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## Digital Transformation: Enhancing Economic Development in Small States

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### 1. Introduction

Over the past two decades, both scholars and practitioners who work within the field of small states have discussed potential policies and ideas on how to enhance economic development in small states, mainly through improved resilience and sustainability. This is likely to ensure that the economies of such states remain competitive (Briguglio *et al.*, 2006; Fabri, 2014; Jayaraman, 2006). The overall challenge for any country, with no exception to small states, is that in order to maintain resilient and sustainable economies, one has to consistently adapt to the constant changes in the external and internal economic environment. These changes, which are mainly attributed to technological progress, mean that there is no constant recipe for economic success. To ensure resilience and sustainability, economic growth planning in small states needs to be adapted to economic change (Raco and Street, 2012) and leverage advancements in technology. Currently, a number of

new technologies are coming on-stream and when combined these are being touted as the foundation of the fourth industrial revolution as they can bring deep and fundamental improvements. While research acknowledges the improvement such technologies have on economic growth, most research is focused on large countries (e.g. Agarwal *et al.*, 2010; Andal-Ancion *et al.*, 2003; Schweer and Sahl, 2017; Thompson, 2005). Studies that specifically focus on how small states can benefit from and adapt to these technological advancements are very limited (e.g. Hoe, 2016; Tan and Pan, 2003).

To this effect, given the importance of the emergence of new technologies for the resilience and sustainability of small states' economies, the question that arises is – How can small states ensure resilience and sustainability throughout their economic development in the new digitised world?

This paper seeks to explore this question with a focus on the role of digital transformation, in building economic resilience and sustainability. Digital

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transformation has been defined in various ways by different scholars and experts; in fact, there is no holistic definition of this term. By taking stock of the different definitions that exist, Morakanyane *et al.* (2017) propose the following definition: 'Digital transformation is an evolutionary process that leverages digital capabilities and technologies to enable business models, operational processes and customer experiences to create value' (p. 437). In other words, digital transformation refers to development in the fields of digital technology and data utilisation, which leads to innovation through better data transmission, storage and analysis. Such progress facilitates and enhances different aspects of societies starting from the private lives of individuals, to economies at large including the private and public sector (Hanna, 2016; Keidanren, 2018). While on a general level various studies have acknowledged the role of digital transformation in building economic resilience (e.g. Carin, 2017; Maupin, 2017; Simmie and Martin, 2010), research is still unclear how the specific enablers of digital transformation influence economic resilience. This paper contributes to the present research by aiming to address this gap and focus on the impact of blockchain on economic development.

***"To ensure resilience and sustainability, economic growth small states need to be leverage advancements in technology."***

Blockchain technology is a recently developed enabler of digital transformation. This technology involves a large distributed and decentralised database that caters for data records. Once entered into the system these records are secured in a way that it is extremely difficult to

temper or revise the inputs (Destefanis *et al.*, 2018; Kim and Laskowski, 2018). Notwithstanding the recent emergence of this technology, experts and policy-makers are suggesting that this technology is likely to have significant transformative potentials on economies at large. This has led to substantial investments in the technology across sectors and industries. In fact, to date 61% of the major global digital firms have invested in blockchain (Okta, 2019). According to the International Data Corporation (IDC), in 2019 blockchain spending is expected to reach \$2.9 billion, 88.7% more than 2018. Most of this investment – \$1.1 billion – is allocated to banking, securities, investment services and insurers. These sectors are followed by manufacturing and resources, which are expected to invest \$653 million combined (IDC, 2019).

In addition, governments have started to follow suit in terms of investment in blockchain. Not only have governments been supporting investment in blockchain through various initiatives and regulatory frameworks, but most governments are becoming blockchain users themselves (Deloitte, 2019). To this end, the growth in investment on blockchain is expected to continue increasing at an exponential rate. On a global level, investment in blockchain is expected to reach \$12.4 billion by 2022, with the USA leading in terms of spending compared with any other country around the world. In fact, the USA is expected to increase its spending on blockchain technology by 1,000% between 2017 and 2022 (IDC, 2019).

