Some Aspects of Economy Digital Transformation - Benefits, Challenges and Prospects of Implementing Blockchain Technology in Education System

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Abstract:- Initially Blockchain was discussed by the masses as a fundamental technology of cryptocurrency. Today, it is considered as an opportunity to keep information steadily, which can be used in erstwhile unexplored industries and it can have an incredibly huge effect on the industries' development. In the research it is discussed the opportunities and challenges of using blockchain technologies in the education sector. On one hand, the main goal of the research is, to analyse the benefits and point of view of blockchain's establishment (introduction), and on the other hand, to study the use of blockchain as an action to simplify processes, and make them efficient. The research was conducted in the Republic of Georgia, in three different directions: a students' survey, an employers' survey and a survey and analysis of the opinions of representatives of higher educational institutions. As a result of the research, three different segments, that could get a benefit from decisions made by using blockchain, have been analysed.

Keywords:- Blockchain, Blockchain Technology, Edtech, Digitization, Education.

I. INTRODUCTION

Recently, blockchain technology has attracted considerable attention from researchers and practitioners. This is mainly due to its unique features including decentralization, security, reliability and data integrity. Despite this growing interest, little is known in terms of knowledge about the application of blockchain technology in practice. *(Agbo, 2019)*

This paper discusses the opportunities and challenges of using blockchain technologies in the education sector: digitalization of diplomas and various types of educational certificates, decentralization and lifelong learning and motivation. Some of the challenges explored, are the basic data protection laws that hinder programmers; As well as the large-scale challenges posed by slow-moving blockchain transactions. In addition, market readiness for innovation and challenge underscores the fact that blockchain in education is a relatively immature innovation that is often overlooked or perceived by educational institutions' top management. *(Alammary et.al 2019).*

The aim of the paper is, on the one hand, to analyse the benefits and prospects of the introduction of blockchain, and on the other hand, to study the use of blockchain as a way to simplify processes, reduce time costs and financially optimize. In this regard, it focuses on three main issues (1) educational institutions developed with blockchain technology, (2) the benefits that blockchain technology can bring to education, and (3) the challenges of its adoption.

In this regard, the paper addresses two important questions:
- First, how can blockchain technology improve the performance, processes, and financial conditions of the education system to stakeholders? This question will analyse three different segments that can benefit from decisions made using blockchain: 1) Educational organizations (e.g. universities, start-up organizations) looking for ways to increase student data storage and management efficiency and security; 2) Students who can access more attractive, reliable and sustainable ways of accumulating, certifying and sharing knowledge; 3) Employers looking for reliable, safe methods to assess the authenticity of students' skills and certifications. This paper will discuss the incentives, reasons for restraint, and general goals of these three parties. We will analyse blockchain as a solution that can create both individual and collective significance through educational programs.
- Second - What are the obstacles to the implementation of the blockchain in the education sector? This question will focus on identifying and analysing problems that may arise for both private and public education organizations that aim to develop or implement blockchain solutions.

II. LITERATURE REVIEW

Blockchain is an emerging technology that was introduced in 2008. It was first used to record transactions using Bitcoin. *(Allamary, et.al 2019 p.13).*

As mentioned in many papers, a blockchain is an unchanged, decentralized database, a kind of chain of "blocks" that stores information such as dates, times, costs, participants, and etc. Mainly three types of blockchains are distinguished: public, private and permitted. *(Zheng 2017 p. 559).*

Blockchain by its very nature revolutionizes and creates the world without intermediaries. It connects the two poles of the universe - the transmitter and the receiver without an intermediary and without additional interference. A new circle is created, where the number of participants is reduced to a minimum, the so-called Horizontal world. (Bartlome et.al 2017). The influence of blockchain in other areas beyond the cryptocurrency is growing day by day. And this technology has found its development in education as well. Its use seems risky, especially when most of the operations performed using it are of a pilot nature. Piloting and new technology raises high expectations, and at the same time raises many questions how it should be used in education. *(Bartlome et.al 2017).*

