SOVEREIGNTY IN THE AGE OF BLOCKCHAIN: A COMPLEX RELATIONSHIP

BY

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ABSTRACT

In the twentieth century, technology emerged as a powerful tool that allows governments to leverage to improve services, management, and systems that satisfy public needs. However, certain technologies have become so potent that they may render government services obsolete in decades. Among these disruptive technologies is blockchain, with its decentralized and consensus mechanisms offering alluring ways for states to handle information and improve systems; it has the potential to disrupt the traditional large-scale mechanisms that governments and organizations have been using. Thus, the question arises: how will these technologies play a role in the context of the balance of power? The emergence of blockchain technology has challenged conventional systems of governance and raised questions about the relationship between government and civil society, and their national interests. Some possible cases that rely on blockchain can be found in the area of international trade. However, given the potential benefits of blockchain in terms of transparency, security, and automation, it is likely that this technology will be further included in both public and private sectors.

Keywords: bitcoin, blockchain, centralized, governance, decentralization, politics, integration, disparity, digital divide, inequality. services, adoption, development.

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LIST OF ABBREVIATIONS

Symbols/Abbreviations	Terms
BTC	Bitcoin
BNB	Binance Coin
BRI	Belt and Road Initiative
BRIBA	Belt Road Initiative Blockchain Alliances
BSN	China's Blockchain Service Network
CAICT	China Academy of Information and Communications Technology
CBDC	Central Bank Digital Currencies
CCP	Chinese Communist Party
DDoS	Distributed Denial of Services
DeFi	Decentralized Finance
DLT	Distributed Ledger Technology
EU	European Union
ETH	Ethereum
GDP	Gross domestic products
GPU	Graphics Processing Unit
ICOs	Initial Coin Offering
ITAS	Innovative Technology Arrangements and Services Act
MD5	Message digest method
MDIA	Malta Digital Innovation Authority Act
MFSA	Malta Financial Services Authority
NATO	The North Atlantic Treaty Organization Alliances
NIST	National Institute of Standards and Technology

NFT	Non-fungible token
PBOC	People’s Bank of China
PoS	Proof-of-Stake
PoW	Proof-of-Work
PwC	PrincewaterhouseCoopers
SHA	Secure hash algorithm
SSD	Solid-State Drive
SMEs	small and medium-sized enterprises
VFA	Virtual Financial Assets Act
U.S.	United States
USSR	Union of Soviet Socialist Republics

CHAPTER 1
INTRODUCTION

"It will be one of the major forces for reducing the role of government."
Milton Friedman

1.1 General Statement

1.1.1 A possible shift in paradigm and the trust factor

"The one thing that's missing, but that will soon be developed, is a reliable e-cash, a method whereby on the Internet you can transfer funds from A to B, without A knowing B or B knowing A" (Raskin, & Yermack, 2016). As mentioned in Blockchain. News and CoinDesk.com, Milton Friedman expressed and predicted this idea at the National Taxpayers Union Foundation in 1999. The upcoming technology he firmly mentioned will justify his strong view against collectivism, a term he used for governments that became too powerful. Unfortunately, contemporary authoritarian regimes are now facing a new threat, namely, the nature of blockchain's decentralization and transparency. Before the birth of the blockchain technology, Friedman was intrigued by the power of the internet and he even predicted that it would be a major force for reducing the role of government. He believed that the internet would make it easier for people to communicate and exchange information, and that this would lead to greater decentralization and less dependence on centralized institutions.

A few years later, in 2008, the idea of the American dream, with its emphasis on homeownership, prompted individuals to make substantial house purchases without careful consideration of their creditworthiness. This phenomenon led to the 2008 financial meltdown, which took a heavy toll on the U.S. housing market, the bubble burst, and the subprime mortgage crisis. The absence of sufficient control and regulation led to the financial breakdown, resulting in banks easily granting loans during that time. Consequently, the 2008 collapse of the US housing market was one of the cataclysmic events that shook the foundations of the global financial system. The reverberations of the crisis were felt far and wide not only in the US economy but also

in other countries' economic stability, touching the lives of millions of people and leading to widespread economic hardship. The impact of the crisis was so profound and enduring that it fundamentally altered the perception of the financial sector and redefined the roles of both the public and private sectors in society; exposing significant flaws in the financial instruments that was designed to enhance stability, like collateralized debt obligations and credit default swaps. Ultimately, it shattered public confidence in the financial sector, raising questions about its true purpose: whether it existed to serve society as a whole, or merely to enrich a privileged few at the expense of others. Furthermore, the crisis was associated with a general deceleration in global economic growth. These outcomes, taken together, underscore the magnitude of the crisis and the need for a comprehensive response from policymakers and regulators alike. Despite this, governments around the world did took decisive actions to prevent a full-blown economic depression and laid the groundwork for a better system for stability.

Bitcoin was introduced back in 2008-2009. While the financial tsunami hit the world, the creation of Bitcoin marked a significant milestone in the development of digital currencies and blockchain technology. Bitcoin was created by an unknown individual or perhaps, a group of individuals using the pseudonym Satoshi Nakamoto (Nakamoto, 2008). Its emergence coincided with a period of global economic uncertainty following the 2008 financial crisis. For some Bitcoin advocates, Bitcoin was born out of the distrust of the state and political institution. This original cryptocurrency was fundamentally driven by the desire of the anonymous global citizens to rule themselves based on community consensus rather than central authority (Gikay & Stanescu, 2019). As traditional financial institutions struggled to maintain stability and public confidence, BTC seems to offer a decentralized and transparent alternative to traditional banking systems. It operates on a blockchain-based, decentralized system, and “distributed ledger technology” (DLT) where miners are required to verify, thus, recording transactions without relying on a central authority or intermediary. It is essentially a peer-to-peer network where people validate the transactions and the network in exchange for the BTC using super computers and specific GPU and SSD hardware.

As of this moment, Bitcoin and many other cryptocurrencies can be used for exchanging goods, services, and trade. It has revolutionized the way transactions have been conducted by transferring authority and trust to a decentralized virtual network. In short, this technology enables the recording of transactions on a public “block” that creates a unique “chain,” thereby creating a blockchain to keep records and transaction on the particular chain (Marbouh et al., 2020). Unlike traditional systems that rely on human interaction or third parties, the blockchain technology removes the intermediary and replaces it with cryptography, a technique for safeguarding information and communication by employing codes, ensuring that only authorized recipients can decipher and retrieve the content (Bashir, 2017). Consequently, governments, banks, financial institutions, and many organizations are now able to complete various procedures without the need for intermediaries, making the technology a possible game-changer in the world of finance and other areas. (Mougayar, 2016).

During the financial crisis in 2008, it became evident that governments possess the capability to exert influence over the market through monetary policies, which include measures such as adjusting interest rates, managing money supplies, and controlling currency exchange rates. However, because of the emergence of the blockchain technology, states need to consider alternatives regarding the the use of the technology. On top of that, privacy is also a concern regarding the public's data. Of course, blockchain can introduce more privacy to the data of one's entity, whether it is a company, government, or individual. Furthermore, decentralization, data control, anonymity, and self-sovereign identity are some of the results of the blockchain technology that the world must cautiously deal with.

The potential challenge to the concept of sovereignty arises from the nature of the blockchain technology to disrupt traditional centralized systems, particularly in relation to the national control of financial flows. While blockchain has the potential to undermine the control mechanisms of nation-states, it does not inherently defy the sovereign principle. For this reason, it is a complex relationship since blockchain technology can both confer advantages and entail grave repercussions.

1.2 Literature Review

1.2.1 State interest and governance

Melanie Swan defines blockchain as follows: “We should think about the blockchain as another class of thing like the Internet—a comprehensive information technology with tiered technical levels and multiple classes of applications for any form of asset registry, inventory, and exchange, including every area of finance, economics, and money; hard assets (physical property, homes, cars); and intangible assets (votes, ideas, reputation, intention, health data, information, etc.); But the blockchain concept is even more than that. It is a new organizing paradigm for valuation, and transfer of all quanta (discrete units) of anything, and potentially for the coordination of all human activity at a much larger scale than has been possible before” (Swan, 2015). This new paradigm operates by removing intermediaries on a large scale, using automated and trustless transactions that are without precedent.

Henry H. Perritt Jr. argues that the internet has the potential to strengthen national and global governance while posing a threat to sovereignty. Similarly, blockchain technology holds the potential to yield comparable outcomes. Just like the prevailing perception of blockchain technology today, the previous conventional wisdom surrounding the internet suggested that it was seen as an additional force challenging sovereignty, surpassing the impact of globalization (Perritt, H., 1998). He further argues in support of a liberal tradition that the internet can contribute to international cooperation by strengthening international law, bolstering economic interdependence, empowering non-governmental organizations, and enhancing their abilities to contribute productively to the development of international regimes designed to address global problems (Perritt, H., 1998). Additionally, it supports international security mechanisms.

Again, this process gradually reduces the need for traditional intermediaries and is made possible through blockchain technology. However, the impact of the blockchain technology calls for the involvement of the nation-states. Traditionally, state is the primary actor in international relations and is actor that determines patterns, rules, and norms. Although the new perception to that current paradigm or discourse is that blockchain technology emphasizes the role of other non-

state actors and decentralizes institutional power; suggesting that it goes beyond the control of any state or a system created by states.

It is argued that the decentralized nature of the blockchain technology challenges the traditional role of centralized intermediaries, such as governments and financial institutions, in establishing trust and enforcing regulations (Atzori, 2015). This transition challenges the ability for governments to maintain regulatory control, ensure compliance with financial laws and taxation, and protect consumers within blockchain-based financial systems. For instance, the financial system is typically governed and controlled by the nation state. However, the growth of blockchain within the financial sector would reduce traditional regulatory frameworks which may pose a challenge since the states oversees the system. For instance, Bitcoin has gained popularity because it can operate outside the control of any central banks or governments.

This aspect raises concerns about how governments can effectively regulate these currencies and address future potential issues like money laundering and fraud. As such, sovereignty, in its simplest concept, refers to the state's ability to govern itself and make decisions without external interference. This includes the ability to control its own borders, defend its territory, maintain its own political and legal systems, and protect its citizens.

In the field of international relations, however, when combined with states' interests and actions, the concept can become complex, extending far beyond states and economic power. Traditional power structures and phenomenons have historically played a significant role in defining sovereignty, the emergence of disruptive technologies such as the internet and blockchain is both shaping traditional power structures and potentially altering the balance of power between states and other actors. Therefore, the concept of sovereignty may need to evolve and adapt to these variables in order to remain relevant in the modern world.

1.2.2 Argument

Therefore, states are conscious of their authority and strive to maximize their power to ensure security. This authority extends to the formulation and implementation of policies, laws, and regulations aimed at guaranteeing the well-being

and safety of their citizens, maintaining public order, fostering economic development, and addressing social issues, and, similarly to the past, as states possess the capability to regulate international trade structures to serve their national objectives, they will also exert control over emerging technologies. As mentioned, the structure of international trade matters for sovereign states because it have significant implications for their economic, political, and social sovereignty. As Stephen Krasner pointed out that the international trade structure and state-power theory is a significant conceptualization which are one of the ways that allows us to understand the complex actions of nation-states. For example, international trade can provide access to markets and resources that may not be available domestically. However, it can also create dependencies on other countries and expose domestic industries to competition from abroad. The structure of international trade, therefore, can impact a state's ability to regulate its own economy and protect its domestic industries, which can be seen as a key aspect of economic sovereignty (Krasner, 1976).

Both the Internet and blockchain technology have the potential to disrupt power struggles, compete for control over information and resources, and address security implications in their respective domains. The states can use or make the most of these technologies to advance their national interests, gain advantages, or maintain dominance in the global arena. However, at the same time, it also highlights concerns about international cooperation, economic interdependence, the strengthening of international law, and the role of non-governmental actors in addressing global challenges. Therefore, these mixing effects of blockchain could be analysed through the neorealist theory, which suggests that, while states are primarily driven by self-interested sense of survival and power considerations, the international structure can shape their behaviors In the context of analyzing the impact of blockchain technology on international relations, a neorealist perspective makes sense because it can focus on how these technologies interact with the existing power structure, influence state behaviours, and interact with international institutions and norms. Therefore, it would help explain how blockchain technology disruptions are allowed because nation-states permitted them to happen even though their nature conflicts with nation-state systems.

