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Tax as a Service

A business opportunity evaluation

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Abstract

Economies with a 15 percent tax to GDP ratio experience 10 % higher than those below the 15 % threshold. Governments are searching for ways to capture existing value within their economies, but traditional tax systems require a massive upfront investment. Current tax systems have extreme friction levels, both in their delivery channels and experiences for taxpaying citizens and businesses. Through a contextual evaluation looking at multiple structural options for a blockchain design, a business opportunity was outlined for a tax as a service company to provide a solution to governments looking to capture tax value. A stress test on the tax as a service business model was performed to create a thorough risk assessment and implement changes to create a stable business model. Governments require centralized power to operate, and a permissioned blockchain gives this power and enables a tier access solution reflecting the needs of stakeholders throughout a tax system. Through a delegated proof of stake mechanism, the new blockchain could support the development of a local private tax industry that is incentivized to collect citizens' tax contributions and help innovate the service delivery of the solution. A tax-based blockchain's strengths perfectly align with the needs of a new digital tax system, security, and scalability.

Keywords – Blockchain, Informal Economy, Tax.

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1 Prologue

The world has approximately 2 billion people working in the informal economy worldwide, with around 85% of employed people in Africa working informally and 93 % of the world's informal employees in developing economies (International Labour Office., 2018). This lack of formalization significantly reduces a government's ability to capture and tax the value of the economic activities within its borders. In the pre-connected digitized world, capturing data on the economic activities relied on well-developed extensive government agencies, for example, the IRS in the USA. Many developing countries are not in the position where a tax agency modeled off the IRS and other developed countries' agencies is feasible due to cost and human resources (International Labour Office., 2018).

This paper will investigate new technologies and how they could be used by private businesses to help developing countries capture the untapped resources of unreported taxable value in the existing economies. This concept is not new as many developed countries rely on public-owned Enterprises to bring the benefits of new technology. In the past, developing countries have been able to leverage market access and work with private companies to enable access to the same level and often better version of the technology (Kyem, 2016). For example, telephone networks were built in much of the developed world by state-owned enterprises and, through increased connectivity, provide real-time communication both nationally and internationally. However, most developing countries' first national and international communication networks have been through mobile phone technology, allowing communication and access to the internet. This paper is written on the premise that this is once again achievable by developing countries(Peroni and Bartolo, 2018). However, instead of skipping copper phone networks this time, they will take the technological leap over paper tax reporting and electronic filling directly into a blockchain-supported system. This technological leap will put them on par with developed countries' systems and ability to capture economic value. The author believes Tax system implementation can achieve this faster and more efficiently through a private company solution.

1.1 Aim

This academic investigation aims to develop a business model and contextual blockchain architecture for a private enterprise that can support developing economies to capture existing tax value in their economies.

This central aim is enabled by the sub-goals outlined below. These sub goals will form the building blocks of the path towards meeting the paper's main aim.

1. Create an understanding of literature used to identify and review business plans and technology.
2. Deliver a contextualized understanding of the existing tax situation in developing economies and the current technology used to deliver services in the space.
3. Identify New technologies, their implementations, and business plans with the potential to achieve the main aim.
4. Provide a contextual evaluation of the technology to deliver a technology architecture and business plan.
5. Deliver an action plan that can be used as a launching pad to exploit the identified opportunity.

1.2 Objectives

This master's thesis plans to follow an entrepreneurial process designed to produce a practical business plan instead of a traditional academic dissertation by Using established macro perspectives applied through the entrepreneurial process and a holistic view of a specific business opportunity. The steps used in this thesis will be further outlined in the Methodology and include existing theoretical entrepreneurial frameworks. This thesis will focus on business opportunity identification to account for non-uniform regulatory environments to ensure the real-world applicability of the business plan. The sections of this thesis and how they help achieve the aims are detailed below. Not included in the list below are the prologue and the epilogue.

Methodology

The Methodology will explore past entrepreneurial literature related to each of the four action sections. The Methodology will help decide the appropriate framework to achieve the stated aims for each team. The Methodology also intended to explore and identify relevant gaps in the literature related to blockchain technology and business plan evaluations.

Discovery

The discovery will perform a deep dive into the problem and define the status quo for how the system currently operates. Next, the discovery section will include identifying and defining the key stakeholders, their needs, and how existing and new technology could be used in the space. Lastly, the discovery sections will explain the current interaction of private industry in tax systems.

Opportunity Identification

The opportunity identification is designed to take a deep dive into the potential technology and its design and suitable business models. In this deep dive, the opportunity identification will include some context about the potential for these technologies and business models to be used to solve the problem.

Opportunity Evaluation

The Opportunity Evaluation will use the framework identified in the Methodology to evaluate the solutions from the opportunity identification. It will take a holistic view of the problem to deliver a combination of technologies and a business plan best suited to exploit the economic opportunity identified in the problem.

Detailing

The detailing section will create a plan that an Entrepreneur can use to start a business to capitalize on the identified opportunity. It will deliver a synthesized problem definition, business strategy, action plan, and economic overview. It is designed to allow the business to communicate its path forward and identify potential roadblocks and areas of concern the course may face.

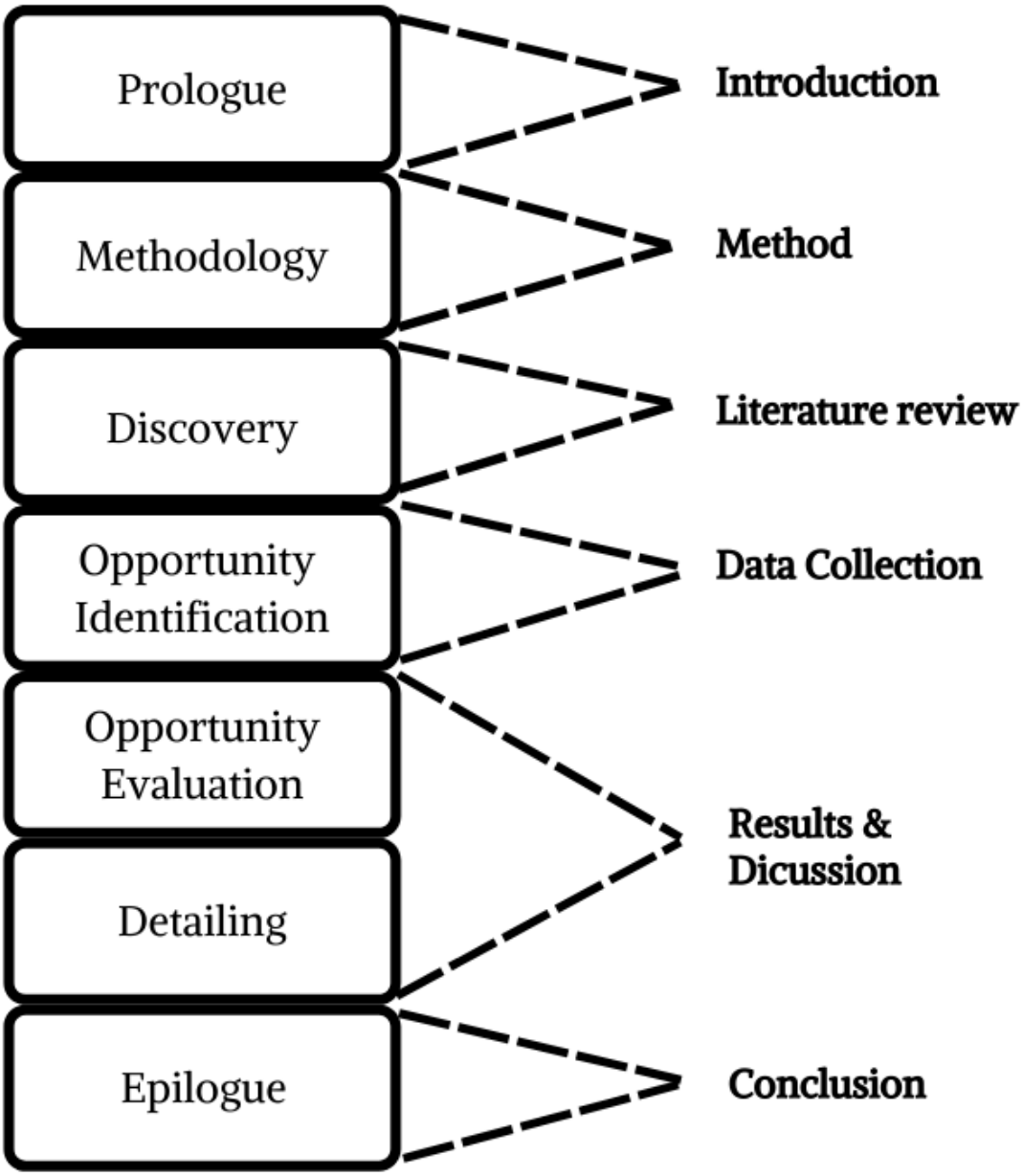
1.3 Reading Manual

The structure of this thesis does not follow the traditional structure of an academic paper. This reading manual will explain how the design of this thesis, as outlined in the objective section of the prologue, meets academic requirements and how it can be interpreted by readers more familiar with a traditional thesis structure. This structure was chosen to best exploit the opportunities provided to students in the Entrepreneurship specialization as defined in the Course plan for the master thesis (Unversity of South-Eastern Norway, 2022).

"The project is based on the development of a potential business opportunity that originated from research work at the USN, companies in the south-east Norway, innovators or students' own projects. The main aim of the entrepreneurial project is to commercialise research conducted at universities and companies, at the same time as developing entrepreneurship. The entrepreneurial project as a business plan is part of the master's thesis and provides students with the opportunity to learn how to commercialise new venture ideas into viable businesses."(Unversity of South-Eastern Norway, 2022)

The author has included an illustration and some text outlining how the structure was chosen to develop the potential business opportunity could be compared to a traditional thesis structure.

Figure 1.1: Thesis Structure



The illustration above attempts to capture the relationship between the structure used in this paper and a traditional thesis structure. The prologue is roughly compared to the introduction; however, some parts of the introduction are also present in the discovery section, where a more holistic view of the issues at hand is found. The Methodology can almost be 1-1 compared to a traditional methods section. The discovery section

meets many of the same aims as the literature review. The opportunity identification section is akin to data collection, where data is taken from many sources related to the aim. As described in the objective section of the prologue, this is where information is collected on the current tax ecosystem, technologies, and business models. Information on new potential solutions is also collected. The Opportunity Evaluation and Detailing section applies the framework discussed in the methodology section to the technologies and business model identified in the discovery and opportunity identifications sections. The opportunity and evaluation are best compared to the results and discussion section comparing a literature review to a methods section. Finally, the epilogue looks to fill the same role as a traditional thesis conclusion in wrapping up the investigation, discussing the limitations, and reflecting on the research.

This report will include any relevant support material in the appendix. It will cite any works used to support the discussed theory through in-text citation in the form of (author, year).

2 Methodology

This methodology explains the approach chosen to try and fulfill the research aim, show how contextual information about the aim was collected, the framework used to evaluate and analyze this information, and how the evaluated information can be presented in an actionable form. The methodology will be developed using the approach recorded by Gaya and Smith in the paper "Developing a Qualitative Single Case Study in the Strategic Management Realm." (Gaya and Smith, 2016). The approach will be adjusted to meet the altered requirements of this paper, from answering an academic question to producing a plan to meet the research aim from a business opportunity perspective. As outlined in the prologue, the research aim is to develop a business model and contextual blockchain architecture for a private enterprise that can support developing economies to capture existing tax value in their economies. The methods used to achieve this goal will be further investigated by looking at the research approach, information collection, evaluation framework, and detailing sections below.

2.1 Research Approach

The research approach taken to achieve the defined aim in this paper is qualitative. Creswell et al. define qualitative research as *"Qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem."*(Creswell and Creswell, 2017) This approach, as defined by Creswell et al., is made up of their components, the philosophical world views of the author, the research design, and the research methods. The qualitative approach used in this research paper can be best defined as a case study, Using Observation data by an author with a constructionist worldview.

Firstly, Lincoln et al. described a Constructivist world view as *"those that believe that individuals seek understanding of the world in which they live and work."* (Lincoln et al., 2011). Constructivists believe heavily that individual/ collective experiences influence how situations are viewed and understood. This perspective helps control the approach as the author has never lived in an economy or culture that the research aim would target. Therefore gaining insight from others' published experiences is vital.

