

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Information Technologies



Bachelor Thesis

**Blockchain in e-government in the Republic of
Kazakhstan**

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BACHELOR THESIS ASSIGNMENT

Nazira Beisenbekova

Economics and Management

Thesis title

Blockchain in e-government in the Republic of Kazakhstan

Objectives of thesis

The main objective is to propose the implementation of blockchain technology in a selected sector of e-government in the Republic of Kazakhstan.

The partial objectives are such as:

- To make a comprehensive literature review of blockchain use and to explore possible options of its use in government.
- To propose an implementation of blockchain in a selected sector of e-government.
- To identify potential benefits and implications of blockchain to government and society.
- To evaluate the proposed solution, formulate recommendations and make conclusions.

Methodology

Methodology of the thesis is based on the author's own research and study of relevant information resources, using documentary analysis and external desk research. The practical part will use both qualitative and quantitative methods. Based on a synthesis of theoretical knowledge and the results of own solutions the conclusion will be formulated.

The proposed extent of the thesis

30 – 40 pages

Keywords

Blockchain, eGovernment, Decentralization, Trust, Peer to peer, Trasforming government, Smart Contract, Digital ledger.

Recommended information sources

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Declaration

I declare that I have worked on my bachelor thesis titled "Blockchain in e-government in the Republic of Kazakhstan" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 13.03.2019

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Blockchain in e-government in the Republic of Kazakhstan

Abstract

As this thesis acknowledges, blockchain technology aims to improve e-government services that rely on trust, such as current real estate transactions, by creating transparent, efficient and reliable system.

This paper will cover basic explanation of blockchain, its benefits and challenges. It will put forth the current real estate transaction system of Kazakhstan and the role of blockchain in Kazakhstan. It will also analyze the experience of leading countries, Sweden and Georgia, in implementing blockchain in real estate sector.

This thesis is literature review that provides a theoretical framework to propose a number of recommendations for blockchain introduction in the Republic of Kazakhstan. The author holds a discussion regarding the benefits that the country has in order to introduce blockchain and drawbacks that prevent Kazakhstan from blockchain implementation at the state level.

Keywords: E-government, Blockchain, Real estate transaction, Land registry in Georgia, Land registry in Sweden, Distributed ledger, SWOT, Trust, Intermediation, Digitalization

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1 Introduction

The (European Commission, 2017) declared that among European Union citizens, 80.9 % of individuals use the Internet at a regular basis, 48.8 % use the Internet to look for a job, to use the public library, to submit tax declarations, to register births, to request a passport or to use other public administration services.

The development of information technology is becoming an important factor in the life of the world community today. Their wide distribution transforms modern reality and leads to serious shifts in the political, economic, social and cultural spheres. Among the global trends that determine the relevance of the topic of information technology in general and e-government, in particular, it is necessary to note the following. First, information and communication technologies have become the basis for globalization and are increasingly affecting public development. Secondly, in modern conditions, overly centralized structures are not able to react promptly to rapid changes in the external environment, and hence, there is a growing need for more flexibility and mobility of public services (Ouye, 2011).

(Yildiz, 2016) claimed that governments around the world have been working to capture the vast potential of the Internet and information technology to improve government processes. However, (Kumar, 2007) argues that the success of these efforts depends, to a great extent, on how well the targeted users for such services, citizens in general, make use of them. Even e-government brings a certain level of transparency and offers good scope for innovative ways of servicing; some people remain suspicious of IT use in relation with government.

In this paper, the possibilities of using blockchain technology in the electronic system of government management will be considered. The first topic that will be studied is E-government, which is a system of public administration based on automating the entire aggregate of managerial processes throughout the country, serving the purpose of significantly improving the efficiency of public administration and reducing the costs of social communications for each member of society. The creation of e-government involves the construction of a nationwide distributed system of public administration that solves the full range of tasks related to the management of documents and the procedure of their processing. (Fang, 2002)

The second main topic is blockchain technology. Blockchain is a way of storing data or a digital register of transactions, bargains and contracts. According to (Kushch, 2017), in the blockchain, data is stored on facets of life such as loans issued, property rights, traffic violations, marriage etc. That is, almost everything. There is no need to resort to the services of centralized institutions and banks, if there is a system that works much faster, more efficiently and saves your money and time. The system enters into contracts and keeps records of all transactions, nullifying the possibility of fraud and deception. Its applications are expected to revolutionize many industries, such as real estate (Corluka, 2017).

In response to greater demand for transparency, technology advancements and the disintermediation by start-ups are gradually making some of the information public. As a result, property-related information is increasingly available in digital and paper form. However, a significant portion of the digitized information is hosted on disparate systems, which results in a lack of transparency and efficiency, and a higher incidence of inaccuracies that creates a greater potential for fraud. Blockchain technology could enable the real estate industry to address these inefficiencies and inaccuracies. (Thota, 2018) Reducing costs, increasing security and transparent transactions are the three main strengths of the blockchain (Atzori, 2017). In connection with the needs of banks, business and society in these three aspects, any theoretical work or development in this area is becoming quite relevant.

2 Objectives and Methodology

2.1 Objectives

The main objective of this bachelor thesis is to give an insight on the core concepts of the blockchain technology and the possible applications of the blockchain technology with emphasis on the real estate sector of e-government.

The partial goals are as follows:

- Conduct a comprehensive literature review of blockchain use and explore possible options of its use in government.
- Identify potential benefits and implications of blockchain to both government and society.
- Evaluate the proposed solution, formulate recommendations and make conclusions.

2.2 Methodology

The methodology that will be applied to this thesis is divided into two approaches. The theoretical part of the thesis is based on the author's own research and study of relevant information resources, using documentary analysis and external desk research. It will provide the literature that has been studied, and the first part will help to compute the information. This necessary for the second part of the thesis, as it creates the foundation for further analysis. In the practical section, both qualitative and quantitative methods will be applied. Based on a synthesis of theoretical knowledge and the results of the author's own solutions, the conclusion will be formulated.

3 Literature Review

3.1 E-government

During the last two or three decades a revolution in information and communication technologies has transformed the image of modern world. This revolution not only changes people's lives, being an important stimulus for the development of various spheres of human activity, but also changes the way of how governments interact with their citizens. These changes lead us to a new form of public administration, so-called, e-government.

According to (Seifert, 2003), e-government involves the use of information technology, especially the Internet, to improve the provision of public services to citizens, enterprises and other government agencies. It has the potential to more directly connect the federal government with its citizens in a way that opens up new opportunities and simultaneously sets new challenges. *“E-government could enable citizens to interact and receive services from the federal government (or state and local governments) 24 hours a day, seven days a week”* (Seifert, 2003).

Another definition and purpose of e-government can be found in the (Fang, 2002) research paper. E-government refers to the use of information technologies by government agencies, such as web-based networks, the Internet, and mobile computing, that have the ability to transform relations with citizens, businesses, and other arms of government. E-government can be defined as a way for governments to use the most innovative information and communication technologies to provide citizens and businesses with more convenient access to government information and services, improve the quality of services and provide more opportunities for participation in democratic institutions and processes (Fang, 2002). *“For the citizens, e-government can offer a huge range of information and services including information for research, government forms and services, public policy information, employment and business opportunities, voting information, tax filing, license registration or renewal, payment of fines, and submission of comments to government officials”* (Larsen, 2002).

Moreover, as (Fang, 2002) defines, it can be used to improve interaction with business and industry, empower citizens through access to information or more effective public administration. As a result, thanks to user-friendly and innovative e-government, citizens can potentially expect various positive effects to arise (Kozak, 2018). The government can be *“more reachable, efficient, effective, accessible and answerable to their citizens”*

(Shareef, 2012), which in turn leads to less corruption, bureaucracy and administrative burden reduction, increased transparency, greater convenience, revenue growth and fee reductions (Fang, 2002).

3.1.1 E-government in Kazakhstan

Kazakhstan has competitive advantages for attracting investments focused on the development of the digital economy due to its geographically and geopolitically convenient location, the lowest electricity prices and a developed telecommunications infrastructure. In the world (United Nations, 2018) ranking Kazakhstan ranks 33rd on the e-government development index, which consists of indicators of the development of human capital, telecommunications infrastructure and online services. Every year the country is trying to improve the process of providing public services for citizens. In this part of the thesis, important stages of the development of the electronic government of the Republic of Kazakhstan will be presented (United Nations, 2018).

The idea of creating an electronic government belongs to the President of the Republic of Kazakhstan and has voiced almost 15 years ago. The creation of e-government in the Republic of Kazakhstan was necessary in order to make the work of government bodies more efficient, open and accessible to citizens. Previously, every state body lived its own life and had little contact with the rest, and citizens had to bypass many instances to collect all kinds of certificates, confirmations and other papers. All this turned the process of getting one service into endless walking through institutions. Today, it is all over thanks to e-government projects (egov.kz, 2018).

