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This information overview (“Whitepaper”) has been prepared by KryptEd Educhain OÜ (Limited Company in Estonia) core team for the purposes of providing information on its projected business model and use case for its utility token (“KED”). This whitepaper is provided for informational purposes only and not to be taken as financial advice.

# Executive Summary

KryptEd has been working towards developing a decentralised application built on top of Ethereum VM (Virtual Machine) that contributes to education industry by supporting the educational community and protecting content through utility token reward offers. KryptEd combines concepts from educational ecosystem with lessons learned from several active years of research and development studies in the field of blockchain technology. A vital aspect to achieve global standards in the industry is an advanced system that consistently reflects, protects and awards each person's contribution. KryptEd is the first comer blockchain service that attempts to embrace the current problems in education by establishing a globally recognized platform for its members in which they can protect, share their content and earn rewards through their contributions to its community.

This process create a currency that will be able to reach a broad market, including not yet participators in any current cryptocurrency economy.

KryptEd intends to have a decentralized application platform services (dApp) that is designed to serve as an open standard and common building block for content that provides a storage mechanism along with checks for copyright infringement via blockchain and artificial intelligence.

According to applied sweat equity principle, all forms of capital are considered equally valuable, meaning that those who contribute their scarce time and attention toward producing, absorbing and curating content for others are just as valuable as those who contribute their scarce cash.

Contents

## I. Introduction

We believe blockchain is a complementive and innovative solution with competitive advantages for organisations to adopt. Therefore, KryptEd team have been working towards building blockchain based user friendly products for education industry in the past years. Throughout the whole process of product development, research was the most important factor in how we shaped our approach towards the future. We managed to build two of the four open source proof of concepts that were promised in original KryptEd whitepaper; 'KryptEd Advisors' and 'KryptEd Signature'. To come to this stage, incremental knowledge of the technology, needs of the industry and the needs of the society resulted in higher expectations for ourselves. KryptEd team have been learning something new every single day to achieve the optimum vision.

Therefore, we have come to a realization that what we have achieved is not yet enough. We found ways that can solve more problems and develop better user friendly applications. However, there are still many limitations especially in the case of mass adoption of decentralised applications. According to our research, institutions see enormous potential for organisational innovation via blockchain technology. The potential of the technology can be applied to many aspects of various industries, but to be precise for our research and development we have focused on educational infrastructure.

With over 4000 universities in Europe, which in turn graduates almost a staggering amount of 5 million students a year, we believe Krypted can be a go-to turnkey solution for universities to organise, streamline and secure their documentation and certification processes as well as data and integrity protection that may be implemented with proper research and development.

This paper focuses on how and why blockchain is used to solve the problems found within education through research and use case scenario proposals with an updated vision of KryptEd Educhain.

*Concept of organisational innovation*

To this date, there have been various explanations of the concept of organisational innovation. According to Kogabayev and Maziliauskas, innovation involves increased speed in work processes by implementing different ways to create more efficient outcomes in overall operation. The process of innovation may differ in each case, either minor or major changes can lead to better results as well as radical and incremental changes may allow better outcomes. According to Charan and Lafrey, innovation is an essential need for any organisation to stay ahead of competition and in most cases create margins for higher profits. This tells us the fact that organisational innovation can become a win-win situation in most cases. Therefore, in this whitepaper, we look from a point of view which takes blockchain technology as a very important factor for organisational innovation and provide use cases that can be implemented into real life scenarios.

*Research Methods*

This section will elaborate on the research methods that were used during the processes. It describes the research design, data collection, data analysis and a summary of reflections upon the methods used.

The main objective of KryptEd is to build a decentralised autonomous organisation which provides a base for educational infrastructure. Based on this vision and due to the specific nature of our objective, we conducted a use case scenario approach including multiple cases. To be more precise, we were interested in finding problems with current approaches to education and solutions to create a more efficient global educational ecosystem, therefore we engaged in empirical observations and interviews with industry leaders as we tested out their feedback in potential use case scenarios. Since there is still lack of literature review covering blockchain technology and education, it was crucial for us to gather data from primary sources through qualitative method. The use of the qualitative method allowed for deeper understanding of educational system and variables of present dynamics, especially in Turkey.

Primary and secondary techniques were undertaken throughout the research. During the primary case, qualitative and quantitative approaches were used and during the secondary technique, we used systematic literature review in order to understand how blockchain technology could be innovative for current educational processes. As such, we attended twenty blockchain conferences, five blockchain hackathons, engaged in multiple interviews and meetings with education industry professionals and leaders in addition to reviewing technical white papers of hundreds of blockchain based projects.

*Use Case Scenario Approach*

To explain a newly emerging technology such as blockchain, and to investigate opportunities with itself, we conducted a use case scenario approach. We focused on understanding the current dynamics of educational system and how to improve them via blockchain technology. To take full advantage of our approach, we listed out the characteristics of blockchain technology and following questions were listed in order to understand the how and why a blockchain based application would work more efficiently compared to the current systems:

1. Can a traditional database technology meet the needs?
2. Is there a need for multiple parties to update the data?
3. Do any of the updaters need to trust one another?
4. Is database likely to be attacked or censored?

5. Does the data need to be kept private?

After listing out the questions, we approached many experts to gain a second opinion for our project. The experts helped us to focus on specific needs of the current education system and allowed us to understand how to apply the 9 chosen characteristics of blockchain technology listed below:

1. Trust
2. Permission
3. Transparency
4. Identification verification
5. Competence evaluation
6. Network scalability
7. Data protection
8. Incentivization
9. Transaction speed requirements

*Blockchain technology conferences*

We attended 20 blockchain and cryptocurrency conferences, we were given the opportunity present in 13 of these during our research and development phase (see appendix). Attending the conferences allowed us to expand our network and increase our knowledge of the industry. Attending these events were crucial for the research process as most of the data collected were from and leading from these conferences.

*Blockchain hackathons*

Hackathons tend to last for 48 hours with the objective of developing a proof of concept by end of the event. We attended three hackathons during our research to apply our gathered knowledge into practise. Each hackathon had a different theme but all had a common idea of using blockchain technology. Attendance to these events were also highly beneficial mainly due to the hands on and practical nature of them.