Secondly, Due to the macro nature of the research aims, direct personal research was not chosen as a method but rather secondary data from published sources. This observational data allowed expert opinions, experiences, and studies from the broad cross sections of topics to influence the research journey. Benefits of using secondary data as a source also included the limited chance for author perception influence, low cost, high availability and more significant opportunity for replication since data is publicly available (Rabinovich and Cheon, 2011). It is unlikely another method could gain perspective on radically new technologies while at the same time dealing with a legacy industry like the tax industry from a developing economy perspective.

Thirdly, A case study research is defined by in as *"Case studies are a design of inquiry found in many fields, especially evaluation, in which the researcher develops an in-depth analysis of a case, often a program, event, activity, process, or one or more individuals."* (Yin, 2009). The core research aim is process-focused. Firstly in its creation and the steps which must occur to synthesize a solution to the research aim. Secondly, in its product's final form, the government's process to capture tax value from their citizens.

2.2 Data collection

To meet this paper's research aim, the main method of data collection will be from secondary sources. The Secondary data sources used include books, published papers, news articles/websites, and private and public institutions reports. The wealth of secondary data available on the blockchain and its technology options enabled a complete picture to be formed. Likewise, the macro economic view of the business model concepts meant any business or financial data needed could be collected through trusted secondary data providers with high-quality standards like the World Bank and the international labor organization(World Bank Data, 2022) (International Labour Organisation, 2022).

The secondary data collection is designed to equip the investigation with the research aim's context. The data collection should also be undertaken with the aim of sourcing data suitable for use in the evaluation frameworks described below.

2.3 Evaluation Framework

The opportunity Framework will be looked at from two perspectives and then holistically to ensure that both individual attributes and community interactions are considered. The evaluation will be divided into the technology and business model evaluations.

Technology Evaluation

The technology evaluation will be performed through a framework described by Bamakan et al. (Bamakan et al., 2020). This framework evaluates the consensus mechanisms through several significant properties and assigns weights to each property based on its perceived importance. Their empirical analysis used ranking values from several previous studies to determine the most commonly accepted performance evaluation criteria. They found that transactions per second were the most highly weighted evaluation criteria. The following three most highly weighted criteria were the consensus mechanisms' Resistance to a common type of attack. These were the double-spending attack, the 51% attack, and the Sybil attack. The broad categories applied by Bamakan et al. are throughput, mining profitability, decentralization level, and vulnerabilities (Bamakan et al., 2020).

Using this framework, this paper will adjust the priority of the evaluation criteria to serve the used case of its proposed situation. Through tailoring this framework, we can look to achieve a holistic view of the proposed blockchain architecture.

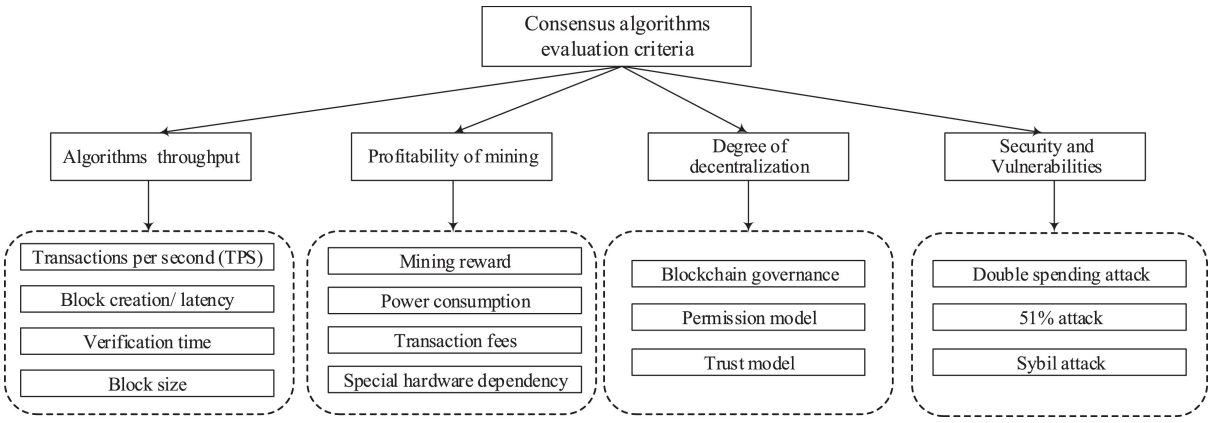


Figure 2.1: Consensus Algorithm evaluation framework (Bamakan et al., 2020)

Business Model Evaluation

Business models are a formulated plan of how the business plan to capture value from

innovation (Chesbrough and Rosenbloom, 2002). Business models reflect companies' internal resources and the external operating environment. Business model innovation is not only used by new entrants into markets but business model innovation can be used to help stagnating businesses regain market traction. However, business models formulated in meeting rooms may not meet their goals when they hit the market, highlighting how crucial the business model is to exploit best and identify opportunities (Christensen et al., 2016).

Scenario planning is a concept to stress test business model innovation. Haaker describes a six steps stress testing approach that will be applied in this paper to evaluate the chosen business models (Haaker et al., 2017). The six steps in this business model evaluation are:

1. Describe Business Model

   The business model description will be provided through a business model canvas. A business model canvas is a 9 section framework used to outline the main factors in a proposed business model.

2. Identify and select Stress factors

   Identification of stress factors is performed by analyzing current trends and developments in the selected industry and proposed markets.

3. Map Business Model to Stress Factors

   Mapping the business model to the stress factors identifies which area the stress factors relate to in the business model canvas.

4. Heat Map

   The heat map is created by assigning the mapped stress factor a heat value/color and its identified impact on the business model.

5. Analyse Results

   The analysis is performed through a sub view analysis and then a pattern analysis to show both the stress factors' impact on the business model components and its holistic view on the business model overall.

6. Formulate Improvements with actions

The discoveries throughout the framework will enable improvements and changes to the business plan.

2.4 Detailing

After performing the opportunity evaluation, a blockchain architecture and business model should be identified as best fitting for the contextual opportunity. The business model canvas explored in the stress test during the opportunity evaluation phase will be expanded using steps outlined by Osterwalder and Pigneur (Osterwalder and Pigneur, 2010). Through examining the business strategy, the value proposition, strategic partners, competitive landscape, and competitive advantage will be explained. Further, an action plan including an implementation plan, a risk assessment, and a concept of operations will be used to add clarity to the proposed solution. Finally, financing options and scaling effects will be used to form a starting point for acquiring resources to begin exploiting this business opportunity.

3 Discovery

The Discovery section will look at published literature surrounding opportunity identification, evaluation, and detailing. Then it will describe the problem behind the investigation aim and define the existing state of the tax system. The contextual discovery portion will next identify and define the main stakeholders and their requirements. Finally, the technology discovery part will show how current and new technologies may be leveraged in the sector.

3.1 Literature Discovery

The literature discovery is designed to gain insight into opportunity identification and evaluation by obtaining the data necessary to accurately follow the methodology, a more comprehensive solution to the paper's aim.

Opportunity discovery involves searching for a market demand that can be met using available resources. However, from an entrepreneurial perspective, opportunity discovery also includes the ability to extract value from a market demand using available resources (Casson, 1982). Initially, an opportunity may be imprecisely defined concerning its market need. However, through time this need will become more defined and better described. Often with underdeveloped opportunities when the product/service and benefits are explained to potential customers there is no recognizable value. Not only do market needs represent entrepreneurial discovery, but new technologies also create a path forward for value creation. If the new technology initially lacks a market fit, its benefits, and potential value could still be recognizable.

Decking (De Koning and Muzyka, 1999) concludes that opportunity identification can be broken down into sub-processes these are 1, identifying market needs, 2. recognizing fit between market and resources/technology, and 3. creating a business model to capture the value in that product-market fit. Singh et al. synthesized this sub-process into perception, discovery, and creation (Singh et al., 1999).

Perception requires identifying the market needs and the resource/net technology that can create value. End-users may be experiencing a market need but may not be able to

formulate this into an explainable need. Likewise, people who develop a new technology may not have the required perception to see all the market fit the new technology could fulfill. The critical step of perception is essential to kick-start the entrepreneurial processes. Endsley (Endsley, 1995) documents the presence of hyper-aware individuals that will be able to perceive the market in any situation. However, this ability to rapidly perceive market needs does not imply that the hyper-aware individual will be able to identify a product o fit their need. This level of hyper-awareness extends the other way, with people extremely aware of technological solutions. However, they cannot identify market fits that will be able to capture and generate value. The perception aspect of this paper will rely on the strengths of hyper-aware individual and organization publications at the forefront of the subject matter.

Once the market need and technological solutions have been perceived, there exists the possibility to match these two perceptions into a discovery. A discovery will form the foundation of an investigation into a particular market, whether geographic or demographic-based and further investigation into the technological solution. When investigating the geographic opportunities understanding the market needs that genuinely relate to the potential benefits of the technical solution is vital. For an appropriate assessment of geographic options, this paper will first investigate the possible technological solutions and the different paths they offer toward solving the answer. Krizner (Kirzner, 2015) highlights the importance of fully grasping the difference in technical quality and characteristics.

Finally, creating a business concept that may be able to extract value from the match between the market need and technological innovation is crucial to the opportunity discovery section. Without a sustainable business concept, it is unlikely that technological innovation will be able to fill the market need in the long term sustainably. The business concept created could be very similar to the current operating business in the space. However, discovering a new opportunity is also a situation that lends itself to new revolutionary business models.

3.2 Contextual Discovery

The contextual discovery will introduce the problem at the core of the investigation aim, outline the relevant stakeholders, and look at the potential impacts of change.

3.2.1 Introduction to the Problem

Hart (Hart, 1973) first used the term informal economy to describe the economic activities of the urban migrants in Ghana that operated outside the scope of the existing bureaucracy. The informal economy has around two billion people working worldwide, equating to more than 60 % of the world's workforce (International Labour Office., 2018). In Africa, 85.8% of employment is informal. The proportion is 68.2% in Asia and the Pacific, 68.6% in the Arab States, 40.0% in the Americas, and 25.1 % in Europe and Central Asia (International Labour Office., 2018). Williams and Ardiana found that wages are 14% lower for women and 26% lower for men in the informal economy. This study was conducted in Kosovo, and it is likely these numbers vary widely across other regions and different developing economies but remain low than formal economy workers (Williams and Ardiana, 2021).The lack of formalization in the economy worldwide poses real problems and substantial opportunities for citizens and governments.

3.2.2 Stakeholders

Governments

Governments must document and oversee the economic activity within and across their borders. The responsibility for tracking and capturing value from the informal economy will cover several government departments. The problem can be attributed to statistics departments counting and tracking people and businesses across the informal economy. Departments of labor could be responsible for ensuring the following of existing labor laws and enforcing these breaches. However, the most significant responsibility of capturing value falls entirely on the tax department of nations. They need to have well-documented enforceable, and traceable methods of ensuring individuals and business tax liabilities are paid in full on time to the state.

Businesses

Small businesses are the backbone of the informal economy. Many businesses that partake in the informal economy are sole proprietorships and have fewer than three employees. The cognitive burden and perceived lack of benefits from joining the formal economy are significant barriers to entry into business when attempting to enter the informal economy (Abel Valenzuela, 2003). Large businesses do benefit significantly from existing operating conditions in the informal economy. The exploitation of workers in the informal economy and lack of worker protections means that large multinational businesses can save money on the workforce and look for costly short-term gains for workers in the informal economy instead of suitable long-term business and employee development (Abel Valenzuela, 2003).

Employees

Day labor is used to describe formal and informal work agreements that are agreed upon daily and often with specific workplace benefits (safety equipment, breaks) (Abel Valenzuela, 2003). Day labor is practiced worldwide; however, its use is typically concentrated in marginalized communities in both developed and developing countries, with India having the largest day labor market in the world. Dahl estimates that in 2020 in India, the informal construction workforce will consist of 36.12 million workers. While construction is the primary employee of day labor worked other dominant sectors or domestic work and the more seasonally dominated agricultural work (Dhal, 2020).

Private Tax Industry

The Internal revenue service defines a tax preparer as "an individual who, for compensation, prepares all or substantially all of a federal tax return or claim for refund." (Service, 2018). In the United States the private tax industry plays a significant role in preparing and submitting tax returns. The IRS reported almost 40% of total tax return were prepared and submitted through the private tax industry. While the private tax industry does not have the full market for individual tax returns the private tax industry prepares the majority of business tax returns (Service, 2018).