1.3 Research Questions

- How do the states adopt and make use of the blockchain technology?
- What is the importance of the blockchain technology in the world of emerging technologies?
- What are the benefits and consequences of adopting blockchain technology

1.4 Theoretical Framework

1.4.1 A neorealist perspective on blockchain

In the context of neorealism, the actions of states, including their decisions to allow or permit the use and development of blockchain technology can indeed be influenced by their pursuit of power and their desire to maximize their power position. Neorealism argues that states are primarily driven by self-interest and power considerations in international relations. When it comes to emerging technologies like blockchain and digital currencies, states may choose to allow their development or adopt regulations that permit their use for various reasons, one of them includes power maximization. States may perceive these technologies as potential tools to enhance their economic, technological, or strategic power. By embracing blockchain and digital currencies, states may aim to gain advantages such as economic influence, improved financial systems, increased control over transactions, or the ability to navigate global economic trends. However, as mentioned earlier, state actions are nothing but complex, therefore, power considerations can play a main part, while other factors can also influence states' decisions regarding blockchain and digital currencies. These factors may include economic interests, the potential for innovation and growth, international cooperation, public sentiment, and the influence of global norms and institutions. So, even though power considerations are a crucial aspect of neorealism, the decision of states to allow or permit the development of blockchain and digital currencies may be influenced by not only power maximization but also a combination of economic factors, technological advancements, and other considerations specific to each state's context and interests.

1.4.2 The state power theory

Based on the state-power theory by Stephen Krasner, he explains more further into the structure of international trade that is determined by the interests and power of states to maximize national goals (Krasner, 1976). Accordingly, states are fundamentally interested in four factors — aggregate national income, social stability, political power, and economic growth (Krasner, 1976). A state's interests generally refer back to these goals and objectives. Moreover, the state's openness is influenced by its potential economic power which also relates to the size and level of economic development. The connection between interests and openness varies, depending on a state's economic potential, which is determined by its size and level of economic development. In other words, the larger and more economically developed a state is, the more potential economic power it has, and this affects its interests and level of openness. Therefore, applying this theory with blockchain technology as a variable will also explain why the use of blockchain is more prevalent in certain countries than in others. This will also help elaborate the similarities and differences between traditional structures and the new structures that incorporate blockchain as a new tool. According to Krasner, neoclassical trade theory is based upon the assumption that states act to maximize their aggregate economic utility (Krasner, 1976). Traditional trading structures have been the backbone of international trade for centuries, which indicates that countries are assumed to pursue policies that enhance their economic well-being in a centralized manner, handling information, and ensuring trust between parties. These mechanisms have historically appeared on various occasions historically and contemporarily on intermediaries such as banks and brokers which play a critical role in ensuring the smooth flow of goods and services across borders.

1.4.3 Aggregate national income

Regarding the aggregate national income, Krasner suggest that the greater the degree of openness in the international trading system, the greater the level of aggregate economic income (Krasner, 1976). However, when it is particularly about aggregate national income, smaller states and SMEs depend on trade in order to grow economically due to limited resources. For example, in the World Economic Forum 2022, it is reported that small and medium-sized enterprises (SMEs) play a crucial role

in the global economy, accounting for approximately 90% of businesses and 50% of jobs worldwide. In emerging economies, the SMEs contribute up to 40% of national income and generate 70% of employment in the formal sector (World Economic Forum, 2022). Their significance in driving economic growth is important, given that the World Bank projects the need to create 600 million jobs by 2030 to accommodate the expanding global workforce. Singapore and South Korea are the two prime examples on this matter. The advent of blockchain technology has provided the SMEs in developing economies with an opportunity to expand their market reach and contribute to domestic economic growth. The foundations of blockchain technology and the surge of fintech companies has made possible for smalls businesses to the solution of cross border payments.

1.4.4 Political power

As Stephen Krasner has expressed in his paper the intricate relationship between political power and trading structures has been the subject of intense scrutiny in the field of international political economy. Despite the involvement of blockchain technology, the consequences of trade for goods and services are inextricably tied to the influence of political power on the trading landscape. These examples will reveal the costs associated with such actions and the broader implications for political power within the landscape.

A case in point is the China-US trade dispute that began in July 2018 under Donald Trump's presidency. The US accused China of engaging in unfair trade practices, and both countries retaliated by imposing a back-and-forth escalation of tariffs on goods. This trade dispute serves as a stark reminder of the political power dynamics at play within the trading structure. Both countries have political goals and national interests for their actions, including protecting domestic industries and promoting national security interests. However, the consequences of this trade dispute have resulted in significant economic costs for both nations, including declines in trade and increased costs for businesses and consumers. As two major global powers, the impact of this dispute has had far-reaching implications for developing countries, underscoring the interconnectedness of trading structures and the potential for political decisions to have significant economic and political consequences. Furthermore, the

countries that maintain strong economic partnerships with both the US and China such as Australia, Germany, Canada, South Korea, and etc.; will face considerable pressure on their economic ties. In addition, Australia, Germany, Mexico, South Korea, and Canada are among the countries that have been impacted by the ongoing US-China trade dispute.

These examples highlight the far-reaching impacts of the US-China trade dispute, demonstrating the importance of understanding the relationship between political power and trading structures, and the potential benefits of utilizing blockchain technology to create decentralized and transparent systems. However, blockchain technology may be able to prevent the negative consequences in the traditional trading structure. An example of this would be "Petro," a cryptocurrency created by the Venezuelan government to bypass US economic sanctions; backed by the country's oil reserves to circumvent the sanctions and access international financing. By using blockchain technology, the Venezuelan government was able to create a decentralized and transparent system for the Petro that was not subject to the same political pressures as traditional financial systems (Wroughton & Gupta, 2018). This creates more pathways and opportunities for efficiency. But while blockchain technology has been proposed as a potential solution to trade-related issues, it has not been widely adopted by governments or businesses for this purpose. Instead, most countries affected by the trade dispute have been focused on negotiating trade agreements with other countries to mitigate the impact of the dispute on their economies.

1.5 Research Contributions

This research attempts to contribute to the ongoing discussion on the development and deployment of blockchain technology which is an important issue for states. Emerging technologies in the twentieth century such as blockchain and artificial intelligence have posed challenges to the state outreach and control.

1.6 Research Methodology

This independent study adopts a research methodology of qualitatively assessing some of the most important determinants of Blockchain's impact on states and the ethical considerations surrounding the use of blockchain and its impact on society. In this study sovereignty of states is a complex concept, however, attempting to explain national interests can be included in the spheres of international trade and state-power theory. Most importantly, the study applies the neorealist perspective to analyse the new disruptive technologies such as blockchain. Since new technologies can have significant implications for power dynamics between states and other actors in the international system, the neorealist view is highly relevant and crucial to understand how the states react to the rising of the blockchain technology. Furthermore, a key theoretical assumption of this research is to employ these notions in analyzing the impact of blockchain. By examining how blockchain can affect power dynamics between states, this study can provide insights into how this new technology could shape international relations and influence national interests.

The strategy is to compare how different countries handle issues related to government authority and society, especially in areas such as finance, security, and privacy. The case studies include three countries such as Malta, Estonia, and China. In each case, I explore the role of key stakeholders, such as government agencies and industry organizations, in shaping the adoption and use of blockchain technology in each of the selected countries. Each case aims to investigate the challenges and obstacles that each government has been encountered when their leaders adopted the blockchain technology. In the concluding part, this study aims to outline policy recommendations and best practices for the adoption of the blockchain technology.

CHAPTER 2
BACKGROUND AND MECHANISMS

2.1 What Is Blockchain?

It was first revealed by Satoshi Nakamoto in his paper 'Bitcoin: A Peer-to-Peer Electronic Cash System,' which laid out the mathematical foundation for the Bitcoin cryptocurrency (Nakamoto, 2008).

> A purely peer-to-peer version of electronic cash would allow online payments to be sent directly from one party to another without going through a financial institution. Digital signatures provide part of the solution, but the main benefits are lost if a trusted third party is still required to prevent double-spending. We propose a solution to the double-spending problem using a peer-to-peer network. The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work. (Nakamoto, 2008)

And as Nakamoto stated in his paper, The reliance on financial institutions as trusted intermediaries for processing electronic payments has become the norm in online commerce. Although this system is generally effective for the majority of transactions, it is still susceptible to the inherent vulnerabilities of a trust-based model. It is challenging to achieve completely irreversible transactions because financial institutions must intervene in resolving disputes (Nakamoto, 2008).

Interestingly, blockchain is often compared to the Internet in its early days, for instance, e-mail was invented in 1971, but it took almost two decades for people to start using e-mail on a wide scale. From a realist perspective, of course, the technological development of the Internet seems to be a threatening issue (Perritt, 1998). Regardless, the Internet can have very positive results on shaping public opinion or regulating the economy.

What’s more interesting is the Internet as an information technology presents unique challenges to the concept of sovereignty; he argues that the Internet's

characteristics make it potentially more dangerous to the authority and control of governments than previous revolutions in print and electronic communications. Unlike technologies such as telegraphy, telephone, radio, and television, which were subject to certain physical and regulatory limitations, the Internet operates in a decentralized manner (Perritt, 1998). It is not bound by geographical boundaries or traditional forms of control imposed by governments or regulatory bodies. One of the prominent issues in the modern-day of the Internet is misinformation and disinformation; it can spread rapidly on popular online platforms like Twitter, Facebook, Instagram, Reddit, and even dating apps like Tinder. This rapid spread contributes to the propagation of false or misleading information, impacting the accuracy of online content, making cyberspace more vulnerable. Not to mention the increasing of cyber-attacks and hacking which provides opportunities for cyber criminals and state-sponsored hackers to launch attacks on governments; For instance, cyber-attacks targeted on Estonia in 2007; of course, these attacks bypass traditional physical and regulatory controls, making it challenging for governments to defend against them effectively. While the Internet offers interconnectivity, it also plays a significant role in online activism and mobilization. The anonymity and decentralized nature of the Internet have given rise to illicit activities on platforms like the deep web and dark web. Criminal organizations engage in illegal activities such as drug trafficking, money laundering, and cybercrime, often operating across borders and evading traditional forms of government regulation and control. Although the most basic similarity of the internet and blockchain is that blockchain transactions can occur across borders seamlessly and without the need for intermediaries, similar to how the Internet enables global communication and information exchange. Blockchain's decentralized nature allows transactions to take place without being bound by geographical boundaries, just as the Internet transcends physical borders. Moreover, blockchain technology ensures the authenticity of information, thereby eliminating the presence of disinformation and misinformation within the blockchain system.

Therefore, presumably the nature of the threat that the internet poses to sovereignty is considered under the basis of the political context rather than as a universal and unchanging concept in all situations; So, whether the internet is seen as a challenge to sovereignty or not can vary from one situation to another. Regardless, the

Internet can indeed pose a direct threat to certain conceptions of sovereignty, particularly those that rely on centralized control over people's lives (Perritt, 1998). In such cases, where governments seek maximum control, the Internet's decentralized nature and its ability to facilitate the exchange of information can challenge and disrupt such conceptions of sovereignty; However, it is also important to point out that complicating the task of national governance through the Internet does not necessarily undermine sovereignty itself. On the other hand, it does highlight the fact that the government is prevented from exerting influence over cyberspace (Lewis, 2010). Similarly, to the Internet while blockchain's decentralized nature and its ability to facilitate peer-to-peer transactions can challenge certain conceptions of sovereignty, it also does not automatically undermine sovereignty itself. In comparison, the adoption and regulation of blockchain technology can vary among governments, and the extent to which it poses a threat or challenges sovereignty depends on its implementation, regulation, and integration into existing systems. Considering the technological infrastructure of blockchain, which is governed by the principle of 'Code is Law,' this concept highlights the laws that are incorporated into a code-based format, essentially, law in digital platforms govern differently from democratic states, instead, they are govern by software and algorithms (Hassan & De Filippi, 2017). It is essentially the interplay and governance differences which further the contribution to the varying dynamics (De Filippi & Wright, 2018). To get a deeper understanding, we can examine technology through paradigms.