Observing EU blockchain imitative map one will find, that most of the blockchain initiatives are concentrated in EU (pic-1) – Source: EU Blockchain initiative map
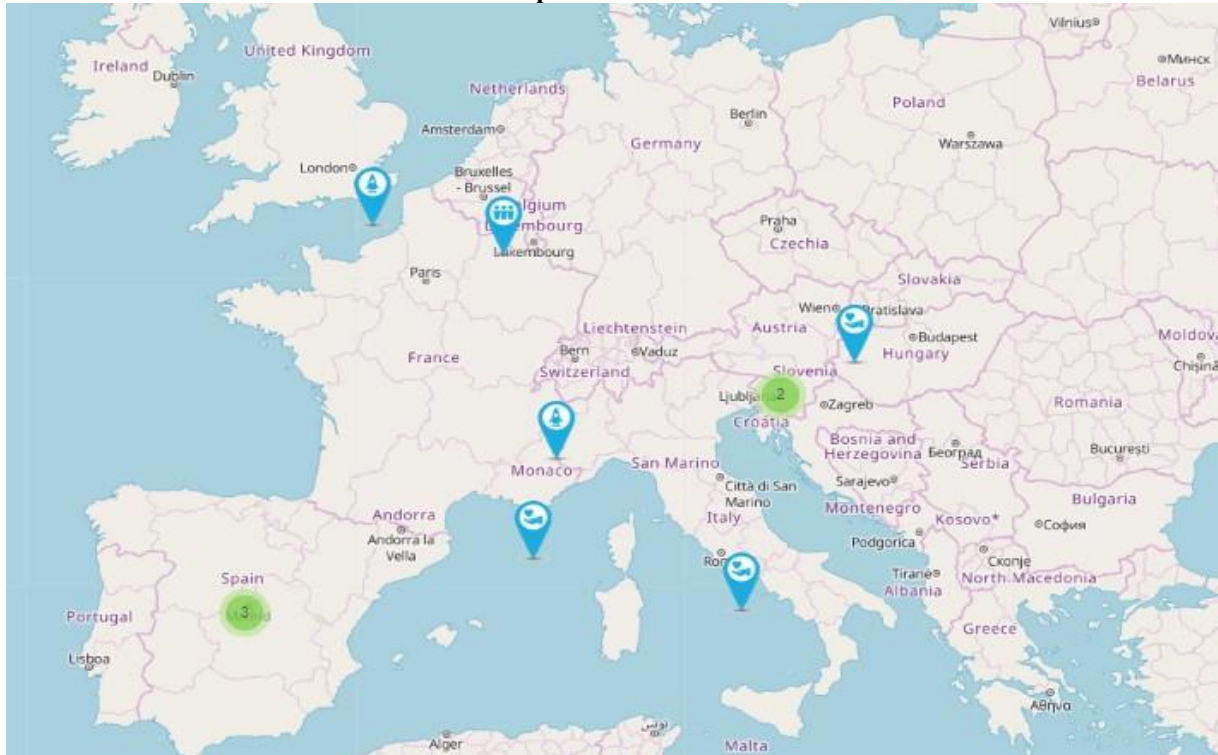
Picture N1 – Block chain Initiatives Worldwide
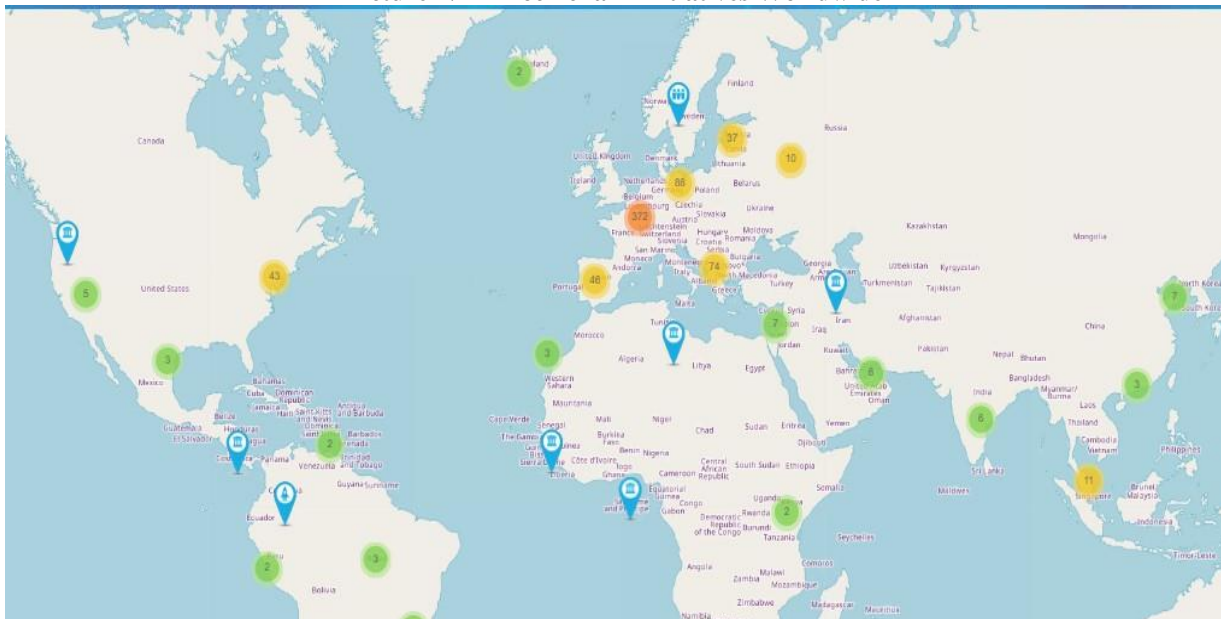
But if we separate blockchain initiatives in education (pic – 2), we see reduced numbers, and if we filter the results by "pilot completed with real results", we can easily count them on the map, due to its small number (pic-3).