While Governments of large countries are leading the way in terms of investment in blockchain technology, small states are also seeing the benefits and potential of this technology. One of the main blockchain leaders in blockchain among small states is Malta, a small island that forms part of the European Union. During recent years, the government of Malta has consistently worked in building the country's reputation as the 'blockchain island'. Malta was one of the first countries to recognise the opportunities of blockchain by being among the first countries in the world to legislate the technology and to start integrating

blockchain in its broader digital transformation process, primarily those relating to the delivery of services to its citizens.

Despite the significant investments worldwide, research on the impact of this technology is the least investigated compared with other enablers of digital transformation. This is mainly because it is still a relatively new technology and thus evidence on its impact is limited. From the restricted number of studies published within this area of research to date, focus was mainly made on how blockchain influences specific sectors, in particular financial services (e.g. Casey *et al.*, 2018; Collomb and Sok, 2016; Treleaven *et al.*, 2017) and the public sector (Berryhill *et al.*, 2018; Hyvärinen *et al.*, 2017; Ølnes and Jansen, 2017). Limited research exists on the generic impact of this technology on economies at large. These studies highlight various benefits of such technology at the micro-economic level. This paper aims to address these gaps by assessing the impact of this new technology on the macro-economic development of small states.

## ***“Investment in blockchain is expected to reach \$12.4 billion by 2022.”***

Following an introduction to digital transformation and its main enablers, this paper delves deep into how blockchain can help in supporting small states. The paper also takes a practical approach and provides specific examples on the current progress of Digital Ledger Technology (DLT)-based government services around the world, before highlighting the opportunities for small states. This is followed by a case study on Malta. The paper concludes with a number of recommendations.

### **2. Deconstructing digital transformation**

As discussed in the previous section, digital transformation refers to any progress

made in the areas of digital technology and the use of data (Keidanren, 2016). To date, research suggests that the definition of digital transformation is based on four enablers – the Internet of Things (IoT), Artificial Intelligence (AI), robotics, and DLT (Matzner *et al.*, 2018). Each of these enablers enhances societies and economies in different ways. First, IoT is defined by the European Commission as ‘a pervasive innovative technology building on the universal connectivity of things and people’ (Aguzzi *et al.*, 2013: p. 9). Improvement in this connectivity through digital transformation will allow enhanced real-time data gathering and enhanced communication among different individuals located in different environments (Da Xu *et al.*, 2014).

Second, AI is defined as a ‘system’s ability to correctly interpret external data, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation’ (Kaplan and Haenlein, 2019: p. 1). Technological progress in AI is likely to improve individual (and thus of the overall society) skills and abilities by allowing users to share skills with a system, e.g. automated driving systems (Salomon *et al.*, 1991).

Third, robotics involves the physical implementation of AI. Improvement in this field will continue to support industry and individuals in conducting routine tasks. Examples include home-cleaning robots and robots in the manufacturing industry (IFR, 2018).

Fourth, it ‘has established itself as an umbrella term to designate multi-party systems that operate in an environment with no central operator or authority, despite parties who may be unreliable or malicious (‘adversarial environment’)' (Rauchs *et al.*, 2018: p. 15). An important component of DLT includes blockchain technology. This technology involves a large distributed and decentralised database that caters for data records. Once entered into the system, these records are secured in a way that it is extremely difficult to temper or revise the inputs (Destefanis *et al.*, 2018; Kim and Laskowski, 2018).

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***“Digital transformation refers to any progress made in the areas of digital technology and the use of data.”***

Overall, literature suggests that these four enablers of digital transformation have an important impact on business models, operational processes, consumer experiences, employees, culture and infrastructure (Henriette *et al.*, 2015; Morakanyane *et al.*, 2017). For example, in the area of retail banking, digital transformation is becoming increasingly important as consumers are increasingly demanding increased use of digital services. Investment in such digital services is likely to change consumer experience (Loebbecke and Picot, 2015). However, this also implies that banks need to adapt their business model in line with the demands of the digital consumer. In addition, based on the constant technological advancements, business models should focus on exploiting existing services that can be offered through digital channels, while exploring new business fields that are likely to emerge in this digital age (Schuchmann and Seufert, 2015).