The evolution of technology has witnessed several paradigms, starting from the simplest — yet still complex during the time of invention — of mainframe computers to personal computers and then the transformative impact of the internet; surprisingly, mobile and social networking have become the latest dominant paradigms in the technology landscape; according to Melanie Swan, this today decade's emerging paradigm may be the "connected world of computing," which relies on blockchain technology (Swan, 2015). In this paradigm, many blockchain technology applications can enable new business models, such as decentralized finance (DeFi), supply chain management, digital identity verification, smart contracts, and more. It has the potential to reshape how transactions are conducted, how data is stored and shared, and how trust is established in various domains. Furthermore, In the past two decades, there has been

a change in how the internet is regulated. Online platforms, instead of just relying on government authorities, have taken on the responsibility of enforcing rules and ensuring compliance with laws. They act as private "police" for the internet, overseeing activities and making sure people follow the rules set by the government and private organizations (De Filippi & Wright, 2018). This shift shows that governments are becoming more involved in governing the online world. They work together with online platforms to create regulations and guidelines for how things should be done online.

Apparently, the bitcoin white paper proposes a system for facilitating electronic transactions without relying on trust (Nakamoto, 2008). A situation which is commonly seen in the digital realm is double spending, it describes the difficulty of ensuring digital money is not easily duplicated (Malanii & Fáwọlé, 2023). Double spending rarely occur in banks traditional systems since there's always a person who's privately verifying transactions. Therefore, A digital signature framework, which provides strong ownership control, is incomplete without a way to prevent double-spending thus — a type of deceit where the same money is promised to two parties but only delivered to one — To counter this, the proposed peer-to-peer network uses proof-of-work to record a public history of transactions that quickly becomes computationally impractical for an attacker to change (Nakamoto, 2008).

To grasp the uniqueness of Bitcoin, it is necessary to delve into its technical aspects. However, due to space limitations and the need for in-depth explanations, this segment only covers the necessary portion of Bitcoin's technical concepts and features which are the fundamental types of digital currencies.

Digital currencies refer to any form of currency that exists in electronic or digital form. These currencies are typically represented as digital records and are used for transactions and value exchange in online or digital environments.

Virtual currencies are a type of digital currency that exists solely in virtual or digital realms; Examples of virtual currencies include in-game currencies used in online games or virtual marketplaces within virtual worlds. Decentralized virtual currencies are a specific subset of digital currencies that operate on a decentralized network. In decentralized virtual currencies, the consensus mechanism is often based on cryptographic principles to ensure security and integrity. Bitcoin is an example of a decentralized virtual currency, as it operates on a peer-to-peer network and is not

controlled by any central authority. Cryptocurrencies are a type of decentralized virtual currency that employs cryptographic techniques to secure transactions, control the creation of new units, and verify the transfer of assets.

Cryptocurrencies often operate on blockchain or similar distributed ledger technologies, which enable transparency and decentralization. Bitcoin, Ethereum, and Binance's BNB are well-known examples of cryptocurrencies. In short, Bitcoins and blockchain utilize hash functions and that created the functions of mining and virtual wallets, Nevertheless, it does a great job in securing information from people who want to manipulate the data, although, each purpose depends on different type of hash algorithms, for instance, SHA-256 is widely used in blockchain, including Bitcoin, generating a secure 256-bit hash. MD5, while once popular, is now less secure with a 128-bit hash, mainly used for non-cryptographic tasks such as checksumming and fingerprinting. SHA-3, chosen by National Institute of Standards and Technology (NIST), offers enhanced security and performance compared to SHA-2 algorithms. Furthermore, as far as mining and virtual wallet are concerned, miners operate using different mechanisms, with the most commonly employed ones being proof-of-work, proof-of-stake, delegated-proof-of-stake, proof-of-authority, and others (Haritonova, 2022). However, taking into consideration the aforementioned information, blockchain technology is still in its infancy and needs more time to mature before we can fully realize its potential; Of course, the continuation of blockchain and the emergence of Bitcoin have given rise to the concept of cryptocurrency. Cryptocurrencies, which are created within blockchain technology, possess inherent authenticity, and cannot be duplicated. They are particularly pertaining to ownership rights and are classified as digital assets. These digital assets can be categorized into three main types: currency, as a medium for exchange; utility tokens, to access or acquire specific services or products within a blockchain network; and security tokens which represent ownership rights or equity in a particular asset or company. As a matter of fact, the design of blockchain technology is already being interacted with on a global scale. As of now there are four levels of blockchain systems, the first level is enabling decentralized consensus and drives better transaction costs, the second are smart contracts enabling more services to the user, The third level enables decentralized application, storage and computing pushing organization boundaries. The fourth which is in development is the

result of blockchain and artificial intelligence (Angelis & Da Silva, 2019), This is a new generation of blockchain applications that go beyond currency, finance, and markets-especially in areas such as government, health, science, literacy, culture, and art (Swan, 2015). Most companies in various countries are operating on the third level of the system. Not only that, it also calls for the challenges of traditional paradigms on economic and financial activities. However, what's interesting is that no matter what category it falls into, Don and Alex Tapscott identified seven design principles that must be followed when implementing blockchains (Tapscott & Tapscott, 2016). 1) Networked integrity: It is intrinsic, not extrinsic, that trust exists. The integrity of the process is encoded at every step and distributed among the team members, not vested in any individual. As long as the other party acts with integrity, participants can exchange value directly. 2) Distributed power: power is shared through the network and no single entity can shut the system down 3) Value as an incentive 4) Security: all activity is protected by confidentiality, authenticity, and non-repudiation measures embedded in the network without a single point of failure. 5) Privacy: data should be controlled by individuals, and only individuals. 6) Rights preserved: individual freedoms are respected and protected, and ownership rights are enforced. 7) Inclusion: the economy is at best when it works for everyone, that means lowering barriers, which empowers people without banking access to join the global economy and play in a more active role (Tapscott & Tapscott, 2016). In addition, both fintech companies and governments make use of various kinds of blockchain platforms. Public blockchains, in particular, are widely adopted by companies. These platforms are open and decentralized, allowing anyone to take part, verify transactions, and keep the blockchain secure. Well-known public blockchains include Bitcoin, Ethereum, Matic, Binance, and more; However, in the case of popular public blockchains, they often have development teams, foundation organizations, or core groups responsible for overseeing the network's operations and making critical decisions as seen in many cryptocurrencies and NFT projects; These entities may have varying degrees of control or influence over aspects such as network upgrades, consensus mechanisms, and overall direction. Also, the level of centralization can differ among different blockchain platforms. Some public blockchains strive for a higher degree of decentralization and community governance, while others may have a more centralized approach due to

various reasons such as scalability concerns or security considerations. Furthermore, the control exerted by central entities in public blockchains is typically different from traditional centralized systems like banks or governments. The decision-making processes often involve discussions and consensus-building among stakeholders, and the transparency of the blockchain allows for scrutiny and accountability. Private blockchain, on the other hand, are designed to cater to specific participants and are frequently adopted by organizations or consortia for internal utilization. These blockchains operate within a permissioned framework, ensuring controlled access and participation. Noteworthy instances of private blockchains include Estonia's e-Estonia Blockchain, China's Blockchain Service Network (BSN), South Korea's National Blockchain, Dubai Blockchain Platform, and similar implementations found in various countries in the global north. The other types of blockchain is more complicated since both combined the elements of public and private blockchains making it more complex. Distinctly, consortium blockchains are governed by a group of organizations rather than a single entity. These platforms offer a balance between the openness of public blockchains and the control of private blockchains. While hybrid blockchains combine elements of both public and private blockchains. They allow for certain data to be public while keeping other information private within a permissioned network.

2.2 Types of Blockchain Platforms and Countries That Are Adopting?

When considering the public use of blockchain platforms, Binance stands out as one of the most recognized and widely used platforms. Founded in 2017 by Changpeng Zhao, Binance has quickly emerged as the largest cryptocurrency exchange globally, primarily in terms of its daily trading volume. Binance offers a user-friendly and intuitive platform that enables individuals to buy, sell, and trade various cryptocurrencies. It supports a wide range of digital assets, including popular cryptocurrencies like Bitcoin, Ethereum, and many others, to less popular cryptocurrencies where the platform's extensive selection of available cryptocurrencies has contributed to its popularity among traders and investors. Another notable example would be OpenSea, recognized as the world's first and largest Web3 marketplace for non-fungible tokens (NFTs) and crypto collectibles. OpenSea gained significance and

popularity becoming one of the first leading platform for trading and discovering digital assets. OpenSea positioned itself as one of the platforms that offers a wide and diverse range of NFTs from various categories including art, gaming, virtual worlds, sports, and collectibles. Users can explore and discover a vast collection of unique and rare digital items, participate in auctions, or purchase NFTs directly from creators or other sellers, providing opportunities for artists and collectors to engage in a transparent matter.

However, non-fungible tokens occur on decentralized networks, which may pose jurisdictional challenges as governments struggle to regulate and enforce laws related to non-fungible tokens consistently. Other challenges may also occur, such as intellectual property protection. The decentralized nature of NFT platforms can pose challenges to traditional intellectual property rights frameworks, making it harder for governments to protect and enforce copyright and related rights. Not to mention issues regarding anti-money laundering, ensuring compliance with these regulations can be more challenging in the decentralized and pseudonymous environment. Especially in the year 2020, following the impact of the COVID-19 pandemic, there was a notable surge in the creation and sales of non-fungible tokens (NFTs) on platforms such as OpenSea and Rarible. The emergence and acquiring of NFTs as a means of representing digital ownership has facilitated direct peer-to-peer trading among individuals, which raises awareness to the gradual elimination of intermediaries on various aspects of our daily lives. Besides that, there has been a growing interest in Web3 as the next evolutionary phase of the internet. In the past, the internet was seen as a potential threat to national sovereignty. In 2013, support for Bitcoin was limited, with several countries, such as Bangladesh, Bolivia, Ecuador, Iceland, Kyrgyzstan, Vietnam, and China, banning financial institutions from dealing with the virtual currency. Germany, France, South Korea, and Thailand also held negative views toward Bitcoin during that time. However, since 2017, different governments worldwide have developed their blockchain ecosystems in various ways. For instance, Malta established a Digital Innovation Authority to regulate and certify blockchain platforms (Ellul et al., 2020). e-Estonia partnered with the WTO for digital health and innovation initiatives (World Health Organization, 2020); while the Korean government adopted blockchain for identity management, aiming to provide blockchain-powered digital IDs to Koreans by

2024 (*South Korea's Digital*, 2022). Caribbean countries embraced blockchain technology for their tourism industry. Singapore explored blockchain as a means of preventing fraud in banks, using a digital ledger to record trade invoices and trigger alerts for duplicate entries (Patel, 2020). Georgia became the first country to register property on the blockchain in 2017, aiming to enhance data security and streamline the registration process (Kshetri, 2017). Swedish land registry systems have also considered incorporating blockchain to prevent fraudulent activity and enable real-time monitoring of transactions (McMurren et al., 2018). China's blockchain-based service network (BSN) is expected to expand internationally, although it operates without cryptocurrencies due to Chinese laws (Ekman, 2021). Chinese President Xi Jinping endorsed blockchain technology in 2019, recognizing its potential to reduce costs and improve process efficiency. It has become evident that there is a growing adoption and recognition of blockchain technology worldwide, highlighting its potential to transform various aspects of society and the economy.