*Data Acquisition*

*Execution of industry leader interviews and meetings*

Being a young and distributed team of individuals, first, it was challenging to gain the attention of industry experts. Therefore, we predefined a strategy to be able show our competence to improve our reputation. Our objective was to be well known in the cryptosphere, therefore we actively produced educational video content, published research papers, gave free public lectures about crypto and blockchain and shared our views heavily on social media channels such as Twitter, Discord and LinkedIn. The contributions we have made to the community gained the attention of industry professionals and as a result we started getting public speaking requests from various universities. As most of the people in Turkey were still unaware of the blockchain technology's potential, we were able to single out easily.

After gaining the attention, it was crucial to attend the meetings and gather insights from the experts to get the ultimate benefit. We generally went into the meetings as a pair. One would ask the questions and the other would observe the responses then provide follow up questions for the interviewer. The meetings generally had an approximate duration of 60 minutes, some taking up to three hours of brainstorming. Even though we predefined our roles before entering the room, the meetings tend to come out of track as experts were also very interested in what we would tell them about our plans and project.

The questions asked to the experts were mainly about the potential of blockchain technology, limitations of the technology. The questions experts asked were mainly about the business model of KryptEd and the capabilities of the project.

Some of the meetings we attended had much bigger impact than others. To be precise, Minister of Education of Turkey and CEO of Sebit meetings were highly beneficial as they pushed us out of our comfort zone. Before attending these meetings we had to prepare for many sleepless days. Meeting with the Minister was special as we have never had a meeting with any high ranked official. We were fairly nervous which gave us a fair advantage to prepare more.

Sebit is an educational technology company based in Ankara. Just like a university final exam, we had to study and present our knowledge and in return collect insights from the experts of the industry. The meeting with Sebit was especially important. The duration of the meeting was over 4 hours. We had to travel from Istanbul to Ankara in the morning attend the meeting and go back to Istanbul on the same day. CTO and CEO of

Sebit were extremely open minded and interested in our technology, they told us the benefits of usage of blockchain technology in education. On the other hand, Ismail Hakki Polat, President of Digital Transformation Turkey, has been extremely inclusive with KryptEd since the beginning. He has guided our team towards our vision, his expertise in the field of education showed us the potential reasoning of why our vision was feasible and more importantly needed. Mr. Polat's mentorship also allowed us to connect with most our targeted experts. His connections opened doors which led us to develop our product more effectively.

*Blockchain Conferences*

The conferences were highly necessary for us to meet with industry professionals to increase our network within the cryptosphere as well as the information received from in-depth presentations of the speakers. We predefined our actions before all the events; find the most suitable presentations, find the most suitable individuals, take notes of the targeted presentations and meet with the targeted individuals.

To target presentations, we listed out the criterias below;

- The presenter must have at least 2 years of experience with crypto and blockchain.
- The topic must be relevant to our research.
- The topic should not be about the laws and regulations of the industry (due to the lack of regulations).
- The presentation must include one of the following key words; cryptocurrency, blockchain, smart contracts, Ethereum, Neo, cryptography, artificial intelligence, internet of things, ecosystem, ICO, marketing.

To target individuals, we listed out the criterias below;

- Individual must be within the crypto related industry.
- Individual must be well known and reputable.
- Individual must have a track record of accomplishments within his/her field.
- Individual must have a wide range of network.

*Industry leader meetings and interviews*

In order to complement what was missing from the literature, and to understand the needs of the current education system, we met and interviewed experts within education and blockchain technology industries. The purpose of this process was to increase our understanding about the education industry and its' leading stakeholders' views towards current issues.

We engaged in meetings with:

- Minister of Education Turkey, Ziya Selcuk.
- President of Digital Transformation Association of Turkey, Ismail Hakki Polat
- CEO of Sebit Edtech, Ahmet Eti
- Co-founder of Diplomacy.Live, Gokhan Yucel
- Economics Author, Erkan Oz
- Assistant Professor at Ankara Yildirim Beyazit University, Tolga Medeni
- Associate Professor Doctor at Yildirim Beyazit University, Hasan Engin Sener
- Lecturer at Bahcesehir University, Kozan Demircan
- CEO/Co-Founder of Further.Network, Kadir Ozgur Oguz
- CTO/Founder of Further.Network, Erdem Uney
- CEO/Co-founder of Limk, Oguz Serdar
- CEO of 4129Grey, Alemsah Ozturk
- Mentor at ITU Cekirdek, Robert Barry
- Sales Director at Oracle, Muge Gokcek
- Brand Manager at Anadolu Efes Beer Company, Elif Sen
- Co-founder of TRAngels, Erol Lengerli
- Regional Director of BilgeAdam, (a software education institute) Murat Altintepe
- Rector at Molde University College, Steinar Kristofferson
- Senior Executive Partner at Gartner, Mete Yuksel
- Microsoft Start-Up Program Manager, Serkan Yagiz
- Founder of Gamification Turkey, Ercan Altug Yilmaz
- Founder of Nephocraft, Onur Yuksektepeli
- Expert at BilgeAdam, (a software education institute) Devrim Danyal
- Consultant at Qmark, Anil Akin
- Managing Director at Mindstone, Tansel Kaya
- CEO of Ovis Exchange, Serbulent Arslan
- CTO of Ovis Exchange, Zubeyir Ozturk
- Founder of Defterhane, Cemil Sinasi Turun

All of the professionals listed above have contributed to the research and development phase of KryptEd. These contributions are not limited to only gathering data from them but also affected our product development for the better. Each person above is very valuable to our project and has been critical in preparing the roadmap of KryptEd.

*Hackathons*

Hackathons played an important role for our research as these events allowed us to apply our knowledge into developing a real proof of concept. Most of the times, research projects are only able to provide theory and recommendations. Being able to attend hackathons that connect people to build products was an important factor for us to shape out vision.