As banks increase the amount of digital services they offer, the operational processes of how they operate will also need to change. This is due to the complexities in the processes involved in offering a technologically advanced service. Thus, businesses need to implement adequate management practices to monitor and effectively operate the new technology (Matt *et al.*, 2015). The new operational process is likely to influence the tasks of employees. It is of utmost importance that employee competence development moves in line with product development. In other words, employees need to learn how to implement their new tasks in order to be able to effectively deliver new services (Schuchmann and Seufert, 2015).

The effectiveness of employee development is also interlinked with the culture and structure of the firm. Learning involves developing a culture of experimentation, and providing the employees with the ability to make mistakes and learn from them. The culture that firms create is likely to support or restrain the employee learning process and thus the quality of the service, in this case the digitised banking service (Hansen and Sia, 2015; Schuchmann and Seufert, 2015). In terms of structure that promotes this culture, research indicates that firm structures that are not very centralised are more likely to promote learning and innovation. With investment in digital transformation, these are two important key elements for firms in terms of retaining their competitive advantage (Alavi *et al.*, 2014).

Finally, investment in digital transformation requires infrastructural investment. Although research on this aspect is very limited, there are some authors who actually acknowledge the importance of infrastructural investment. In line with this argument, Kohli and Johnson (2011) suggest that digitisation requires firms to convert the physical products into digital ones. Operations and processes are inserted in data systems, which help in delivering the product and/or service to the client (Hansen and Sia, 2015).

If businesses adapt to these changes in an effective way, the implementation of digital transformation is known to lead to value creation, operational efficiency, competitive advantage, improved relations and enhanced consumer engagement (Keidanren, 2018; Morakanyane, Grace, & O'Reilly, 2017).

With digital transformation, problem solving is based on the creation of tailor-made, rather than standardised, goods and services. This implies that value creation is enhanced by meeting the ever-increasing and diversified individual needs of society (Keidanren, 2018). This is especially important for small states whereby traditional economic systems and inherent vulnerabilities have inhibited the creation of value. Digital transformation can change this. For example, through blockchain, the individual becomes centric and allows

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individuals and societies to tap into new sources of value and problem-solving tools. Through digital transformation underpinned by DLT, individual needs and wants are better catered for through personalised financial and government goods and services, such as tailor-made mortgages with a specific time frame that is adequate for the personal life and plans of the specific individual (Swan, 2017).

Operational efficiency (i.e. the ratio between output and input) is another implication of digital transformation. For example, investment in blockchain is likely to lead to operational efficiency as it removes performance bottlenecks that are usually present when intermediaries are involved (Zheng *et al.*, 2018).

Another important implication of digital transformation is the enhanced competitive advantage it provides to the entities who invest in it. Research has shown that technological advancement is likely to give a competitive edge to firms (Koch and Windsperger, 2017; Powell and Dent-Micallef, 1997; Sabbagh *et al.*, 2013).

Digital transformation is likely to improve relations among diverse individuals with diverse abilities, values, nationalities. For example, blockchain is an enabler through its trust-building characteristics and by its decentralisation and distribution of trust among network participants. Through blockchain, diverse individuals, entities and societies are able to work more closely together (Sun *et al.*, 2016). A trust-enhancing transformation can support integration and also support entrenching democratic institutions and reducing the risks of corruption and nepotism.

Digital transformation is also likely to provide an enhanced consumer experience. Through investment in digital transformation, people have more equal access to opportunities at any point in time, irrespective of the country they live in (Keidanren, 2018). For example, blockchain, being public and user-controlled, allows all users to provide 'an auditable trail for moving things and value' (McPhee and Ljutic, 2017).

Summing up, literature consistently suggests that digital transformation has a positive impact

on various sectors of the private and public sectors. This positive impact is likely to enhance economic growth while making economies increasingly resilient and sustainable.

