

BLOCKCHAIN TECHNOLOGY IN ENHANCING THE EMPLOYMENT STATUS IN HIGHER EDUCATION

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The era of technology and the Internet of Things has widened the study in all social science fields and education is not an exception. Many kinds of technologies that have been applied to enhance the efficiency of education can be listed as Virtual Reality, Augmented Reality, Realtime Testing (Kaggle), and most recently, Blockchain (BC) based technology. Compared to existing studies, in which most of developed or proposed BC – platforms focus on developing models that revolve around the learners' benefits, we introduce a conceptual design that allows the headhunters to contribute more to the development of the students as well as earning a list of potential candidates who might become the firm's employees in the future.

Keywords: *Blockchain, education, employment, project-based education.*

1. INTRODUCTION

The significant boosts in technological development have changed the world since 2009, also known as the beginning of the Industry 4.0 era. However, before this era, blockchain technology (BC/BCT), which is introduced in 2008, was believed to be the core for one of the most secured resources transfer system [1]. Its target is to avoid the interference or administration of the third party to the transactions between other parties. This is done by the decentralized designed network under the following parallel actions [2]:

- All transaction records within the blocked network will be backed up.
- When there are payments from other accounts, the recipient will be notified by an entry, which is stored in the account's ledger.
- Announce to all members in the network.

- All of them verify the business by checking the identity of the beneficiary.

The advantages of the BC system have caught the eyes of scholars. Thus, its structure has been applied and expanded to the studies in multiple fields such as logistics and supply chain management, economic, finance, healthcare, and medical systems. And education is not an exception.

Recently, Bhaskar *et. al.* [3] showed in his review paper that although the BC system has been proposed since 2008, scholars have just put their attention to this miracle technology in education for just over 5 years (2017 – 2021) which shows the young and potential expansions for this research. It is also mentioned in their work that most of the studies aim to analyze the privacy of the intellectual properties or equivalent products that will become the evidence for the abilities of the learners later, for example, the academic credentials, achievement records [2], the

proofs for intellectual works [4], and the students' exams' results [5]. Though these scholars created a decentralized, synchronous, precise, and sustainable system for enhancing the tight connections between the students, the educators, and the recruiters, these systems mostly boost the benefits for the learners [6]. This directs us to the question: "Whether or not the recruiters, especially the headhunters, can gain more benefits from initiating such systems to their current operations?". Our work will answer this question by introducing an integrated BC – education system with 4 sections: proposing our research question in section 1 before giving a summary in existed BC – works in the education field. Then we will give a blueprint on how our system will work before concluding our work in section 4.

2. BLOCKCHAIN AND ITS APPLICATIONS IN EDUCATION

A blueprint of BC was introduced in 2008 by Satoshi [7], which introduced a trading digital currency without the intervention of any central parties, or a bank in the finance area, who will control the transactions between agents [8]. The expansions of BC are known through the first cryptocurrency: the Bitcoin, which has claimed its importance in the eyes of the scholars who work in the financial field since the day it is announced to the market, by its unique, decentralized, secured ability, adaptation to the change in trading status, efficiency enhance, and transaction cost reduction [2]. The limitless potential of Bitcoin and BC then have expanded their boundaries beyond the finance [9, 10] with the smart contract Ethereum using Ether as its crypto coin by software programs publishing [2, 11, 12], the Consortium and Blockcerts of MIT for accessing the education credentials [13-15] and a lot of BC-based applications for knowledge and data sharing in the healthcare system [16, 17].

In the educational field, a lot of directions have been proposed and summarized in the reviews of Bhaskar *et. al.* [3], Oyelere *et. al.* [8], and Alammary *et. al.* [18]. However, the studies of applied BC – related technology within this field can be mainly grouped as follows:

(1) Validations on students' achievements

Most works in this field have laid eggs for Satoshi's later developments and discoveries in the

educational environment. The first deployment of the BC-based verified certificate system is known to be done by The University of Nicosia besides the degree information safeguarded under the service provided by Sony Global Education [4, 6]. This run then significantly cut down the time consumed, cost, and complex processes for granting the old – fashioned – physical certifications due to the simplicity of managing the achieved cyber diplomas by students themselves. The digital credentials are also easily validated and have a critically high level of guaranteed thanks to the strict controls by multiple parties in the chain's block where the learners' deeds are issued and stored. The samples for this type of degrees granted scheme can be found in the works of Han *et. al.* [2], Gräther *et. al.* [19], or the case study on the deployed system operating in the University Fernando Pessoa of Vidal *et. al.* [20]. By solving the needs of simplifying the processes to store, accord, and confirm the achievements of students, BC has proven its potentials for further developments while being in educational aspects.