According to early studies, (Amanbek, 2009) identified three stages of e-government development in Kazakhstan:

1. The first stage is *informative* (from 2005 to 2006). During this period, the e-government portal was launched and filled with information. Information about government bodies, their work and the services they provide to the public was appeared. Every citizen could get a list of necessary documents, find out the size of the state duty, and contact information of the state body that can be accessed.
2. At the second, *interactive* stage (since 2007), mechanisms were introduced to identify and authorize users, citizens' reception services and the mobile version of the portal. Portal users can receive certificates from various institutions and send a

request to any government agency, simply staying at home without any loss of time in queues. At this stage, departmental information systems, state databases, electronic licenses and e-government gateways were introduced.

3. The third stage is *transactional* (since 2008). At this stage, citizens could pay state duties, fines and utilities. If earlier, it was necessary to go to the bank to pay for the service, now the service can be received and paid online. (Amanbek, 2009)

In accordance to the most recent information in official portal of electronic government in Kazakhstan (egov.kz, 2018), in addition to the three stages above, one more, fourth stage of the formation and development of e-government was added:

4. The main goal of the fourth *transformational* stage is maximum efficiency in the provision of services to citizens. To achieve this goal, interactive and transactional services are combined into comprehensive services that citizens require. Users have the opportunity to register a legal entity in just 15 minutes, register the birth of a child, apply for benefits and put the child in a queue in kindergarten.

Overall, the significance of socially important services will be emphasized. Therefore, all of them have been transformed into electronic format. According to State of the Nation Address by the President of the Republic of Kazakhstan (Nazarbayev, 2018), in 2019, 80%, and in 2020, at least 90% of public services should be converted to electronic format.

3.1.2 Current real estate transactions in Kazakhstan

Before discussing how blockchain technology can improve the system of real estate purchase and sale, it is necessary to study the key features of the current Kazakh system of real estate transactions.

In Kazakhstan, there are two ways to transfer property. Parties may apply for the transfer of property to the local centre of the State Corporation “Government for Citizens” that provides numerous public services to citizens and commercial enterprises or attend a notary. The first method of transferring ownership is conducted directly by the parties of the transaction, and the application process is carried out on paper. The second, frequently used method of registration is electronic, conducted remotely from a notary office. (Yurasovskaya, 2017) In the period of 2012 and 2015, the government gradually expanded the possibilities for registering property, legally authorizing notaries to submit electronic

applications for registering property on behalf of their clients. To date, only notaries can perform electronic registration (Kazakhstan, 2016).

According to the Civil Code of the Republic of Kazakhstan, the transaction is considered completed only after its state registration (Council, 2017). That is, a completed transaction on real estate, drawn up in a notary and not registered in the ENIS (Unified Notary Information System) of the State Corporation “Government for Citizens” does not take legal effect (egov.kz, 2018).

To register property in Kazakhstan, you need to go through these procedures:

- 1) The notary carries out the necessary checks to make sure that the property does not have any encumbrances, is not pledged or under arrest, which may impede the sale. In order to check the status of the property, the notary addresses the Unified Notary Information System (enis.kz), an electronic portal that provides access to government information relating to the operation and allows interaction with government agencies. (Yurasovskaya, 2017)
- 2) The parties notarize their purchase agreement. The notary confirms the identity of the seller and the buyer, certifies the signing of the contract, and registers the transaction in a journal, where the parties also put their signatures. Then the notary submits an application for registration along with a signed contract to the Department of Justice through the ENIS. The notary charges a fee (0.1% of the value of the property) for drawing up the contract of sale and notarization, registration of property transfer and the fee for state registration. (DoingBusiness, 2017)
- 3) The final stage of registration is the completion of the transfer of ownership. The local Justice Department receives an application for registration immediately after the payment. The head of the real estate rights registration department transmits an electronic file to a registration specialist who checks the legality of the transfer of property using the state database “Real Estate Register.” Then the specialist will add the purchase price to the file, re-register the ownership of the property to its new owner and transfer the file to the clerk for verification. The certificate of ownership registration is returned to the notary for the issuance of the new owner. To carry out the above three procedures through a notary takes 2-3 days on average. (Yurasovskaya, 2017)

It can be noted that the use of electronic databases and the Internet for storing and accessing the real estate registry has made the process of real estate transactions more convenient and possibly more efficient. However, these components are simply a digital replacement for some aspects of the process. Real estate operations themselves are still largely dependent on human actions, which can lead to human errors that can have negative consequences for the management of property rights. (Gaudio, 2002) Moreover, the current system of Kazakhstan relies on a central authority, where downloaded electronic copies of documents are stored in the State database. Most archive files are scanned images that cannot be searched electronically. It is possible only for notaries to carry out an electronic search for information about property burdens when conducting an inspection of the property during registration. General information about the necessary documents, fees and dates of real estate transactions in the registry is available online, but access to information about the ownership is limited to the notary. (World Bank, 2017)

Buyers and sellers must assume that the transaction registry, which is entered manually, is accurate and safe. This uncontrolled human element of this process in a centralized ledger exposes the buyer and the seller to risk (Ewendt, 2018). Property buyers in Kazakhstan can only rely on the documents provided by the seller, and are not able to independently verify these data and verify whether the seller really owns the property or check the housing for unpaid utilities, tax debts and so on (Akhmetov, 2017). This unreliable property registration system does not provide clear information about ownership, which leads to fraudulent transactions and significantly reduces the quality of services provided and their effectiveness (Ewendt, 2018).

Kazakhstan, having entered the digital age in 2005, has invested heavily in information and communication technologies to reduce time, introduce transparent administrative processes, prevent corruption and improve record keeping ensuring the reliability of state information (Bhuiyan, 2009). In order to improve the quality of public services, namely to simplify the process of real estate buying and selling, Kazakhstan is trying to expand the possibilities for registering property, making changes over the past decade almost every year. It makes sense to focus on improving the property registration process, as property rights have proven their importance throughout the world as a factor promoting investment, productivity and economic growth (Yurasovskaya, 2017; DoingBusiness, 2017).

3.2 Blockchain

Blockchain (distributed ledger technology) is a network software protocol that ensures the safe transfer of money, assets and information over the Internet without the need for an external intermediary, such as a bank (Swan, 2015).

In the main studies of (Benton, 2017), it is said that the blockchain is a common digital register, which cannot be changed after the transaction has been recorded and verified. The algorithms used to perform the verification and writing process are implemented in the software and mathematically guarantee that after agreement with the details of the transaction described by the ledger, they cannot be changed by anyone and anywhere, without using more computing power than exists on the planet. All parties of the transaction, as well as a significant number of supposedly neutral third parties, store a copy of the ledger, which makes it impossible to edit each of these copies. (Benton, 2017) This ledger is not in one centralized and reliable institution, it is distributed, and therefore, each participating node keeps a complete copy of the ledger. Any changes must be agreed upon by the majority of nodes before they are accepted and filled in all registers. Thus, the verification does not depend on one central party, but depends on all participants. Once a transaction is written in a chain, it does not change. (Milani, 2018)

In addition, the last transaction pools are ordered into a block, and then the block is cryptographically linked to a chain of blocks and checked using a consensus model that includes significant computing resources. The blockchain is an open access file that is replicated on several complete network nodes; therefore, no one entity controls the transaction list. Since each block is hashed and inserted into the chain, it does not change, but serves as the final record of past transactions. An entity cannot change the chain without changing all subsequent blocks, which is a complex and expensive process that provides a lock and establishes trust independent of the central authority. (Sultan, 2018) Traditional transaction models rely on central authority. Trust is provided to the central body with the expectation that it will remain honest in verifying and releasing transactions. The instances of records are stored with authority. If the central authority is compromised, either deliberately (manipulated) or unintentionally (hacked), the interlocutor can cause significant damage to the system. The main disadvantage of the central body is that third party can abuse its power and provide its services unfaithfully. Moreover, there is a risk that an attacker will gain control over a third party, which allows an attacker to violate the services of a third party and to invalidate its guarantees. (Sultan, 2018) The blockchain

model excludes the central authority, facilitating the automation of the mechanism of trust without central authority and instead distributes copies of the records to all parties. Each participant retains his own copy of the blockade. They broadcast changes, forming new blocks and requesting confirmation based on the rules of the consensus model. After verification, the block is added to each chain. (Sultan, 2018) This process is potentially safer than the traditional model. *“It mitigates risk, and enables all manner of efficiencies in human interaction whether in business or government contexts, whether formal or informal”* (Benton, 2017).

3.2.1 Criticism of Blockchain

Many experts believe that the blockchain capabilities are overvalued and exaggerated. According to a professor of New York University and a world-famous economist (Roubini, 2018), blockchain is something different than a spreadsheet that considers all governments, central banks, and traditional financial institutions as an evil concentration of power that must be destroyed. The ideal world of blockchain fundamentalists is a world in which all-economic activity and human interaction is subject to anarchist or libertarian decentralization. They would like the entire social and political life to end up in public accounting books that are supposedly unacceptable and mistrustful (Roubini, 2018). There is not a single institution — a bank, corporation, nongovernmental organization, or government agency — that would place its balance sheet or registry of transactions and interactions with customers and suppliers on public decentralized peer-to-peer ledgers without permission (Roubini, 2018).