*Analysis of data*

Process of qualitative data analysis was highly challenging and complicated as we took hundreds of pages of notes and met with hundreds of professionals. The material was mainly unstructured textual data. We used various coding techniques to separate the data collected into categories and we looked for patterns in received information. To achieve the most effective result, we used a web based application to distribute all the data collected into categories and topics. This process was recorded for due diligence. After separating all the necessary data from the unnecessary ones, we prioritize each category.

*Reflections on the methods*

The methods we used during our research needed immense commitment and patience. We have built strong relationships and collected very valuable data from all the experiences. Many of the team members of KryptEd gave up on the way, and few kept on going. It is not easy to form a group of individuals who are willing to take risks and spend their time on only collecting information. Everyone's time is valuable and KryptEd has thought that to many people. Meetings, hackathons, conferences, literature reviews and at the same time mental well-being all together was hectic and challenging. However, being able to come this far, shows the potential for success. An idea turning into reality, through extensive research, is indescribable. Reflecting on the methods used, we can be proud of what we have accomplished so far. We believe, there could not be a better way of finding the answers we were looking for.

## Findings Applied to Use Case Scenarios

In this section, we will go through the use case scenarios that are applicable to our findings. Each case described solves a problem within the current system it is in via blockchain's unique features. We chose 9 characteristics of blockchain technology as a point of reference to create the use case scenarios; trust, permission, transparency, identification verification, competence evaluation, network scalability, data protection, incentivization and transaction speed. These characteristics paved the way for solutions to surface and allowed for a better understanding of the needs.

Case number one describes a network of institutions collectively sharing the same data but with confidence and swift transaction capability. Security of the network is gathered from the nodes which need to be built within each institution. KryptEd is already able to store data on the Ethereum network via Swarm. We are able to produce diplomas and capable of creating a p2p community which interact with each other.

Case number two is also able to share the same network and on top bring in a fitting technology 'artificial intelligence'. A new graduate from Koc University, Ece Hepdarcan, came up with the idea of using a blockchain based system to detect plagiarism and combine it with AI. She had done her research to be able to come up with the problems and the solutions along. She had conducted her research within Koc University in Istanbul. However, as we have no expertise or background in AI and ML. We decided to find a partner that could be interested in such a study. This case's feasibility depends on the technical aspects of AI being detaily researched. Therefore we looked into it as more of a what can be done with a partner which is already working in this field. We already contacted the potential firm 'Artiwise' and advised them of our vision. Their response was highly enthusiastic, and that is how we gained our confidence to continue with this part of the study and reflect our finding towards it. We have purely theoretical and non-technical approach in this use case scenario.

## *II. Case 1: New decentralised education network*

### *Background*

Technology is constantly developing at an incredible pace. Driverless cars, self learning robots, humanless planes, drones, artificial intelligence and so on. As technology develops, we try to adopt our lives to it. Knowledge is one of the most important assets of humankind which allows us to develop and go forward. However compared to the growth of the technology, education system haven't changed much. It is possible to come across very similar teaching techniques all over the world. In classrooms, blackboard and chalk is still used as widely as books, notepads and pencils. As far as it goes, education system is still trying to adopt to the new technologies. Especially in Turkey, institutions are slowly accepting the use of personal computers in classrooms and an online education hub has been introduced to the public by the government. However, kids are still not allowed to use calculators in classrooms. This system is currently working however needs huge improvements. We believe blockchain technology could increase the capabilities of the education system and allow for a more secure network to grow and increase the efficiency of the learning population.

Listed below are the questions asked and the answer that follow up from the current system. With each answer that leads to 'yes', paves the way for a blockchain based infrastructure adoption:

1.Can a traditional database technology meet the needs?
In some cases yes, however traditional database is currently causing issues such as not being able to transfer files in a secure fashion.

2.Does more than one individual need to be able to update the data?
Yes. Students go through exams, multiple teachers submit the grades received to the system.

3.Do any of the updaters need to trust one another?
Yes. Teachers are to be trusted in the case of submitting the grades. It is very common to see bribery in Turkish schools for kids to improve their marks.

4.Is trust to a third party by all the participants necessary?
Yes. The data entered into the system needs a trusted government portal which allows for a secure registration and network.

5.Is database likely to be attacked or censored?
Yes. The government websites tend to get attacked very often in cyber wars. Students who are good with computers try to hack into the systems as well to change their grades.

6.Does the data need to be kept private?
Yes. All data of the students need to be kept private and needs a permissioned service which then allows individuals to share their data accordingly.

The questions above allowed us to come to an understand that, the national education system is one of the best areas for blockchain technology adoption.