The private tax industry in the United States has faced some criticism as in developed economies with highly digitized governments citizens are not required to submit tax returns as there tax contribution are automatic deducted or credited (The Danish Customs and Tax Administration, 2022). However the private tax industry have lobby against tax

industry reform for 20 years to maintain the status quo and support there business model. Many private tax companies have concerns a free and easy government interface could put them out of business (Elliott and Kiel, 2019).

3.2.3 Potential

There have been recent quantitative investigations that show that if a country's GDP to tax ratio of 15% or over experiences GDP growth 7.5% larger over a period of 10 years (Gasper et al., 2016). About 60 countries fall below this threshold. However, these countries can be divided into two main categories. Firstly, countries with a significant non-tax source of revenue like oil-rich Kuwait and Saudi Arabia. Secondly, countries without significant non-tax revenue, i.e., Nigeria and Indonesia. Developing countries have a tax gap between their current tax to GDP ratio and the 15% threshold of 180 billion USD. The most significant tax gap exists in Nigeria, which has a tax gap of 46.94 billion USD with a tax to GDP ratio of 3.4% and Indonesia is a close second with 43.28 billion USD with a tax to GDP ratio of 10.36% (Jinquera-Varela and Haven, 2018).

Several countries have enacted progressive tax reforms aimed at increasing tax collection rates from the informal economy. Spain is one such example of these reforms working as intended. the Spanish government target five key areas to meet the goals of the tax reform package. (Unni, 2018)

1. Reducing the costs of being formal.
2. Improving its audit technology and increased enforcement.
3. Improving its communications strategy.
4. Modernization of the administrative processes and functions.
5. Providing basic social protection for all.

3.3 Technology Discovery

New technologies open up several new pathways governments can be used to capture value from the informal economy.

Central Bank Backed Digital Currency

A central bank-backed digital currency is an e-money issued and managed by a state's Central bank. The benefits of central bank-backed digital currencies are the removal or risk of bank runs and other inflation withdrawal risks. The largest trial of CBDC is in the chain where more than 200 million people have access to the digital yuan (Kshetri, 2022). In practice, the average consumer living in a country with an already highly digitized backing system will not experience any real change in using their money as an online banking provider, much of the consumer-facing benefits already. The ease of money management and fiscal policy implementation is increased for the state when using a CBDC. As a response to the private digital currency, which has most recently been cryptocurrency in modern times. An ever-growing number of nations are announcing an investigation into the feasibility of adopting CBDC. Some countries are using CBDC as a safeguard against the dollarization of their economy. Dollarization, either voluntary or involuntary, is where a nation suffers the loss of trust in its currency either through severe inflation or loss of trust in the government. Countries and citizens often look toward the strongest available international currency to store and trade value when this happens. In the 20th century, this was predominantly the united states dollar (Calvo, 2002). However, when El Salvador experienced dollarization, the government not only made the United States dollar legal currency but a lot made bitcoin legal tender in its country (Alvarez et al., 2022).

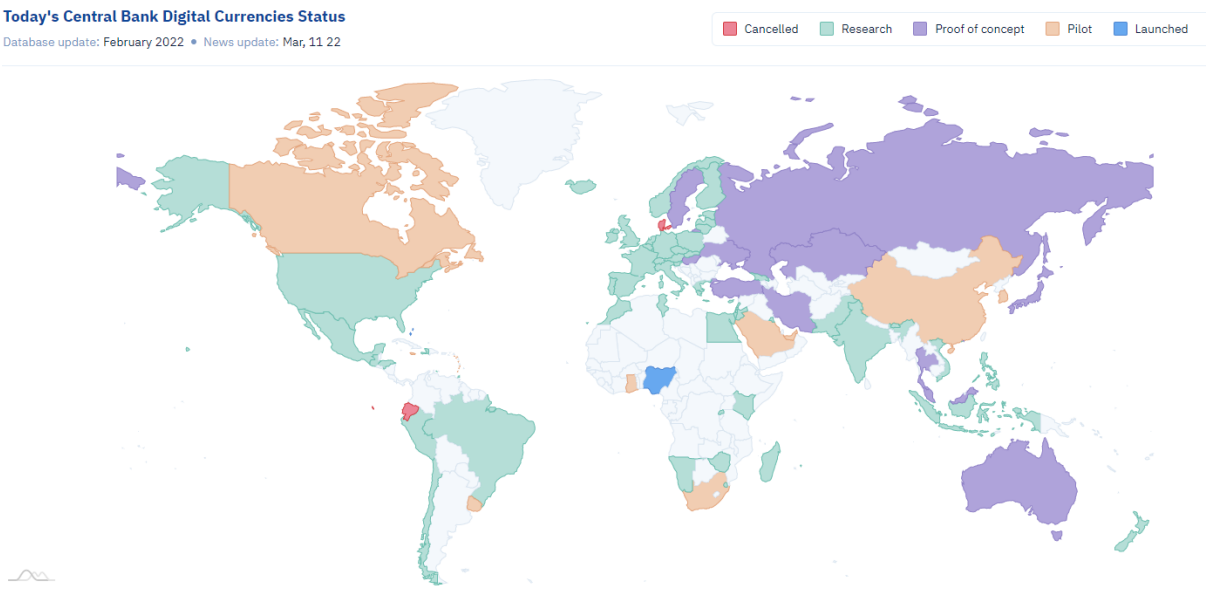


Figure 3.1: CBDC Status (CBDC project, 2022)

Blockchain

The blockchain is an immutable distributed ledger that can be used to store information. Information is stored in blocks and is written to the chain by nodes (Nakamoto, 2008). There are two popular ways that nodes can earn the right to write the block to the chain. Nodes can either use proof of work or proof of stake, and these methods vary by blockchain. Proof of work is when a node completes challenging maths equations to prove to other nodes that it has the right to write the newest block to the chain. Proof of stake is when owners of chain tokens can prove they own or control a specific number to enter the draw to write the following block to the blockchain. The advantages of the blockchain are numerous but depend on the stakeholder and its use case for the chain. Many early adaptors of blockchain technology heavily tout its decentralized nature. Due to the distributed nature of the nodes across many countries and jurisdictions, the blockchain can is controlled by any one party for the benefit of a minority. Blockchains can either be permissionless chains meaning any party can read the information on the chain, write information to the chain (if they are also a node) and submit information to the chain. Personable chains operate differently and require parties to have a predetermined authority level to interact with the chain. The advantage of a permissoned chain is mainly in the privacy and auditing fields and allows for control over the chain by a central authority Ie a tax department.

	Permissionless Blockchain	Permissioned Blockchain	Central Database
Throughput	Low	High	Very High
Latency	Slow	Medium	Fast
Number of readers	High	High	High
Number of writers	High	Low	High
Number of untrusted writers	High	Low	0
Consensus mechanism	Mainly PoW, some PoS	BFT protocols (e.g. PBFT [5])	None
Centrally managed	No	Yes	Yes

Figure 3.2: Blockchain Comparison (Wurst and Gervais, 2018)

4 Opportunity Identification

This discovery section highlighted the rapidly increasing rate of adoption for central bank back digital coins. It also shone light onto the rapid transformation blockchain as a technology had on decentralised financial systems worldwide. Therefore the opportunity identification will seek to define key technology options present in the blockchain that can be used meet the aim of this investigation. Also now more is known about the stakeholder, there current situations and potential impact of change, suitable business model can be discussed. these will be focused a supporting the maximum extraction of value to support the aim of this paper.

4.1 Technology Case Studies

The technology case studies will first look at the permission level of ledgers, both distributed and centralized. The options include a traditional centralized database, a permissionless blockchain, and a permissioned blockchain. Within these technologies relating to the blockchain, two leading technology choices represent the authority to write to the blockchain: Proof of Work and Proof of stake.

Permissionless blockchain

A permissionless blockchain is the most decentralized form of blockchain that exists. Any actor can read the chain at any time, and any actor can write to the chain once they have proven their ability through a proof mechanism (Liu et al., 2019). Blockchain was first used in by bitcoin and was permissionless (Liu et al., 2019). It lets any actor write onto the chain, and any actor reads to the chain. Permissionless blockchain offers superior transparency to other forms of blockchains and databases. It has the least friction for actors wishing to become nodes in the chain as there is no formal process to gain permission (Liu et al., 2019). Due to this reduced friction, permissionless chains also see a higher degree of decentralization and flexibility to changing operating environments, either from government regulations or external operating conditions like the cost of power.

However, the negatives associated with permissionless blockchain are security and chain reading risk. Some information stored on the blockchain may be sensitive to parties and

pose a risk if used in other applications like identity theft (Panait et al., 2020). The complete transparency of permissionless blockchain increases user concern about privacy and may limit the uptake of a chain where users wish to maintain high privacy levels. Also, due to the reduced friction of becoming a node, actors can more easily set up an attempt to attack the chain.

Permissioned blockchain

A permissioned blockchain still maintains the core characteristics of popular permissionless chains, but restricts the reading and writing of specific or all data on the chain. As there are *"restrictions in its membership and control procedures"* (Liu et al., 2019), an actor of a node will need to be granted a level of authority to perform a specific task on the chain. A permissoned chain means that, for example, only authorized tax officials might be able to access people's personal information o the chain. Permissioned blockchains are seeing rapidly increasing use in blockchains that deal with medical data (Xiao et al., 2018). In this sector, the chain users must maintain medical confidentiality of their patient's data.

A permissioned blockchain allows for control by a central authority that issues the permission for actors to access the blockchain and supports decentralization of the chain and the reward of nodes that write to the chain.

Central data base

Centralized databases are the most dominant form of databases currently in use (Alkhateeb et al., 2022). From small servers to massive data warehouses, and these are used by most large private and public institutions. There are wholly controlled by the operator. Centralized databases are a networked series of servers located in one physical location and store all of the data for an organization. They distribute and collect incoming data through a single point and can allow users to access data from the database.

4.2 Consensus mechanisms

The consensus mechanism is how a collection of blockchain nodes decides which node has the right to add the following block to the blockchain (Lashkari and Musilek, 2021). Node delegation is vital to the critical functions of the blockchain as all nodes have their copy of the ledger, so ensuring the ledger is altered in a standard way maintains these copies.

This problem in the blockchain space is often related to the Byzantine general's problem (Lamport et al., 2019). This problem refers to a historical example of many generals of the Byzantine empire circling a city. Some generals wish to attack, but others wish to siege the city. However, unless all the generals act in unison, either action is likely to fail, just like nodes deciding the content of the next block in the blockchain. In order to ensure all generals and nodes act uniformly, a representative must be chosen to have the authority to decide to attack or the content of the next lock. Two main consensus mechanisms have become popular in blockchains used today: Proof of Work (PoW) and Proof of stake(PoS).

Proof of Work

Proof of Work was first used in the bitcoin blockchain as its consensus method. When choosing a node to write the following block to the network, the easiest way might be a random selection. However, random selection poses a risk to the security of the blockchain. The theory Proof of Work operating is that if the network requires a node to perform difficult time and resource-consuming tasks, it is less likely to attack the network (Kirkwood, 2022). Proof of work has some negative traits, mainly focusing on its high energy use when calculating solutions (Yang et al., 2019).

Proof of stake

Proof of Stake is the most commonly used alternative to Proof of work, and it relies on nodes proving their ownership over specific amounts of a crypto currency of the chain (Yang et al., 2019). The theory behind Proof of Stake is that large currency holders that win the right to write the next block are a disincentive to attack the chain as it could affect the value of the currency they hold. At the same time, there are significant energy savings in using Proof of Stake (Wang et al., 2019). There is the risk that a large holder of the chain's cryptocurrency might always win the write to write to the chain and therefore limit the decentralization of the chain.

Delegated Proof of stake

Delegated Proof of stake is a variant of Proof of stake consensus. It allows holders of the chain's cryptocurrency to delegate a representative known as a 'witness', who are elected by voting by all nodes (Yang et al., 2019). As the voting is by resource, the largest

stakeholder may win the right to write the next block of the chain, leading *"to a security risk due to the higher degree of centralization of DPoS"* (Yang et al., 2019). However, it means if a holder and delegate were acting maliciously, coin holders could vote them out by delegating the currency's share to another stake pool.

4.3 Business model Case Studies

A business model that can extract value from the market needs a new technology vital to bringing long-term success to the project. This evaluation will examine three business models: software as a service, tax as a service, and a foundation business model, which is common in the blockchain space.