(2) Knowledge ownerships

Followed by the previous works, scholars then try to boost the capabilities of learners and authorized them via many channels using the BC-based rewarded – tokens – system: taken courses, online competitions, examinations, and achievements in learning objectives. For example, Lizcano *et. al.* [21] introduced a platform analyzing how students have fitted to a given set of competencies after a training period, then evaluates the learners' current knowledge level for being qualified to the headhunters' requirements as well as identify which learning centers is malpractice with their training methods. Also, Shen and Xiao [22] proposed a configuration for enhancing the students' proficiencies via online tests with three stages from registration, exam taking, and quiz deadline tracking. Another contribution to this field is the work of Oyelere *et. al.* [8] who gave a concept on implying the BC technology on boosting the e-learning environment via gamification, also known as the process for transferring the computer games' characteristics into the Edu – context. In a nutshell, studies in this group will try to implement BC into projects which will enlarge the students' knowledge via multiple platforms. The strong implements of such systems thus have created a highly qualified workforce with transparent, secured, enhanced, adaptable, as well as assured capabilities

thus given deep potentials to catch the glances of the employers who can directly evaluate their candidates by joining the blocks which holds the applicants' historical achievements under the validations of the academic centers.

(3) Matching between the workforces and employers

The convincing of pupils' abilities retrieved from the deployed BC-based education system has pulled the beliefs of companies to the newly graduated generations. Although many modified versions have been developed, the concepts for bringing the recruiters to the educational BC system remain similar. For example, Gräther *et. al.* [19] brought a concept platform that involved 3 main groups: the ones who will authorize the certificates that students achieved after their training – *the certificate providers*, *the learners* themselves, and *the employers* who search for new candidates. In this concept, the providers will handle all the tasks related to qualifying the pupils' study records, storing as well as issuing the credentials. The authenticated e – diplomas will be accessed, copied, managed, or shared by the *learners* for their purposes. Also, these students will be notified about the recruiters' activities related to their earned degrees while their *employers* will have the right to receive authentic verifications for any of the certificates listed in their employees' application portfolio without directly contacts the issuing organization. Lizcano *et. al.* [21] also proposed a configuration consists of 4 parties: *the educators*, *the pupils*, *the approvers*, and *the headhunters*. Within his model, the students will be educated under the guidance of their trainers before being validated the obtained skills by the professions with a token system. This token then joins the blockchain, giving rewards to the instructors besides assigning the pupils to the approvers block. A punish – reward – system is also applied for the verifiers team according to the correct of their honest decisions. The final component of the design – the headhunters then will join the chains and access the digital CV of the candidates and thus giving their final decisions for their recruitments while defining the competencies that should be mastered by the learners.

As can be seen from previous studies, a BC-based educational platform is a powerful tool for creating unity among the market needs, educational system, and the unemployed workforces. However, existing works construct the ecosystems which maximize the learners' benefits with minimal contributions from the

headhunters or the companies' presents in the blockchain. To be exact, in previous studies, the recruiters passively join the blocks for searching potential candidates for open positions only, which can be changed by putting them in a more active position so they can evaluate their candidates while these students were pursuing their academic degrees.

3. THE TRIPLE – WIN DECENTRALIZED BLOCKCHAIN BASED EDUCATIONAL SCHEME

(1) The key components and operations of our proposed model

The concept for our proposed work is shown in Figure 1. Similar to the model of Lizcano *et. al.* [21], four main key players will get involved in our design:

Educators: the representative of the training institution who will directly guide the *learners* to some specific competencies. In the relationships with others, these people will:

- Be selected to instruct a specific set of skills/courses by *students* based on their tokens in the reputation pools.
- Using reputation tokens to purchases several tasks, projects, and problems proposed by the anonymous recruiters that are suitable to their strengths, majors, or backgrounds and MUST BE CORRELATED to the lectures and set of abilities that they are going to deliver to the students.
- Be evaluated by the verifiers on the educational standards as well as the level of their capabilities in teaching such courses/skills.