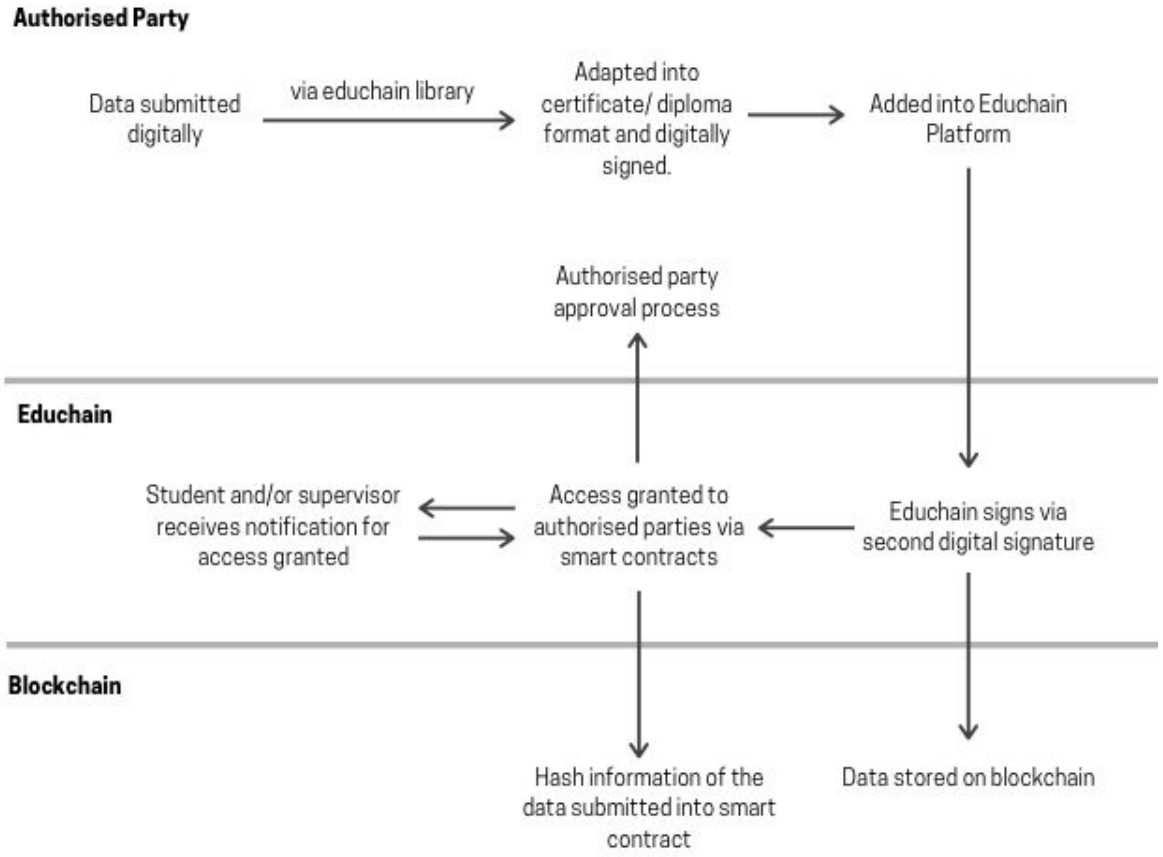
*Problem*

The current education system is unnecessarily centralised due to lack of technological adoption. which makes the system prone to cyber attacks as well as un-efficient submission and transfer of data between parties.

*Solution*

While trying to create the concept of this decentralised education network, we have come to a realisation that this new model needs to be tested out with a simple application. Therefore, we decided to create a proof of concept that allows data such as transcripts and/or diplomas to be submitted onto blockchain while granting certain rights to individuals via smart contracts.
For this process to work efficiently, we have predefined three roles:

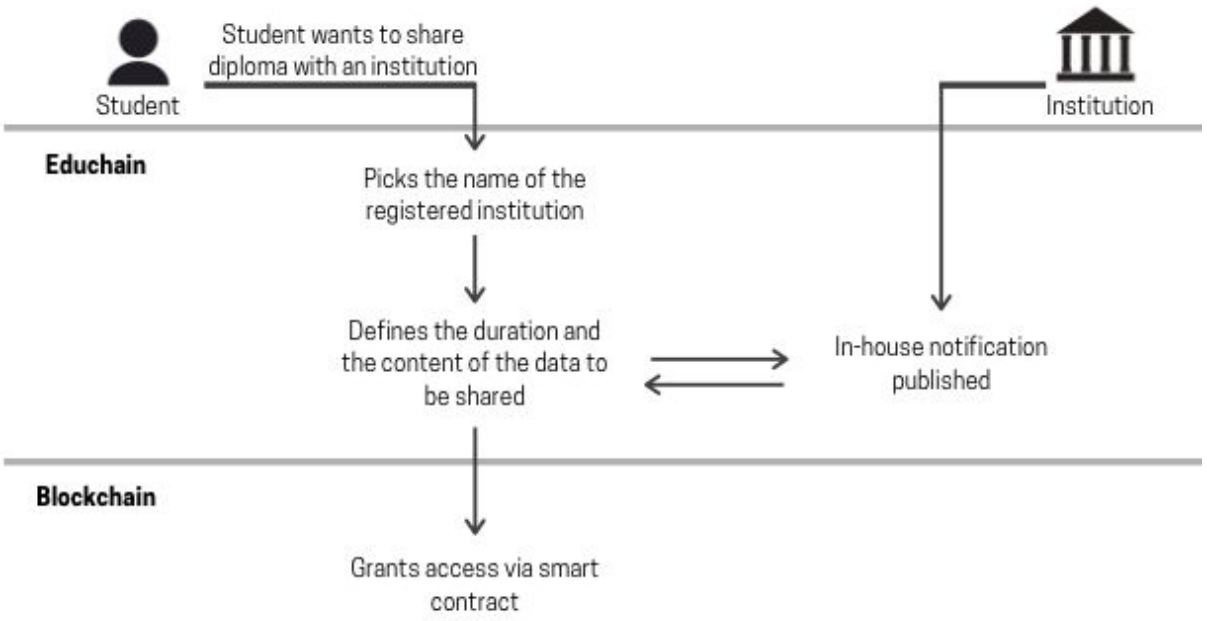
- Authorised party such as government agencies like 'Ministry of Education' and/or education institution that needs to approve of the data.
- Educhain, a decentralised service which provides a library and gateway.
- Blockchain, which stores and validates data submitted.




As seen above, authorised party creates a digital profile, then submits digitally signed data into Educhain. After this, Educhain service digitally signs the data then submits the data onto blockchain. Then, along with the credentials stated in smart

contract gets executed immediately. For example, this can be described as; a student diploma to be accessible from anywhere by the student and the authorized party.

Rights to access the data are stated within the smart contract which allows for immutable and uncensored reach of permissioned parties. For example, in the case of a technical issue with central authority's system, this does not affect the originality of the data. On the other hand, student or student's parent is able to access the data from anywhere, and able to share student's diploma via e-mail or card reader. The data can be taken from the blockchain and parties are able to validate the owner of the shared diploma. This process can be seen below:




*Incentive*

Incentives for *individuals* to use a new decentralised education network:

- Ease of access
- Data security
- Ease of data transfer
- Custom permissions

Incentives for *institutions* to use a a new decentralised education network:

- Secure data storage
- Fraud prevention
- Network of organisations which are interconnected that allows for more efficient processes.

*Challenges*

The biggest challenge in establishing a new education network is that the development needs to be proceeded together with a government authority like organisation. The concerns around the scalability and actual useability of blockchain based applications can be a blocking issue for these types of initiatives. It is recently been common to see countries using blockchain technology however the blockchain platforms are still at an early stage of development and still trying to find the best possible technical capabilities in order to make the best use of the technology.