Software as a service

Software as a Service (SaaS) is a business model that offers users a license term to use the software. Hoch defined software as a service as *"—In the Software as a Service model, the application, or service, is deployed from a centralized data center across a network – Internet, Intranet, LAN, or VPN – providing access and use on a recurring fee basis."* (Hoch et al., 2001). This business model became common in the mid to early 2000s when software companies released yearly versions of their software (Turner et al., 2003). To minimize customer dissatisfaction and save money on legacy version support, software companies began offering yearly subscriptions to users that entitled them to the newest version of the software indefinitely. This was championed by companies offering suits of complimentary software, for example, Microsoft transition from Microsoft office to office 365 and Autodesk or Adobe offering productivity or creativity software suits (Choudhary, 2007).

This business model allows for guaranteed income streams for software companies and allows for a continuous revenue stream of product improvement. Rather than hold back updates - sometimes for years - until a traditional release point, *"publishers using SaaS have an incentive to release new features as soon as they are completed"* (Choudhary, 2007). This provides a better product to the user and leads to greater investment in the product and greater profits for the company (Choudhary, 2007). Part of the gain comes from only a fraction of the development team being needed to maintain the product. Software as a service thus complements the lean startup methodology, allowing companies

to launch very early-stage products and build upon the initial product with a stream of the customer providing income and feedback.

Software as a service can include many different levels of value to the end customer, with the most basic being just access to the software product. However, it can also be fully comprehensive, including long-term support on boarding and administrator and customer support.

Profit Sharing

Profit sharing was detailed as early at 1882 when Taylor described the relationship beneficial to both employers and employee through profit sharing. Profit sharing is when two parties enter into and agreement to share the profits bought about by the sum of there work (Taylor, 1882). This agreement is now used between business as a way to share risk in the agricultural sector. The large amount of unforeseen risk in agriculture and low diversified income streams (ie 1 geographic and 1 crop focus) can place high levels of stress and threaten the survival of agricultural business.

Meuwissen et al, states a number of societal benefits that stem from profit sharing agreements .(Meuwissen et al., 2001) Some of these most relevant to the aim in the investigation include:

1. Win-Win situation for both parties.
2. Higher allowable risk profiles for both parties.
3. Less resources devoted to individual risk management.
4. Revenue stability in the long term.

These benefits potentially align support the development of a solution to meet the investigation aim of this paper. further discussion of these benefits and there relation to other identified business models and stake holder needs will occur in the opportunity evaluation.

5 Technology evaluation

The evaluation of the technological opportunity will examine the consensus mechanism through the framework described in the methodology. This framework is applied through the lens of the described business opportunity. We will examine Proof of work, Proof of stake, and delegated Proof of stake consensus mechanism to understand which one best matches the tax chain opportunity. The consensus mechanism will be examined through 4 areas to ensure they best meet the needs. Firstly the throughput or how active the chain can be. Secondly, the mining profitability, i.e., how attractive it is for nodes to set up and host the chain. Thirdly, the decentralization level of the chain or how much control the government has over the chain, and finally, the chain's security.

While there are many types of consensus mechanisms, PoS, PoW, and DPoS were chosen due to their popularity in existing blockchain networks and human/hardware resources available to support the development and operation of the chain.

5.1 Throughput

Throughput is the ability of the consensus mechanism to process information onto the chain. Bano defines throughput as " the maximum rate of agreement on the values done in order to verify the transactions in a blockchain network" (Bano et al., 2017). While chasing a maximum of throughput may enable a chain to have near instant throughput, the block size and, therefore, the usefulness and detail of the data stored on the chain will be limited. The throughput investigation aims to find the balance between this within the context of the tax chain.

Transactions per second

Transactions per second measure how many times the chain Can be written to in one second. This is the most commonly used measure for a speed of a chain or consensus mechanism. Many newly developed chains have prioritized this as a metric due to the significant use case of block chain being as a currency. However, for use in the tax industry, it is unlikely that transactions per second will be as crucial for near instant settlement as a quick baseline for capability. If there were 5 billion taxpayers who paid once a year,

the TPS would have to be around 160. However, there are also many entities with tax burdens, including businesses.

Bano shows that Proof of work coins max out at around 30 TPS, with Monero holding this title (Coin Checkup, 2022b). While bitcoin is only capable of 7 TPS, some developments in this space are looking at off-chain transactions using the lightning network (Coin Checkup, 2022a). However, these benefits are primarily applied to transactional currency use, as with the tax solution, all users will be paying to just one government. Proof of stake consensus coins increases the TPS feasibility limits to an average of close to 100 TPS. 100 TPS will still be likely inefficient for a fully scaled tax chain solution. Delegated Proof of stake has multiple active coins capable of more than 1000 TPS, with the largest DPoS coil Cardano able to execute 300 TPS.

Block time/ latency

Block time is the difference between the chain receiving data to the data being written to a block on the chain. This is commonly measured in minutes, and the Proof is completed after chain validation between the nodes. Proof of Work chains commonly requires two or more minutes of block time, with bitcoin requiring a 10 min block time (Coin Checkup, 2022a). Proof of stake chains has, on average, a 1 minute block time. Delegated Proof of stake chains all have sub-1-minute block times, with some requiring only 3 seconds of block time.

Block Verification time

Block verification time is the time from when the block is written to the chain to when other nodes can validate the most recent version of the blockchain. Block verification time is not very important for the use case of a tax blockchain. On average, the time is only 10 minutes which is shorter than the time any block could face an audit from the appropriate authorities (Coin Market Cap, 2022).

Block size

Block size in bitcoin is limited to 1m which can hold more than 1000 transactions (Coin Checkup, 2022a). Block size must achieve a balance as huge block sizes can cause high transaction fees and a slowing down of the network. Many new chains are trying to limit their block size for increased throughput (Zheng et al., 2017). This could be an advantage

to a tax-based blockchain as the tax information is likely minimal amounts of text and integer data. Because of this, the block size will have little impact on the consensus mechanism.

5.2 Node Profitability

Node profitability is related to the incentives of nodes in the network to act by writing the block to the chain. The factors that directly impact the profitability of mining are the mining rewards, power consumption, transaction fee, and dependency on specific hardware.

The context of the node system for a tax-based blockchain is vital in understanding the mining profitability. The tax industry in developed economies relies heavily upon tax subsidized tax preparation for citizens. For example, in the united states, turbo tax and hr block offer a freemium efilling experience with the cost being tax deductible (HR Block, 2022). If a private tax industry that reward companies to help citizen pay their tax Can be established, the burden of communication and training will be reduced from the government. Likewise, block chains distributed nature could use private tax companies as nodes in the chain, thereby further distributing the operating cost load and further decentralizing the solution. Creating meaningful benefits for private tax companies to act as nodes will be critical for the success of the tax chain.

Mining rewards

The Proof of work consensus mechanism performs a task called mining in which a node will perform complex calculations to win the right to write the following block to the chain. To be rewarded for this, nodes that have minded are awarded the right to mint a specific value of the currency of the chain, i.e., they can create a specific value of the new currency. Both Proof of stake and delegated Proof of stake to operate differently. Generally, currency on chains that use these for their consensus mechanism can be fixed or have a set inflationary mechanism that controls the increase of currency supply. Rewards for Proof of stake consensus mechanisms come from either new currency created by the inflationary currency. Alternatively, the node in Proof of stake chains can be rewarded by the transaction fees users pay to have the block written to the chain.

Power Consumption

Power consumption was a significant cost for bitcoin node operators as the calculations required for Proof of work requires heavy computing power from often specialized hardware. As competition increased in the node operating space, the amount of work needed to win writing rights increased, and so did energy use (Stoll et al., 2019). However, Proof of stake nodes use very little power for node operation and, therefore, have benefited from recent sustainability trends in the commercialization of blockchain technology.

Transaction Fee

Transaction fees are used to incentivize nodes to write to the chain securely. Each time new information is required to be written to the chain, a small fee must be paid to entice node operators. Proof of Work and Proof of stake can use transaction fees to support node operators. In the case of this tax-based blockchain, the fee from the citizens' tax should be collected and given to the node operator, just as existing private companies are allowed to deduct their fees in developed economies.

Hardware dependency

Proof of work node operators on bitcoin has adapted to use application-specific integrated circuits tailored to their needs to increase their chance of earning mining rights. This is another cost Proof of work consensus mechanism that applies to node operation. Proof of stake and delegated Proof of stake consensus mechanism do not have nor benefit from specific expensive hardware to gain rewards as a node operator.

5.3 Decentralization level

Decentralization level is one of the most contentious factors in blockchain design, as many early adaptors of blockchain technology were drawn to the technology's decentralized nature. Now blockchain advocates in the decentralized finance space tout the distributed governance models of blockchains as the competitive advantage over traditional financial mechanisms.

Governance

The governance of a tax-based blockchain will need to be very centralized. The national

tax authority or other financial regulatory authority maintains complete control over the system just as they do with existing financial systems. However, the private tax industry that serves as nodes and governance raises opportunities for increased corporation and buy-in.

Permission Model

Decentralized blockchains commonly operate with a permissionless blockchain model. However, for a tax chain where sensitive user information might be stored, a permissioned model would be more suitable. Either the central tax authority or the tax chain business could be responsible for permitting users to interact with the chain. There could be permission levels based on action, either reading or writing. Permission levels are based on the amount of information needed, i.e., identity or full tax record. a permissioned model could also provide an increased perception of security to citizens whose information would be stored on the chain and could also help protect business information their competitive advantages (Liu et al., 2019).

5.4 Security

A centralized public chain must be implemented with robust security protocols to maintain trust. Three main types of common attacks will be discussed below, and a defense against them will be identified to design a more resilient blockchain.

Double spending attack

A double spending attack is when an actor in the chain attempts to write the value of a chain's currency to 2 different blocks (Rosenfeld, 2014). This is performed by utilizing the time it takes to deal with conflicting block creation. If two nodes both think they have won the right to write the next block, they may create different blocks. While the rest of the nodes look to agree on which fork to continue the chain, the person may have to spend the same coin in each block in different transactions waiting to be decided on. A centralized permission model could revoke a user's privileges if they are discovered to have taken part in a double spending attack upon review.

51 % attack

The 51 % attack is when in Proof of stake and delegated Proof of stake chains, once a

pool of staked funds gains control of more than 51 % of the currency on the chain (Sayeed and Marco-Gisbert, 2019). It can also occur in the Proof of work system if one node controls more the 51 % of the computational power, drastically increasing their chances to write to the chain. The 51 % attack could be mitigated on block chain by setting regional operating boundaries from nodes like along the state of municipal districts. This would ensure that one private tax pool could never achieve 51 % of the currency. Also, the central authority is likely to hold more than 51 % of the currency and has the authority to discipline any attacks, further reducing attack incentives.

Sybil attack

A Sybil attack is common on smaller chains when malicious nodes attempt to coerce, hack, or influence another node to control their stake or computational power (Douceur, 2002). The tax chain should have a robust and secure permission process that is routinely audited to help reduce the chance of a Sybil attack.

5.5 Consensus Algorithm Evaluation

The Consensus algorithm framework above was applied to the context in which the business will operate it. The ranking of PoW, PoS, and DPoS consensus mechanisms can be applied through the weight table Bamakan et all developed when creating this framework (Bamakan et al., 2020). Bamakans weighted criteria where first standardized as in that study there were extra evaluation criteria present that was not used in this evaluation. the relation was maintained between criteria weights was maintained and a standardized weight waas created to help guide the authors creation of the contextual weights used for this evaluation.

Criteria	PoW	PoS	DPoS	Weight	Standardized Weight	Contextual Weight
TPS	1	2	3	8.68%	12.54%	10%
Block Time/Latency	1	2	3	5.29%	7.64%	9%
Block Verification Time	2	3	3	5.37%	7.75%	8%
Block Size	2	3	3	4.18%	6.03%	7%
Mining Rewards	3	2	2	4.32%	6.24%	11%
Power Consumption	1	3	3	7.52%	10.86%	10%
Transaction Fee	2	2	2	4.57%	6.60%	11%
Hardware Dependency	1	3	3	4.41%	6.37%	10%
Double Spending Attack	1	1	3	8.85%	12.78%	8%
51% attack	1	1	1	8.03%	11.60%	9%
Sybil Attack	1	1	2	7.99%	11.54%	7%

Table 5.1: Consensus Algorithm Evaluation

During the technology evaluation the suitability of each consensus mechanism was applied to the selections criteria. Through the discussion the author identified how will each consensus mechanism aligned with the context a tax based block chain will operate in. each consensus mechanism was scored eight with a 1,2 or 3. with 1 meaning the consensus mechanism poorly fit the contextual requirement, 2 meaning an adequate fit was identified and 3 meaning the consensus mechanism exceeded criteria requirements.