Picture N2 -Block Chain Initiatives in Education in EU
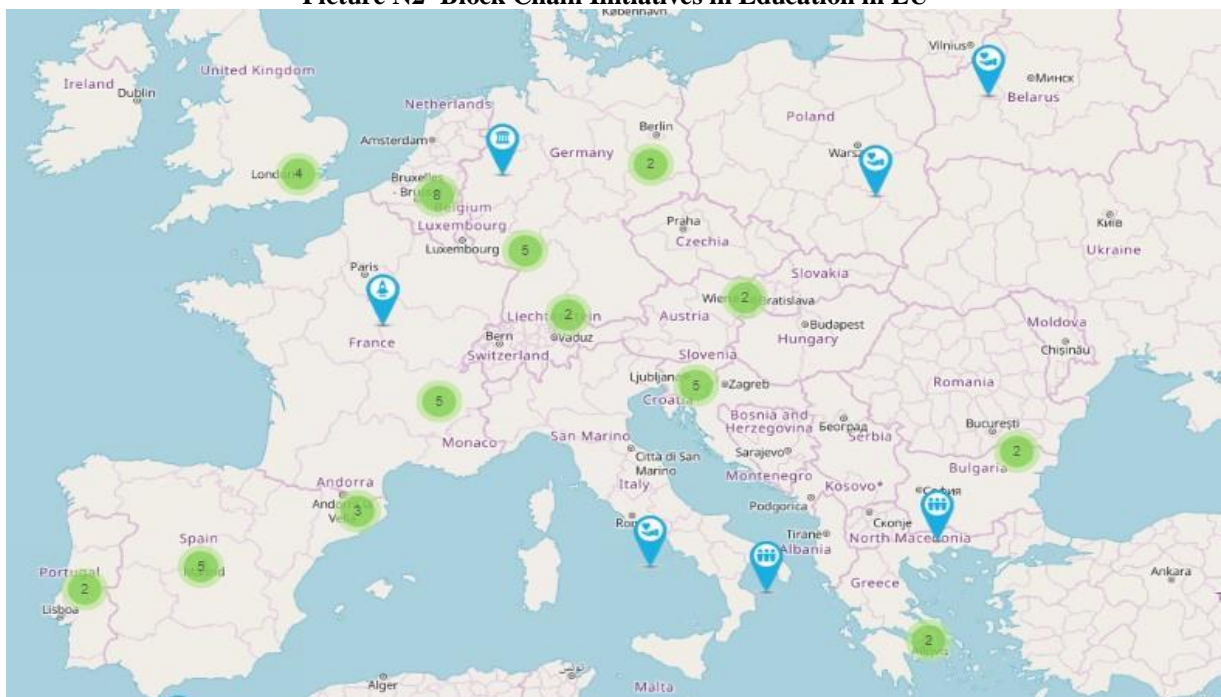
Picture N3 – Completed Block Chain Pilots in EU

The use of blockchain in education is still in its infancy. Only a small number of educational institutions have started using blockchain technology. Most of these institutions are in different fields. This technology is used to verify and share academic certificates (diplomas, certificates, etc.), as well as to digitize the results that their students have achieved. However, field researchers believe that blockchain technology has far more potential to revolutionize the field. Blockchain can reduce the central role of educational institutions as a certification agent and provide more opportunities for students. *(Alammary et.al 2019)*. The introduction of blockchain technologies in the education system and the digitization of huge databases are associated with fundamental, ground-breaking changes, although the consequences that this decision will bring to the system are far greater. The education system faces great challenges that go beyond the teaching process on its scale. The issue is no longer just about optimizing processes. The system must respond to existing technological trends. It is necessary to change not only the existing rules, but also the thinking. Can blockchain technology solve some of the problems caused by progress? - This is the main question related to the issue of the introduction of this technology.

When considering the introduction of blockchain technology in education, first of all, it should be noted that it is a matter of using timely and up-to-date experience. The starting point is to modify the curriculum. It may take years to make the appropriate changes. However, we must not forget that change is happening very fast and the speed of implementation will be driven more by the rapid social adoption of technology than by the success of this experience.

Nowadays, there are many programs created using blockchain. It is interesting how they are realized for educational purposes, since it is a new word in the continuous progress of the educational system. These programs can be classified into twelve categories *(Alammary 2019)*:

− Certificate Management
− Competencies and Learning Outcomes Management
− Assess students' professional skills
− Protection of study subjects
− Provide a collaborative learning environment
− Transfer of fees and credits
− Obtaining digital consent for guardianship
− Manage competitions
− Copyright Management
− Empowerment
− Student interaction in e-learning
− Review exam materials and promote lifelong learning.

Although a growing number of blockchain-based programs have been created for educational purposes, only a few of them have found development. These programs can be divided into certain categories and each category deals with issues related to trust, privacy or security in the educational environment.