## III. Case 2: New AI powered decentralised intellectual property management and plagiarism detection application

*Background*

*IPRs and global perspective*

In international arena there have been some efforts to regulate intellectual property rights because unlike material property, intellectual property is intangible, the possession of such property need to be protected legally with international organizations and related contracts.

Unauthorized use of material protected by intellectual property law that violates the original copyright owner's exclusive rights to reproduce or build upon the copyright work is legally described as IPR violation. Not only that, but reviews and criticism over copyrighted material without proper citing is also another way of practising IPR violation.

Because IPRs are protected by the IPR laws, violations of such laws are directly projected on revenue share, causing a loss of profit and control over the owned material. The web offers instant publishing and access options, meaning that IPR violations can occur in varying types of digital forms. Regarding educational institutions, IPR violation through plagiarism can be traced in formats like term papers, thesis, research papers, essays; educative designs and other types of written formats such as project papers, news, articles, web content.

Plagiarism is not always necessarily subject to copyright infringement. The case is not regarded as copyright infringement unless there is a violation of the copyright law. Plagiarism doesn't occur if the original source of the work is properly cited. Intellectual property rights have broader sphere but included in IPRs; copyright infringements are protected and even if this does not necessarily equal to plagiarism, in the international arena, it is the most acknowledged mechanism. Therefore, any debate or progress on IPRs are highly correlated with plagiarism.

The writer of a plagiarism free text is expected to offer original content and/or paraphrase the related author in their own words and cite the source properly. For avoiding any charges against plagiarism, proper citation is necessary.

If an author's intellectual copyright is violated, the act of plagiarism can be subjected to legal courts and be sued for infringement. Being the most comprehensive multilateral agreement on intellectual property, Trade-Related Aspects of Intellectual Property Rights (TRIPS) contract holds the purpose of advancing the liberalization of international knowledge trade, empowerment of global knowledge markets and protection

of intellectual property rights. Signed by all 162 World Trade Organization (WTO) members, TRIPS not only establishes the copyrights but also combines the ability to enforce conformity by penalizing through economic sanctions for the breaching nations. Furthermore, the UN organization World Intellectual Property Organization (WIPO) is another organization with strong emphasis on intellectual properties' role for economic growth and it focuses on providing and developing global regulations for intellectual property regime. Thus, the UN World Summit for the Information Society (WSIS), takes a closer look on the issue and entrusts with the task of developing strategies to overwhelm "digital divides" by bridging between the developed and developing countries through specific funding, such as Global Digital Solidarity Fund. Also, in 2015, European Council established The Council of Europe Platform on Ethics, Transparency and Integrity in Education (ETINED) for the purpose of protecting, developing and enhancing academic knowledge. More specifically, ETINED fights with plagiarism to ensure quality in higher education. This Platform aims to overcome corruption by implying ethics in both personal and professional life. With several studies conducted by the platform in cooperation with the IPPHEAE European Union-funded project on the "*Comparison of policies for academic integrity in higher education across the European Union*", the authorities recognize the need to implement principles of ethics, transparency and integrity through a supranational body.

Nationwide, the level of interest against the intellectual property differs. Although there are global actors and agreements, plagiarism is strictly tied with the nation's copyright regime. As each country have different levels of respect in the field, the differences of development of plagiarism detection in each language specific are recognizable. While languages within areas that value intellectual property rights and academic integrity have already developed anti-plagiarism market, the areas that lack profound respect and regulation can be considered as new players. Global harmonization of the knowledge and information is reinforced through the extension of IPR protection in the context of subjects, duration, platforms and location by introducing IPR and enhancing its scope where IPRs are undermined.

Consequently, it is hard to talk about a globally uniform directives as each country has varying political economy and information and knowledge sector conceptions.

*Problem*

Challenges to authentic assessment

- Plagiarism – deliberate and accidental
- Working together - inappropriate collusion
- Contract cheating (essay mills)
- Self-plagiarism
- Exam cheating
- Impersonation
- Data fabrication, manipulation, selectivity
- Bribery
- Coercion, bullying
- Aiding others to be dishonest

A simple search on internet has already became a substitute of inquiry-driven scientific analysis of information. As accessibility of knowledge and information is escalating on an exponential rate, the process of internalizing of that specific knowledge minimize and what we consider as learning becomes a process of combining the new information and making it presentable to the lecturer. In terms of acquiring genuine intuitions through an active learning process, appealing to plagiarism prevent absorbing knowledge and its gradual application.

*Current System*

Plagiarism detection tools help verification of claims of originality. These tools are designed to determine whether a content is original or plagiarized from another domain by offering instant check for traces of plagiarism. By extracting the text and by using comparing tools, match plagiarised text with the original material, visualize the evidence and generate reports showing the plagiarism detection tools rely on identifying and matching similarities between documents. The studies on current text-matching software tools prove that these tools lack the technicality for recognizing plagiarism at semantic level. The algorithm of current plagiarism software tools solely enable detection of verbatim similarities showing that current technology is limited in technicality for recognizing non-traditional types of plagiarism. Yet even with their limited capacities their usage has been increased overwhelmingly in recent years because they are the most convenient tool to resort. Current detection tools apply comparison techniques through unique digital fingerprints. Each plagiarism detection tool's approach in determining the way of generating digital fingerprint is distinctive. Plagiarism detection tools are expected not only to identify and match the similarities between the submitted text and the original

work, but also to have the ability to provide an extensive database of both digital and non-digital documents and works.

*Solutions*

What are the solutions KryptEd offer to resolve disputes related to revenue and control loss?

KryptEd platform allows data to be stored on Ethereum VM blockchain via Swarm. This gives us the advantage of being able to protect data according to the needs of each individual by using smart contracts. All data stored through Educhain has to go through our next service of targeting, matching and analysis of text via natural language processing techniques and machine learning.