Criteria	PoW	PoS	DPoS
TPS	10	20	30
Block Time/Latency	9	18	27
Block Verification Time	16	24	24
Block Size	14	21	21
Mining Rewards	33	22	22
Power Consumption	10	30	30
Transaction Fee	22	22	22
Hardware Dependency	10	30	30
Double Spending Attack	8	8	24
51% attack	9	9	9
Sybil Attack	7	7	14
Sum	148	211	253

Table 5.2: Consensus Algorithm Evaluation Results

The results of this evaluation show a delegated proof of stake consensus mechanism best fits the needs of the research aim.

5.6 Chain Architecture

Upon the contextual review of available technologies, several suitable options become clears. It should have the following properties for a chain designed to support tax collection through a distributed private network of tax agents.

1. Delegated Proof of stake consensus mechanism to support appropriate throughput and enable long-term scaling. This also reduced resource consumption and hardware dependency.
2. Node profitability should be ensured through a transaction fee-supported reward system.
3. A centrally governed permission chain will project security to users and ensure their sensitive information is only accessible to authorized actors.
4. This need to be supported through an equally robust and audit-able identity authorization model capable of taking enforcement action on those responsible for attacks.
5. Nodes must be limited to regions with balance populations and economic activities to ensure good decentralization of the chain.

6 Business model evaluation

The two business models outlined in the opportunity identification, software as a service and profits sharing could on there own potentially be suitable for meeting the aim of this investigation.However business model innovation has the potential to improve the financial value capture and open business to new market and customers. The tax a service business model will be outlined below then applied to a business model stress test through the frame work identified in the methodology.

6.1 Tax as a Service

Tax as a service is a new business model the author proposes for this paper. The basis of Tax as a service is a mixture between profit sharing and software as a service business model. Software as a service was detailed previously in the opportunity identification. Profit sharing is commonly in the agriculture sector, where the customer may not have the initial capital to pay for the business solution and were risk sharing reduces the risk profile of all parties involved (Meuwissen et al., 2001). They agree with the business to share the increased profits from using the technology/business solution.

Tax as a service is a business model where tax authorities could agree with a software provider that would involve paying the software and provide a share of increased tax revenue made from the software integration. Due to the size of under collected tax bases and the scalability of software solutions, there could be either a tiny percentage of the profit shared or a capped reward value for the company offering tax as a service solution.

Tax as a service if the profit-sharing results in an extreme payment to the facilitator could be viewed detrimentally by the population as the tax pool the reward it comes from is the people's money. However, this image problem could be offset by only sharing in taxpayers' profit over a specific pre-defined limit. Therefore placing the perceived burden on the wealthier tax-paying part of the population.

Tax as a service would require a minimum number of taxpayers and a minimum volume to be financially profitable for the company offering the service. Also, the tax as a service business model would rely on close coordination with regulatory authorities and

enforcement to ensure the operating condition needed for success in the tax as a service business model.

6.2 Tax as a Service -Stress test

In order to fully understand how the Tax as a Service could function, Haakers 6-step business model stress test will be applied to it (Haaker et al., 2017). The context needs to be detailed for sufficient application of this business model.

The BM will describe a private company's business model to sell their product to government departments to capture tax value through establishing a national tax system. There is a direct correlation between GDP growth and the percentage of GDP coming from Taxes. Many developing economies severely lack the infrastructure required to capture the current tax value within their economies. However, just as developing economies have taken technological leaps with the help of private enterprise in the past, it can happen in the future with blockchain-enabled tax infrastructure. However, some of these developing economies face an extreme scale, with some having over 100 million taxpayers. There is no universal government organizational structure as some developing countries also empower state and local authorities to capture tax value on top of Federal tax authorities.

Business model Description

The Business model canvas is used to describe Taxchain. The primary customer of the tax chain is governments in developing economies at all different levels and companies in the domestic tax industry. They have a significant amount of untapped tax value within their economies. The value proposition of the tax chain is a low-cost, high trust flexible tax system. The service Taxchain provides reading and writing to the chain and assigns permission for others to support, educate, and integrate new customers. Customer relationship with high-level stakeholders is critical for Taxchain. Taxchain's services will be distributed through digital channels only. The primary revenue source will be a profit-sharing agreement with the tax authority and software as a service sales to private domestic tax companies. The key partners outside the primary government customer are infrastructure providers that service the internet and electricity to citizens. The main cost of the tax chain is personal development and customer acquisition. Due to scaling efforts and the distributed nature, the operating costs are low.

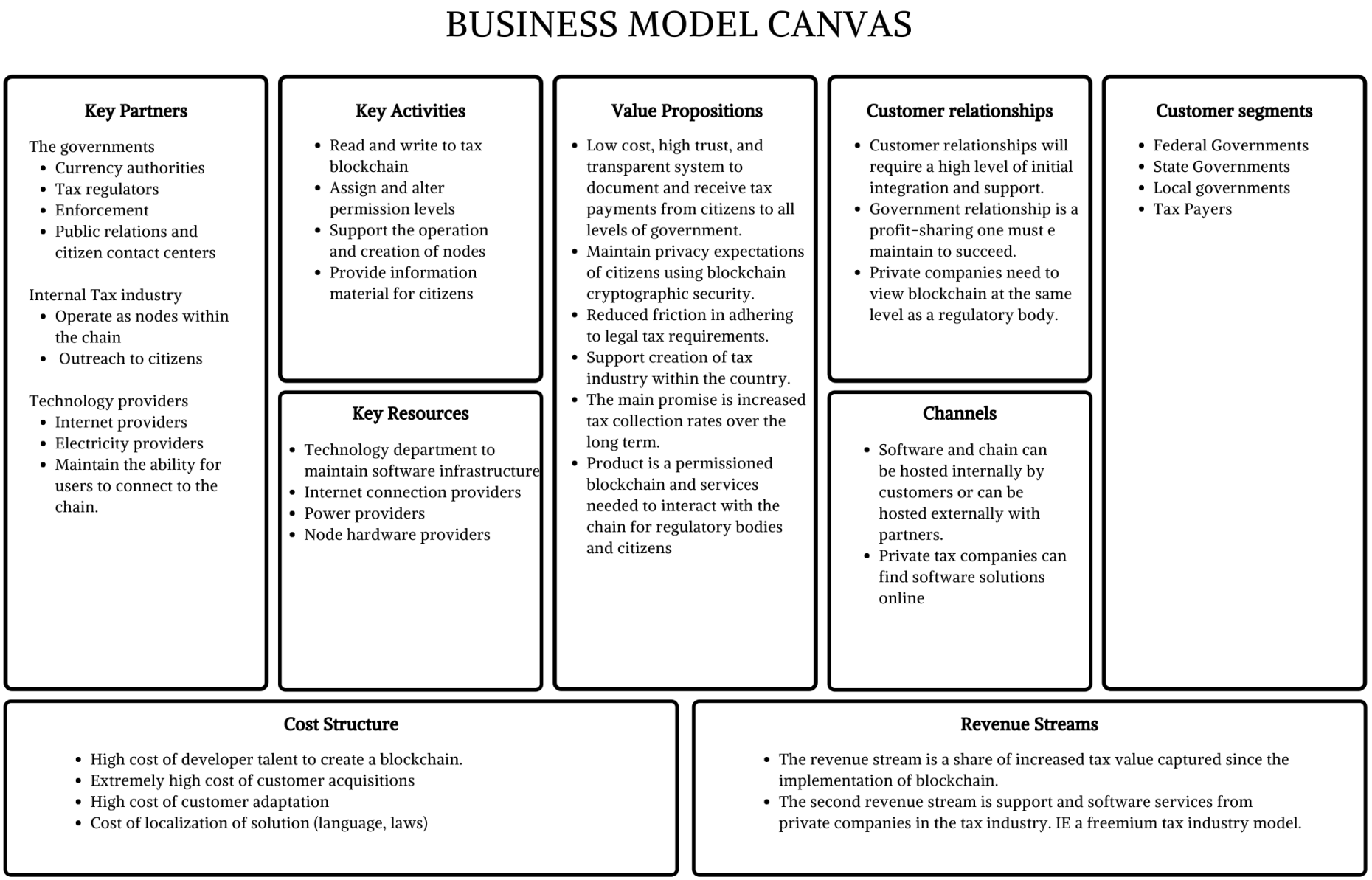


Figure 6.1: Business Model Canvas

Stress factors

The following stress factors are developed from recent publications and news sources about the current situation in blockchain deployment and tax collection. The four perspectives the stress factors will be viewed from are legal, technological, societal, and political.

- Internal customer issues

  For a successful tax department to operate, cooperation is needed across many government departments at all different levels. Ensuring that customer support communication across the who value chain will be key. Suppose there is one area lacking effectiveness, i.e., enforcement or identity management. In that case, the described business model will be under stress as these issues could drastically affect user uptake and use.

- Access to internet

  The business model is based wholly on a digital solution and does not plan to help tax departments offer any non digital solutions. If citizens lack access to The internet either through their geographic location or economic status, their ability to interact with the system will be severely hampered. Likely, if the existing structure is taken offline for some reason, the whole process and business model would e put in jeopardy.

- Existing nonpayment of tax culture

  The business model relies on the assumption that the existing attitude towards tax culture will change as countries' economies develop. However, there will be significant friction in convincing people that currently Do not pay tax to sacrifice part of their income to governments that may not be held in the highest regard. without a significant change in tax culture, the informal economies value will prove very difficult to capture

- Privacy/security

  The security of people's information will be a major concern for the citizens who value their privacy. If there is even one security breach, it could irreparably damage the perception of Taxchain. This stands for people writing false information onto

the chain to reduce their tax burden and reading sensitive information off the chain about people's income or economic situation.

Perspective	Uncertainty	Outcome 1	Outcome 2
Legal	Privacy/security	Permanent loss of trust in the Chain	Temporary loss of Trust in the Chain
Technology	access to the internet	Low Uptake of the solution	No uptake of the solution
Society No change in tax paying culture	Existing Non payment of tax culture	Existing nonpayment of tax culture	Culture changes to tax paying one
Political	Internal Customer Issues	Continued dysfunction between government departments	Government departments for effectively cooperate

Table 6.1: Stress Factor Outcomes

Map of Business model stress factors

Firstly, we consider the privacy and security stress factor. This is related to customer relationships and value proposition. A core factor of the value proposition is the privacy and security of information on the chain, and this threat is more than the functional act of securing the chain. Although that is important, maintaining stakeholders' perception that the chain keeps their private data secure. The leak of private data also interferes with maintaining the high level of customer relationship needed with the government as it could face pushback from its citizens with any leak.

Secondly, Access to the Internet could place substantial stress on the channels and key activities section of the business model. Without the ability to distribute, the service uptake will be much slower than possible. Likewise, if users have unreliable access to the Internet interacting with the chain citizens will be difficult. Then the tax chain will not be able to meet its full activities.

Thirdly, the Existing nonpayment of tax culture stresses the revenue structure and critical partners. May economies with poor tax-paying cultures lack visible government services and benefit those economies with a high tax-paying culture will see. If citizens fail to see benefits from increased tax payments, the culture is unlikely to change. Due to

the profit-sharing agreement with the government, nonpayment of tax culture also puts pressure on the auxiliary departments that could work to change this, such as enforcement departments.

Finally, internal customer issues will have the broadest effects from value and services, key activities, key partners, and critical resources. The business model is tax as a service. However, due to the size of some potential customers, the business operator will need to function in a partnership with different organizations within the customer. If there are issues that significantly affect the implementation or operation of the system, then the revenue structure could be under extreme stress.

Heat map

The heat map shows the impact of the outcomes of threats on BM components. At the same time, some reasoning has been argued for each stress. While mapping the stress factors, the heat map is designed to give a cursory overview of hall interactions with the Business model Components.