No serious institution would allow an anonymous cartel to test its transactions operating in the shadow of authoritarian world kleptocracies, which can be described as a government with corrupt leaders. Therefore, it is not surprising that whenever the blockchain was tested under traditional conditions, it was either thrown into the trash bin or turned into a private database with access rights, which is nothing more than an Excel spreadsheet or a database with a misleading name. (Bloomberg, 2017; Roubini, 2018)

Inability to achieve adoption today is because systems built on trust, norms and institutions, by their nature, function better than blockchain-type systems, which do not require trust to the parties (Song, 2018).

Blockchain systems do not magically make the data accurate or the people entering the data trustworthy, they just allow them to check to be sure they were not forged. A corrupt

government can create a blockchain system for counting votes and simply allocating an extra million addresses to its friends. An investment fund whose charter is written on software may still misallocate funds. In the case of buying an e-book with a smart contract, instead of auditing software, people need to rely on one of four things, each of which is a characteristic of the “old way”. For example, the author of a smart contract is a trusted person, since the user's friends have bought e-books from this seller in the past successfully. In each case, even if the transaction is carried out through a smart contract, in practice they rely on the trust of the counterparty or intermediary, not on their self-protective right to audit the software, since each man an island unto himself. The contract still works, but the fact that the promise is written in the controlled software rather than government-enforced English makes it less transparent. Projects based on the elimination of trust, could not capture the interest of clients because trust is actually so valuable. As a society, and in particular technologists and entrepreneurs, we must learn to cooperate and build trust. Instead of channelling resources to the elimination of trust, we should direct our resources to create trust, whether or not we use a long series of sequentially hashed files as our storage medium. (Stinchcombe, 2018)

In an article for Finextra, (Birch, 2016) fears that due to the lack of understanding of the essence of the Blockchain technology, large companies do not understand the degree of its usefulness. Many companies use the word “blockchain” to denote some kind of magical device, with the help of which all their data will never be erroneous. Such a device, of course, does not exist, at least when it comes to the real world. It is clear that many companies that want to use blockchain do not really want blockchain at all, but prefer to upgrade IT in their particular industry. (Song, 2018)

However, there are those who doubt experts’ competence in the blockchain field. Professor of computer science at Carnegie University, (Mearian, 2018), said that it was not clear for him whether Roubini really was a technology expert and understood the cryptocurrency world, pointing out that major IT companies such as Amazon, IBM, Microsoft and Oracle are actively investing in the blockchain and creating blockchain platforms as services. Major players such as Nasdaq and the Australian Stock Exchange are already attempting to develop Blockchain projects that can be used in the near future. Nevertheless, perhaps those who claim that Blockchain still have something to prove are right. Because many concepts on the introduction of technology in the life of large

companies hang at the development stage, one cannot say what to expect in reality. (Palmer, 2016)

According to Seamus Cushley (Kennedy, 2016), an expert at PwC, the technology is still at an experimental stage, but people have to move from the fear of the blockchain to understanding and respecting its potential, and they are close to that. To say that blockchain is only a fashion would be unfair and inaccurate. This technology is still developing and its potential has yet to be realized. It is clear why people think that this is just a fashion, each new technology first giving a feeling of endless possibilities. We have survived the space era, the nuclear age and the dot-com bubble, and now the blockchain revolution is taking place around us. (Dhaliwal, 2017)

3.2.2 The role of blockchain in Kazakhstan

According to the report “Global Innovation Index 2018” by (Cornell University, 2018), the Republic of Kazakhstan is ranked 74th in readiness for the digital economy, with a significant margin from dozens of leading countries such as Sweden, Singapore, Switzerland and others. To minimize the separation and development of the digital economy, the Government of the Republic of Kazakhstan approved the program “Digital Kazakhstan,” which aims to develop the following areas:

1. *“Digitization of the economy branches*
2. *Transition to the digital state*
3. *Implementation of the digital Silk Way*
4. *Evolution of the human capital assets*
5. *Innovative ecosystem formation”* (Kazakhstan, 2017).

The program was created to accelerate the pace of development of the Kazakh economy and improve the quality of life of citizens. According to the president (Nazarbayev, 2018), a modern technological solution, called the blockchain, is an integral part of the state program “Digital Kazakhstan”.

The number of countries applying the blockchain technology is rather limited. The leaders in this industry are Estonia, Sweden and Georgia. Kazakhstan ambitiously plans to replenish this list of countries. According to the president of the Internet Association Shavkat Sabirov (Mederkhanova, 2017), the only first attempts are being made to use this technology in the daily needs of the population and the provision of public services, since blockchain is an entirely new technology for the Republic of Kazakhstan, as well as the

rest of the world. The potential of using blockchain technology in the field of digitalization of the economy, optimizing the work of government departments and reorienting the public services system is enormous. The President of Kazakhstan (Nazarbayev, 2018) has repeatedly noted the wide possibilities of using the blockchain technology, from the sphere of transit of goods through the territory of Kazakhstan to an automated tax collection system. (Nazarbayev, 2018) mentions that it is necessary to strive to reduce direct contacts of civil servants with the population within the framework of public services provided, as today citizens need a more transparent system. One of the areas of concern is bureaucratic procedure in the field of land relations and construction, because of the lack of transparency.

In order to remain competitive in a market that is rapidly changing and replenishing new players, the first attempts to use blockchain have been made by the financial sector of the country (Corluka, 2017). For example, the National Bank of Kazakhstan, in partnership with IBM and the accelerator Almaty Tech Garden (ATG), launched a new pilot project called Invest Online, which was designed to conclude securities transactions online using the blockchain (Grekov, 2017). Moreover, the Deputy Prime Minister of the Republic of Kazakhstan, Askar Zhumagaliyev said that blockchain technology was planned to be introduced into the activities of the Ministry of Finance (MarketWatch, 2018). Very complicated and long, the VAT refund process causes many complaints. Therefore, the blockchain technology will allow companies to return VAT very quickly. However, the state will still receive its dividends in the increase of tax payments since this process is transparent. In addition, several pilot projects for placing real estate information are being considered. Astana City Akimat (city administration) plans to launch an electronic auction platform for the sale of the rights to lease land and public premises. This is the first electronic trading platform in Kazakhstan based on blockchain technology, which ensures the most transparent and secure auction process. (Ramazanov, 2019)

According to the Vice-President of the National Association for the Development of Blockchain and Crypto technologies of the Republic of Kazakhstan (Kadyrov, 2018), terms such as blockchain, mining and smart contract are not legally fixed by law. Each time officials come across that words they cannot identify them or understand how to behave in a given situation, as unspecified in legal documents has become prohibited. To identify these gaps, legal monitoring has been implemented, which shows that the legislation of the Republic of Kazakhstan lacks systemic regulation and a number of

important provisions and legal definitions that are necessary to define legal relations arising from the use of digital innovations. The digitalization of the country is held back due to the lack of legal regulation. As one can see, legislative base and an appropriate infrastructure are needed for practical application of Kazakhstan's wide range of projects in various fields. Experts believe that in the next five years, the blockchain will change not only the global economy, but also the daily life of citizens of Kazakhstan. It will then help society to get rid of bureaucracy and corruption. (Kumyspayeva, 2019)

3.2.3 Blockchain in land registry in Georgia

According to economist (Soto, 2000), only about two billion people have full property rights and can prove that they own their land. The remaining 5.3 billion have no such rights. People cannot use their resources to create wealth and their assets become dead capital, which cannot be used to generate income, since land with inexplicable legal rights cannot be sold. As Hernando de Soto (2000) mentions, property rights protected by law are a key source of prosperity in the developed world, and their absence is the reason that many countries remain in poverty. One of these countries is Georgia.

Georgia is a young democracy that has laid geopolitical insecurity from Russia's aggressive neighbor and a history of corruption in the state. One of the starting points for the illegal actions of the state is the ownership of land. The one who controls the ownership of land can also manipulate the property of the country itself (Nimfuehr, 2017). The land registration system in the Republic of Georgia was previously implemented by the Technical Inventory Department and the State Department of Land Management. These two agencies had significant functional duplication, as each of them operated its own land registration system, which was generally opaque (Weiss, 2017). This allowed government officials to illegally alter land records in the system in their favour, since it was difficult to detect such misconduct (Shang, 2018). Later, the Bureau of Technical Inventory and the State Department of Land Management was replaced by the National Agency of the Public Registry to reduce bureaucratic red tape and increase the transparency of government work by simplifying the land registration process, allowing more stakeholders to participate in land-related services (Weiss, 2017). In addition, NAPR created a digitized database that included land ownership information, where one could easily find the name, address, and cadastral code. This reform dramatically reduced the time and costs of land registrations. However, the creation of the NAPR digital database

for land ownership did not completely solve the problem of trust in state bodies, since officials could still change land records. Georgia was still faced with the task of ensuring data integrity and protecting the system from internal manipulations and external cyber attacks. (Shang, 2018)

In 2016, the Georgian government and the world's largest hardware and software technology company, Bitfury Group, decided to launch a land rights registration project through the blockchain. Georgia and Bitfury decided to use the blockchain to eliminate corruption and fraud, because the technology takes into account the authenticity of each transaction thus confirming the participation of the parties, time and date of the transaction, and its content. (Shin, 2017; Pipan, 2016) The reason why Bitfury and Georgia entered into this partnership is that Bitfury has already established strong ties with the Republic of Georgia. At the time of signing the memorandum of cooperation, Bitfury has opened three data centers in the country. But, more importantly, Georgia could already keep accurate records of land ownership in its current NAPR database, which was crucial to the success of the Blockchain project (Shang, 2018).