Unintentional plagiarism arises when an author submits a work that lacks proper citation of the original sources with genuine disregard.
KryptEd will serve as a platform to detect, guide through and help manage its users for potential plagiarism.
Some of the features that we found to be useful of this case are summed up below:

- Decentralised storage of documents with time-stamped proof of ownership,
- synonyms
- translations and similar patterns
- Having a huge database to serve as a ground for comparison is essential.

*Incentives*

Incentives are very critical for people to use a certain product or join an organisation. There are various methods to increase motivation of people to do what can be done. Cryptocurrencies have a very interesting point in this matter. Thanks to Bitcoin, people have realized a new way of earning value, just like money. Machines got programmed to solving complex mathematical problems so that they can earn rewards for it. KryptEd will use a similar technique to Bitcoin's proof of work algorithm. User who hunt for copyright infringements, plagiarism and intellectual property issues can report evidence to the network and if their evidence is true, they may receive rewards (KED tokens) for their contribution to the community automatically through smart contracts. This tactic will enable a community of hunters to feed the network with data for matching and analysis.

As the community earns rewards, the data collected will be bigger. This way KryptEd can store all valuable information on a decentralised network much more efficiently.

Creating and publishing original content is encouraged by educational institutions. By adding incentives through gamification, KryptEd plans to create a platform for training students use of correct form of citation and referencing.

***Technical Design Process***

This section elaborates our experiences and views towards the technical design of the concept.

*Which blockchain platform is the most suitable?*

Developing a decentralised application is a challenging process. One of the most crucial factors of success is the choice of a blockchain platform to develop on. As it was mentioned above, we asked various questions to determine what type of blockchain platform is most suitable, case by case. Each result allowed us to analyze our needs and led us to find the most suitable platform.

So far, we developed both of our proof of concepts on the Ethereum Virtual Machine. Some of the reasons of our choice were; Ethereum has one of the biggest communities in the crypto industry, our CTO has vast experience in developing Ethereum based applications and Ethereum has decentralised applications which we could implement into our platform to achieve our objectives. However, these factors did not stop us from exploring our options. As we attended blockchain conferences, hackathons and meetings in addition to constant reading of different platforms. We identified 3 different blockchain platforms which may meet our needs; NEO, Komodo and Ethereum.

*Use of artificial intelligence and its potential benefits*

Machine learning and artificial intelligence (AI) are some of the buzzed up words of the recent years. It is easy to stumble across many events that have a section covering artificial intelligence topics. During our research, we also came across to seminars and panel discussions about artificial intelligence and its potential risks/benefits.

What can AI do? How smart can machines get? Or even the simplest question; what is artificial intelligence?

Throughout our research, we found that AI is a great tool to make better decisions for various tasks. A task that requires a decision through a process of observation and

orientation can benefit from such technology. Collection of data, classification of current and future predictions for the data, and choosing the best way to act. These are findings that all part of a framework that was developed by John Boyd. It is argued that AI can be beneficial but at the same time it is risk. Which is why many people are still thinking about the questions stated above. Without a total understanding of the concept, it is extremely difficult find ways to use it.

*Use of Oracle*

As a technical term, it originally comes from cryptography where it signifies a truly random source, for example of a random number. This provides the necessary door from a crypto equation to the world beyond. As within an algorithm, there simply cannot be randomness.

Oracles feed smart contracts information from beyond the chain. The range of what people regard a an oracle is broad. It can be a sensor of an IoT device, but also web services that prove information in a format suitable for smart contracts to consume.

A smart contract often needs to be able to learn about things happening in the real world. Let's say in KryptEd, someone needs to receive a reward for their exceptional work in a class. This information needs to reach the blockchain somehow, otherwise the contract won't be of any use. KryptEd Oracle is a source of such required information and as such it will often be the trigger for crucial state changes in the digital reality. Especially for smart contracts to resolve themselves and make a payout. KryptEd Oracle will be the service that point out digital proof for any event that happened within the ecosystem.

*Swarm on Ethereum VM*

KryptEd adopts the use of Swarm which is built to serve via Ethereum Virtual Machine. We are able to store any type of data on Ethereum blockchain through the use of Swarm. (Check Appendix for further information on Swarm)

*Metamask*

For a decentralised application to be used by an average person, it is necessary to implement a user interface which is easy to use and understand. Metamask allows

individuals to inject a plugin directly to their browser. This plugin enables the browser to have extra functions such as reading and writing requests on the Ethereum blockchain. All without the need of setting up an Ethereum node or downloading over +10GB of data.

Metamask can be considered as a bridge to the Ethereum network for the average user. User's do not need any previous knowledge to connect to blockchain, only a front-end solution for everyday use, if necessary.

*Gamification Implementation*

Gamification is a developing technology trend, can be seen as a tool to engage individuals into activities in a more efficient way. People learn faster and more effectively through gamified methods. In traditional education systems, we have found that students are struggling to achieve their goals mainly due to the fact that there are not enough motivational activities. KryptEd is aiming to change this by implementing a gami cation model. It is a crucial factor to attract the students by distributing rewards for them to reach their full potential.

In our extensive research, we found that companies and computer games which use gamification system are more successful in terms of performance, effectiveness, and satisfaction. It is proven that a person learns only 20% of what they hear, however they can learn up to 90% if they participate in the learning process even if it is only a simulation.

In KryptEd platform we have already implemented multiple gamification models in order to increase engagement and incentive to use the platform;

- First one is to collect data of users. Filling out all account information allows for a more trustable network, individuals who complete the required fields get rewarded with KED tokens. The process goes as:

    1. Individual signs into the platform via Metamask.
    2. Individual fills out cells which distribute rewards.
    3. Individuals signs that information provided is correct.
    4. Individual receives rewards in his/her vault on the platform which is connected to a decentralised wallet 'Metamask'.

- Second gamification model is to increase engagement. Individuals who gets approved to become an expert on the platform can get paid to answer questions. These payments are made via smart contract service.
  The process goes as:

    1. Expert sets an amount he would like to get paid to answer questions/ get connected.
    2. Student asks a question to the expert,
    3. Expert receives a request of question,
    4. Expert sees the amount he will get paid to answer the question.
    5. If expert chooses to answer the question
    4.1. Then expert gets a reward.
    4.2. If expert denies to answer the question
    4.2.1. Then paid reward goes back to the original payer.