The articles reviewed outlined 10 different types of benefits that blockchain can bring to education. These are:

− safety
− Data protection
− Privacy
− Integrity

- Ability to control how students' data is accessed and by whom
- Increase accountability and transparency
- Build trust
- Reduce extra costs
- Authorization
- Student assessments
- Improved data sharing efficiency and improved student record management
- Student interactivity and system interaction
- Students 'future careers - supporting students' career decisions.
- *(Alammary et.al 2019).*

Although blockchain has shown its potential in the context of education, there are many challenges that need to be addressed when applying it to education.
Some, and most important of them are:

- Safety – Safety is a key feature of blockchain technology; however, the risk of malicious attacks cannot be completely ignored. It is very difficult to ensure security and privacy. This issue becomes more crucial when a person's career is in jeopardy (online authorization of educational credentials and certificates). To ensure privacy, a number of blockchain frameworks use public and private keys. However, the blockchain does not guarantee the confidentiality of the transaction as the details of each key are made public and, in this way, user transactions can be used to obtain user information. Adequate storage and protection of all members' personal keys is also a security issue that needs to be addressed. *(Gilda, 2018)*
- Scale - The scale challenge is related to slowing down the speed of operations performed with blockchain technology. Large amounts of data on many pupils and students are collected in educational systems, which leads to an increase in the size of the blocks, due to the large amount of information, the number of blocks increases and consequently the operations on the blockchain require more time. The rationale for the "Scalability Trilemma" is as follows: Scalability is significantly affected by "block time interval and block size", a reduction in time may enhance performance, but at the same time, may reduce security. Another potential challenge that may arise on a large scale is that the use of blockchain technology is associated with the loss of large amounts of electricity. *(Alammary et.al 2019), (Zheng, et.al. 2017).*

- Data security and privacy - Critical analysis of a blockchain database highlights a popular misconception that data on a blockchain is encrypted. Although the data is digitally signed by the parties to the transaction, it is not encrypted by default. According to Chowdhury, "this is an open book system where anyone can join and verify any transaction on the network", while the privacy of the parties is ensured by public key cryptography. Educational institutions may need to implement strict privacy measures using private or authorized blockchains, or using protocols such as Zero Knowledge proof. *(Chowdhury, et al. 2018).*
- Market readiness - An important issue when introducing blockchain technology is whether the local market is ready to make similar educational decisions. What are the attitudes of potential beneficiaries (e.g., school governance stakeholders) towards these programs (e.g., fears, concerns)? Many educational institutions are reluctant to adopt blockchain technologies. Some of the reasons for the lack of trust may be the lack of necessary knowledge and skills on how to manage student data on the blockchain platform. It is important to note that another important aspect that can significantly affect the admission of the education sector to the blockchain market is the government. Thus, large-scale blockchain-making decisions can be more easily secured through partnerships and collaborations with government and university governance stakeholders. *(Steiu 2020)*
- Innovativeness -Thayer argues that blockchain technology is immature and rapidly changing, which often leads to a "propensity for failure and termination" of blockchain-based projects. "Realization will probably take longer than just the introduction of technology." (Thayer, 2019), n order to overcome the challenge of market penetration innovation, it is necessary that blockchain-educational solutions be sustainable. This requires the unified, complex work of governments, educational institutions and innovators (e.g., the legislative bodies, private and public educational entities, technology companies, the business sector, etc.) (Steiu 2020)

Educational technology (EdTech) has made significant progress over the last twenty years, but complete modernization has a long way to go. Blockchain, rapidly replacing bulky desktops and antique manuals. Below are some examples of how blockchain technology is being implemented and used widespread in learning processes.

Table N1 – Examples of Block Chain Technologies Used in Education

#	Provider	Origin	Description	Use in Practice
1	**BLOCKCERTS**	**Cambridge, Massachusetts**	Academics have joined the MIT Media Lab to create Blockcerts - an open standard blockchain-based platform for creating, issuing and verifying certifications. The company can verify the authenticity of the documents and detect false information.	In 2018, more than six hundred MIT alumni chose to receive a digital version of their diploma on the Blockcerts blockchain. Consequently, students 'academic records will be stored forever and future employers will be able to receive and verify them immediately.

