ledger technologies (DLT). The Centre was created in 2018 to support governments in addressing the challenges of DLT as well as to seize the opportunities it offers for achieving policy objectives.

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