The decentralised social infrastructure enabled by digital transformation is expected to enhance resilience, defined as the ability to recover. By building resilience, countries would be able to recover more easily from adversities such as terrorism, cyber-attacks and so on (Keidanren, 2018). This is especially important for small states who need resilience-building strategies to minimise the impact of inherent vulnerabilities. Digital transformation enabled by DLT can support resilience building across a number of areas including but not limited to enhanced governance, and environmental, economic and disaster risk reduction (Fabri and Fabri, 2019a).

#### **Sustainability and environmental harmony**

Digital transformation can support countries, especially small states in achieving sustainability. Blockchain and integration of other technologies such as IoT and AI can support countries deal with climate change but also find innovative ways to unlock national resources. Decentralised renewable energy production and trading of energy over the blockchain can also bring about benefits to small states. (Castellanos *et al.*, 2017; Imbault *et al.*, 2017).

In line with these benefits associated with investment in blockchain technology, governments have a responsibility to drive digital transformations enabled by blockchain. We believe that governments and the public sector play a critical role; in fact, there are a number of governments that are already doing this. The next sections will present a data-based analysis of the current situation, and opportunities and finally recommendations for small states in this regard.

After reviewing the main enablers and implications of digital transformation, this study will provide a case study example based on DLT, specifically the application of blockchain technology in the public sector. The focus on blockchain is based on the fact that this

technology is considered to be the most recent component associated with digital transformation that is revolutionising how different industries, societies and governments operate. Given its relatively recent emergence, the implications of this specific technology are still unclear. This is due to the limited research and lack of empirical evidence currently available, particularly within the public sector context (Alexopoulos *et al.*, 2018; Fan *et al.*, 2018). However, blockchain technology is seen to be a key enabler in digital transformation and can lead to a number of benefits as can be seen in the next section.

### 3. Blockchain use in governments

Digital transformations are already under way in a number of countries and blockchain enabled projects are gaining ground across the globe as can be seen from Figure 1.

As can be seen, countries across the world, differing in size and stage of development, are implementing blockchain-enabled projects. Small states are no exception either, and this can truly support the idea of a Commonwealth of blockchain islands as mooted by Fabri and Fabri (2019b). Such an initiative will allow a transfer of knowledge and best-practice approach for other small states and other Commonwealth countries, as they seem to be losing out from the blockchain transformation. This joint collaboration will allow leveraging of the technology and its applications, allowing greater standardisation and synergies. The scope of projects also varies, with government services being a preferred choice (Figure 2), thus supporting the idea of a technology-driven governance improvement and resilience-building opportunity.

In terms of specifics, given that DLT is about transforming ledgers of records, applications that centre around information databases or registries are the most apt for blockchain transformation. This is shown in Table 1 where registry-type and database-type projects are currently undergoing blockchain-based projects. However, it is important to note that work on digital currency and financial services is also underway and this can open avenues for

small island states, especially the prospects of digital currencies or trade coins, which have the potential of improving terms of trade and reducing exposure to currency volatility.

The above data confirm that digital transformations are a reality. The blockchain-based approach is gaining ground across a varied group of countries and we can see that governments are pioneering such transformations. As seen in Table 1, government services can be revolutionised by blockchain and below are some of the key areas which can be truly transformed.

#### Identity and records

Blockchains could be used to establish digital identities for citizens, residents, businesses and other government affiliates and include birth certificates, marriage licenses, passport and visa information; death records could also be managed via blockchains (ACT-IAC, 2017). The Maltese Government has started a process to issue educational and skill records on the blockchain.