2.3 Shaping the Future of Nations

The extension of bitcoin and blockchain opens up greater channels of expansion with regards to payment partners and banking; it also driving new possibilities and new advocates whilst challenging the traditional system of governance in which centralization and social order are the priority. The early advocates of these mechanisms "tend to have in common the same "dissociative" attitude towards centralized institutions and the State" (Atzori, 2015, p. 4). It is convincing to them that governments cannot keep up with the innovation that blockchain technology offers. The digital economy moves too quickly and requires too much flexibility for the processes of government to be (Lewis, 2010). Therefore, centralization is often operated as top-down management, voting power lies in people with higher authority, On the other hand, the voting system for decentralization is unbiased because code is the language used to operate and govern the system, which is why many bitcoin enthusiasts and blockchain advocates have already initiated projects that aim to exclude governments from the equation in the global setting. This notion of "Code Is Law" reflects their belief in the power of blockchain technology to enforce rules and regulations, reducing the

reliance on traditional governance structures. It is right to say that the advocates of bitcoin and blockchain technology are seeing governments as more inefficient and perhaps unnecessary. Therefore, in the emergence of a blockchain world, there will be less and less space for intermediaries and middlemen. The history of the global financial status involves a prolonged series of regulations and control of nation-states; Despite the economics of free trade and common markets, agreed upon bilaterally and multilaterally — there are always barriers for countries to compete in order to develop domestically and internationally, which countries that cannot compete against the other always have a disadvantage. It can be implied that blockchain technology disrupted that barrier, as more blockchain-based technologies emerge, it is beyond the nation-state's capability to reduce the manifestation of these technologies as to create policies and regulate to gain control. In a sense, blockchain technology has become an “invisible hand” of the market (De Filippi & Lavayssière, 2020). In some parts, it is not controlled by any state or individual, but it still has an effect on the economy and society. This is because blockchain-based technologies are borderless and decentralized, which means that they cannot be controlled by any country or authority yet. Hence, the question of how a state can compete with other nation-states on a level playing field becomes more important than ever before. The rise of blockchain-based technologies will require states to develop policies and regulations that will allow them to compete in the digital economy. In addition, other countries are also working on their own blockchain strategies to ensure that they don’t get left behind. States must realize that they cannot compete with blockchain-based technologies if they continue to rely on traditional techniques of governance and politics. This is because these technologies have the potential to change the way we think about states, institutions and policies. To compete, a state needs to create policies and regulations that are in line with the global trends. In fact, it is not enough just to be aware of the trends; it is also important for states to anticipate how and what will happen next in the future.

CHAPTER 3
ESTONIA

3.1 Case Study I

Considering the fact that former President Barack Obama expressed his regret for not harnessing the expertise of Estonians during the establishment of their healthcare website, underscores the nation's remarkable proficiency in the digital realm (Jackson, 2014). The exceptional digital advancements of Estonia have been branded as “the most advanced digital society” in the world by Wired (Hammersley, 2017) and recognized by Forbes as “the world's most digital country” (Greenwald, 2018). These admirations serve as a profound testament to its groundbreaking and hardworking achievements of how a country has adopted technology as part of its governance.

Estonia is a country that has been at the forefront of the adoption of blockchain technology and has taken a proactive approach to the development of this technology, particularly in the context of decentralization and transparency. The government is one of the pioneers in utilizing blockchain technology for various public sector applications. As a matter of fact, 99% of public services in Estonia are available to citizens as e-services. Officials reported that Estonia saves over 1400 years of working time and 2% of GDP annually through its digitized public services (PwC, 2019).

In order to fathom the reasons for Estonia's technological advancement, we must examine its historical trajectory. Following its restoration of independence from the USSR on August 20th, 1991, Estonia perceived itself as an economically challenged nation that required substantial modernization. This perception prompted a critical decision to prioritize the affordability and accessibility of public services, particularly in rural areas. However, the effectiveness of this decision is subject to debate given the inherent risks associated with allocating scarce resources towards the establishment of internet connections, schools, and public libraries equipped with free internet access points. Although, the approach that the government took resulted in children having become computer literate at an early age, years later, it became evident for Estonia that the focus on technological revolution yields greater benefits compared to exclusive

technology that is accessible only to a privileged segment of the population. For instance, an essential endeavor undertaken in Estonia centered around education, with a firm commitment to ensuring computer accessibility in every classroom. By the year 2000, all educational institutions in Estonia had been equipped with internet connectivity. Furthermore, the government has facilitated free computer training for 10% of the adult populace. This proactive initiative played a pivotal role in the substantial growth of the internet literacy among Estonians, with usage rates skyrocketing from 29% in 2000 to a remarkable 91% by 2016.

Another reason why Estonia is at the forefront of the digital society can be traced back to 2007 when Estonia faced affirmed state-sponsored cyber-attacks (Pihlak, 2018). These attacks targeted various Estonian organizations, including the Estonian parliament, banks, ministries, newspapers, and broadcasters. The attacks occurred during a period when the country had a disagreement with Russia concerning the relocation of the Bronze Soldier of Tallinn. Additionally, the Bronze Soldier, originally named the “Monument to the Liberators of Tallinn,” was introduced by the Soviet authorities in 1947. It held symbolic significance for Russian natives residing in Estonia, signifying the USSR's victory over Nazism (McGuinness, 2017). However, ethnic Estonians did not consider the Red Army soldiers as liberators but as occupiers. Consequently, the Bronze Soldier became a painful symbol of Soviet oppression endured for over five decades.

In 2007, the Estonian government decided to relocate the Bronze Soldier from its central position in Tallinn to a military cemetery on the city's outskirts. This decision triggered protests primarily led by the ethnic Russian minority in Estonia, as well as by some Russian nationalists and sympathizers. The Bronze Soldier was a Soviet World War II memorial that held significant symbolism for the Russian-speaking population in Estonia (McGuinness, 2017). These protests escalated into violent clashes with the police and resulted in diplomatic tensions between Estonia and Russia that was believed that these tensions led to cyberattacks orchestrated by the Russian government Thus, the majority of the attacks that had an impact on the general public were classified as distributed denial of service (DDoS) attacks. These incidents ranged from individual perpetrators utilizing diverse techniques like ping floods to the costly renting of botnets, typically employed for spam distribution (McGuinness,

2017). According to Liisa Past who was formerly running an op-ed desk of one of Estonia's national news papers "Cyber aggression is very different to kinetic warfare," she explained; "It allows you to create confusion, while staying well below the level of an armed attack. Such attacks are not specific to tensions between the West and Russia. All modern societies are vulnerable." (McGuinness, 2017). The incident lasted twenty-two days and during the time that blockchain was not in its prime stage. It was obvious that the anonymity of the internet alone was a level-playing field for this attack. This serves as a wakeup call for governments that there is a need to improve security in the cyber space.

According to e-Estonia.com (*Frequently Asked Questions*, 2022), after the incident, cyber security has been one of the areas that Estonia closely involves. The government also extended cyber security concerns to other areas such as finance and privacy. Estonian scientists were given the task of redesigning data security by creating a tagging system for electronic data that could demonstrate the accuracy of data, network, and processes without relying on centralized trust authorities. Consequently, Guardtime, an Estonian cybersecurity company that was founded in 2007 has since gained recognition as a leader in the field of cybersecurity; The Estonian government has been a strong supporter of Guardtime and its technology; Regardless, they developed the KSI (Keyless Signature Infrastructure) blockchain which serves as a highly scalable alternative to public key infrastructure, replacing human trust with digital truth. According to PWC, Today it takes seven months on average to discover data breaches – with Estonian KSI Blockchain technology these breaches can be detected instantly (PwC, 2019).

What's more is in 2012, Estonia became the first nation-state to implement blockchain technology systems in its security and privacy systems. The objective was to establish unwavering confidence in the information provided to its citizens which is a crucial aspect for a country in order to trust its data as it serves as the foundation for decision-making and policies. Additionally, Estonia strives to ensure the integrity of government data, which entails guaranteeing the accuracy, reliability, and absence of tampering in the information stored by the government. Moreover, the aim is to enable independent verification of government data, reducing reliance solely on the government's database; allows different systems and organizations to promptly verify

the accuracy and reliability of data in real-time. The actual “data” remains within the system, and only a unique identifier called a “hash” is sent to a blockchain service. The KSI Blockchain does not store the data itself, which allows it to handle massive amounts of data — even in the range of petabytes — with immutability and high speed. Estonia's experience has shown that maintaining speed is crucial for providing a good service for citizens (PwC,2019).

In the case of Estonia, the power dynamics underscore the significant impact of Estonia's successful implementation of blockchain technology, which has enhanced its influence within the region. Emerging as a pioneer in digital governance, Estonia has gained an increased leverage in shaping regional digital policies. The anticipated trend is that more governments will begin to establish services in the virtual realm. The efficiency and security exhibited by the Estonian model have approved from esteemed organizations such as the NATO, the US Department of Defense, the UN Security Council, and the EU. Not to mention, it was the first nation to implement online voting, and its citizens can now conveniently file their taxes through online platforms (PwC, 2019).

Ever since Estonia has experienced a series of cyberattacks, the country has become risk-averse. They aim to mitigate the risks associated with localized threats, such as natural disasters, cyberattacks, or infrastructure failures by using the establishment of a data embassy and hosting its servers in foreign data centers, such as in Luxembourg (Pihlak, 2017). The data embassy is still fairly new, although, the purpose of data embassy was to spearhead the use of cross-border storage and use of data within the international sphere. Over time, the world’s first data embassy will validate the importance of ensuring digital continuity of the state and the possibilities of building distributed systems with the assistance of technologies such as blockchain to help increase a country’s security (Pihlak, 2019). According to NBC News, Estonia is currently paying the government of Luxembourg 200,000 to 300,000 Euros ($226,000 to $339,000) a year for hosting its data (Talmazan, 2019).

The e-Residency program offers an opportunity for individuals who are not residents of a particular country to apply for digital identification and utilize online government services. It is particularly beneficial for those who wish to run their businesses remotely or lead a nomadic lifestyle. However, while Estonia has strict data

protection regulations in place, there is always a risk of data breaches or unauthorized access to personal information. Any such breach could compromise privacy and lead to potential identity theft or fraud. But the decentralized nature of the technology means that personal data stored on the blockchain is only accessible by only people whom have the necessary permissions. Because of the blockchain technology, it was able to effectively ensure that all citizens, including marginalized or disadvantaged groups, can equally access and benefit from the blockchain-powered services. Efforts should be made to bridge the digital divide and provide support for those who may face challenges in utilizing digital platforms effectively.

However, Estonia also had an incident that occurred in 2017, where Estonia's e-Residency digital ID cards were discovered to possess a security vulnerability, highlighting the imperative importance of implementing stringent security measures in blockchain implementations (Ghosh, 2017). As a result, Estonia promptly responded to the situation by taking immediate action to rectify the identified vulnerability and enhance their security protocols. According to Kaspar Korjus, the managing director of the government's e-residency program, it is crucial to acknowledge that the responsibility for this issue does not solely rest with Estonia but also extends to the cards and computers worldwide that utilizes chips manufactured by the same producer. Consequently, as a precautionary measure, Estonia has temporarily suspended the usage of nearly all ID cards issued within the past three years until users update to a new security certificate. It is clear that even though the infrastructure that Estonia is utilizing can enhance data security, there is certainly unexpected loopholes which can be exploited and can grounds for security concerns.