By implementing these gamification methods, KryptEd aims to increase registrants to the platform, collect data, and increase the use of services. This will ultimately generate immense value for all participants of the platform. Implementation of gamification is important for us to solve the potential problems that may arise for platform usage. We can develop the most advanced technology out there, however if no one is using the application then its not worth anything. No usage means no value, therefore gamification is a crucial part of our future success.

Limitations

There are various limitations for the use case scenarios listed above. First of all, we aim to connect all educational institutions and its' stakeholders on a blockchain network. This requires a very challenging process of meetings and agreements. If this work is to be done individually with each institution it can be very lengthy and costly. Therefore this a very important limitation for us, we have planned tactics to overcome this limitation and it is already been explained above.

Another limitation is that, we are looking to create a decentralised network, this would require institutions to be a part of something which they have no control of. It could be difficult for most institutions to accept this function. Therefore, the system might have to be tailored to the needs of the institutions if the decentralisation is not

something they are willing to be part of. Private or public platforms are still in the process of evaluation and development. Ethereum is one of the most used platforms for developing such projects but even Ethereum is still trying to improve and change their consensus. In such environment, limitations can be exhausting but to acquire the knowledge it is best to keep on working to develop research.

## IV. Core Team

Altug Ozturk, Team Lead (Istanbul)
Mert Susur, Technical Director (London)
Onat Kibaroglu, Global Representative (Singapore)
Ece Hepdarcan, Business Development (Istanbul)
Mert Eskinat, Head of Product (Istanbul)

## V. Strategic Partners and Potential Customers

**Artiwise**

Artiwise is a new generation software technologies and text analytics company. It provides data analysis by using machine learning and natural language processing techniques in its products. With the technological solutions it produces, it aims to save time and cost to the users. The Artiwise Text Analytics Platform developed by Artiwise engineers works with machine learning on the cloud. Lets you analyze all your written resources in a short time with useful interfaces in Artiwise. Artiwise is a strategic potential partner of KryptEd to provide the need for text matching and analysis via machine learning and natural language processing techniques.

**KoopHub**

KOOPHub is an Istanbul based fintech innovation center. Its main mission is to contribute to fintech ecosystem by supporting & accelerating starts up with Blockchain, P2P lending, Crowdfunding, Robo-Advisory and Digital Banking business models. KryptEd is a member of KoopHub and gets continues support for various needs.

**ITU Cekirdek, Istanbul, Turkey**

Backed by Istanbul Technical University, ITU Cekirdek is a start-up accelerator program which provides mentorship, legal advice, partnership opportunities and open office space. ITÜ Çekirdek was selected as the 2nd best in Europe and the 3rd best in the world by the international UBI Global index, which compares and lists the entrepreneurship incubator centers of the leading universities in the world. KryptEd is a part of ITU Cekirdek. KryptEd managed to rise through to top 50 start-ups within 10,000 as part of Big Bang Start-Up Challenge and made it to the Semi-Finals.

**Ngee Ann Polytechnic, Singapore**

> "Ngee Ann polytechnic offers 44 full-time courses and 3 common entry programmes through its nine academic schools - School of Business & Accountancy, School of Design & Environment, School of Engineering, School of Film & Media Studies, School of Health Sciences, School of Humanities & Social Sciences, School of InfoComm Technology, School of Interdisciplinary Studies, and School of Life Sciences & Chemical Technology."

We are enthusiastic to create a partnership with such an institution in order to develop our working product together and be one of the pioneers to implement blockchain technology for educational purposes.

**Kadir Has University, Istanbul , Turkey**

> "Kadir Has University (KHU or as mostly preferred by its students KHAS), was founded in 1997, in Istanbul. A private university, it has seven faculties, Engineering, Sciences and Humanities, Economics and Administrative Sciences, Communication, Law and Fine Arts, as well as its several vocational schools, and is dedicated to becoming a leader in educational and cultural fields in Turkey, as well as establishing itself as an international center for research and scientific development."

We have been in close relationship with Kadir Has University since the beginning of our project. The seeds of the idea were planted within the university's innovation center with guidance of our mentor and educator of KHAS, Ismail Hakki Polat. The university is very enthusiastic to create a partnership with us to apply for 1505 TUBITAK project development. It is highly likely for us pursue such partnership and grow further with such institution.

**Teknokent Koleji, Ankara, Turkey**

Teknokent Koleji is a technology focused high school based in Ankara founded in 2018. We have **already established** a partnership with this institution for them to take usage of our blockchain based diploma and certificate services for their students. They are the first organisation that we have signed an agreement with and they allowed us to develop our concept around their school system. Teknokent koleji a highly innovative and visionary school. They believe blockchain technology is the future and were highly helpful to support our project and create a partnership. We are looking forward to add more institutions as such to develop our project further.

**Quarkchain, PR of China**

> "QuarkChain is a secure, permission-less, scalable, and decentralized blockchain. One of the goals of QuarkChain is to utilize sharding technology to deliver over 1 million transactions per second (tps). Essentially, QuarkChain

markets itself as a peer-to-peer blockchain with a high capacity throughput to help deliver fast and secure decentralized applications." (blockonomi.com)

We see QuarkChain as a very important player in the blockchain industry. The level of competence shown within the project is highly evolving. The ecosystem that Quarkchain has developed shows the potential increase in the usage. This is mainly due to the fact that QuarkChain has already solved many problems that arise within other projects. We believe it would be an important move for KryptEd to develop a partnership with QuarkChain as both parties can benefit as QuarkChain may enjoy an education based project and KryptEd may enjoy a more scalable blockchain.

## ***VI.Roadmap & Conclusion***

In our original whitepaper, we set certain targets for the year of 2017 and 2018. We are proud to say that, we have achieved %75 of our objectives on time. Now, we are happy to update our roadmap according to our findings and objectives. Below you may find the estimated timeline of our projected outcomes for the upcoming year of 2019.