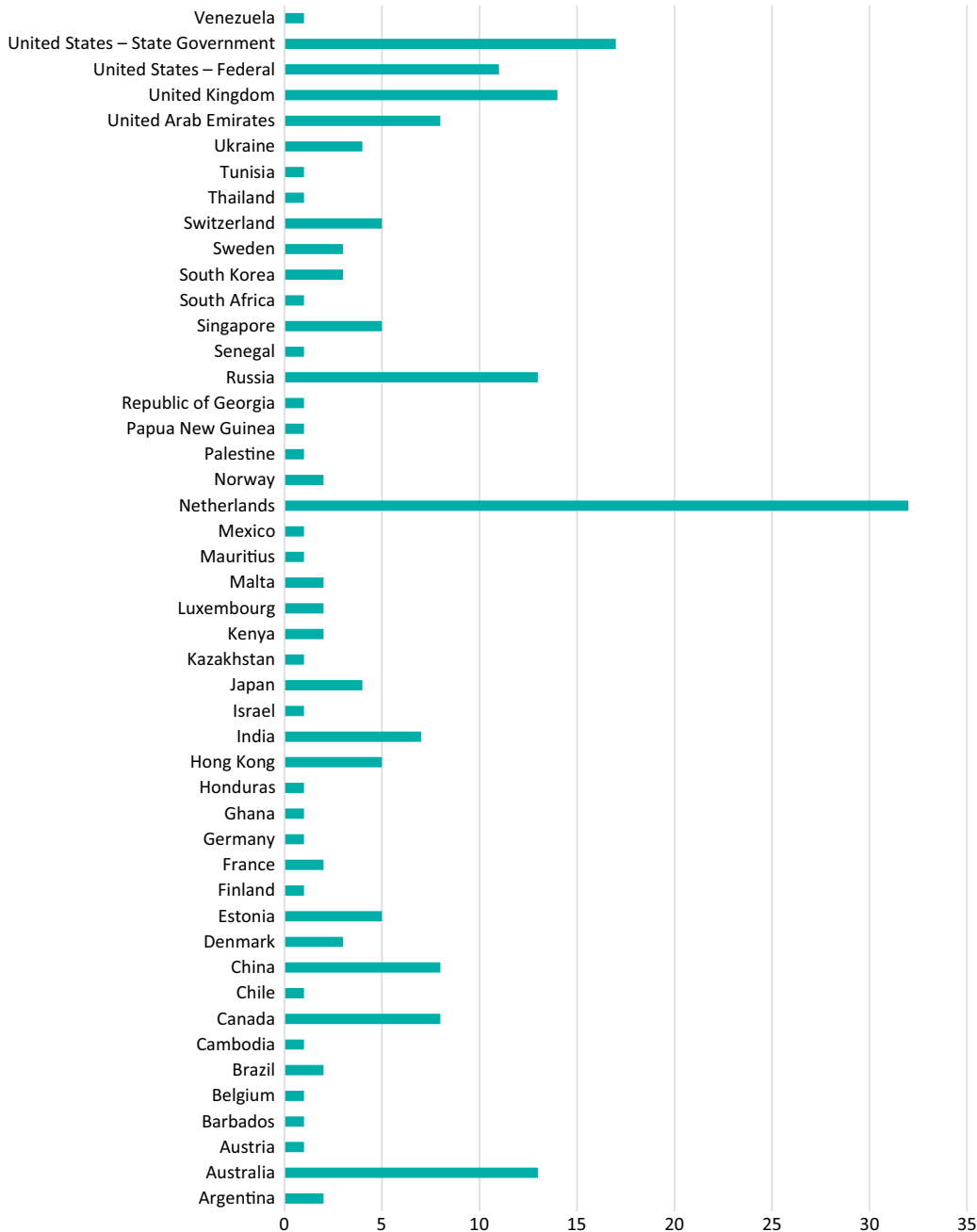
#### Financial services and banking

Blockchain technology can be used by governments to ease the overheads and burden associated with transferring funds among parties (e.g. facilitating interbank and international payments). In addition, some countries' central banks are experimenting with their own digital currencies built upon blockchain platforms. The Eastern Caribbean Central Bank (ECCB) is working on a blockchain-issued Central Bank Digital Currency (CBDC) pilot within the Eastern Caribbean Currency Union (ECCU).