	Privacy		Internet access		Tax culture		Internal Customer	
Business Model Components	Permanent trust loss	Temporary Trust loss	High friction to adoption	Rapid adoption	Change to pay tax	Stay non payment of tax	Dysfunction	Cooperation
Customer Segments								
Customer relationships								
Channels								
Value proposition								
Key activities								
Key resources								
Key partnerships								
Cost structure								
Revenue structure								

Table 6.2: Stress Factor Heat Map

Results

	Privacy	
Business Model Components	Permanent trust loss	Temporary Trust loss
Customer Segments	Core customer will lose major perceived benefits	Alot of public relations work need to explain why loss off trust is temporary
Customer relationships	Resources for customer management will need to be massively devoted to damage repair	Temporary change is customer relationship to focus on security repair
Channels		
Value proposition	Main value proposition of security will be lost	Change value proposition to be above a certain security level ie greater then tradition tax systems
Key activities	Other activities will be secondary to reassuring security	Other activities will be secondary to reassuring security
Key resources		
Key partnerships	Hardware providers might loss interest and permanently devote supply to other chains	Hardware providers could be swayed to sell to other chains
Cost structure		
Revenue structure	With people not feeling secure less tax likely to be paid meaning lower revenues	Could have an extremely low year during temp loss of trust

Table 6.3: Privacy Heat map

	Internet access	
Business Model Components	High friction to adoption	Rapid adoption
Customer Segments	Less people able to pay tax via the internet	
Customer relationships		This will enable the customer to see value quickly
Channels	Without the digital Chanel solution can not be delivered	
Value proposition	Value prop for governments is wide reach, without internet this is jeopardised	Will help spread value proposition to as many users as possible
Key activities		
Key resources	Internet connection is a key resource and enables other key resources	Could strain resources if scaling is not setup correctly.
Key partnerships		
Cost structure		Scaling quickly will help reduce costs per user served
Revenue structure	Slow uptake will hamper the massive investment needed to kick start revenue generation	This will help boost revenue and stabilised business s revenue

Table 6.4: Internet Access Heat Map

	Tax culture	
Business Model Components	Change to pay tax	Stay non payment of tax
Customer Segments	Could potentially benefit customer in other citizen government interactions	Will hinder ability to collect other forms of tax within government
Customer relationships	Will help the customer receive maximum revenue from new tax	This will require intense interaction and asks of customer to support culture change
Channels		
Value proposition	The change is culture will underpin may parts of the value proposition	Value prop is based around citizens seen value in tax payment
Key activities	The change will enable a more efficient set of key activities	
Key resources	A quick change could put massive pressure on resource if scaling not set up	Will strain key resources
Key partnerships	Will help attract business to key partner of mobile intent provider	
Cost structure		Will put pressure on small number of existing tax payers
Revenue structure	Will ensure long term revenue payment	Without increased tax payment revenue structure doesn't work

Table 6.5: Tax Culture Heat Map

	Internal Customer	
Business Model Components	Dysfunction	Cooperation
Customer Segments		Will help attract more customer and sub customer like local and state tax agencies
Customer relationships	Dysfunction internally in customer will strain relation during change process	Will ensure goal are aligned between customer and tax chain
Channels	Dysfunction could hamper channel distribution as channel must be unified	Will give unified channel to customer both business and private
Value proposition	Value prop for citizens is easier integration With government so it must change	Will help government collect and inevitably use collected tax
Key activities	Key activities will be very difficult with out all sectors of government working together	Will enable a smoother process for all uses in activity delivery
Key resources	Could strain tech talent with customer dysfunction loosing them	Cooperation could mean massive uptake would strain internal resources
Key partnerships	Government controlling partner sectors could prove a hindrance	Will help partners increase business also
Cost structure	Much more cost in dealing with dis functional customer	Will help scale and there by reduce cost per user
Revenue structure	Without high functioning customer revenue stream will be reduced	Will ensure more citizen enticed to pay tax.

Table 6.6: Internal Customer Heat Map

Patterns analysis

By understanding patterns in heat maps, areas in need of change or support Can be identified in the business model. Privacy and security have shown to be a massive concern for many areas of the business model. Both permanent and temporary loss of trust could prove disastrous for the business model. This would significantly hinder the citizen's uptake of the tax chain and mean that pressure will be put on the revenue structure and value proposition. Likely a privacy or security breach will also reflect negatively on the customer and partners and could damage their relationship with them.

Another area of significant concern can be seen in internal customer dysfunction outcomes. As multiple departments within the customer are needed to cooperate to deliver the value, their dysfunction means that cost and revenue structure will be impacted as uptake Will below, enforcement could below, and more resources will need to be devoted to deal with the dysfunction. Also, key partners could be impacted by the dysfunction of the customer as they deal with other departments from the customer, likely licensing funding for their activities.

Some of the strong points of this business model show that if it is executed in an area with high internet connectivity and dispersion, there is the potential for fast uptake. This would benefit most components of the business model canvas. High internet connectivity will help in the execution of critical activities and the delivery of the value proposition. It will also allow for rapid scaling, putting downward pressure on the cost structure and collecting more significant revenue.

The change of tax culture into a tax-paying one will also massively support the business model's execution. It will have the most significant benefits on customer segments, key partnerships, and customer relationships. Being the key driver of cultural change in tax payment, Taxchain can help change citizens' relationships with the government, which would help support the relationship with the customer.

Finally, cooperation within the customer and a united front between the customer and Taxchain could pose the most significant positive impact on Taxchain. An effective customer, both in communication and action, will enable Taxchain to focus on delivering its key activities. specifically, this could be securing the privacy of data on the chain and

ensuring the technology behind the chain is set at the appropriate scale with increased use. This will also free up internal resources to expand the chain to other customers, further increasing the benefits of scaling effects.

Improvement and actions

The business model stress test provided several areas that can be used to improve the business model and some areas that give insight into other parts of the business plan. The improvements will look at ways to ensure security and ways t mitigate the effects of security breaches. Secondly, ways to support the change in tax culture will be identified. The third is identifying markets that are favorable to the business model.

Block chain security is a major draw card to the technology. The technology evaluation identified three significant forms of potential attack and how they can best be countered. Beyond the technical solutions to the security and privacy issues, there should be a well-developed plan that deals with crisis management in case of a security breach. An effective response plan could help mitigate the damage done by a security breach. This plan should focus on maintaining both the customer relationship and critical partners. These organizations will be directly responsible for communicating with the end user. Ensuring adequate rewards for node operators is another way to help strengthen the chain's security. Developing a distributed private tax industry will disperse the number of stakeholders and help the community of users sees the reduced benefits of an attack. This privacy and security threat also highlights the need for reliable authentication of actors permitted if a permissioned chain is used.

Change management is critical to the success of the business model. Many potential customers operate in countries and regions that do not have a culture supportive of tax paying. This is not due to a particular aversion to it, but many participants in the economy may never have paid tax. Therefore, it will be completely new skills and concepts for these participants. Countries with high tax-paying cultures like Europe, for example, do so because they expect and rightly receive benefits from their tax contribution through government services. Saudi Arabia has recently undergone this change for years that had 0 Value added tax in the economy, but they changed this in 2017 with a 5 % VAT rate. There was significant public resistance to this as many Saudis tacitly accepted the tax-free life and their monarchy's rule. However, taxation without representation was a hard pill

to swallow for many Saudis. For the potential customer of Taxchain, Robust change management producers in the population will need to be supported and identifiable public spending of their tax contributions.

Favorable markets for the tax as a service business model have some common traits. Firstly is high population coverage of mobile internet and smart phones. This is the primary channel through which the tax chain will conduct its key activities and enable the most rapid scaling of the solution. Secondly, the market will have a unified government that will have a central point of contact with the tax chain organization and will have methods of either enforcing or enticing cooperation to the goal among participating departments and users. Ideally, the customer will be somewhere with long-standing internal stability that can execute the expectations of their citizens after they begin paying taxes.

7 Detailing

The opportunity evaluation created a contextual solution for a tax based blockchain to enter developing economies. This solution consisted of a business model and blockchain architecture. A business with a Tax as a service business model using a delegated proof of stake consensus mechanism and a permissioned governance structure is best suited to capture the value present in the business opportunity.

In order to understand the business opportunity, this paper will begin by outlining the present situation and detailing action plans for the opportunity. Firstly, business strategy, the value proposition, strategic partners, competitive landscape, and competitive advantage will be explained. Further, an action plan including an implementation plan, a risk assessment, and a concept of operations will be used to add clarity to the proposed solution. Finally, financing options and scaling effects will be used to form a starting point for acquiring resources to begin exploiting this business opportunity.

The information and used in this section is a result of the discovery, opportunity identification and opportunity evaluation sections. From here on, the business opportunity and solution will be referred to by the business tile of *Taxchain*.

7.1 The business opportunity

Worldwide, two billion people in the informal economy operate outside the existing tax collection framework (International Labour Office., 2018). The friction individuals and businesses face in declaring and paying their taxes is one of the critical roadblocks many face. In countries with high levels of informal employment and developing economies, tax authorities lag in the infrastructure and lack the financial resources to capture this value in their economies (Joshi et al., 2014). It is not feasible to aim to develop a system similar to what is currently found in developed countries, due to the high cost of formalisation of the tax system and the lack of technological resources (Joshi et al., 2014). However, just as other domains skipped technology levels, developing countries have a generational opportunity to be the pioneers in future tax systems.

Governments wishing to capture tax value present in their economies face a choice: either

a long development period requiring internal capabilities to create a product suitable for use across the whole economy, or to utilize innovative financial technology, such as Blockchain. Blockchain is a distributed ledger technology that can be adapted to meet the needs of all stakeholders in a system. Blockchain technology is secure, scalable, and auditable - three key traits for an effective tax system (Schuetz and Venkatesh, 2020). These strength are the foundation of a well-developed tax system and can better track value, capture value, and enforce legislation economy-wide.

A new tax system opens the door for new business models for supporting industries. Developed economies often allow deductions for the cost of tax preparation from an actors total tax contribution. This proven model can be updated to be an integral part of the new enabling technology and allow for the development of private companies supporting the tax industry in these developing economies. In a study across 69 countries, Friedman et al. (2000) found informal companies *"go underground not to avoid official taxes but to reduce the burden of bureaucracy"*. If the benefits outweigh the costs, such as reduced the barriers to entry and allowing for government support of industry, firms will formalise and increase tax participation (Joshi et al., 2014). This increase in government revenue could be used as a source of compensation for the Tax chain business through a tax as a service model where essentially only the profits are shared.

7.2 The Business Strategy

The business strategy revolves around the stage gates of the technology. The focus on getting the basics right like security and scale ability is the core of the business's long-term success. A development partner must be identified early in the process. This partner could be a state or local authority burdened by their existing tasks of collecting declared tax or a locality with a large proportion of undeclared tax. Note that these taxes will most likely be taxes not commonly levied at the Federal level, such as state taxes or taxes for local services like waste collection or infrastructure.

In agreement with the local authorities, a framework for introducing policies that support the hyper-localized tax service industry should be established. This industry support is unnecessary if the government authority already has a system with appropriate outreach, but partnering with private industries could accelerate the implementation, save on initial

costs, and foster an environment for service innovation.

Value Proposition

The value proposition of Taxchain is the ability for the customer to tap into the long-term, legally owed source of tax revenue already existing in their economies. Using Taxchain, authorities can massively reduce the human resources, development time, and hardware needed to develop and operate a world-class tax system. The tax as a service business model removes any up from payments from the customer to Taxchain. However, ideally, the customer will invest in supporting infrastructures such as outreach, identity authorization, and an enforcement system to help Taxchain scale.

Strategic Partners

Taxchain requires two strategic partners to operate. Firstly, infrastructure providers for internet and power services; secondly, companies in the private tax industry. Support from these partners will reduce the burden on the Taxchain and the government in outreach and chain hosting.

Any newly reformed tax system in these places must be able to service the most significant percentage of the population possible. Since Taxchain is a digitally delivered solution, internet connectivity is key to its success. Many large population centers will be covered but working with strategic partners to ensure a reliable and secure connection to Taxchain will enable its rapid adoption.

The private tax industry in developed economies significantly reduces friction in tax contributions for individuals and businesses. Establishing a similar industry in developing economies will be vital in capturing value. A competitive space could help drive service innovation and maximize citizen outreach by enabling the private tax industry. Also, these private tax companies could be incentives to invest in the hosting infrastructure of Taxchain. Private tax companies will help distribute the system and make it more reliable and secure. Hosting nodes in a delegated proof of stake chain will mean businesses could compete for the right to complete citizens' tax contributions, and nodes that write to the chain will receive pooled transaction fees as rewards.

Competition

The competition in this space is best viewed from the blockchain perspective, the personal tax industry, and the governmental perspective.