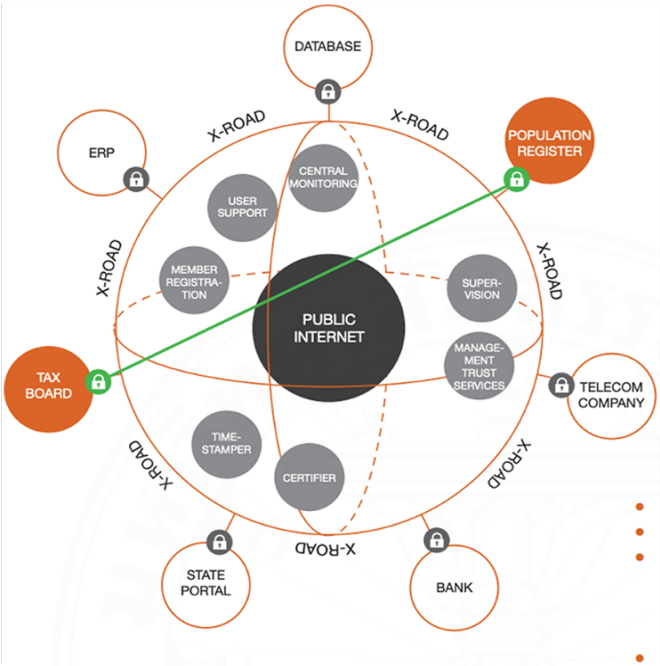
In the case of Estonia's X-Road and the so-called KSI Blockchain, the combined system is not focused on cryptocurrency but rather on establishing a decentralized technological and organizational environment for secure, internet-based data exchange between information systems. This technological setup has enabled Estonia to evolve into a truly digital society (PwC, 2019). The system primarily revolves around the organization of the data and the establishment of sophisticated digital infrastructure. As pointed out by Semenzin, Rozas, and Hassan (2022), the system has the potential to improve various issues within the existing system for citizens, including digital identity, authentication, efficiency, privacy data security,

innovation, and economic opportunities. By addressing these areas, it aims to enhance the overall functioning and user experience of the system. To clarify, Estonia's technology does not align with the commonly understood concept of blockchain in the finance sector which is associated with "cryptocurrencies"; It incorporates protected logs and a specific data structure, it does not encompass the blockchain commonly referred to by the general public since it uses private blockchain to operate. Most fintech companies use blockchain and cryptocurrencies complementary to their unique organizations, However, Estonia's X Road blockchain is not the case. Thus, the distinction between utilizing cryptocurrencies and the type of blockchain, either public or private, plays a role in this context.

To go into detail, in Estonia, the X-Road system relies on a private, permissioned blockchain. It is easier to control the flow of the data which is effective for administrators because data can be tracked each time it is changed (Semenzin et al., 2022). The Estonian Information Systems Authority (RIA) plays a crucial role as a service provider for the government. It ensures that the state agencies have secure access to the blockchain network through the X-road infrastructure. The utilization of blockchain technology supports various important State Registries, including the Healthcare Registry, Property Registry, Business Registry, Succession Registry, Digital Court System, Surveillance/Tracking Information System, Official State Announcements, and State Gazette.

Figure 3.1

An Overview of the Functioning of X-Road as Interoperability Layer (PwC, 2019)



Note. Reprinted from "Blockchain-based application at a government level: disruption or illusion," by S. Semenzin,, D. Rozas, & S. Hassan 2022 (https://www.researchgate.net/figure/An-overview-of-the-functioning-of-X-Road-as-interoperability-layer-PWC-2019_fig1_359908026). Copyright 2022 by Semenzin, Rozas, & Hassan.

It facilitates data exchange by assigning unique digital identities to entities, establishing access points for authorized systems to connect and securely transmit data, verifying authorization and retrieving requested data, creating logs for transparency, ensuring data security through encryption and access control, maintaining data integrity with digital signatures, prioritizing privacy by allowing individuals to control data access, and ultimately enabling seamless digital services and governance.

In 2020, KSI became the first blockchain system to carry eIDAS accreditation which stands for "electronic Identification, Authentication, and Trust Services." It is a regulation established by the European Union (EU) that sets the

standards for electronic identification and trust services across EU member states it is essentially the EU trust mark for qualified trust services with legal power for electronic transactions in the European Single Market (EU, 2023). Moreover, this technology is even used by the NATO and US Department of Defense. The historical trajectory of Estonia has laid the foundation for the emergence of tech-savvy companies. Estonia is home to numerous companies that excel in utilizing blockchain technology within the finance industry such as Choise and Funderbeam (Kendall, 2022).

In terms of the use of cryptocurrencies such as Bitcoin, Estonia has a relatively liberal approach. While the Estonian government has implemented some regulations to prevent money laundering and other illicit activities, it has generally taken a supportive stance towards the use of cryptocurrencies. Estonian residents and businesses are free to buy, sell, and use cryptocurrencies. Also, the country has a number of cryptocurrency exchanges and other services that cater to the needs of cryptocurrency users. This crypto-leaned policy enables people to tap into global markets and become key players in the global economy. Moreover, it tackles the problem of data misuse and corruption in one's country.

Blockchain's decentralized and tamper-resistant nature can enhance data security, providing individuals and businesses with more control over their information. This can be seen as an ethical benefit. However, different opinions are formed on the type of blockchain to use. For instance, crypto-anarchists (Husain, 2020) believe that a distributed ledger can be considered a blockchain exclusively if it is global and open. On the other hand, crypto-institutionalist (Husain, 2020) see closed blockchains as tools to build more resilient digital architectures that can help governments exert more control over their informational data fluxes. Millions of lives and resources are saved as the potential manipulation of defence data or smart war machines is prevented using blockchain technology.

According to e-Estonia.com (*Frequently Asked Questions*, 2020), in the realm of healthcare, blockchain ensures transparency and accountability by detecting unauthorized access and modifications to a person's digital health data, allowing for a clear trail of who accessed the information and when. Within the business landscape, blockchain provides security for the e-Business Register (Centre of Registers and Information System, n.d.), enabling the tracking of changes made to company

information and offering insights into the reasons behind those alterations. Moreover, in the realm of real estate and legal proceedings, blockchain technology acts as a guardian by protecting data integrity in the e-Land register and the e-Court system. It enables the detection of any unauthorized modifications to real estate information or legal statements while offering visibility into the responsible parties and the exact timing of the changes. Lastly, blockchain technology plays a crucial role in preventing the manipulation of smart devices like intelligent transportation systems and military machinery. By ensuring the integrity of these devices, blockchain mitigates potential risks that could arise from unauthorized tampering, ultimately prioritizing the safety and well-being of individuals (e-Estonia, n.d.).

In conclusion, Estonia's pioneering use of blockchain technology positions it as a model and inspiration for digital transformation initiatives in other countries. By demonstrating its digital leadership, Estonia has the potential to reshape the balance of power in the digital landscape. Furthermore, in the economic perspective, Estonia’s ability to establish itself as an innovation hub, attract foreign investment and partnerships enhances its political influence on the global stage. As other countries seek to collaborate with Estonia and leverage its expertise, there is a potential for knowledge transfer and strengthened diplomatic ties. In terms of security, Estonia has implemented blockchain technology to enhance its security infrastructure and protect important government data. The decentralized and tamper-resistant nature of blockchain ensures data integrity, making it difficult for unauthorized access or modifications to occur. The KSI (Keyless Signature Infrastructure) blockchain developed by Guardtime, for example, provides real-time detection of data breaches, allowing for immediate response and mitigation (PwC, 2019). By safeguarding against cyber threats, Estonia has established trust in its digital systems, which is essential for businesses and individuals operating in the digital realm. Additionally, Estonia's risk-averse approach to cybersecurity, including hosting servers in foreign data centers and establishing a data embassy, mitigates the risks associated with localized threats and ensures the continuity of digital services. As these countries adopt similar approaches, it has the potential to reshape power dynamics in the global political landscape. Overall, Estonia's achievements in the blockchain technology have far-reaching implications, positioning it as a significant player and influencer in the evolving digital world.

CHAPTER 4
MALTA

4.1 Case Study II

Apart from Estonia as being the trail blazer in adopting the blockchain technology, Malta has also become the incentive for various Fintech companies and blockchain entrepreneurs that wish to enter the cryptocurrency or blockchain world. Unlike many other countries that have tried to regulate blockchain-related operations in a disorganized fashion, Malta has taken a holistic, all-encompassing regulatory approach to create the most attractive environment for blockchain start-ups to choose Malta as their base. With a land area of 122 square miles and a population of approximately 516,000, Malta is ranked as the tenth smallest country in the world and stands out as the fourth most densely populated sovereign nation on the map. Their government aims to position itself to be the world's first blockchain island. This lead to Malta government being cautious on how to regulate the area without posing any unnecessary restrictions, with the hope that Malta Blockchain will be a global success.

Similar to Estonia, Malta's vision is not entirely about Bitcoin. Their plan is to make the Malta Blockchain Strategy into a reality. Malta's Prime Minister, Joseph Muscat, announced in April 2017 that the initial version of a national plan to advance blockchain technology had been authorized by the cabinet (Cauchi, 2018). Malta development on the blockchain ecosystem is more related on the regulation. With this openness, it allows businesses to be able to utilize blockchain within the country. Its strategy for Distributed Ledger Technologies (DLT) such as cryptocurrency businesses (including exchanges) and virtual assets is creating new business opportunities in a fast-evolving digital environment. However, prior to that, the historical trajectory of Malta has also demonstrated a tendency to be one of the pioneers of the blockchain technology. During the 1990s Malta's economy underwent a transformation. The traditional agrarian sector gradually declined, while manufacturing industries such as textiles and electronics expanded. These industries faced challenges due to globalization and increased competition, leading to concerns about their long-term sustainability (Grech, 2015). Over the years, there has been a notable transition towards

export-oriented services, with their contribution to the economy increasing significantly from 59% in 1980 to 81% in 2014. In contrast, the agriculture and industry sectors have experienced a gradual decline during this period (Grech, 2015). Unemployment rates were relatively high, especially among young people, leading to concerns about job opportunities and economic stability. In order to boost and stabilize its economy, Malta formally applied to join the European Union (EU). The application underwent evaluation by the European Commission, leading to accession negotiations starting in 1998, covering various policy areas such as economy, agriculture, fisheries, justice, and the environment. Following the conclusion of negotiations, the Accession Treaty was created, outlining the terms and conditions for Malta's EU membership. This treaty addressed obligations, rights, implementation timeframe, and transitional arrangements. Before officially joining, Malta held a referendum in 2003 where the majority of voters expressed support for EU membership. After the positive outcome of the referendum with the result of more than 50% in favour, Malta's accession treaty was signed and ratified by both Malta and existing EU member states. On May 1, 2004, Malta became an official EU member, joining nine other countries simultaneously. This marked the completion of the accession process, and Malta fully integrated into the EU's political, economic, and social structures.

During the early 2000s, Malta embarked on a strategic effort to diversify its economy by attracting financial services and international investments. To establish itself as a financial hub within the European Union, the country implemented regulations and create incentives to attract investments. Recognizing the potential of emerging technologies, Malta actively pursued initiatives to promote their growth. Notably, it became a prominent jurisdiction for the iGaming industry by offering favorable regulations and licensing frameworks, pioneering the implementation of the Remote Gaming Regulations in 2004 (Fenech, 2017). This showcases Malta's readiness to embrace digital technologies and create a supportive legal framework for online gaming platforms. Furthermore, Malta made significant investments in its information and communication technology infrastructure, positioning itself as a technology hub and fostering innovation. The government's e-government initiatives played a crucial role in propelling the country's digital transformation, enhancing the efficiency and accessibility of public services. These proactive measures, combined with Malta's

openness to technology-based industries, have solidified its reputation as an attractive destination for companies seeking a conducive environment for their development, particularly in the thriving iGaming sector.

However, in the mid-2010s, as the interest in blockchain technology and cryptocurrencies grew globally, Malta recognized the potential economic opportunities and decided to position itself as a blockchain-friendly jurisdiction (Ćirić, & Ivanišević, S, 2018). In 2017, the Maltese government announced plans to create a supportive regulatory framework for blockchain technology and cryptocurrency-related businesses, aiming to attract blockchain companies and foster innovation in the sector. The following year, Malta passed three significant pieces of legislation including the Malta Digital Innovation Authority Act (MDIA), the Innovative Technology Arrangements and Services Act (ITAS), and the Virtual Financial Assets Act (VFA) (PwC, 2018). These laws established a legal framework for blockchain-based businesses and provided regulatory certainty, solidifying Malta's reputation as a leading destination for blockchain innovation and development.

Firstly, the purpose of the MDIA Bill is to establish the Malta Digital Innovation Authority, a regulatory body responsible for promoting and regulating innovative technologies, such as blockchain, DLT, and smart contracts, with functions including certification and supervision of technology service providers, audits, establishment of technical standards, and promotion of technology adoption, while also introducing regulatory sandboxes for businesses to test innovative technologies within a controlled environment, and governed by a board of governors overseeing the strategic direction and implementation of the regulatory framework. The bill defines technology arrangements as systems and procedures utilizing DLT and smart contracts, and technology services as services related to the operation or use of technology arrangements (Feikert-Ahalt, 2018).