#### Land title registry

Land title registry is a natural fit for blockchain technology. Land titles and other records related to ownership could be chronologically recorded on a blockchain ledger, along with any details relevant to a sale of property. As blockchain transactions are immutable, a full historical record of a property or other asset could be reviewed through previous records in a blockchain. This could minimise the need

Figure 1. Blockchain-Enabled projects undertaken by governments



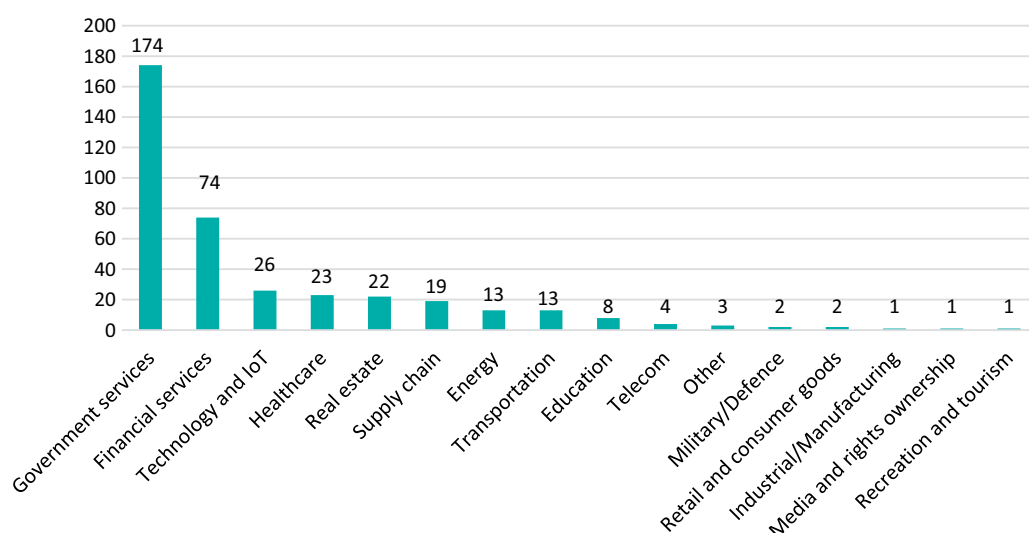
Source: <https://sites.google.com/view/blockchain-govt-tracker>

for expensive and time-consuming third-party involvement for transactions (ACT-IAC, 2017). In view of this, the Malta Business Registry and also the Lands Registry have started preparations to start migrating and transforming their respective registries on to the blockchain.

#### Benefits, entitlements and aid

The benefits, entitlements and aid processes of today often involve a significant amount of overhead and checks for compliance. Government programmes such as social security and pension payments, medical care benefits, and domestic



**Figure 2. Blockchain-based services by sector**

Source: <https://sites.google.com/view/blockchain-govt-tracker>

and international aid could benefit tremendously from blockchains. For example, smart contracts could be used to automate processes for eligibility verification and disbursement of funds, such as distribution of funds for those affected by a major natural disaster.

#### Voting

Blockchain technologies have the potential to enable new methods of voting by transforming what is often a paper-based process in many countries, or an electronic process with limited validation and auditability capacities. These challenges, if not overcome, may result in a lack of trust in democratic processes and can enable election results that do not reflect the wishes of the public (Foroglou and Tsilidou, 2015).

Small islands present some unique challenges in this regard, especially those linked to scale and resources. Therefore, a central and independent organisation like the Commonwealth Secretariat can play a pivotal role in supporting blockchain technology adoption by small island states. There can be collaboration between small island states which are in the process of adopting blockchain as Malta has done. This can serve as a launchpad for a broader adoption by other small states.

***“Countries across the world are implementing blockchain-enabled projects.”***

#### 4. Malta: the blockchain island

The small island of Malta has in a short while built a reputation of ‘the blockchain island’. The country continues to be a pioneer when it comes to regulating new sectors. When Malta gained independence in 1964, the government of the time realised that the only way to create a self-sustaining economy that generates wealth for its people is through its legislative power. In fact, over the years, Malta has developed a number of economic sectors that are based on jurisdictional and legislative innovation. Blockchain is a case in point. Following the launch of a national vision on blockchain and distributed ledger technologies, the government identified key areas of focus, which include the transformation of public services, the educational infrastructure and the legislation and regulation of a framework for