The blockchain industry is in a stage of rapid innovation. With a technology that is only really 14 years old in its most recent form, the pace and scale of innovation are massive (Nguyen and Dang, 2018). Many other chains with altruistic focuses and outstanding teams are looking to improve transparency and governance. Cardano, a permissionless delegated proof of stake chain, recently signed an agreement with the Ethiopian government to store all official education records on their chain (Hochstein and Baydakova, 2021). The process of verifying individuals' educational background will be massively improved, and people who in the past have forged their educational experience will be encouraged to invest officially in their education. Algorand is another permissionless proof of stake chain looking to reduce the friction in government. The Algroand Foundation recently agreed to implement a country-wide payment system for the state medical industry in Bermuda. With the goal of reducing transition costs present in the existing system (Shaurya, 2021). These solutions revolved around the main public permissionless chain and would likely face a server privacy backlash if used for tax purposes. They also fail to give the primary institutional customer centralized control over the chain, unlike a permission chain would.

The private tax industry is a very well-established global industry and will likely already have a presence in the countries of some potential customers. Taxchain is designed to support the creation of new private tax companies with local roots. This new industry will likely attract attention from large multinationals. If integrated into the chain, it could pose several technology-related security floors based on the concretion of power in a delegated proof of stake system. In order to counter this threat, dialogue should be established with the multinationals, and their focus should be encouraged on international business and non-tax residents' operation in the economy with the tax chain. This cooperation will allow them to capture some of the new tax value while still allowing the local industry to flourish.

Government competition should not be viewed as regular market competition but rather as friction in the change management process. If power holders benefit from the current loose tax system with a low level of enforcement and audit, they might look to resit the creation and support of a new tax system. This friction should be carefully monitored, and champions of change should be embraced in the new markets with the power to persuade these individuals.

Competitive Advantages

The competitive advantage of Taxchain is that it is a permissioned network. A permissioned network allows the customer to retain overall control of their chain. Unlike many competitors that operate permissionless solutions, Taxchain allows for central tax authorities to implement changes to the chain at their will. A permissioned chain also increases data security which is a very sensitive issue in tax services when the income information of individuals is private, and their competitors could use business tax information against them. Taxchains focus on developing a local tax industry and incentive development and innovation without cost to the customer but at a significant benefit to the customer.

7.3 Action Plan

The action plan is the list of steps that need to be taken to make the tax chain a reality. The development and implementation plan, a risk assessment, and a concept of operations will guide this next step to lay the foundation of Taxchain.

Implementation Strategy

The implementation strategy aims for a low-cost business launch, avoiding all-or-nothing circumstances like huge capital inputs in an unproven setup. In order to confirm the assumptions defining the business model, the strategy also seeks to test and control uncertainties at various stages. The implementation strategy is designed to get the fundamentals of the technology right. With appropriate security and scalability built in from the start, diffusion and adoption of Taxchain will face little friction on the technology side.

1. Development Plan

   A development period should be initiated as soon as possible. This initial stage would prioritize human resources capable of designing and coding the chain. This stage should also have teams focused on delivery channels, legal implications, and customer/change management; however, more resources will be put into these once the pilot customer is known.

2. Test

   Testing phase will focus on security and scale ability. The chain should be attacked purposefully through know chain venerability and a closed bounty reward system with qualified testers. The scale testing should simulate large throughput volumes and the reliability of the chain. Also, false information should be added to the tax chain to test the audit mechanism and changes the outcome of the audits require.

3. Pilot Launch

   Pilot launch will be done with a regional tax authority. This first real-world deployment of Taxchain will help display the claimed benefits of the tax chain. the pilot launch should be with a customer more willing to give data access to Taxchain so clear before and after snap shots can be accurately evaluated.

4. Expansion strategy

   The expansion strategy should look to expand outwards from local tax authorities further to state and then Federal level. Local governments will enable a results-driven market strategy by taking a bottom-up approach and targeting initial customers who struggle with constant revenue and access to funding from above. This bottom-up approach will also help establish lower-level change advocates nationally that can help drive adoption economy wide.

Risk Assessment

The risks used in this risk assessment were identified in the opportunity evaluation during the business model evaluation. These risks were synthesised from the business model stress factors. Each one of theses risks were shown to have a potentially negative impact on the success of the business model if not taken into account. Through detailing them in the action plan, preventative measures to reduce both the likelihood and impact can be integrated into Taxchain from its foundation.

1. Security risk

   Security risk is a major potential issue for Taxchain. Security risk is multi-faceted, firstly the technological ability to secure information on the chain and the perception of security of the chain. Both of these areas could have massive impacts on the

success and implementation of Taxchain. A successful attack on the chain could result in contractual penalties from the customer and publicized news of the event, possibly triggering a loss of perceived trust scenario among users. To mitigate the likelihood of security risk, resources during development should be intently focused on attacking the chain before its public. Reducing the impact of the risk will be done by creating a robust crisis management plan that can be enacted instantly when a breach happens.

2. Scale risk

   Scale risk on the chain is about the problems faced by rapid adoption. Rapid adoption is a major success criterion for the business, and any technical issues impacting this scaling could be detrimental. The impact of this risk could be stalled growth or even a decline in the uptake of Taxchain. The likelihood of scale risk occurring is medium as there are ways to mitigate it, but likely stress causes scale problems will be hard to predict in a test environment. Scaling must be a massive focus during the development and testing phases to reduce scale risk. To reduce the impact of scaling risk, proactive communication to the customer about the impact must be done. A crisis response plan could potentially help minimize the chain's public image damage.

3. Revenue risk

   Revenue risk is a solely internal risk for the tax chain organization. The tax as a service business model is not compatible with bootstrapping and will rely on external funding. This initial investment will be required to fund the development and first customer acquisition and integration. If Taxchain fails to capture enough unrealized tax value in the economy, funding the high cost of further customer acquisitions will be difficult and attract additional funding. The impact of this would be disastrous and likely cause the business to fail. Tier revenue streams should be applied to mitigate the likelihood of this risk. An alternate revenue model would be to have a small fee to cover base operating costs with lowering profit share percentages as the total amount of new tax collected increases. Solid funding partnerships should be established to reduce the impact of revenue risk. A favorable initial customer should be selected with due diligence, with riskier customers only being considered

after achieving revenue stability.

4. Political risk

   The political risk faced by Taxchain is focused on resistance from internal actors within the customer. The likelihood of this risk is medium as the lax tax culture that exists now benefits people who choose not to declare. The impact of this risk would be friction of adaptation and slow down of growth. The revenue model could also be framed as a potential negative to a current administration by a political opponent. To reduce the impact of this risk, customers should be supported in using new tax money initially for high impact and highly visible public spending.

Concept of operations

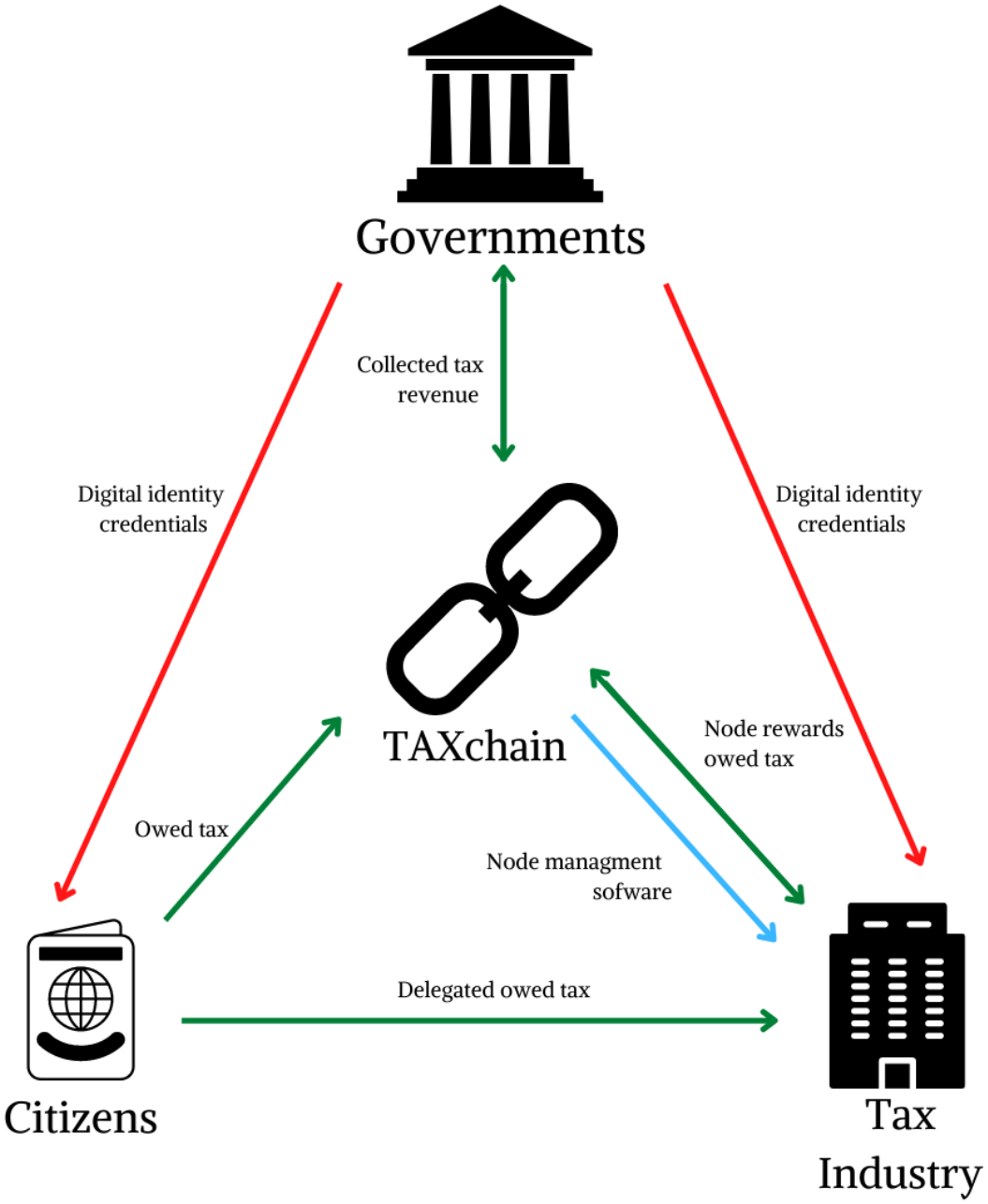


Figure 7.1: Concept of Operations

The concept of operations demonstrates the three main flows of resources. Firstly, financial resources are represented by green arrows. Financial resources are mostly the value of the owed tax changing hands. However, it also includes payments from the government to Taxchain as profits, and it includes node rewards to the private tax industry for hosting

nodes on the blockchain and writing to the code. The support of node management is software that is hosted externally from Taxchain. Software support flows from the tax chain to private tax companies giving them the technological capacity to host the node. Thirdly the red arrows represent digital identity management which is crucial in a permissioned chain. Digital identity management is distributed by the government to private tax companies and citizens, allowing them to write to the chain and submit transactions for writing r reading data aligned with their permission level. Note that this assumes that Taxchain has full access to all data stored on the chain.

Note that if the government does not have digital identity services, already established strategic partners that provide this service could be easily engaged.

Node Design

The node design is a major enabler to the tax as a service business model and has the potential to rapidly accelerate adoption both within customers' tax bases and to new customers. Before the node architecture is detailed, it must be known that Taxchain can operate hosted from one central source and without nodes. However, some extra benefits will not be fully realized without a node ecosystem. Taxchain is designed to have private tax companies operate as nodes within the chain. The business case for the private tax companies operating as nodes is twofold. Firstly, helping a citizen submit a tax return will be rewarded with a fixed percentage of their total tax contribution. Secondly, the nodes will represent the value of the citizen's tax contributions as delegated proof of stake. The higher stake a DPOS node has, the higher chance it will win the right to write to the chain, which is an activity rewarded by transaction fees. The transaction fee in Taxchain will be funded buy at a 0.1 % fee taken from people's tax contributions.

The rewards associated with operating as a node will help drive an ecosystem of service innovation and enable the private tax industry to compete for the business of helping citizens complete their tax returns. This design poses some concerns about the 51 % attack when a node influences more than half of the available tokens on a chain. To help mitigate the likely hood of the 51 % attack, private tax industry nodes should be geographically limited to areas equally divided by either population or economic output. This decentralization will also enable localization to occur within the offerings for citizens. Whether this localization is with respect to culture, language, religion, or geography, it

will also create an environment designed to capture more tax value.