Headhunters: the people who will search for potential employees and are the main key to our conceptual model. Their importance is marked by the number of problems that they solved while performing their business. Thus, the tasks they proposed are believed to be as close to the markets' needs as possible. Since these problems are what they dealt with in the past, it is believed that some solutions had been drawn for them which are the key for the professions in the *verifier* block used to score the ability of the academic parties: the *learners* and the *instructors*.

Learners: anyone who tries to obtains an ability, skill, or takes a course under the instructions of the *educators*.

Verifiers: the professions in many fields of studies. These people can be professors, directors, educators, skillful and experienced students, or equivalent who master the skills and also have great knowledge about the projects that are being evaluated. It must be noted that their decisions are very important and must be neutral because any wrong verdicts will take great efforts to change the records which have been saved to the main chain.

(2) The information flows of the model

Similar to other proposed models, our platform will take Blockchain as the key for storing, transferring, autonomous update tools the information due to its advantages in securing and censoring information.

Firstly, the headhunters from various organizations or the teachers themselves will launch some projects

with the correlated – suggestions for the answers into the blockchain. This will award them some coins based on the complexity of the given tasks and solutions. These packages will be permanently stored in the blockchain, cannot be modified or changed, and later will be purchased by the lecturers using the coins in their reputation pools which suits the courses or skills they are trying to deliver to the pupils.

During the course taught by the educators where these teachers are the block managers, students will use the coins in their reputation pool to buy the courses’ evaluation projects purchased by their lecturers with a cost equivalent to the tough level of the project or the harder, the cheaper the problem is. After solving them, these students will submit the solution to the block, and the system will notify all members within there for coming to accept the freeze – submission within a limited time as well as justify the answers. It should be remembered that only