2	APP II	England, London	APPII has partnered with Open University to provide a qualified and accredited platform for managing prospective student submissions as well as ensuring record integrity for graduates. The platform uses blockchain to verify certificates.	Users create a profile and complete their academic resume, including education history and records. Uses blockchain to verify user profile and store his / her information in blockchain. The company combines blockchain, smart contracts and machine learning to refine the academic credentials of prospective students and professors.
3	GILGAMESH PLATFORM	USA, California	The Gilgamesh app (available for iOS only) combines a variety of books, social media information, and wallets to store GIL tokens and use them as desired. It is knowledge sharing platform based on smart Ethereum contracts.	The platform rewards participants with GIL tokens - in other words, it is a kind of incentive for participants to be actively involved and participate in discussions. Users can collect tokens and then use them to purchase the desired material, book or other academic paper.
4	ODEM	Switzerland	It is a decentralized marketplace for educational products and services. Using blockchain, the company connects teachers, students and professionals with relevant courses and resources. Using smart contracts, professors and students agree on specific courses, helping them gain professional knowledge by students.	the platform transmits points to both students and lecturers. The higher the lecturer's rating, the more students enroll in his/her course. Such approach stimulates not only students but also lecturers to develop skills and improve scoring.
5	SONY GLOBAL EDUCATION	Japan, Tokyo	SONY GLOBAL has partnered with IBM to develop a blockchain platform that allows multiple institutions to add individual academic achievement and other relevant student information to the blockchain book. The platform ensures that students' information is stored forever, regardless of whether students have completed their studies at a particular university or have moved elsewhere	Using blockchain, Sony has awarded certificates of participation to contestants in the 2018 Global Math Challenge. These certifications are a constant score report that will help participants with future educational or professional programs.
6	BLOKCHAIN EDUCATION NETWORK	USA, Delaware	A unified database of students and alumni around the world based on blockchain and cryptocurrency initiatives.	BEN now has more than 4,000 members who share blockchain ideas, build prototypes and create their own creations.
7	DISCIPLINA	Estonia, Tallinn	Uses blockchain to create a unified register of university students' academic performance and qualifications. The company's decentralized algorithm automatically scores customers based on their achievements and qualifications. Disciplina has released the Alpha version of the blockchain platform so that universities and students can familiarize themselves with the app.	Universities can use these scores to determine individual curricula based on what a student has studied. The company Student App allows students to browse through their academic history. The Teacher App offers professors a review of their profiles, teaching styles, and training courses.
8	PARCHMENT	USA, Arizona	Offers digital certification services to students, academia and employers.	Higher education institutions use the platform to review academic merit, process applications, and produce immutable diplomas. In addition, students have unrestricted access to all educational information and can easily share academic achievements with prospective employers.

| 9 | **BITDEGREE** | **Lithuania, Kaunas** | BitDegree integrates blockchain books and tokenization into its technology-oriented online education platform. The platform offers students many free and paid courses of any name, from any field. | The company offers online courses such as "Cryptocurrency for Dummies: Ethereum vs Bitcoin and Much More" to help more people learn about DLT. The platform also stimulates the successful completion of training courses, one of the motivating mechanisms being the offering of scholarships in line with certain achievements. |

Country Background

The Republic of Georgia is a country located at the intersection of Eastern Europe and Western Asia. It is a part of the Caucasus region, bounded to the west by the Black Sea, to the north and east by Russia, to the south by Turkey and Armenia, and to the southeast by Azerbaijan. It covers 69,700 square kilometres and has a population of around 4 million. Georgia is a representative democracy governed as a unitary parliamentary republic. ("Georgia - The World Factbook". CIA. Retrieved 25 March 2021). Tbilisi is the capital and largest city, home to roughly a quarter of the population.

Georgia is a developing country with "very high" Human Development, high levels of economic freedom and ease of doing business, as well as relatively low corruption indicators, although poverty and unemployment remain a challenge. (Georgia Poll Reflects Widespread Concern over Economic Issues, International Republican Institute, 2019). The country is a member of international organizations across both Europe and Asia, such as Council of Europe, Organization of the Black Sea Economic Cooperation, OSCE, Euro control, European Bank for Reconstruction and Development, and GUAM.

The education system of Georgia has undergone sweeping modernizing, although controversial, reforms since 2004. ("Georgia purges education system". 2005) (Molly Corso,2005) Education reform rocks Georgia).Education in Georgia is mandatory for all children aged 6–14.The school system is divided into elementary (six years; age level 6–12), basic (three years; age level 12–15), and secondary (three years; age level 15–18), or alternatively vocational studies (two years). Students with a secondary school certificate have access to higher education. Only the students who have passed the Unified National Examinations may enrol in a state-accredited higher education institution, based on ranking of the scores received at the exams (National assessment and examinations centre, 2017) Most of these institutions offer three levels of study: a bachelor's programme (three to four years); a master's programme (two years), and a doctoral programme (three years). There is also a certified specialist's programme that represents a single-level higher education programme lasting from three to six years. Higher education institutions are accredited by the Ministry of Education and Science of Georgia.

Georgia has seen tremendous recent improvement in educational participation and outcomes. Nevertheless, educational progress has not been equitable across all population groups and many students in Georgia still struggle to master basic competencies. These issues reflect systemic challenges in modernising the teaching profession, using evidence in policy-making and strengthening school oversight. The country's evaluation and assessments systems need to be strengthened in order for education outcomes to be improved for all students. (OECD Reviews of Evaluation and Assessment in Education: Georgia).

The trend of digitalization, automation and decentralization is relevant in Georgia. Although blockchain technology is only used by unit destinations and is still in the early stages of development, some sort of basis for future development has already been laid. It should be noted that Georgia is one of the first countries to introduce blockchain technology in real estate registration process since 2017. The electronic service of the real estate registry has been added to the "Search in blockchain" window, where unique blockchain access to Bitcoin blockchain and public registry websites It's possible. In addition to the public registry website, citizens can check the authenticity of real estate statements in the blockchain network on special websites: blockchain.info, blocktrail.com, btc.com. It should also be noted that the pilot project of the blockchain technology-based system was introduced by the Public Registry Agency on the basis of a memorandum of cooperation with Bitfury Group (napr.gov.ge). Another area in Georgia where blockchain technology is used is e-commerce. Shelf.Network was founded in 2018. The company managed to enter the international markets and gain recognition in a short time after its launch by creating solutions that are interesting for both technology and industry.