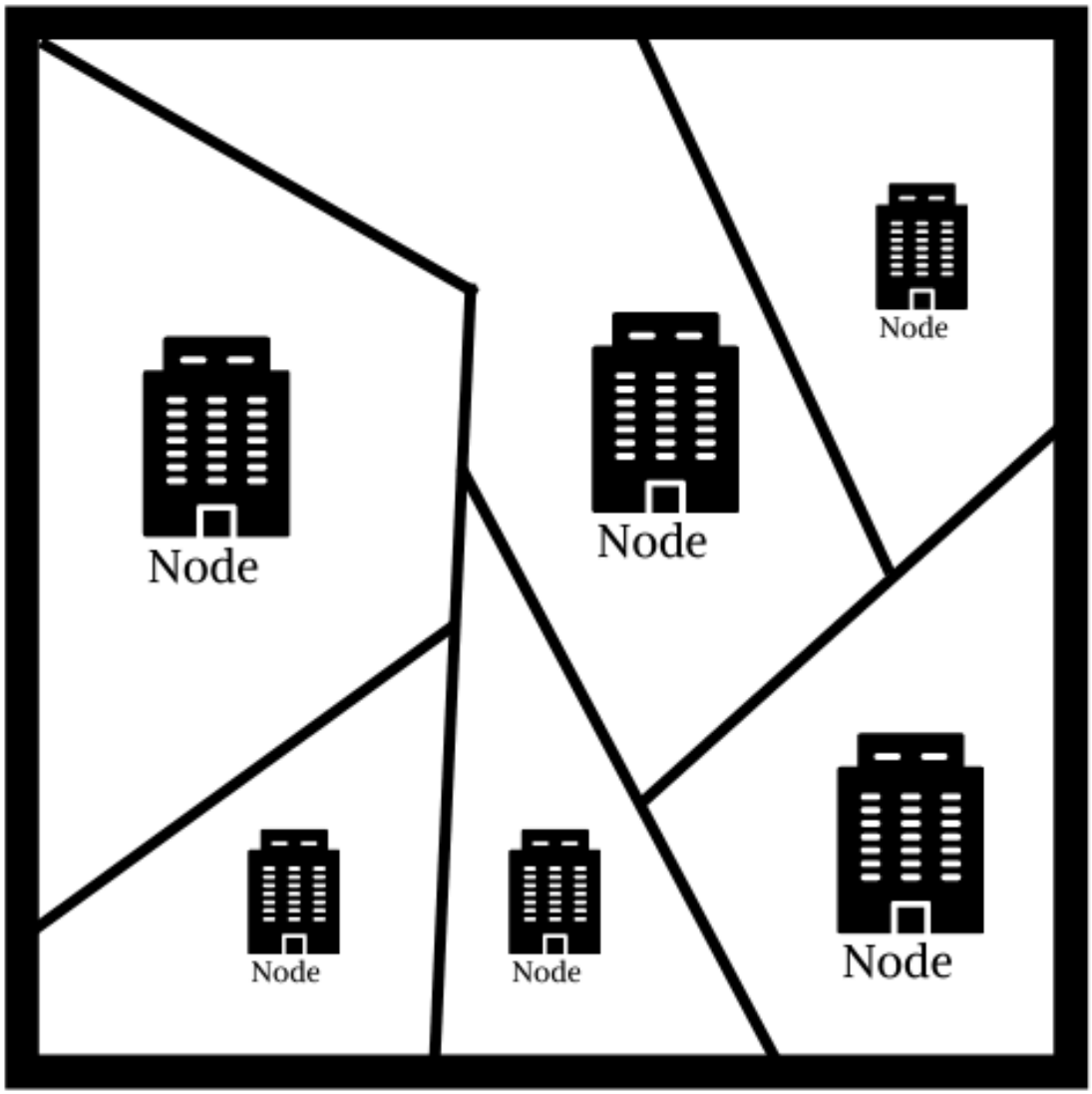


Figure 7.2: Blockchain node design

7.4 Economic Overview

The economic reality of Taxchain and its chosen business model is vital to its long-term success. Any profit-sharing model needs significant financial resources to successfully develop and implement its product and operate until successful revenue streams are solidified.

Financing Options

The financing of Taxchain must seek external funding early to kick start development. Venture capital firms offer one solution to this as they have financial resources available, and Taxchain would meet standard VC financing requirements. Taxchain is rapidly scalable and has a large addressable market which could help attract institutional VC funding. Likewise, the ten-year return cycle typical with VC funding agreements is roughly compatible with the scaling life cycle and revenue stability goals of Taxchain. one possible angle for funding is also development dollars provided by NGOs and a foreign government to help build government capability in developing economies. This direct financial funding might also come with advantages that help secure customers from the government sphere.

There is some risk involved with heavy VC funding as a public option might not be favorable with money from developing economies being profit drivers for already wealthy individuals. One counter to this might be to look at other large institutional investors open to more risk with a social capital project that could help the development of all aspects of the country. For this, pension funds and sovereign wealth funds could be targeted.

Scaling Effects

Scaling Taxchain is key to its success. The large one of customer acquisition and development costs can be offset with the larger scale operation of Taxchain. Maintaining and auditing the chain would be the only ongoing cost for Taxchain. Taxchains scaling effects should be considered the number of users per customer. once the initial testing phase is over, governments with large populations and high uncaptured tax values should e targeted. Success in huge markets will likely enable Taxchain to offer proven reliable services to customers with smaller tax bases who potentially are more averse to the risk of an unproven product.

8 Epilogue

This research investigation through the use of proven methodology and contextual analysis produced a business model and blockchain architecture ideally suited for enabling customer to capture existing tax value in there economies. A permissioned trust mechanism using a delegated proof of stake consensus mechanism with a tax as a service business model was identified at the most capable combination of solutions.

8.1 Conclusion

The discovery section highlighted the status quo of collecting tax in underdeveloped countries and examined the academic literature around the identification of new business opportunities. The discovery also utilised secondary data sources to get a picture on the wider scope of work occurring worldwide to develop the tax industry and harness innovation to improve performance.

Through the foundation established in the discovery section, the opportunity identification took a deeper look into the potential technology options and business models designed to enable success for the paper aim. The technologies detailed in this section formed the basis of the opportunity evaluation. Through the use of the framework outline in the methodology the technologies and business plan were evaluated through a contextual lens. This evaluation was completed with the goal of creating a technology and business plan combination that would be most successful in enabling a private company to extract value from the business opportunity.

The results of the process outlined above was the identification of a permissioned governance model as the best fitting governance mechanism according to the success criteria. Likewise for a consensus mechanism, a delegated proof of stake mechanism was identified as the best fit for the contextual criteria. The tax as a service business model is a profit-sharing variation of the software as a service model. Through stress testing, these business model threats were identified. The threats faced by this opportunity are security-related and revenue stream-related. People's income information is incredibly private, and for many businesses, their financial performance is an industry secret. Managing the perception of security to users and customers should be a significant focus of Taxchain. Revenue risk

is twofold. The high development costs and high customer acquisition cost before any revenue means significant external investment is needed to kickstart the project.

By embracing the solutions private industry can bring to market and the dynamic they can do it, governments can gain access to a long-term sustainable source of existing revenue. Achieving a tax income to GDP ratio of 15% will help boost GDP growth in the countries that need it most. This economic growth and access to sustainable capital could transform government spending to provide services to its citizens. Also, the ability to formalize large parts of the economy will provide a link between government and citizens. The formal participation in the economy presents as a catalyst for other government services such as healthcare and social security.

Sub Goal	Outcome
Create an understanding of literature used to identify and review business plans and technology.	The literature discovery and methodology showed both evauation frameworks and research approach suited for reaching the main aim.
Deliver a contextualized understanding of the existing tax situation in developing economies and the current technology used to deliver services in the space.	The Contextual and technology discovery highlighted the problem and introduced the relevant stakeholder and potential benefits of change. Then the technology discovery took a surface-level look at Blockchain and CBDC.
Identify New technologies, their implementations, and business plans with the potential to achieve the main aim.	The opportunity identification introduced lock chain governance models and consensus mechanism as well as the Software as a service and profit sharing business models.
Provide a contextual evaluation of the technology to deliver a technology architecture and business plan.	Using The frameworks from the methodology a permission model for governances and a Delegated Proof of Stake for consensus proved to be the best solution. Also, a Tax as a service business model was stress tested against the context.
Deliver an action plan that can be used as a launching pad to exploit the identified opportunity.	Using the results from the evaluation of the business Opportunity, business Strategy, action plan, and economic overview were provided as a structure for the business moving forward

Table 8.1: Sub Goal Outcomes

This paper was a critical investigation into the commercial opportunity of using blockchain

technology to capture existing tax value in developing economies. The context surrounding the opportunity was examined to understand the existing situation in developing economies. The thorough review of available technology and the stress test of a new business model lays the road map for a commercial entity to enter the space and capture financial value.

8.2 Limitations

The main obstacle for identifying the potential of financial value capture through blockchain technology was the lack of available information on the tax systems and potential value for developing economies. A better understanding of the market and customers would of enabled a more nuanced solution potentially fitting a certain regions need more effectively. However, for the author the two main restriction causing this limitations was the ability to contact responsible parties in target economies and lack of secondary data available outlining the current process and design of tax systems. Also, many of the frameworks used, required assumptions to be made about the technology, business model and contextual operation situation. Ideally, the assumptions used in formulation the results for this paper will be tested in the early stage of the business creation to assure that the developed plan holds true.

8.3 Reflection

The reflections below are those the author has had during and after this project about the tax industry and potential markets Taxchain could operate in.

8.3.1 Service innovation

Creating an environment for service innovation has a massive benefit for industries. An exciting example relates to the Taxchain proposal of creating a technological foundation that innovation can use as a back end to deliver innovation quickly developed front ends to customers. Shopify found a create deal of success with this model (This, 2019). Before Shopify, the backend of an online eCommerce business was complex and required significant resources to manage. However, with the introduction of Shopify, merchants could revolutionize the customer experience and focus their resources on the front-end of their businesses while Shopify handled the back-end of the sales process. This model

accelerated the decentralization of e-commerce (This, 2019). With a similar model, Taxchain can potentially create a service innovation system for paying taxes. This innovation could also diffuse many existing tax systems in developed economies, which could suffer from a lack of service innovation.

8.3.2 Change management

Through the investigation of Taxchain from the perspective of a business opportunity, it became apparent that the low payment of tax rates is due to the friction involved with the technology. The cost associated with developing economies to set up robust digital solutions one of the main influences on tax collection was a tax paying culture. The success of any project aiming to capture tax value from the informal economy is essentially an exercise in change management. Getting people who have never paid tax or come from a tax-paying culture to pay tax is very difficult. Many citizens in developing countries live with little visible government or government services and have historically been unable to rely on government services. Approaching Taxchain from a change management perspective should be a strong focus of the new business. Also, Taxchain should encourage the government to work with NGOs and other organizations that could help them plan and prepare for practical tax spending projects.

8.3.3 CBDC and stable coins

When writing on the 17th of May 2022, the crypto currency market is in extreme volatility. Stable coins are crypto currencies theoretically pegged to a 1-1 exchange for a fiat currency equivalent. An algorithmic stable coin means a coin that has its liquidity volumes adjusted by an algorithm to hold a value. Terra USD recently lost its mathematical peg to the dollar, which caused capital to flood out of it and its sister coin, Luna. Roughly 38 billion USD value was lost, affecting institutional and retail investors. This most recent stablecoin collapse is likely to further spur a central bank-backed digital currency to help protect investors. CBDCs would help set the stage for a blockchain-based tax solution and spur worldwide development in the industry.

8.4 Localization

Localization is the process of adjusting a product of business model components to better suit the needs of an individual market or customer base (Esselink, 2000). one major issue with current distributed chains is that they often fail to serve specific markets in an attempt to maximise there decentralisation penitential. tax needs differ broadly across cultural, economic conditions and government structure and a one size fits all solution may not be able to full capture the value localized solutions could.

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Appendix

Abbreviations

USD: United States Dollar

CBDC: Central Bank Backed Digital Currency

GDP: Gross Domestic Product

IRS: Internal Revenue Service

PoW: Proof of Work

PoS: Proof of Stake

DPoS: Delegated Proof of Stake

TPS: Transactions Per Second