Secondly, The ITAS Bill aims to provide legal certainty and establish a regulatory framework for the recognition and regulation of technology arrangements and related services, including the DLT platforms. The legislation outlines the process for registering technology arrangements and certifying technology service providers (Feikert-Ahalt, 2018). The certification aims to ensure the quality, integrity, and security of technology arrangements and services. Furthermore, it sets out the rights

and obligations of technology service providers, including record-keeping requirements, audits, and compliance with the regulatory framework.

The Virtual Financial Assets Bill focuses on regulating virtual financial assets, which includes cryptocurrencies and initial coin offerings (ICOs). The framework establishes a licensing framework for entities engaging in activities related to virtual financial assets, including issuers, wallet providers, custodians, and exchanges. Licensing aims to ensure consumer protection, market integrity, and prevent money laundering (Feikert-Ahalt, 2018). The bill also highlights investor protection. It introduces rules on disclosure and transparency for ICOs, providing potential investors with relevant information about the project, its team, and the associated risks. It also mandates the segregation and safeguarding of client assets. Moreover, the legislation empowers the Malta Financial Services Authority (MFSA) as the regulatory authority responsible for supervising and enforcing compliance with the VFA framework. It outlines the MFSA's powers, including inspection, investigation, and enforcement actions.

Despite the fact that both Malta and Estonia being members of the European Union (EU) and participating in the EU Digital Single Market initiative, what is interesting is their implementations of blockchain technology differ to a certain extent. For example, Malta has taken significant steps to establish comprehensive legal and regulatory framework for blockchain and cryptocurrency-related activities as mentioned above. Although Estonia embraced digital technologies, it does not outline specific blockchain-focused regulations. Instead, the Estonian government utilises the blockchain technology under their existing legal frameworks rather than passing new laws. Compared to Estonia, major cryptocurrency exchanges such as Binance (Parker, 2018) and OKEx have more offices set up in Malta making it easier for exchanges to operate legally (*Okx Is Expanding*, 2023). Malta pursues potential areas such as land registry and public procurement, while Estonia implements blockchain into government services, thereby embracing the concept of “e-governance.” These differences can have varying effects to the public. Maltese citizens may have a more traditional experience when accessing government services compared to Estonia. As Malta positioned itself as the "Blockchain Island," the direct impact on the daily lives of Maltese citizens may be more evident through employment opportunities and the potential economic growth

in the blockchain financial sector. Additionally, the presence of cryptocurrency exchanges in Malta provides Maltese citizens with increased access to digital assets and cryptocurrency trading. This can potentially offer alternative investment opportunities and financial services that may not be as readily available in other countries (see Table 4.1).

Table 4.1

Estonia & Malta Comparison Table

-	Estonia	Malta
E-Residency	Innovative e-Residency program	Not applicable
Regulatory Framework	No specific blockchain-focused regulations	Comprehensive legal framework for blockchain
Cryptocurrency Exchanges	Some exchanges operate within the jurisdiction	Actively attracts cryptocurrency exchanges
Government Services	Extensive integration of blockchain in government services	Exploring blockchain's potential in government services
Collaboration	Involved in international collaborations and partnerships	Fosters partnerships with blockchain companies
Impact on Citizens	Enhanced access to digital services and business opportunities	Potential economic growth and alternative financial services

In Malta, enacting the three significant laws overseeing the use of the blockchain technology has empowered the country to establish and enforce laws governing various aspects of its society, including its economy, public services, and the rights and responsibilities of its citizens. Through the introduction of the MDIA, TAS, and VFA bills, Malta has been able to create legal frameworks aimed at regulating

emerging technologies like blockchain (Feikert-Ahalt, 2018). This proactive approach reflects Malta's recognition of the potential benefits and challenges associated with these technologies.

The gaming industry holds considerable importance in Malta. Companies such as ChiliZ have capitalized on blockchain's capabilities by developing platforms for esports and sports betting services (Chiliz, 2019). By relying on the decentralized nature of blockchain, these companies have introduced enhanced transparency and security measures for their users. This technology has also opened up new avenues for innovative business models and additional revenue streams within the gaming industry.

Moreover, in 2017, the Maltese Ministry for Education and Employment was quietly launching the country's first blockchain project: the certification of its students and workforce using the blockchain. The way they decided to implement Malta's new blockchain strategy was quite straightforward. They used Blockcerts, an open standard developed by the Massachusetts Institute of Technology (MIT) Media Lab and a software company called Learning Machine. It was then released into the public marketplace for anyone to build on (Turner-Jones, 2019).

Chris Jagers, the founder and CEO of Learning Machine, explained that his company's goal is to make these blockchain credentials "smart," so that they can lead to other more credentials. For instance, completing the final class of a degree program would not just give you the class transcript grade, but also the degree itself. Jagers called these "stackable certificates," and the hope is that the right infrastructure could reduce a lot of paperwork involved in managing academic and other programs (Crichton, 2018). Not only this strategy provides economic sustainability, but Malta is also able to foster a sense of national identity and pride, distinguishing itself as a unique and independent nation, and of course, the public can be able to have more trust in the system.

Therefore, in Malta's case the emphasis on blockchain technology and it's positioning as a global blockchain hub is likely to drive technological adoption among its citizens. In an economic dimension, by actively pursuing initiatives to promote emerging technologies such as blockchain, Malta has successfully diversified its economy. This may lead to increased usage of digital currencies, smart contracts, and decentralized applications. The government's supportive stance towards innovation can

foster an entrepreneurial culture, encouraging individuals to explore entrepreneurial endeavors, particularly in the technology and blockchain sectors. Moreover, these foreign investments contribute to the growth of the country's economy and enhance its global competitiveness. The growth of the blockchain industry may create new job opportunities, including positions related to blockchain development, cybersecurity, and data analytics. The digitization of services and e-governance initiatives can result in a higher rate of digital literacy and a shift towards digital citizenship. Malta's attraction of international talent and investors may contribute to a more culturally diverse population. Additionally, the country may witness increased awareness and adoption of sustainable lifestyles and renewable energy solutions due to environmental concerns and the government's commitment to sustainability. In a security perspective, Malta's comprehensive legal and regulatory framework for blockchain and cryptocurrency-related activities, including the Malta Digital Innovation Authority Act, Innovative Technology Arrangements and Services Act, and Virtual Financial Assets Act can help prevent illegal activities, fraud, and money laundering, enhancing the security of the financial ecosystem. By promoting and regulating innovative technologies like blockchain, Malta enhances its technological security capabilities.

CHAPTER 5
CHINA

5.1 Case Study III

China's implementation and approach towards blockchain can be described as a blend of traditionalism and adaptive pragmatism. While China recognizes the transformative potential of the blockchain technology, it also values stability and control within its domestic context. In addition to prohibiting the cryptocurrency mining, China has further banned cryptocurrency trading and transactions. One of the arguments for its decision to ban cryptocurrencies is motivated by concerns that these digital assets were being used as a means to circumvent traditional regulations, leading to the potential outflow of capital from its markets. In September 2021, the People's Bank of China (PBOC) issued a ban on all cryptocurrency transactions due to concerns regarding their involvement in financial crimes and the increasing risks they pose to China's financial system (Shin, 2022).

Ironically, the Chinese government has expressed support for the development and adoption of blockchain technology and has invested heavily in research and development in this area. In fact, China is home to several large and rapidly growing blockchain industries, and major blockchain projects and companies are based in the country. The Chinese government, on the contrary, sees blockchain as a tool to enhance its control and regulation. Some examples of Chinese blockchains include ChainMaker, also known as the Chang'An Chain which implemented and has been utilized by medical institutions, government authorities, and insurers to share information on a verifiable and cryptographically secured channel (Morales, 2023). Also, there is VeChain, which operates in China as a blockchain platform focusing exclusively on supply chain management and business. Its technology combines blockchain, Internet of Things, and cryptographic features to enhance transparency, traceability, and efficiency in various industries. VeChain offers a decentralized and tamper-proof platform where businesses can record and verify data related to product origins, logistics, quality control, and authenticity.

The Chinese blockchain industry and market present numerous intriguing aspects. Various challenges in China, spanning trade finance to food safety, are being tackled through the implementation of the blockchain-based solutions. For instance, food companies have discovered that engaging in these activities can enhance their reputation. Furthermore, the utilization of the blockchain-based solutions has enabled small and medium-sized enterprises (SMEs) to obtain affordable working capital (Kshetri, 2023). But what is interesting is China's political system, which can be characterized as highly centralized. The country's philosophy combines socialist ideology, market-oriented economic policies, and specific Chinese socio-political factors that shape the governance of the country. Furthermore, power and decision-making authority are concentrated in the hands of the Chinese Communist Party (CCP) and its top leadership. The CCP maintains a centralized structure, with the General Secretary holding significant influence and control over key decision-making processes.

In 2014, the Chinese government recognized the potential of the blockchain technology and was included in its 13th Five-Year Plan for Information Technology agenda. The 13th Five Year Plan enlists several key objectives for China to achieve by 2020. China aims to achieve advancements in renewable, fossil fuel and nuclear technologies as well as mini-grid, super-grids and smart-grids in order to increase country's competitiveness in the energy sector internationally. Later on in 2015, the People's Bank of China (PBOC) established a digital currency research institute to study the feasibility and potential applications of blockchain and digital currencies; furthermore, in 2016 the China Academy of Information and Communications Technology (CAICT) published a white paper on the development and application of blockchain technology in China that discussed the core technologies and typical applications of blockchain, put forward suggestions for technological development, and standardized the use of blockchain in different sectors in China. Even though the Chinese government views decentralized blockchains negatively and prefers centralized control (Kshetri, 2023), China's blockchain industry has been focusing on developing practical applications from the technology, rather than just speculative investments. LongHash, a blockchain and crypto data platform, reported in August 2020 that China had over 84,410 registered blockchain companies, with approximately

29,340 actively operating. Within the first seven months of 2020 alone, around 10,000 new companies were registered (Kshetri, 2017). As of 2023, China aims to educate and equip half a million blockchain professionals through the establishment of a recently launched blockchain research center (Morales, 2023).

Despite the boom of blockchain technology in China, the case of cryptocurrency is entirely a different case. The Chinese government has taken steps to regulate and control the use of cryptocurrencies such as Bitcoin. In 2017, the Chinese government implemented a ban on initial coin offerings (ICOs) and shut down many cryptocurrency exchanges in the country. About 90 cryptocurrency exchanges and 85 ICOs were shut down in China in 2017. Therefore, while it is not illegal to own cryptocurrencies in China, the government has taken a cautious approach to their use and has sought to regulate them in order to prevent financial instability and protect consumers. Overall, China's approach to blockchain technology and cryptocurrencies has been characterized by a combination of support and regulation. The Chinese government recognizes the potential benefits of these technologies, but also wants to ensure that they are used in a responsible and controlled manner. Therefore, to expand in a similar manner, China is broadening the use of the blockchain technology on its central bank digital currency (CBDC), known as the digital yuan and to further include it in the Belt and Road Initiative and cross-border trade (Jha, 2023).

Consequently, China has integrated smart-contract capabilities into the digital yuan through the popular e-commerce app Meituan, which is widely used for food delivery and lifestyle services. However, while the digital yuan has been utilized in retail transactions and for purchasing securities, the widespread implementation of smart-contract functionality in retail scenarios is yet to be tested (Gkritsi, 2023). Although China’s ban on cryptocurrency trading and transactions is clear, it seems to be a robust demand for cryptocurrencies among the Chinese people. A common strategy employed by companies is to relocate their operations from mainland China to Hong Kong. Unlike China, Hong Kong has cultivated a favorable environment for cryptocurrency businesses. For instance, Huobi, which faced significant challenges due to the 2021 cryptocurrency ban and was on the brink of bankruptcy, has managed to recover by leveraging Hong Kong's cryptocurrency-friendly policies (*Huobi Set to Launch*, 2023).