As for the Education, blockchain technology unfortunately, is represented in a small insignificant number. For research purposes, we have identified several projects and initiatives based on blockchain technology.

"Emercoin" has created a blockchain system through which high school graduates will be able to store an approved diploma and officially certified certificates on a secure platform. A pilot project primarily was developed to create a universal technology for Business and Technology University. The project was closed later on. The Ministry of Education, Science, Culture and Sports of Georgia is

launching a partnership with the largest international technology company within the framework of education reform. Memorandum of Understanding was signed between „Input Output HK Ltd "(IOHK), one of the largest international blockchain companies in the field of technology, and the Ministry of Education, Science, Culture and Sports, signed by Minister Mikheil Batiashvili and IOHK Signed by CEO Charles Hoskinson.

III. RESEARCH METHODOLOGY

A mixed type of the research was selected for the study. Both quantitative and qualitative methods were used. Based on the research questions, the research was conducted in three directions: student survey, employer survey, survey of opinions of representatives of educational institutions - a qualitative type of research. The research was conducted in two stages: i) student survey and employer survey, ii) understanding the opinions of representatives of educational institutions according the results of the first stage results. When surveying students, the questionnaire consisted of only 17 closed-ended questions. When compiling the questionnaire, we had several main priorities - it was

compiled in the simplest possible terminology, the questions were understandable and perceptible, and the proposed possible answers included all possible answer options. When interviewing employers, the questionnaire included both open-ended and closed-ended questions because we wanted to get comprehensive answers to certain questions. As for the third type, we conducted a qualitative study, which included an in-depth interview with university officials. Due to the pandemic reality and restrictions, we sent a questionnaire to the respondents by e-mail, and then arranged online meetings with them. This study enabled us to obtain extensive, in-depth answers and to analyze them.

In order to understand research student population, below are given some statistics about HEI-s and numbers of students in Georgia. In this regard, it is also important to know numbers of the students who need services of diploma authentication for study purposes in abroad, as one of the widespread ways of using block-chain technology is education is the ease of diploma certifications. For this population, we surveyed 308 students with a 95% confidence interval and a 5% margin of error.
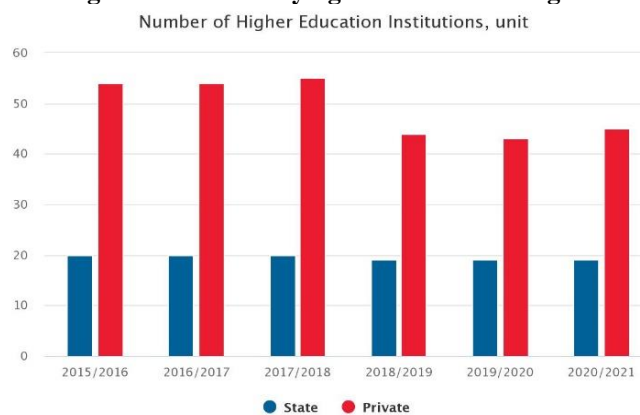
Graph N1 -The number of HEI-s in Georgia
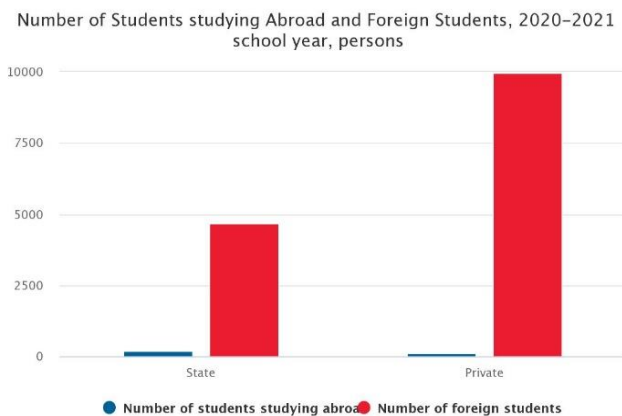
Graph N2- Enrollment at HEIs, thousands
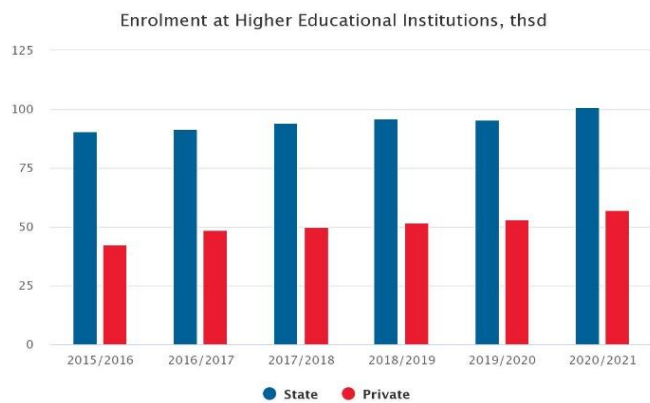
Graph N3 - Number of Georgian students studying abroad and Foreign students studying in Georgia

We have selected 22 large companies among the employers, according to several characteristics, considering: number of employees, level of technological development, cooperation with educational institutions to find staff, etc. The human recourse managers were interviewed, because the questions were mainly about recruitment simplification, also administering the employee records.