By creating a property registry based on the blockchain and fully using the security provided by the blockchain technology, the Republic of Georgia can show the world a modern, transparent and corruption-free country that can lead world to change the order of land rights and pave the way for additional prosperity for all (Shin, 2016). According to the “Doing Business” (World Bank, 2016) report, the Republic of Georgia ranked third among 189 countries in terms of ease of registering property. A couple of years ago, buying or selling land in Georgia was a one-day process, requiring the buyer or seller to go to the public registry and pay between \$50 to \$200, depending on how quickly they want the transaction to be notarized. However, today the pilot project will transfer elements of this process to the blockchain and will cost buyers and sellers much cheaper in the range of \$0.05 to \$10. (Shin, 2016) Moreover, the effectiveness of land registration in the Republic of Georgia far exceeds that of registration in developed countries such as the United States and Germany, where it took an average of between 15.2 and 39 days to register property, respectively. In Georgia, it is possible to meet the owner on his site, make a sale, use mobile phone application and complete the whole process in 10 minutes instead of several days. Georgian citizens are very satisfied with this, because corruption is falling, and the Georgian government is happy that it can demonstrate transparency. (Nimfuehr, 2017) As early as February 2017, more than 100,000 documents were registered, and the

Georgian government announced a new agreement with Bitfury to expand the use of blockchain technology for other government departments (Shin, 2016).

The introduction of the blockchain system in the country allows all industries to make their activities as transparent as possible, which maximizes the degree of trust and simplifies economic relations. To create an ideal economic environment, parties no longer need intermediary services, which will have a direct impact on the cost of the product and make it accessible to all, and saving financial and time resources is an additional incentive for the production of additional products. Moreover, economic growth is a step forward for national development. A transparent economy and a good business climate are great motivation for investors to invest their finances in Georgia, which will create additional jobs in the country and will have a positive impact on the national economy. (Sabashvili, 2018)

3.2.4 Blockchain in land registry in Sweden

Lantmäteriet is an institution that is responsible for mapping, keeping the cadastre, and land registration. Lantmäteriet has made major investments in the computerization of old systems and the digitization of case management. As at 2016, every fourth application is currently being made in digital form, and almost 10 percent of decisions on registration cases are now automatic. (Lemieux, 2017)

In 2016, Lantmäteriet Kairos Future, Telia Telecommunication Company and blockchain start-up ChromaWay began exploring potential blockchain applications to improve real estate transactions in Sweden (Lemieux, 2017).

Blockchain is a potential solution that could improve trust by increasing the security, efficiency, transparency and accuracy of the transaction process, allowing all parties to track a transaction in digital form from beginning to end (Keane, 2017). However, it does not change the legal rules of the transaction, but only tries to improve it with new technologies. Major changes will occur in the process of concluding contracts. Citizens will also rely on the state authority in charge for land registration and the Landmäteriet will continue to play a significant role, as it is the body guaranteeing that the digital code in the blockchain really represents real estate in the physical world, and management the applications and the blockchain. (Garcia, 2017)

The main goal of this start-up project is to reduce the time between the signing of the purchase agreement and the registration of ownership from months to a few days. By

creating smart contracts based on the blockchain, the steps of the process and the reduction of delays associated with mailing, repeated checks and physical signatures will be eliminated. In addition, project developers suggest that the blockchain will increase confidence in the transfer of ownership, since all the necessary information is collected by the system and becomes visible to all parties involved in transactions. Because of transparency and blockchain properties, the process is less vulnerable to errors and fraud, since everyone — the buyer, the seller, the banks, the buyer and the seller's banks, and the registration authority — all have full information about the transactions. (Lantmäteriet, 2017; Vos, 2017)

This application based on the blockchain technology works in such a way that it is used as an interface to simplify all transactions. The purchase agreement is converted to a unique hash code and placed on the blockchain. The Lantmäteriet, banks and buyers can confirm the authenticity of this purchase agreement and other documents through their unique digital signature. For example, banks will make sure that the buyer has enough funds in his account to complete the transaction, and Lantmäteriet can provide ownership and grant title to the buyer. (Bal, 2017)

The Swedish land registry office, Lantmäteriet, continues to test the way the real estate transactions are recorded on the blockchain and saves US \$ 106 million annually by reducing paperwork, eliminating fraud and speeding up transactions (Lantmäteriet, 2017). In June 2016, the first phase of the pilot project ended with the release of a demo of the user interface, and the second phase began with the addition of two new partners, SBAB and Landshypotek Bank, and sought to build a prototype for testing from a legal and technical perspective (Lemieux, 2017).

In 2017, The Lantmäteriet began small-scale official use of blockchain for registration of land and property (Lantmäteriet, 2017).

In 2018, the project completed the verification of the concept and the creation of a testbed with working technology. The Lantmäteriet believes in expansion of this project and hopes that it will soon carry out the actual process of buying and selling land on the blockchain. (McMurren, 2018)

4 Practical Part

4.1 Survey

When planning the practical part, the author of the work is faced with a rather difficult task. After analysing all the literature, rereading all the material, the author has come to the conclusion that the practical part should be built in such a way that one can see the participation of ordinary citizens of Kazakhstan in the implementation process. First of all, this technology was designed to improve the quality of services provided by the state to the population. E-government is not a novelty in Kazakhstan. Citizens are accustomed to this innovation. However, there are voices of people who demand the improvement of the e-government system. The rapid pace of development of the global community moves people to mobility and sociability, thus people have less and less time to sit in queues for a specific document. Therefore, this blockchain technology came at the right time in the age of information technology.

In order to analyse the awareness of residents about the blockchain technology, an online survey of the population was conducted through the Typeform platform, which was posted on the author's Facebook page and sent by email to public sector employees. The survey was conducted by using convenience sampling, one of the non-probabilistic sampling techniques relying on data collection from population members who are conveniently available to participate in the study (Dudovskiy, 2018). This is an appropriate research approach in a small-scale research such as this thesis.

4.1.1 Sample characteristics

To begin with, it is necessary to familiarize yourself with the representatives of the population, whose answers are distributed by age, level of education and employment status. The total number of respondents surveyed reached 73 people in total. Despite its small number of respondents, the results from the questionnaire can be viewed as an indicator for the entire population.

The bar chart below (Figure 1) illustrates an overview of the distribution of respondents by age, where one can see that the majority of respondents are young people between the ages of 18 and 29, representing 58 % of the sample. The rest accounts for people 30-39 years old (27 %), 40-49 years old (8 %), 50-59 years old (6 %), and 60 and above (1 %).

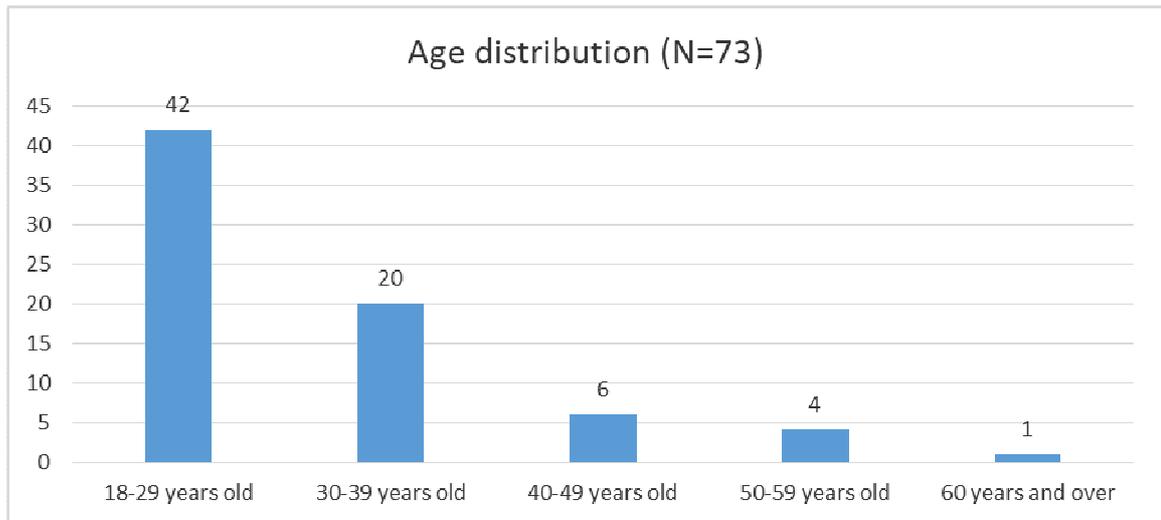


Figure 1: Age distribution (N=73)

On (Figure 2) below, it can be seen that representatives of the sample are educated people, 49 out of the total 73 respondents have either a Bachelor's degree (53 %) or a Master's degree (14 %). Only 3 % are PhD holders, 23 % are high school educated, and the remaining 7 % are college graduates.