As mentioned in the previous case studies, blockchain transforms centralized management into decentralized management (Kshetri, 2017). For the authoritarian regimes that are accustomed to maintaining complete control over information flows and records, one of their notable challenges is the diminishing authority of their centralized entities because they no longer possess absolute control over information within their borders. In April 2018, a previous Peking University student named Yue Xin brought attention to the university's cover-up of sexual misconduct incidents through a written letter. The letter exposed the distressing account of Gao Yan, a student who tragically took her own life in 1998 after enduring sexual assault and harassment by a professor. Despite facing censorship on Chinese social media platforms, an unidentified individual uploaded the letter onto the Ethereum blockchain as a way to safeguard the information for future reference (Kshetri, 2018).

In the case of China, blockchain has been extensively used even further. For example, VeChain had already created over 40 enterprise applications on its platform (Garg, 2020). VeChain is a founding member of the Belt and Road Initiative Blockchain Alliance (BRIBA), which was established in December 2019. The objective of BRIBA is to utilize blockchain technology to contribute to the Belt and Road Initiative (BRI), a global development and industrial project introduced by the Chinese government in 2013 (VeChain, 2019). It is quite straightforward when blockchain is implemented in the Belt and Road initiative. Products sold by the BRI-targeted countries need to gain trust, and blockchain can help to increase trust in a product’s digital footprint blockchain can prove the existence of certain data points in time and the completeness of information (Lehmacher, 2019). Moreover, paper-based documents may lead to delay and complexities reducing the efficiency of supply chains.

Despite being a tremendous aid to traditional systems in China, the blockchain systems are still expensive to implement and manage. Similar to the previous cases of Estonia and Malta, the capability to possess and adopt blockchain-base system in rural areas is still unattainable. All in all, the Chinese government recognizes the potential of blockchain technology and has shown support for its development in various industries. Therefore, from a security perspective, strengthening the digital infrastructure will help other industries to be more efficient, creating a more connected and transparent ecosystem. However, they also maintain

strict control and censorship over certain aspects of blockchain, such as cryptocurrencies and decentralized platforms, to ensure compliance with its regulatory frameworks and maintain social stability. Furthermore, by positioning itself between traditionalism and adaptive pragmatism, China acknowledges that adapting new technologies while also preserving its core principles and values is crucial. In an economic sense, this unique approach has allowed China to harness the potential benefits of blockchain while maintaining a level of control that aligns with its broader social, economic, and political objectives. In the context of China's approach to blockchain technology, especially from a neorealist perspective, China's positioning between traditionalism and adaptive pragmatism can be seen as a strategic choice to balance its desire for technological advancement with its broader goals of safeguarding its sovereignty and maintaining control over its domestic affairs.

CHAPTER 6
CONCLUSION

The blockchain technology, with its decentralized and transparent nature, poses a significant challenge to authoritarian regimes determined to maintain control. Its unique characteristics bring both advantages and repercussions for traditional centralized systems. By enabling trustless — that is you don't have to trust a third party — and automated transactions without reliance on intermediaries, blockchain technology has a transformative potential. What makes it even more intriguing is how disruptive technologies like the internet and blockchain challenge established power structures, potentially reshaping the concept of sovereignty. From a neorealist perspective, states' decisions regarding the use and development of blockchain technology can be heavily influenced by their pursuit of power and the desire to maximize their power position.

However, it is essential to acknowledge that other factors also play a crucial role in shaping states' choices concerning blockchain. These factors encompass economic interests, technological advancements, international cooperation, public sentiment, and adherence to global norms and institutions. State power theory highlights the intricate relationship between states' interests, and power dynamics. It provides a framework for understanding how blockchain technology aligns with states' objectives, such as enhancing aggregate national income, promoting social stability, consolidating political power, and fostering economic growth. Embracing blockchain can foster economic openness and create opportunities, particularly for developing economies. The complex interplay between blockchain technology, state interests, power considerations, international trade structures, and governance necessitates a multifaceted analysis. States' adoption and regulation of blockchain technology are influenced by a combination of factors, including the drive for power maximization, pursuit of economic interests, leveraging technological advancements, engaging in international cooperation, and conforming to global norms and institutions. What is visible is that blockchain is in a series of trial and error not only in Estonia, Malta and China, but in other parts of the world. The implementation of blockchain is being tested for its transparency and efficiency in various sectors. However, given the current

observations and cases on blockchain technology, it is apparent that blockchain is still not affordable or rather practical for our daily lives, but it is quite prominent on the institutional level.

In summary, Estonia's adoption of blockchain technology has brought economic benefits through cost savings, increased productivity, and the attraction of investment and partnerships. Simultaneously, it has bolstered the country's security infrastructure, protecting critical data and mitigating cyber threats. These advancements have positioned Estonia as a model for digital transformation and an influencer in the global digital landscape, enhancing its political influence and diplomatic relations. Overall, Estonia's achievements in blockchain technology have had far-reaching implications for both economic growth and security, making it a significant player in the evolving digital world.

Both Estonia and Malta have demonstrated their commitments to embracing the blockchain technology and positioning themselves as leaders in the digital landscape. Estonia's historical trajectory and focus on modernization led to its early adoption of digital advancements, including the use of blockchain in governance and cybersecurity. On the other hand, Malta proactively diversified its economy and became a prominent jurisdiction for the iGaming industry before focusing on blockchain technology in the mid-2010s. Malta's comprehensive legal and regulatory framework for blockchain and cryptocurrency-related activities, combined with its initiatives to attract international investments, have solidified its reputation as the "Blockchain Island."

While Estonia's approach is centered around e-governance and integrating blockchain into existing government services, Malta's strategy is more focused on creating a supportive regulatory environment for blockchain start-ups and fostering innovation in various sectors. These differences in implementation can have varying impacts on the daily lives of their citizens. In an economic essence, Malta’s emphasis on the blockchain sector can lead to increased employment opportunities and economic growth, while Estonia's focus on e-governance may result in improved efficiency and accessibility of public services.

It cannot be denied that when it comes to cryptocurrencies, China has taken a cautious and regulatory approach. The government has banned ICOs and shut down

many cryptocurrency exchanges in an effort to prevent financial instability and protect consumers. While owning cryptocurrencies is not illegal in China, the government seeks to regulate their use and ensure responsible and controlled implementation. But China's approach to the blockchain technology can be characterized as an interesting blend of traditionalism and adaptive pragmatism. While the Chinese government recognizes the transformative potential of blockchain, it also values stability, control, and adherence to its regulatory framework. Not only China views blockchain as a crucial tool to enhance governance capabilities and address various challenges across sectors such as trade finance and food safety, it also sees blockchain-based solutions as a way to improve reputation, provide affordable working capital to small and medium-sized enterprises, and enhance its transparency and traceability in supply chain management. However, countries have its own different factors to account for their strategy in blockchain, While China recognizes the potential of blockchain technology, there are challenges to its widespread adoption, including cost and accessibility. China has largely mirrored the development pattern of the internet in its approach to the blockchain industry. The Chinese government has imposed substantial modifications and restrictions before permitting blockchain implementation. The Chinese government maintains strict control and censorship over certain aspects of blockchain to ensure compliance with regulations and maintain social stability.

What is evident in this passage is that the adoption and regulation of the blockchain technology by the states is influenced by a complex interplay of factors, there is no one-size fits-all measure when it comes to topics including power considerations, economic interests, technological advancements, international cooperation, and adherence to global norms and institutions. Along with the intend to maximize power, different countries, such as Estonia, Malta, and China, have.

REFERENCES

Angelis, J., & Da Silva, E. R. (2019). Blockchain adoption: A value driver perspective. *Business Horizons*, *62*(3), 307-314.

Atzori, M. (2015, December 1). *Blockchain technology and decentralized governance: Is the state still necessary?* http://dx.doi.org/10.2139/ssrn.2709713

Baldacchino, G. (2002). A nationless state? Malta, national identity and the EU. *West European Politics, 25*(4), 191-206.

Bashir, I. (2017). *Mastering blockchain*. Packt Publishing.

Buttigieg, C. P., & Efthymiopoulos, C. (2019). The regulation of crypto assets in Malta: The virtual financial assets act and beyond. *Law and Financial Markets Review, 13*(1), 30-40.

Butts, D. (2023, May 14). China's new blockchain research centre will train half a million industry workers. *South China Morning Post*. https://www.scmp.com/tech/article/3220444/china-opens-blockchain-research-centre-plans-train-500000-industry-professionals

Cauchi, M. C. (2018, October 31). *Malta blockchain strategy revealed*. CCMalta. https://www.ccmalta.com/insights/news/malta-blockchain?lang=hu-HU

Centre of Registers and Information System. (n.d.). *e-Business register*. https://www.rik.ee/en/e-business-register

China 13th energy technology innovation five year plan (2016-2020) – policies. (n.d.) IEA. https://www.iea.org/policies/6267-china-13th-energy-technology-innovation-five-year-plan-2016-2020

Chiliz. (2019). *White paper - Chiliz ($CHZ)*. Chiliz. https://www.chiliz.com/docs/CHZ_whitepaper.pdf

Ćirić, Z., & Ivanišević, S. (2018). Blockchain and tourism development: case of Malta. *Modern management tools and economy of tourism sector in present era*, *565*.

Crichton, D. (2018, May 9). *With MIT launched, learning machine raises seed to replace paper with Blockchain credentials*. TechCrunch. https://techcrunch.com/2018/05/07/learning-machine-credentials/

Couture, S., & Toupin, S. (2019). What does the notion of "sovereignty" mean when referring to the digital? *New Media & Society, 21*(10), 2305-2322. https://doi.org/10.1177/1461444819865984.

Data security meets diplomacy: Why Estonia is storing its data in Luxembourg. (2019, June 25). NBC News. https://www.nbcnews.com/news/world/data-security-meets-diplomacy-why-estonia-storing-its-data-luxembourg-n1018171

De Filippi, P., & Wright, A. (2018). *Blockchain and the law: The rule of code*. Harvard University Press. https://doi.org/10.2307/j.ctv2867sp

De Filippi, P., & Lavayssière, X. (2020). Blockchain technology: Toward a decentralized governance of digital platforms? In A. Grear & D. Bollier (Eds.), The great awakening: New modes of life amidst capitalist ruins (pp. 185-222). Punctum Books.

Frequently asked questions: Estonian blockchain technology. (2020, March). e-Estonia. https://e-estonia.com/wp-content/uploads/2020mar-nochanges-faq-a4-v03-blockchain-1-1.pdf

e-Estonia. (n.d.). *e-state building blocks*. Retrieved November 21, 2022 from https://e-estonia.com/solutions/

E-ID cards unit: Identity Malta Agency. (2023, May 15). Identity Malta. https://www.identitymalta.com/unit/e-id-cards-unit/

Ekman, A. (2021). China's blockchain and cryptocurrency ambitions: A first-mover advantage. *Brief*, *15*, 1-8.

Ellul, J., Galea, J., Ganado, M., Mccarthy, S., & Pace, G. J. (2020, October). Regulating blockchain, DLT and smart contracts: A technology regulator's perspective. *ERA Forum, 21*(2), 209-220.

EU. (2023, May 17). *Discover eIDAS*. Retrieved November 21, 2022 from https://digital-strategy.ec.europa.eu/en/policies/discover-eidas

Feikert-Ahalt, C. (2018) *Malta: Government passes three laws to encourage blockchain technology*. Library of Congress, https://www.loc.gov/item/global-legal-monitor/2018-08-31/malta-government-passes-three-laws-to-encourage-blockchain-technology/.

Fenech, A. A. (2017). The Maltese position on responsible remote gaming: A way forward [Bachelor's thesis, University of Malta]. OAR@UM. https://www.um.edu.mt/library/oar/handle/123456789/28930

Frebowitz, R. L. (2018). *Cryptocurrency and state sovereignty* [Master's thesis, Naval Postgraduate School Monterey United States]. Defense Technical Information Center. https://apps.dtic.mil/sti/citations/AD1059865

Ganne, E., & World Trade Organization. (2018). *Can blockchain revolutionize international trade?* World Trade Organization.