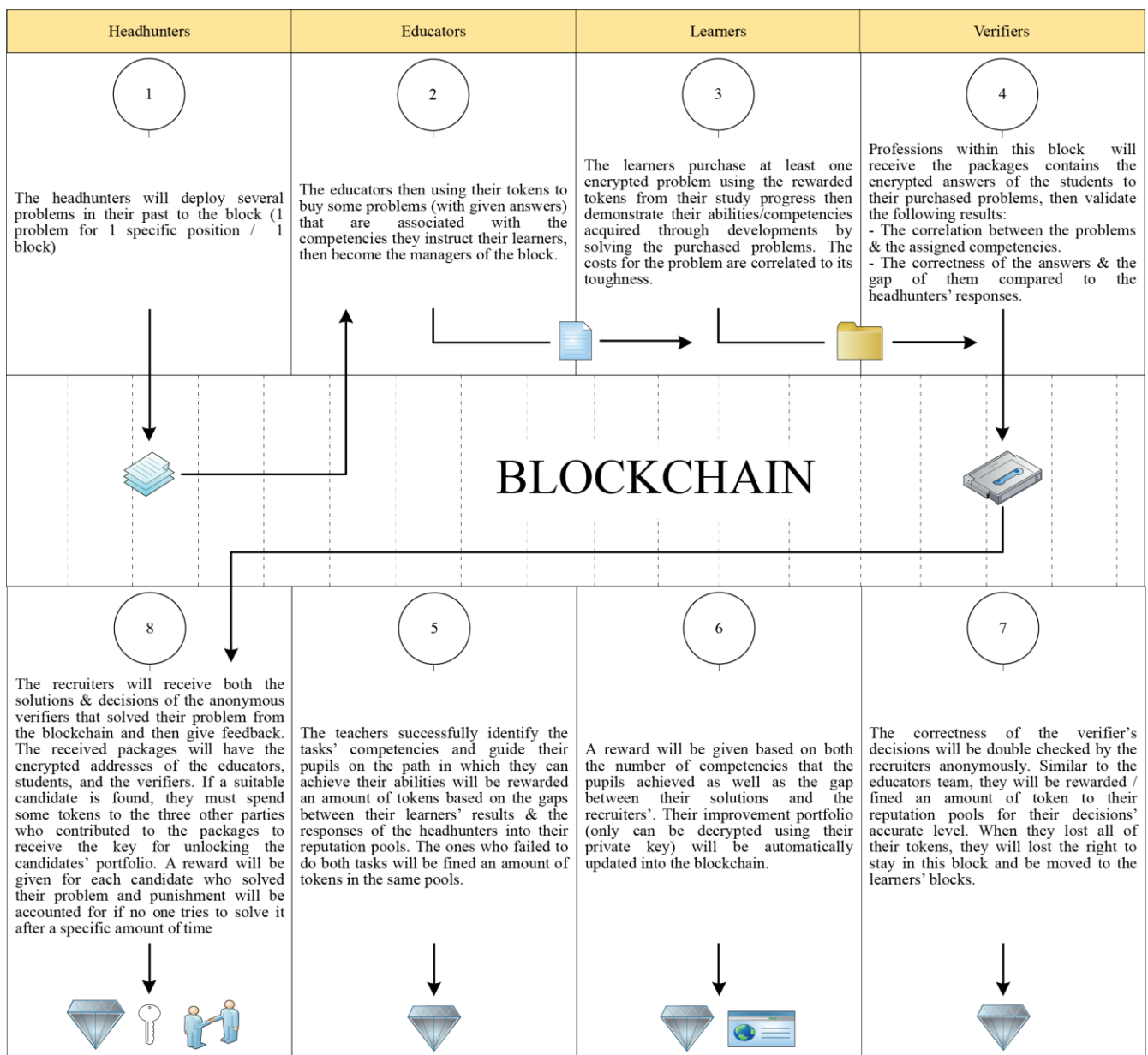


Fig. 1 Our proposed configuration

very few members with a significantly high number of coins that equivalent to the verifiers' level can purchase for the answers to perform the checking process under anonymous status. For example, the minimum tokens for each blocks' manager can be shown in Table 1. This means that the personal information of the answers' owner has been censored from the system thus creating fair evaluation progress.

Table 1 The minimum tokens required for associated positions

Positions	Minimum tokens required
Learners	0
Educators	150
Verifiers	1,000
Headhunters	50,000

After having the conclusions, the verifiers will pack all of their final judgements, the problems, the given solutions, and the students' solution, scores, and the correlation between the tasks – capabilities – the gap between the provided answers and the received answers to the blockchain with a valid cost associated with the quality of the responses that will later be purchased by the recruiters. Then the system will announce to all parties who contributed to the package that the results have been updated.

Teachers then will receive their payments or pay the fines for their choices on the correlation between the selected problem and the achieved competencies. Students will receive a small payment which is the sum of profit from solving the problem as well as their abilities' achievements, also being updated about the status of their capabilities gaining progress. The headhunters then purchase these packages with an appropriate cost that is transferred to the verifiers' accounts. When a candidate's solution impresses the employer, they can request the key to reveal the candidates' information by paying all members who contributed to the package at a reasonable fee. Otherwise, if the solution is overrated, the recruiters can submit the requests on rechecking process, which will announce the verifiers' block, and then a bid will be made among other members within a limited time. If the inspector's decision is similar to the first auditor, the recruiter will gain nothing but a loss in their requests. On the other hand, the number of coins that the previous verifier received will become a fine for the dishonest or false decisions they committed.

4. CONCLUSIONS

In this paper, we proposed a conceptual four parties BC-based platform that will allow the headhunters to recruit potential candidates while they are students.

For practical implication, our model removes the need for e – certificates when applying for a position since the recruiters now can evaluate their applicants better via the way they deal with the company's issues. This also reduces the pressure on the company's HR department since they always have a list of potential candidates for their own when it comes to the needs of new employees to fill in empty positions.

For educational implication, by introducing the censoring information method, we believe that this would create a fair and square educational environment where people are treated equally likely based on their capabilities only. Also, this system can help revealing the real capabilities of not only the educators but also the quality of the institutions hence improving the educational environment in general.

For learners, this study provides more insights into the state-of-art technology BC. Besides, our system can help them utilizing their time better, understanding the learning outcomes as well as the implication of the courses in the real world, and making plans for self – improvements as well as self – study better since they can know which kind of jobs or positions they want to work in their future via the previous experiences on solving the issues provided by various companies.

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