The next stage of the research was to interview the representatives of the universities. Our goal was to interview representatives of both public and private universities to get a complete picture of the research topic and to be able to summarize the results and draw conclusions. In the

framework of the research, we interviewed the representatives of four private and two state Universities.

IV. RESULTS

The paper reviews the benefits, challenges and prospects of introducing blockchain technology in education system. We believe that one of the most important stakeholders in the case of blockchain decisions in HEIs are students. The paper reviews and discusses what benefit this technology can offer. From the results we selected most relevant that are summed up below:

Note: *all data in tables are shown in percentage, June 2021*

Table N2- Results of Students' Survey

1	percentage distribution of students by level	undergraduate	graduate	doctoral
		37	58.3	4.7
2	awareness if their Universities use blockchain technology	not aware	uses digital data bases	does not use
		79.6	12	8.4
3	How long is the deadline for issuing a diploma after being awarded a qualification?	too long	normal	-
		80.6	19.4	-
4	in case of blockchain-based database in Georgia, I would agree to digitize my data	yes	no	-
		82.4	17.6	-
5	having a block chain - based digital data base will influence and make easier the communication with employers	greatly influence	moderately influence	does not influence
		74.1	23.1	2.8
6	Having a block chain - based digital database will reduce both time and financial costs	yes	no	have no answer
		62	36.1	1.9
7	What is the main obstacle to the introduction of blockchain technology in educational institutions	Technological capabilities	Readiness of universities	Data protection legislation
		65.7	61.1	52
8	Would you like your university to use a digital database that would allow you to reduce the financial costs associated with document certification, get qualifications in a short period of time, and, if necessary, use an already certified, authenticated document?	yes	no	-
		90.7	9.3	-

Table N3- Results of Employers' Survey

1	Distribution of Companies by Industry	Banking	Tech	Education	Insurance
		18.2	63.6	9.1	9.1
2	Number of employees in company	0-100	101-300	301-500	
		45.5	27.3	27.3	
3	Have you heard of blockchain-based digital databases	yes	no	-	
		72.7	27.3	-	
4	Do you have digital data bases	yes	no	-	
		90.9	9.1	-	
5	Do you have block chain based digital data bases	yes	no	-	
		0	100	-	
6	Is data accounting / processing / storage associated with additional costs for your company?	yes	no	I don't know	
		45.5	36.4	18.2	
7	The search and hiring of new employees are associates with additional cost and time at your company	yes	no	-	
		81.8	18.2	-	
8	If you had a chance to get information about qualifications of	yes	no	-	

	the students without intermediaries would you use it?	100	0	-
9	It is more profitable for the company to hire staff with relevant knowledge and skills, with proven qualifications than to train them inhouse	yes	no	-
		63.6	34.4	-
10	do you cooperate with University in terms of recruitment?	yes	no	-
		80.8	19.2	-
11	will the digitalization of documentation have issued by educational institutions, and authorized access to it simplify recruitment process?	yes	no	-
		70	30	-

Besides the yes-no questions, company representatives were asked to name the problems they face when recruiting staff:

- It is often difficult to find people with certain skills, as employment portals are very general and filtering candidates from there in most of the times is waste of time and other resources.
- The requirements of our vacancies are mainly targeted at young people who do not yet have experience, but are active and want to develop. Consequently, platforms such as jobs.ge, hr.ge, etc. are not relevant to us.
- Lack of relevant staff in the labour market. They can be found among students.

Another open-ended question for them was to name the barriers for block-chain introduction in educational system, in terms of data bases, that could greatly simplify their recruitment processes and allow them to find relevant employees with less effort. Most of them had nearly the same answers:

- Lack of readiness.
- Lack of sufficient qualified developers and high costs.
- Refusal by students to digitize documents and their data, which prevents the creation of a complete database.
- Data privacy issues.
- This service may be required when recruiting a specialist with long experience when there is a risk of falsification of personal information.

The third phase of the research was a survey of universities, as they are key players in the implementation blockchain technology. According to the results, the answers are convincing. First of all, it is noteworthy that awareness among the University representatives is higher compared to other surveyed segments, and more or less all of them possess information about blockchain technology in general.

All respondents agree that data management is quite a time consuming and difficult, especially when it comes to information about several thousand students. 100% of respondents say that this process is related to both time and financial costs, therefore, their interest is to reduce costs to a minimum using block-chain technology. One of the most difficult processes they outline, is the physical issuance of qualification documentation (diplomas, certificates and etc.). The pandemic even worsened the situation. In addition, respondents name several other problems related to the physical issuance of documents: inaccuracies, time resource, the need for additional staff, bureaucracy of issuance

procedures and etc. However, students report dissatisfaction with time-consuming procedures. This is one of the challenges for universities that needs solutions.