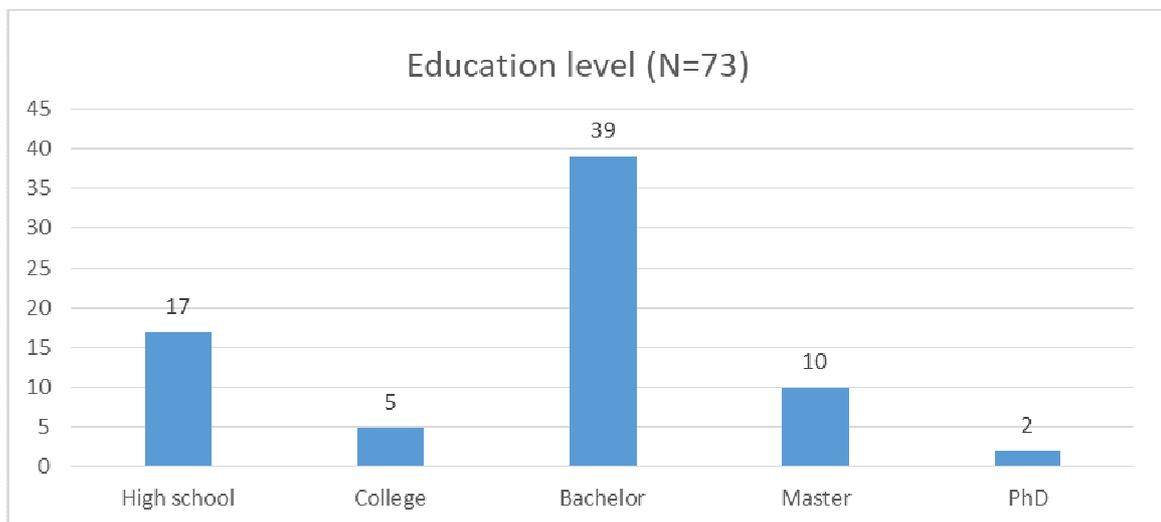


Figure 2: Education level (N=73)

From (Figure 3), it is clear that the majority of participants identified as students, with just 3 % difference between the two (26 students and 23 full-time workers). The remaining 13 % of the sample population are self-employed, retired, unemployed or part-time workers (12 %, 4 %, 7 % and 10 % respectively).

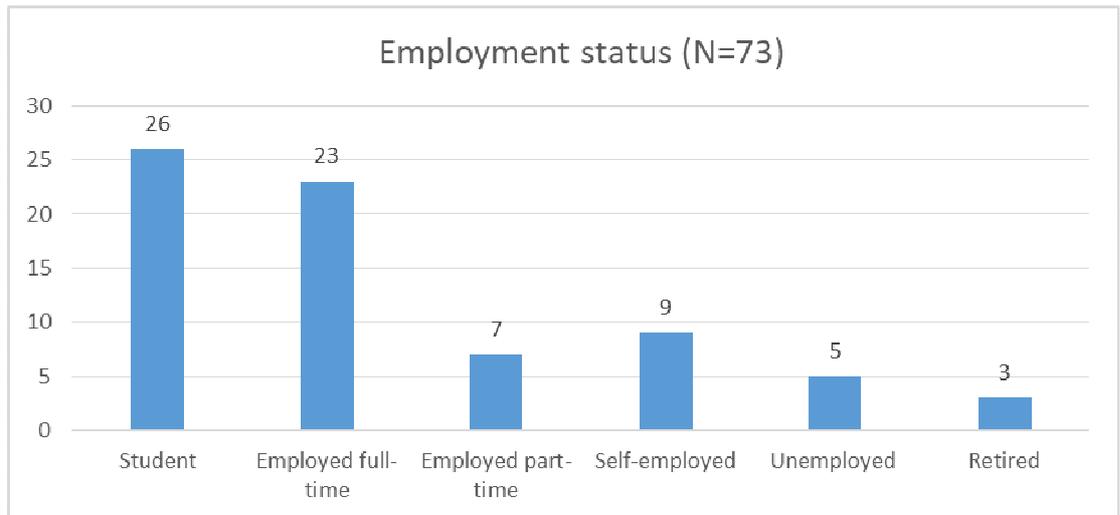


Figure 3: Employment status (N=73)

After getting an idea of the demographic distribution of the sample, the author decided to find out how aware the people are about upcoming innovations in the e-government system.

This bar chart (Figure 4) shows the results of a survey in which people ages 18 and older were asked about their awareness about blockchain technology. The number of informed people is 48 % out of 73 people surveyed. Of these, 10 % have certain interest in this technology and know well what it is. The remaining 52 % have never heard of it.

Overall, one can see a clear downward trend in the number of participants due to an increase in the level of knowledge about blockchain.

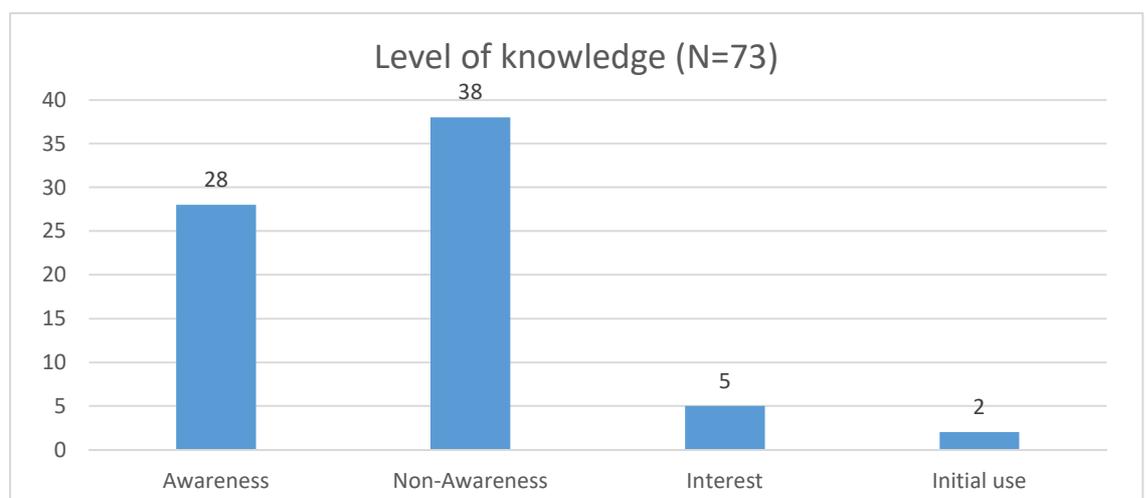


Figure 4: Level of knowledge (N=73)

4.1.2 Respondent's attitude towards digital system

As stated in the theoretical part of the thesis, the blockchain is a process that is designed to provide quality services to the population of the state, ensuring transparency, fast feedback and reliable security. The main advantage of the blockchain is the potential to eliminate numerous intermediaries such as notaries, government officials, banks, insurance companies, and auditors that deals with functions of confirming the authenticity of the operations performed.

According to the main advantage of the blockchain technology, the author decided to find out whether personal contact with intermediaries is important for people when signing contracts or when buying and selling property.

The bar chart below (Figure 5) shows the proportion between the age intervals and the diverse education categories in reference to the importance of personal contact with the mediator. One can see that personal contact plays a significant role for people in a group with a Bachelor's and Master's degree at the age of 40 and up. On this (Figure 5), one see that the need for a broker increases with the age of the respondents, since the older the population the more they see the necessity of mediator, regardless of their education level. There is a clear rise in groups of people with a high school diploma up to professional PhD.

Overall, the average is between 3.8 on the scale: 1 being not important and 5 being very important, regarding the personal contact to the intermediary.

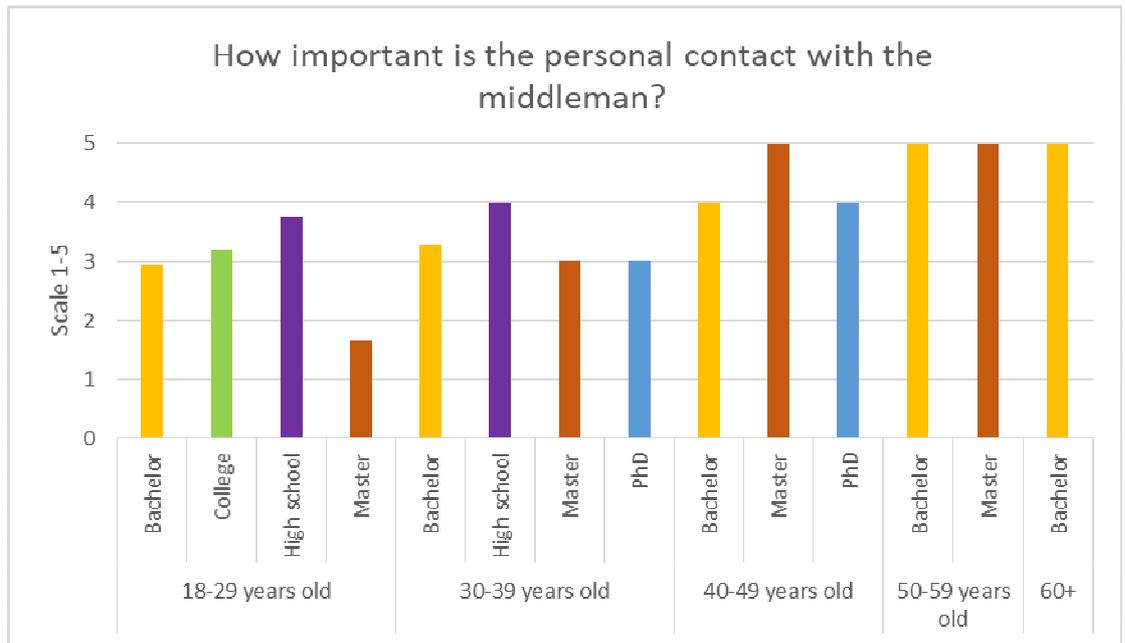


Figure 5: Relationship between age, education level and importance of personal contact with intermediary.