**Table 1. Types of blockchain-based projects**

Project type	Count
Strategy/research	42
Identity (credentials/licenses/ attestations)	25
Personal records (health, financial, etc.)	25
Economic development	23
Financial services/market infrastructure	20
Digital currency (central bank issued)	19
Land title registry	19
Benefits/entitlements	13
Compliance/reporting	12
Research/standards	12
Supply chain management/trade	9
New products/services	7
Voting/elections	7
Asset registry	6
Data marketplace/data monetization	6
Payments/financial infrastructure	6
Public records	6
Public transportation	6
Public utilities	5
Purchasing/procurement/ contracting	5
General infrastructure	4
Government finance	4
Regulatory	4
Tax collection/credits	4
Cybersecurity (critical infrastructure)	3
Law/legal enforcement/courts	3
Business formation/licensing	2
Digital token	2
Law enforcement	2
Military/defence infrastructure	2
Supply chain/manufacturing	2
Internet of Things	1
Loyalty rewards	1

Source: <https://sites.google.com/view/blockchain-govt-tracker>

crypto assets. Currently a number of initiatives are underway in the public sector, which are testaments to the DLT-enabled transformation. These includes the digitisation and eventual placement on the blockchain of the land registry, the publication of educational certificates on the blockchain and also the transfer of the business register to the blockchain. This is in line with the government's vision and strategy to establish an economic cluster anchored around DLT. Successive Maltese governments have invested heavily in a digital transformation process of the public service and it has a broad e-government service offering and infrastructure. The advent of DLT saw Malta's legislators realise the potential the technology has for financial services. In fact, Malta was the first country to legislate a holistic framework to regulate crypto-assets. Today, Malta offers a regulated environment for the issuance of Initial Coin Offerings, crypto-exchanges and custodians, among others. Malta has managed to attract some of the global leaders in the space, thus facilitating the creation of an ecosystem. In line with this, Malta is also working on other financial services innovations that will allow it to become a FinTech hub. There are also some tangible projects that have since commenced and which are giving further momentum to the blockchain transformation of the Maltese government and public sector.

In the education sector, Malta is employing the Massachusetts Institute of Technology (MIT) developed technology Blockcerts. In January 2017 the Maltese Ministry for Education and Employment signed a contract with Learning Machine (LM), MIT Media Lab's partner, to implement a pilot project for learner- and worker-owned records. LM's vision matches the Groningen Declaration of 2017, whose mission is to promote the portability of global citizens skills across borders by sharing authentic educational credentials with whomever they want, whenever they want, wherever they are. This is reflected in the Malta project. LM together with the Malta College for Arts Science and Technology (MCAST) plans to design digital diploma templates that can be independently verified

as authentic. They will also develop training certificate templates with the local Institute for Tourism Studies. Another innovation at Malta is the workplace equivalency certificate that would give workers official recognition for demonstrated skills even if they do not possess university credentials.

The Malta Business Registry has also unveiled plans to migrate Malta's company register and all related forms to the blockchain. This, the government believes, will not only enhance trust in the registry but more importantly will allow changes to be authenticated automatically, thus improving the client experience. This transformation is also being mirrored with the lands registry where it is believed that efficiencies will be brought about by the new system.

These developments, together with the government's vision, will allow the island to benefit from synergies between correlated sectors and it is specifically for this reason that it has become known as 'the blockchain island.'

## 5. Conclusions and recommendations

Small countries remain inherently vulnerable and exposed to external shocks, yet most have not managed to build up their resilience.

The opportunity for blockchain-enabled innovation to benefit humankind, economies and our environment is substantial. Digital transformation enabled by a DLT-anchored public sector reform can lead to tremendous benefits for small states in the governance, public sector, economic and also environmental domains.

Harnessing blockchain technologies to drive sustainable and resilient growth and a new wave of value creation will require decisive action. The opportunities that blockchain offers need to be developed and governed wisely. Our recommendation is that the Commonwealth Secretariat should take global leadership in harnessing blockchain between its member states. It should be a thought-leader in the use of DLT-enabled technologies to bring about concrete and tangible improvements to countries and their citizens. Blockchain and digital transformations should become a

cornerstone for the Secretariat with a focus on developing strategies and visions and also on implementing solutions in member states.

Given the vulnerabilities and the need for resilience in this area, we believe that The Secretariat should strive for the creation of a commonwealth of blockchain islands to use blockchain technology as an enabler for resilience.

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