The surveyed universities actively cooperate with various companies for the employment of students; therefore, they play the role of mediator between these two parties.

Universities are ready to participate in blockchain decision-making and introduce this technology (99%), but at the same time emphasize that the desire and readiness of the university alone is not enough to implement this innovation and it is necessary to involve all stakeholders.

V. DISCUSSION AND CONCLUSIONS

The literature reviewed allowed us to discuss successful blockchain solutions, to analyze the experience of other countries, benefits and opportunities that the introduction of blockchain technology has brought them.

The research questions aimed at connecting foreign experience to the Georgian reality and identifying the benefits and obstacles that accompany the initiatives to introduce blockchain technology.

The survey of students allowed us to find their position as of a stakeholder and their readiness to introduce new technology. The level of awareness among students was low. However, on the other hand, after providing general information on the issue, the majority of respondents indicated that they would have used this technology.

The employer survey allowed us to understand their priorities, the directions of the processes and the key issues that concerned them in terms of finding staff. The employer survey provided a more or less complete picture of the level of research awareness in the business sector and the willingness to support the introduction of blockchain technologies.

The research revealed a diverse picture, in terms of awareness about blockchain technology, part of the respondents is not familiar with the technological field and have not heard about this technology. Which, we think, is the part from which to start working in Georgia.

The results showed the attitude of stakeholders towards blockchain technology, the vast majority of them supports this initiative and express their desire to participate in the implementation process.

The results of the study are promising, despite the current situation, we assume that in case of implementation of blockchain initiatives, stakeholders will support them. It is necessary to discuss the issue in different contexts, both for the business and the education sector.

Analysis of the research results shows that there are shortcomings in the education system, which affect the proper functioning of the system, slow down the processes, are related to financial costs and require a huge resource. The main benefit of the introduction of blockchain technology is the simplification of these processes. University officials said in an interview that a significant financial expense for them is the physical issuance of qualification documents, and the digitization of this process will minimize costs and reduce waiting times, which is also often a cause of dissatisfaction for students. At the same time, the target audience of our research was also the employer's sector. The employers' research revealed a problem - finding qualified staff and problems verifying the authenticity of their qualifications. In this regard, data digitization also addresses the challenge facing employers. Once the qualification documents have been digitized, the employer will have access to the already verified authentic data, which will significantly reduce both the financial and time costs associated with finding / retraining qualified staff. And for job seekers to request documentation, to collect all the necessary documents, to verify authenticity.

The second research question was about the impediments that exist in our reality to the introduction of blockchain technology. The results of the research revealed several important problems:
• Lack of initiative and support
• Technological and financial readiness
• Lack of providers
• Data Protection Challenges / Legislation.

After summarizing and analyzing the responses received from the target groups surveyed in the study, we can conclude the following:
1. The level of awareness in the people, which are interested to establish (introduce) blockchain technology - is low;
2. Every respondent agrees that the introduction of blockchain technology will have a positive effect on their financial resources;
3. In addition to financial interest, there is an important cost of time that is evident when it comes to accounting / processing / storing large amounts and volumes of data
4. The business sector is one of the most essential stakeholders in blockchain technologies., its representatives in the research noted that they were positive about the introduction of new technology, taking into account all the issues that these solutions would bring to their companies;
5. All respondents agree that verifying the authenticity of documents requires extra time, finances and effort, and

therefore they welcome to make these procedures simpler by using blockchain.
6. Communication between potential employers and employees is much easier and more convenient without additional intermediaries;
7. When it comes to using blockchain technology into the educational system, a number of challenges need to be considered, including the legislative aspect - data protection and security issues;
8. In addition, the financial and technological preparation of the educational system, universities and the business sector remain a challenge in our country;
9. Another important problem is the lack of blockchain technology providers.

RECOMMENDATIONS

We tried to research the main stakeholders and formulate recommendations that might be useful for further introduction and development of blockchain technologies in education system. The Ministry of Education, with the support of the government and the legislature need to develop an action plan and outline the steps they need to go through in order to successfully implement blockchain technology and make a number of useful decisions.

The legislature should start reviewing legislative initiatives and reviewing / updating data protection laws, which is essential to provide security to stakeholders, which in turn will encourage more companies, universities and students to express their willingness to digitize their information. In addition, it is essential that the Ministry of Education ensures that accurate, comprehensible and comprehensive information is provided to stakeholders so that they are not blindly involved in various related projects.

It is necessary to encourage and stimulate universities to express their readiness and interest to start introducing blockchain technology and digitizing data in all possible directions. On the part of the state, it is necessary to develop incentives for businesses to start introducing the proposed technologies, to actively cooperate with universities and to support new initiatives, especially in times of pandemic.

In addition, it is necessary to find blockchain technology providers both outside the country and to encourage technology companies in the country to be able to develop blockchain technology and develop digital databases and platforms to be further introduced in universities and beyond. (Meaning schools, various LEPLs, etc.).

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