Moreover, the survey examines the attitude to replace intermediary services by a reliable digital system. The overall average is about 2.7 on a scale from 1 being very comfortable to 5 being not comfortable with a replacement of the intermediary services.

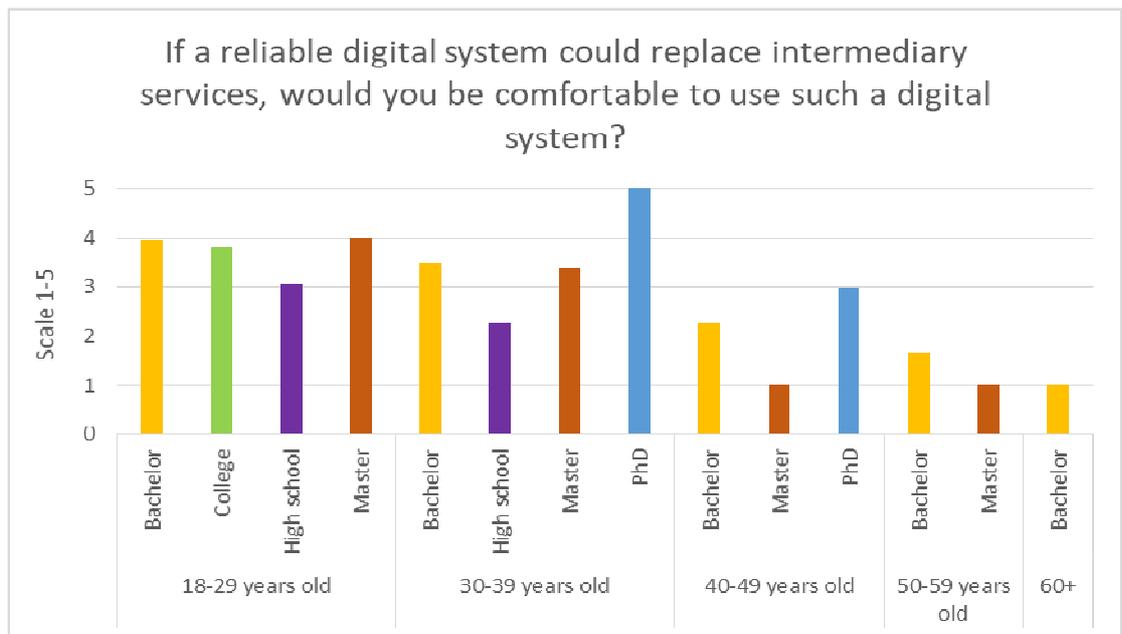


Figure 6: Relationship between age, education level and people's perception of replacing the old system with a new digital system.

According to the (Figure 6) above, the level of people's perception of replacing the traditional system with the digital system drops noticeably depending on the age of the population. People from the age of 40 consider the digital system not very convenient. This may be explained by the fact that older people have seen many different changes and innovations in their lives. They look at digitalization, on the one hand, as a source of threats to the established order. People are ready to see the source of development in digital systems only if the usefulness of these applications is proved. On the contrary, a younger generation of people ages 18 and over support new solutions. They are ready to test them and implement promising ideas. Modern digital technologies have appeared with these people. Therefore, they are active supporters of the introduction of such technologies.

4.2 SWOT analysis

The topics discussed in literature review and practical part should have provided the reader with a broad overview of potential applications of blockchain technology in land administration sector. Based on the analysis of implemented international projects in the field of property rights registration, it became possible to highlight a number of Strengths, Weaknesses, Opportunities and Threats of blockchain implementation, which could be also useful and applicable to different sectors of government.

In (Table 1), the following results were derived:

<p>Strengths</p> <ul style="list-style-type: none"> • Storing data • Data integrity • Transparency • Smart Contract • Decentralization • Speed • Trust 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Complex to understand • Insufficient Research • Energy consumption • Privacy concerns
<p>Opportunities</p> <ul style="list-style-type: none"> • Lower fees • Prevent corruption • New horizon to explore • Fraud prevention 	<p>Threats</p> <ul style="list-style-type: none"> • Government unwillingness to adopt • The challenge with legislation • Hacks and Attacks • Third party elimination

Table 1: SWOT analysis of blockchain technology

Strengths

Storing the data: Thanks to the blockchain, the data is easily managed and stored in digital form, therefore it is better when all the necessary information is placed in a digital format rather than documented on paper. This is especially useful for areas, where information is highly confidential and cannot be transmitted to people in general. The amount of fraud decreases, which is usually the case for paper documents that are more susceptible to security vulnerabilities. Thus, the major application of blockchain will be applicable when we transact a major chunk of information from papers and move them into digital blocks, which simplifies the process of data management and the associated fraudulent activities. (BroctagonGroup, 2017)

Data integrity: Multiple duplication of data among its participants ensures the safety and immutability of information entered into the blockchain. Moreover, due to the main features of the blockchain device, this information cannot be changed, edited or deleted. The use of consensus algorithms suggests that all transactions included in the blockchain are confirmed. (Rieth, 2018)

Transparency: The information stored in the blockchain is available to all peers in the network, which makes the whole system transparent and unchangeable. The blockchain technology works by creating permanent public ledgers of all transactions, potentially replacing many overlapping records with one simple database, which allows information distribution for all in the real estate and construction markets, in the rental market, investments and capital (Agarwal, 2017). Transparent real estate market is open and organized and reliably works with reliable information between the participants. The transparency in the market has the ability to reduce financial crises and speculations that entail negative consequences for the national economy of the country. Increasing transparency will positively affect competition among market participants. Increasing competition will arise from the increased knowledge of market participants and their intentions, which may be beneficial for the real estate market and its participants. (Corluka, 2017)

Smart contract: Blockchain technology means a faster transaction process due to the lack of reliable intermediaries, which, combined with the use of cryptography, creates smart contracts that, in turn, are integrated for distributed and automatic processes (Christidis, 2016). A smart contract in itself has many advantages, which include autonomy (self-executing, without intermediaries), trust and security (encrypted in a

distributed ledger), speed and cost reduction (less paperwork and manual hours) and accuracy (fewer forms to fill out, with encoded terms) (Fisher, 2017). Smart contracts add additional information to what is already stored in the blockchain and regulate the authorization and storage of data. They are tamper-resistant, because they are launched and stored on a network of computers that is beyond the influence of the contract participants. All parties of the contract can be confident that this type of contract will be executed in the form in which it is written, since none of the contract parties can affect the smart contract beyond the actual performance of their obligations. (Bal, 2017)

Decentralization: The lack of centralization is one of the strengths of the blockchain. Decentralization is the basic feature of Blockchain, which means that Blockchain does not have to rely on centralized node anymore, as the data is recorded, stored and updated on multiple systems (Nithy, 2018). As blockchain does not have a single control centre or storage location, all members of the network whose nodes are located all over the world can be directly involved in maintaining performance. Accordingly, decisions regarding the work of such a network are taken in the most democratic way, and the network itself is extremely stable. (Rieth, 2018)

Speed: Blockchain transactions reduce transaction times to minutes and are processed 24/7 (Nithy, 2018). Without blockchain, the process of buying and selling real estate requires a considerable amount of time. Each step requires an asset check, background checks and fraud cases that slow down each transaction (Katiyar, 2017). However, thanks to blockchain, the speed of different processes are increased by using software code to automate tasks that are usually performed using manual tools. With the use of blockchain, buyer's credit history and income will be instantly checked, avoiding long trips to banks, lawyers and real estate agents, while homeowners will be able to prove ownership of their property, backed by an easily digestible record of their time there. (Oparah, 2017) Moreover, all data will be immediately available online and will be compared across all properties. It reduces the time and effort required to verify, which ultimately simplifies and speeds up the process (Katiyar, 2017).