2018 Q4

- Release of 'KryptEd Advisors' proof of concept
- Allow users to test out the system
- Collect feedback from users

2019 Q1

- Airdrop campaign launch via Nauticus Exchange
- Bounty campaign launch via Icotonin Platform
- KED Token listing on agreed exchanges
- Partnership agreements to be signed
- Find Seed A investment

2019 Q2

- Form a full time working team
- Text data collection process begins
- Start of machine learning implementation process

2019 Q3

- Release of publishing platform proof of concept
- Platform open for user tests
- Collect feedback from users

2019 Q4

- Release of KryptEd platform, Alpha
- Text analysis tests
- Complete machine learning implementation

The findings we have acquired during our research allowed us to pivot our project into a more useful and user-friendly product. Throughout this paper, we described the research design, research process, and our findings. Then we applied our findings into two use case scenarios to estimate the possibilities within the industry. When we started KryptEd project we have had four different concepts develop. However, now it is obvious for us to eliminate the excess concepts in order to focus on the most important and most needed ones. As it was described thoroughly in this paper, plagiarism and intellectual property rights management service is highly necessary for the current system. To make this system effective, we have come to the conclusion of combining our ability to store data on blockchain, then apply machine learning and natural language processing to monitor, analyze and target fraudulent activity. However, this process requires more time for research and development and to achieve such objectives funds are critical for success. This research allowed us to realize the potential of the combination of these two new technologies. We are fully aware of the potential impact that it might bring to the education ecosystem. To have digital identities of students since their childhood, all the way up to their workplaces. This project can connect the world much closer to each other and allow for a more transparent and fair environment. Allowing accessibility and monitoring of talent and fraud to be recognized more efficiently.

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## Appendix

**Conferences Attended**

Norway
- Speaker, Blockchain 101, Molde University College
- Speaker, Digital Transformation Festival, Molde University College

Ukraine
- Attendee, Blockchain Summit by SmileExpo, Kiev

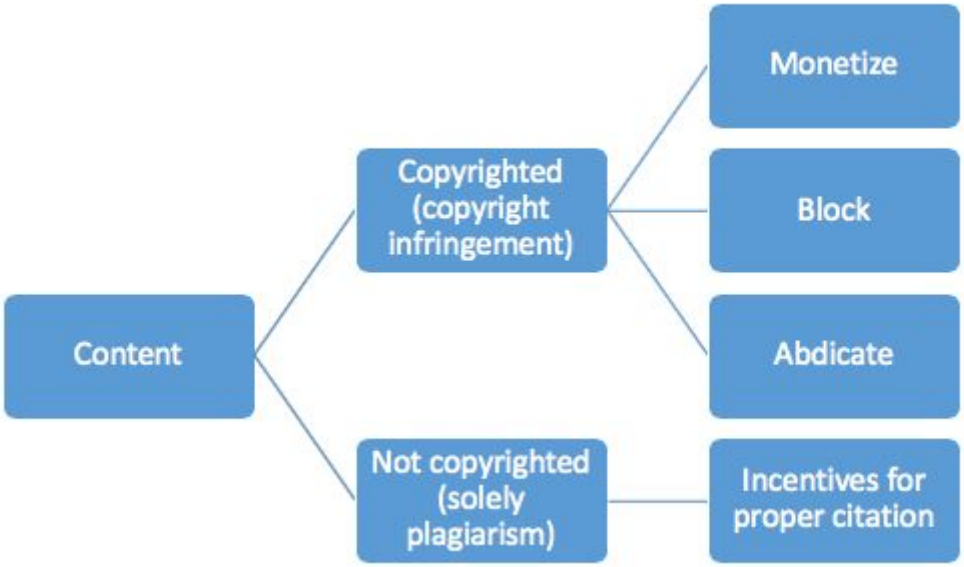
Malaysia
- Masterclass Lecturer, Global Entrepreneurship Summit, Kuala Lumpur

England
- Attendee, Humaniq Conference, London

Turkey
- Speaker, Blockchain and Cryptocurrencies by Inoix, Kadir Has University, Istanbul
- Speaker, Blockchain 101, Uludag University, Bursa
- Speaker, Blockchain Technology Panel, Itu Magnet, Istanbul
- Speaker, CCT Summit, Istanbul University, Istanbul
- Speaker, Blockchain Workshop, Istanbul Commerce University, Istanbul
- Speaker, Blockchain Technology Conference, Marmara University, Istanbul
- Speaker, GamFed Conference, Bahcesehir University, Istanbul
- Speaker, Blockchain tech in Logistics, ITU Cekirdek, Istanbul
- Speaker, Blockchain technology conference, Eskisehir Anadolu University, Eskisehir
- Speaker, YORSIAD Bitcoin Meet-up, Antalya
- Speaker, Smart Contracts Panel, Sakarya University, Sakarya
- Speaker, Intro to Blockchain World, Istanbul Technical University, Istanbul
- Attendee, Blockchain Fest 18' by KoopHub, Istanbul
- Attendee, Crypto 101 for Business Professionals by KoopHub, Kolektif House, Istanbul
- Attendee, Webrazzi Summit 2018, Istanbul
- Attendee, Future Talks by Webrazzi, Istanbul

Singapore
- Panelist: Inclusive Fintech Summit at the Singapore Fintech Festival

Case 2 - Content Management Schema:




What is Swarm?

*"Swarm is a distributed storage platform and content distribution service, a native base layer service of the ethereum web3 stack. The primary objective of Swarm is to provide a su ciently decentralized and redundant store of Ethereum's public record, in particular to store and distribute Đapp code and data as well as blockchain data. From an economic point of view, it allows participants to efficiently pool their storage and bandwidth resources in order to provide the aforementioned services to all participants.*

*From the end user's perspective, Swarm is not that different from WWW, except that uploads are not to a specific server. The objective is to peer to peer storage and serving solution that is DDOS-resistant, zero-downtime, fault-tolerant and censorship-resistant as well as self-sustaining due to a built-in incentive system which uses peer to peer accounting and allows trading resources for payment. Swarm is designed to deeply integrate with the devp2p multiprotocol network layer of Ethereum as well as with the Ethereum blockchain for domain name resolution, service payments and content availability insurance"*