Garg, P. (2020, January 14). *VeChain CEO says China banning crypto trading is actually a good thing*. CryptoSlate. https://cryptoslate.com/vechain-ceo-says-china-banning-crypto-trading-is-actually-a-good-thing/

Ghosh, S. (2017, November 6). *Estonia has frozen its popular E-residency ID cards because of a massive security flaw*. Business Insider. https://www.businessinsider.com/estonia-freeze-e-residency-id-cards-id-theft-2017-11

Gikay, A. A., & Stanescu, C. G. (2019). Technological populism and its archetypes: Blockchain and cryptocurrencies. *Nordic Journal of Commercial Law*, *2*, 66-109. http://dx.doi.org/10.2139/ssrn.3379756

Gkritsi, E. (2023, January 19). *China launches smart-contract functionality on Digital Yuan through E-Commerce App Meituan*. CoinDesk. https://www.coindesk.com/policy/2023/01/19/china-launches-smart-contract-functionality-on-cbdc-through-e-commerce-app-meituan/

Grech, A. G. (2015, September). *The shifting structure of the Maltese economy: Evidence from chain-linked data (2021)*. Central Bank Malta . https://www.centralbankmalta.org/shifting-structure-maltese-economy

Greenwald, M. (2018, August 21). *Business lessons from the world's most digital country, Estonia, and the happiest country, Finland*. Forbes. https://www.forbes.com/sites/michellegreenwald/2018/08/16/business-lessons-from-the-worlds-most-digital-country-estonia-the-happiest-country-finland/?sh=4029a6719358

Gruin, J. (2021). The epistemic evolution of market authority: Big data, blockchain and China's neostatist challenge to neoliberalism. *Competition & Change, 25*(5), 580-604.

Hammersley, B. (2017, March 27). *Concerned about Brexit? Why not become an E-resident of Estonia*. WIRED UK. https://www.wired.co.uk/article/estonia-e-resident

Haritonova, A. (2022, March 31). *What are the types of blockchain consensus mechanisms?* PixelPlex. https://pixelplex.io/blog/best-blockchain-consensus-algorithms/

Hassan, S., & De Filippi, P. (2017). The expansion of algorithmic governance: From code is law to law is code [Special issue]. *The Journal of Field Actions, 17*, 88-90.

High, P. (2018, January 16). Lessons from the most digitally advanced country in the world. *Forbes*. https://www.forbes.com/sites/peterhigh/2018/01/15/lessons-from-the-most-digitally-advanced-country-in-the-world/?sh=1ece64e21ac0

How economist Milton Friedman predicted bitcoin. (2014, March 5). CoinDesk. https://www.coindesk.com/markets/2014/03/05/how-economist-milton-friedman-predicted-bitcoin/

Huang, Y., & Mayer, M. (2022). Digital currencies, monetary sovereignty, and US-China power competition. *Policy & Internet, 14*(2), 324-347.

Huobi set to launch trading service in Hong Kong. Huobi Blog. (2023, May 26). https://blog.huobi.com/2023/05/26/huobi-set-to-launch-trading-service-in-hong-kong/

Husain, S. O. (2020). *(De) coding a technopolity: Tethering the civic blockchain to political transformation* [Doctoral dissertation, Wageningen University] , Wageningen University and Research. https://doi.org/10.18174/514268

Jackson, D. (2014, September 3). Obama cracks health care joke in Estonia. *USA Today*. https://www.usatoday.com/story/theoval/2014/09/03/obama-estonia-health-care-website-joke-toomas-hendrick-ilves/15017647/

Jha, P. (2023, April 24). *China to expand CBDC use case for belt and road initiative*. Cointelegraph. https://cointelegraph.com/news/china-to-expand-cbdc-use-case-for-belt-and-road-initiative

Kaljulaid, K. (2019, February 19). *Estonia is running its country like a tech company*. Quartz. https://qz.com/1535549/living-on-the-blockchain-is-a-game-changer-for-estonian-citizens

Kendall, M. (2022, June 27). *101 top blockchain startups and companies in Estonia (2021).* BestStartup.eu. https://beststartup.eu/101-top-blockchain-startups-and-companies-in-estonia-2021/

Kharpal, A. (2022, May 25). *China's state-backed blockchain company is set to launch its first major international project*. CNBC. https://www.cnbc.com/2022/05/22/chinas-state-backed-blockchain-firm-to-launch-major-overseas-project.html

Korjus, K., del Castillo, C. I. V. A., & Kotka, T. (2017, April). Perspectives for e-residency strenghts, opportunities, weaknesses and threats. In L. Terán, & A. Meier (Eds.), *2017 Fourth International Conference on eDemocracy & eGovernment (ICEDEG)* (pp. 177-181). IEEE. https://doi.org/10.1109/ICEDEG.2017.7962530

Krasner, S. D. (1976). State power and the structure of international trade. *World Politics, 28*(3), 317-347. https://doi.org/10.2307/2009974

Kshetri, N. (2017). Will blockchain emerge as a tool to break the poverty chain in the Global South? *Third World Quarterly, 38*(8), 1710-1732.

Kshetri, N. (2023). China’s digital yuan: Motivations of the Chinese government and potential global effects. *Journal of Contemporary China, 32*(139), 87-105.

Lehmacher, W. (2019, July). *Blockchain in the Belt and Road: Connectivity 2.0 between East and West.* Port Technology International. https://wpassets.porttechnology.org/wp-content/uploads/2019/07/25163756/WOLFGANG.pdf

Lewis, J. A. (2010). Sovereignty and the role of government in cyberspace. *Brown Journal of World Affairs*, *16*(2), 55-66.

Malanii, O., & Fáwọlé, J. (2023, March 20). *Double-spending in blockchain and how to prevent?* Hacken. https://hacken.io/discover/double-spending/#:~:text=Double%20spending%20can%20rarely%20happen,also%20adopt%20this%20security%20check.

Marbouh, D., Abbasi, T., Maasmi, F., Moustafa, N., & Saddik, A. E. (2020). Blockchain for COVID-19: Review, opportunities, and a trusted tracking system. *Arab Journal of Science and Engineering, 45*(12), 9895-9911. https://doi.org/10.1007/s13369-020-04950-4

McGuinness, D. (2017, April 27). *How a cyber attack transformed Estonia*. BBC News. https://www.bbc.com/news/39655415

McMurren, J., Young, A., & Verhulst, S. (2018). *Case study*: *Addressing transaction costs through blockchain and identity in Swedish land transfers*. GovLab.

Morales, J. (2023, May 14). *Chinese government shows support for blockchain amid crypto ban.* BeInCrypto. https://beincrypto.com/chinese-government-backs-blockchain-despite-crypto-ban/

Mougayar, W. (2016). *The business blockchain: promise, practice, and application of the next Internet technology*. John Wiley & Sons.

Nakamoto, S. (2008, October 31). *A peer-to-peer electronic cash system*. Bitcoin. https://bitcoin.org/en/bitcoin-paper

Nobel prize winner Milton Friedman, Satoshi Nakamoto and Bitcoin. (2020, June 10). Blockchain News. https://blockchain.news/insight/Nobel-Prize-Winner-Milton-Friedman-Satoshi-Nakamoto-and-Bitcoin.

Okx is expanding to Malta given country's comprehensive blockchain initiatives. (2023, March 3). OKX. https://www.okx.com/help-center/360002598072

Pace, R. (2006). Malta and EU membership: Overcoming 'vulnerabilities', strengthening 'resilience'. *European Integration, 28*(1), 33-49.

Parker, P. M. (2018, October 11). *Attracting blockchain and technology specialists to Malta*. CCMalta. https://www.ccmalta.com/insights/publications/attracting-blockchain-and-technology-specialists-t?lang=hy-AM

Patel, D. (2020, October 8). Trade finance registry: Singapore launches the world's first blockchain-based solution aimed at preventing double financing fraud. Trade Finance Global. Retrieved November 21, 2022 from https://www.tradefinanceglobal.com/posts/singapore-launches-the-worlds-first-blockchain-based-solution-aimed-at-preventing-double-financing-fraud/

Perritt, H. H. Jr. (1998). The internet as a threat to sovereignty? Thoughts on the internet's role in strengthening national and global governance. *Indiana Journal of Global Legal Studies*, *5*(2), 423-442.

Pihlak, H. (2017, June 14). *Estonia to open the world's first Data Embassy in Luxembourg*. e-Estonia. https://e-estonia.com/estonia-to-open-the-worlds-first-data-embassy-in-luxembourg/

Pihlak, H. (2018, April 5). *How Estonia became a global heavyweight in cyber security*. e-Estonia. https://e-estonia.com/how-estonia-became-a-global-heavyweight-in-cyber-security/

Pihlak, H. (2019, December 11). *Data embassy – the digital continuity of a state*. e-Estonia. https://e-estonia.com/data-embassy-the-digital-continuity-of-a-state/

PwC. (2018). *Malta's regulatory framework built for blockchain technology*. PwC. https://www.pwc.com/mt/en/services/pwc-digital-services/business-solutions/data-analytics-and-emerging-technology/blockchain.html

PwC. (2019). *Estonia – the digital republic secured by blockchain*. https://www.pwc.com/gx/en/services/legal/tech/assets/estonia-the-digital-republic-secured-by-blockchain.pdf

Raskin, M., & Yermack, D. (2016). *Digital currencies, decentralized ledgers, and the future of central banking* (No. w22238). National Bureau of Economic Research.

Reynolds, M. (2016, October 20). *Welcome to E-stonia, the world's most digitally advanced society*. Wired UK. https://www.wired.co.uk/article/digital-estonia

Semenzin, S., Rozas, D., & Hassan, S. (2022). Blockchain-based application at a governmental level: disruption or illusion? The case of Estonia. *Policy and Society*, *41*(3), 386-401.

Shin, F. (2022, January 31). *What's behind China's cryptocurrency ban?* World Economic Forum. https://www.weforum.org/agenda/2022/01/what-s-behind-china-s-cryptocurrency-ban/

South Korea's digital identity blockchain prepares to add new credentials, go international. (2022, December). Biometric Update.

https://www.biometricupdate.com/202212/south-koreas-digital-identity-blockchain-prepares-to-add-new-credentials-go-international

Swan, M. (2015). *Blockchain: Blueprint for a new economy*. O'Reilly Media.

Tapscott, D., & Tapscott, A. (2016). *Blockchain revolution: How the technology behind bitcoin is changing money, business, and the world*. Penguin.

Talmazan, Y. (2019, June 25). *Data security meets diplomacy: Why Estonia is storing its data in Luxembourg*. NBC News.com. https://www.nbcnews.com/news/world/data-security-meets-diplomacy-why-estonia-storing-its-data-luxembourg-n1018171

Tariq, N., Qamar, A., Asim, M., & Khan, F. A. (2020). Blockchain and smart healthcare security: A survey. *Procedia Computer Science, 175*, 615-620.

Turner-Jones, T. (2019, May 30). *Caribbean resilience: Lessons from Malta and the Blockchain*. Caribbean Development Trends. https://blogs.iadb.org/caribbean-dev-trends/en/caribbean-resilience-lessons-from-malta-and-the-blockchain/

VeChain. (2019, December 30). *Vechain is co-founder of the belt and road initiative blockchain alliance (BRIBA)*. PR Newswire. https://www.prnewswire.com/news-releases/vechain-is-co-founder-of-the-belt-and-road-initiative-blockchain-alliance-briba-300979679.html

World Health Organization. (2020). *Estonia and who to work together on digital health and innovation*. Retrieved November 21, 2022, from https://www.who.int/europe/news/item/07-10-2020-estonia-and-who-to-work-together-on-digital-health-and-innovation

World Economic Forum. (2022, August 29). *Why we shouldn't overlook the impact of SMEs on local and global economies*. World Economic Forum. https://www.weforum.org/agenda/2022/08/why-we-shouldn-t-overlook-the-impact-of-smes-on-local-and-global-economies-105d723ec7/

Wroughton, L., & Gupta, G. (2018, January 16). *U.S. warns investors over Venezuela's "Petro" cryptocurrency*. Reuters. https://www.reuters.com/article/uk-venezuela-economy-cryptocurrency-idUKKBN1F52QP

Xie, R. (2019). Why China had to ban cryptocurrency but the US did not: A comparative analysis of regulations on crypto-markets between the US and China. *Washington University Global Studies Law Review, 18*(2), 457-492.