Trust: Many times, participants in leasing and purchase and sale transactions are new to each other and could be over cautious in due diligence and may even have data integrity concerns. However, blockchain reduces the risk through digital identities, more transparent record keeping systems for real estate titles, entitlement, liens, financing and tenancy. (Kejriwal, 2017)

Weaknesses

Complex to understand: Many people do not want and do not even know how to use electronic services, much less understand the subtleties of the blockchain. There are many discussions about the blockchain, what it is and how it works. As people discuss the blockchain, the understanding of technology increases, but they know relatively little how it actually works in practice (Botting, 2018). (Deloitte, 2018) believes that one reason for this may be that the blockchain is a complex system that takes time and effort to fully understand. Those who understand the technology and see that they can benefit from it, show great interest, but so far there are relatively few of them (Botting, 2018).

Insufficient research: The blockchain industry is still in the early stages of development. Besides the potential to make decisions on several issues, the implementation of technology faces constraints, risks, and many problems. Several technical issues were identified, such as energy consumption, processing time required to complete a transaction, high data volume, and constraints that need to be addressed in the future. Many questions need to be explored and resolved before people feel comfortable retaining their personal records in a decentralized way. (Basheska, 2018)

Energy consumption: The high complexity of computational operations associated with ensuring the security of encryption and other automatic system processes requires a significant amount of energy compared to traditional and classical systems. For example, blockchain network's miners are attempting 450 thousand trillion solutions per second in efforts to validate transactions, using substantial amounts of computer power (Nithy, 2018). Moreover, it was estimated that the blockchain network consumes the same amount of energy as a small country, even if it processes only 300,000 transactions per day (Lemmen, 2017).

Privacy concerns: Once information is encoded in the blockchain, it is immutable and accessible by everyone, which cause another weakness. The problem is that everyone could check the amount of money owned by a person, by analysing incoming transactions. (Lamberti, 2018)

Opportunities

Lower fees: The current process for buying property requires the parties, both buyers and sellers, to have the transaction notarized at the public registry house for a fee between \$50 and \$200 (Ewendt, 2018). However, blockchain technology has the potential of

legitimizing the country's property records while reducing the fees of property transactions (Nithy, 2018). The smart contract requires less intervention from the side, fewer intermediaries and overhead for the exchange of assets and therefore, property owners can legally transfer ownership without paying for third-party verification, which in turn eliminates transaction fees.

Prevent corruption: Many countries are actively working to eradicate corruption because of its negative impact on our society. Countries are introducing various anti-corruption measures, where technology has often been used as an effective tool for enhancing integrity and fighting corruption. A technology such as blockchain can reduce unnecessary human intervention and make the administrative procedure more transparent, introducing a public record of hashes, which can make falsification of records much more difficult. (Kim, 2017)

New horizon to explore: The realities of the modern world are such that a person must constantly learn new things in order to be successful and have advantages over competitors. Blockchain is a technological revolution that is accompanied by significant changes in the economy and job responsibilities. When a new technology appears, such as blockchain, the same lawyers will have to learn the basic concepts, capabilities and vocabulary of the blockchain, learn and understand how to represent records from the blockchain, how to interpret the records and how to coordinate evidence rules with the exit from the blockchain. (Graglia, 2018) Moreover, since blockchain technology is a growing sector, in-depth knowledge of blockchain concepts can help you gain the position of cryptocurrency analyst, cryptocurrency developer, developer of full-featured bitcoins and many others (Mailey, 2018).

Threats

Government unwillingness to adopt: Governments can also play an important role in helping to provide the necessary precursors for using the technology, such as high-speed Internet, widely available smartphones, and reliable energy access (Nelson, 2016). However, government agencies prefer to stand aside until someone else takes responsibility and initiative to invest in new technologies (Pisa, 2017). In addition to central banks and government agencies, the blockchain is mainly developed by banks and international corporations, which can lead to increased corporate capitalism and

globalization, which in turn can weaken the government, which is a guarantee of justice (Binek, 2016).

The challenge with legislation: Currently, Internet portals, websites, social networks are full of information about the great possibilities of using the blockchain. However, these opportunities are being used in practice slowly and not confidently. Deloitte (Henry, 2018) expects that going from pilot projects to scale will take longer than many realize, as these organizations grapple with challenges related to data privacy, operational resiliency, and governance. Deloitte (Henry, 2018) believes that one of the reasons for this may be due to the rules, which are usually a serious problem in the process of implementing a new technological solution. For example, there could be situations in which the outcome of the smart contract would not be considered as legal by a court under existing laws (Raskin, 2016). Organizations are usually in a situation where technology is fully developed, but where the question of how to apply it with existing rules remains a mystery. This can be an obstacle to the introduction of technology for organizations as a whole if regulators and legislation do not comply with technological changes in the blockchain. (Henry, 2018)

Third party elimination: The blockchain technology aims to reduce fees and unnecessary use of trusted third-party organizations. It is intended to give an individual control over the processes in a blockchain without using a person in the middle. However, the elimination of a third party can be an obstacle to the success of a blockchain. Organizations, authorities and individuals simply do not want to become redundant, which may indicate a negative attitude towards the implementation of the blockchain. (Falamaki, 2017)

Hacks and attacks: The main attack vector for the blockchain itself is an attack of 51%, although it has never been successfully executed. This attack is a theoretical possibility that, as soon as one party controls 51% of miners in the blockchain network, this party checks or invalidates transactions at will and can even rewrite past transactions. When the power of mining is concentrated in a small number of participants, the blockchain may not be as resistant to distrust as expected. (Lemmen, 2017)

4.2.1 Results

After determining the strengths and weaknesses of the blockchain technology as well as the opportunities and threats for the use of the blockchain in real estate transactions,

actionable strategies should be proposed by making connections between each quadrant of SWOT analysis as it is shown in (Table 2) created by (Furgison, 2015).

	Opportunities (external, positive)	Threats (external, negative)
Strengths (internal, positive)	Strength-Opportunity strategies Which of the company's strengths can be used to maximize the opportunities you identified?	Strength-Threats strategies How can you use the company's strengths to minimize the threats you identified?
Weaknesses (internal, negative)	Weakness-Opportunity strategies What action(s) can you take to minimize the company's weaknesses using the opportunities you identified?	Weakness-Threats strategies How can you minimize the company's weaknesses to avoid the threats you identified?

Table 2: TOWS analysis

After conducting a SWOT analysis, based on literature review, the following general actionable strategies were derived:

1. *Strength-Opportunity:*

- Expand the boundaries of blockchain technology, experimenting and opening new directions (Atlam, 2018).

2. *Strength-Threat:*

- Reduce the percentage of possible attacks by increasing the share of participants in the network and hence, enhance its security by eliminating “*single point of failure risk*” and making it more difficult to tamper with records (Pisa, 2017).
- Improve the definition and detection of fraud by coding the program to detect any incomprehensible transactions, as well as the users who commit these transactions (Henry, 2018).

3. *Weakness-Opportunity:*

- Establish an ongoing dialogue between the developer and technology communities and form partnerships with key industry experts (Atlam, 2018).
- Learn from successful and unsuccessful pilot projects to expand the community knowledge base and improve technical training, which will lead to understanding the benefits of technology and its limitations (Pisa, 2017).

4. *Weakness-Threat:*

- In order to successfully implement and apply new technology, organizations and institutions should test new technological solutions and find suitable ways in a safe environment until agreement is reached that the solution is ready for a successful implementation. (Coleman, 2017)
- Commercial organizations must work closely with government institutions pushing them to introduce several laws to monitor and regulate the blockchain industry for compliance (Coleman, 2017).

5 Results and Discussion

In this section, the author discusses the obstacles that prevent the current real estate transaction system of Kazakhstan from being updated to the new system based on blockchain technology. In order to reach a new level of digitalization, several recommendations that help to speed up the introduction of blockchain will be proposed.

5.1 Potential obstacles to blockchain adoption

The survey results of local residents of the capital city, Astana, show that more than half of the citizens have never heard of the blockchain technology. More than half of the respondents, mostly the adult generation of Kazakhstan, are slightly pessimistic about changes towards digitalization when it comes to eliminating an intermediary, such as a notary or broker, when carrying out real estate purchase and sale transactions, which indicates a poor public awareness about innovative technologies and its capabilities. Initially, it turned out that the parties of transaction sign the contract on paper in the presence of a notary, who takes responsibility for verifying the authenticity of individuals and documents, as well as preparing contracts for requesting and transmitting all necessary information to the state registration authorities. People are accustomed to such a system and are hesitant to present it differently. This is where the problem of peoples' trust in a third party rather than to a digital system comes into play, which will not be solved easily.

Another problem with a negative attitude towards innovation is the concern of notaries to lose their job because of automation. Although, at present, it is unlikely that intermediaries will be completely excluded during the conduct of transactions. Most likely, their roles and responsibilities will be replaced with monitoring the network in order to trigger an alarm in case of interventions, or providing assistance and advising citizens to familiarize users with the new property registration system. As the world does not stand still, it is constantly being improved, new discoveries appear, and new technologies are being developed. Eventually, the world of digitalization will lead to the disappearance of an intermediary, when reliable real estate registers will be created, which will make the whole process of buying or selling real estate fast, convenient, reliable and efficient (Atzori, 2017). Instead of intermediaries, smart contracts will perform the work, which in turn ensures that transactions and names will comply with policies and rules established by the government (Christidis, 2016).

When conducting a general analysis of SWOT, based on an in-depth study of the literature, a third obstacle to the introduction of blockchain technology can be identified as the unwillingness of most states to take responsibility for the implementation of blockchain projects. According to the idea, generated from the (Chapter 3.2.2), the government of Kazakhstan is distinguished by an optimistic view of the future of this technology and its striving for digitalization. However, at this stage Kazakhstan's legislation still lacks mechanisms for legal regulation of various aspects of the blockchain technology, which leads to inconsistency and the holding back of the development of digitalization in the country. The lack of systemic regulation and a number of important provisions and legal definitions that are necessary to determine the legal relations arising from the use of digital innovations are the main obstacle to the introduction of blockchain in Kazakhstan. However, it can be assumed that if the state directs all forces to overcome infrastructure and regulatory obstacles, land transactions between participants based on the blockchain technology, combined with reliable ownership laws, can lead to effective, transparent, secure, and most importantly reliable land registration system in Kazakhstan.

In addition to the legislative framework, it is important to focus on infrastructure. According to the example of Georgia and Sweden (Chapters 3.2.3 and 3.2.4), before deciding to use blockchain technologies to improve the real estate registration system, these countries already had a fairly advanced digital system, where all real estate data was fully accessible to citizens in electronic form. As it is stated in the theoretical part of the thesis (Chapter 3.2.2), Kazakhstan within the framework of the "Digital Kazakhstan" program tries to computerize the main areas of public services, among which digitalization of the registration of the sale of real estate is the main area. It can be stated that Kazakhstan has all chances to use the blockchain for real estate registration, since the country has made a big step in the field of modern technologies, creating an electronic database that stores some of the information about property rights, which, unfortunately, is available only to the notary. From this, it is concluded that Kazakhstan still has room to grow. There is a need for a certain standardization and simplification of current processes to continue building the blockchain application. It is necessary to start investing in the computerization of old systems first, as Georgia and Sweden did.

The weaknesses of the blockchain during SWOT analysis (Chapter 4.2) were related to the fact that the blockchain consumes a huge amount of energy. For countries where energy is quite expensive, this factor will definitely be a problem. However, this problem can be bypassed in Kazakhstan. Due to low cost of energy, Kazakhstan has superiority over other countries, and therefore the potential of technology is significant there. In Kazakhstan, electricity is 4-5 times cheaper than in Sweden (Statista, 2018) and there is a large-scale focus on digitalization, which is actively supported by the state. The high complexity of computational operations, automatic system processes requires more and more electricity (Nithy, 2018), which Kazakhstan has in abundance. Kazakhstan has real chances to become one of the advanced countries in hosting data centers. Moreover, Kazakhstan has not only low-cost electricity prices, but also low-cost labor resources and a well-developed telecommunications infrastructure, which makes it possible to build data centers near electricity sources. There is an assumption that if favorable conditions are created at the legislative level in Kazakhstan, the country will soon be able to fully export the processed data and realize its energy potential in new industries instead of exporting natural resources. (Grekov, 2017) It can be assumed that in the near future the state will have a new market in the sphere of development of the data centre industry, which will allow Kazakhstan to increase revenues, develop new areas of the digital economy and new services market in conditions of global competition.

Supporters of the blockchain in Kazakhstan present this technology as a “*silver bullet*” to solve almost any type of information problem, but the possibility of its application in practice has not yet been given. Since the technology is in its early stage of development, knowledge of its potential is limited. In this thesis, international experience insists that the success of the blockchain project directly depends not only on the technical side of the work, but also on education and public participation. (Ubacht, 2017)

Indeed, in order for the blockchain to take place, common efforts are needed, both by the state and by the population in terms of the implementation of this innovation. It is impossible to regulate something intangible, so it is recommended to start working with all interested parties, including government bodies, so that absolutely everyone has a basic understanding of what the blockchain is and how it works. As introduction of such technologies is aimed primarily at the convenience and comfort for the population, as well as on the efficiency and effectiveness of transactions so that consumers can more easily use the services. It is necessary now to begin to go beyond the existing system, to explore and

understand the possibilities that the blockchain technology can provide in terms of trust and security. Citing Georgia (Chapter 3.2.3) as an example, we see that the blockchain-based project is successful due to the awareness of all interested parties of the transaction about the benefits of the technology. As the NAPR helped the Georgian people to understand the benefits of the blockchain, Kazakhstan also needs to conduct training in order to actively inform people about the new technology through news portals, social networks, conferences and workshops where people can better learn about technology and no longer see blockchain as an enemy. Legislation, in turn, should help clarify why and how to implement blockchain technologies in public services and various sectors of the economy, which will then increase the investment attractiveness of the country and create demand for the use of technological solutions that will form the basis for the development of start-up projects.

5.2 Fostering adoption of blockchain in Kazakhstan

Based on both, the literature review and the survey results, the author tried to identify potential obstacles to blockchain adoption and implementation and came up with a number of recommendations, fostering blockchain adoption in the Republic of Kazakhstan.

1. To provide access to knowledge for a wide audience of people, allowing government agencies and citizens to participate in launch and maintenance discussions to make the system and management process useful and reliable.
2. To pay special attention to the training of specialists responsible for the introduction and effective use of blockchain technology in the real estate transactions system.
3. To bet on the blockchain and distributed computing, using the advantages of low-cost electricity and geographic location, which is found out to be the only “digital way” for Kazakhstan.
4. To develop the data centres by attracting investors, focusing on advantages, such as low-cost electricity that Kazakhstan has.
5. To direct all forces to overcome infrastructure and regulatory obstacles: standardize and simplify current land registration processes.

6 Conclusion

In the conclusion of the thesis, the author needs to analyze whether the goals set at the beginning of the work were achieved. The main purpose of this thesis is to propose the introduction of blockchain technology for real estate transactions in the Republic of Kazakhstan. The author has researched whether or not the blockchain could take place in Kazakhstan, as well as what prospects and limitations the country has on the way to the blockchain implementation. As follows from the content of the thesis, all three goals at the beginning of the work, which should lead to the achievement of the main goal of the thesis, have been successfully fulfilled.

The first partial goal of the thesis was to make a comprehensive review of the literature on the blockchain and possible options for its use in the real estate transaction system. The author presented a broad overview of topics that presented the reader with an understanding of e-government, blockchain, and the real estate transaction system in Kazakhstan. Analysing the current process of carrying out real estate transactions in Kazakhstan, the author, based on the foreign experiences of Georgia and Sweden, tried to understand the advantages of the blockchain for the transformation of the old real estate registration system. Georgia and Sweden serving as examples, the need to implement blockchain with the aim of ensuring transparency and efficiency in conducting real estate transactions was demonstrated. Attempts by these countries to use the blockchain helped to eliminate many problems in the real estate registration system.

The second partial goal was to identify the potential benefits of the technology and the implications of its use for the government and society. To achieve this goal, the author conducted a survey of local residents of Kazakhstan to learn about the awareness of citizens about the technology. Since changes in the system will primarily affect ordinary residents, it was also necessary to find out their perception of the main system update, that being the absence of an intermediary. Moreover, using the SWOT analysis based on the literature and previously supported by the survey results, the main strengths, weaknesses, opportunities and threats of the blockchain technology were identified. The results show that the advantages of the technology outweigh its disadvantages, which can be reduced with the help of the identified strategies to eliminate them.

All previous steps bring to the conclusion that the state digital system, such as the Kazakhstan system of real estate transactions could increase transparency, simplify

processes and get rid of intermediaries. If common efforts are made by all the system participants to develop this area, the focus will be on the country's advantages in the form of cheap electricity and sufficiently developed infrastructure. Then Kazakhstan has a great chance to take a leading position among the countries that use the blockchain and thereby get closer to the execution of the state program “Digital Kazakhstan”.

The results of this study can be useful for all participants of the real estate industry, including but not limited to, blockchain enthusiasts, government employees, businesses and home users. The author believes that these studies will contribute to the academic field, especially in Kazakhstan, since there are essentially no such academic studies on this topic in this country. These studies are primarily a starting point for the government and contribute to filling gaps in understanding the potential and consequences of the blockchain.

This thesis has some limitations. By using the convenience sampling technique, it is impossible to generalize the results of the survey to the entire population, as there is a possibility of under or over representation of the population (Explorable.com, 2019; Dudovskiy, 2018). Moreover, this research has an exploratory nature and is focused mainly on identifying advantages as well as limitations for the implementation of the technology. The author of the thesis recognizes that it is impossible to cover all aspects, as so much of this topic cannot be explained by this study alone, which also does not guarantee its reliability in application.

This thesis only partially reveals the potential of the technology, therefore there are still many areas that require further investigation. For example, the evaluation of new promising projects in Kazakhstan, as mentioned in the work, will be an interesting topic for future research. Any research regarding e-government services and its impact on society will also be promising. Since the blockchain is at an early stage of its development, in order for it to become more mature, further research will be necessary.

7 References

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