BCS : Blockchain Smart Curriculum System for Verification Student Accreditation

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Abstract

The main objective of Higher Education is to prepare students who have academic abilities in developing knowledge and intellectual development of students to prepare technology to enter the world of work. The linkage of higher education and employment is the reason why the services provided by educational institutions direct opportunities for students to find work, because the current job market places more emphasis on the educated workforce. Therefore, tertiary institutions must have a good curriculum structure, requiring students to be productive, creative and innovative individuals who aim to form character students with the level of expertise required by the world of work. This study presents a work funded by the European Union, namely the Qualichain research project which aims to test the quality of education with the labor market related to Blockchain technology. The aim of this research is to develop a Qualichain platform that will offer educational qualifications that focus on the potential of Blockchain technology and perform data analysis to support the curriculum optimization process. This Quanlichain platform will prove its implementation that there are four pilot cases that have their respective differences. Therefore the research is focused on optimizing the administration of higher education through data developed with algorithmic and semantic techniques to support decision making that will be applied in tertiary institutions.

*Keywords: Education, Blockchain, Smart Curriculum, Verifications, Accreditation*

1. Introduction

Most people think that higher education institutions must pay attention to the needs of their students in studying and providing science and technology according to the intellectual abilities and talents of each student [1] . The South African Council of Higher Education explained that the talents possessed by individuals should be used as best as possible to get the opportunities offered by society [2]. However [3], with today's competitive environment, higher education has become a major goal that demands meeting the needs of society and provides the labor market with the potential and individual skills to develop and prosper the modern economy [4]. The actual curriculum is a very important tool because it forms the basis for ensuring the completeness of the educational process [5]. The curriculum must always adapt to the dynamics of user needs from the times [6]. This is based on the curriculum as a set of educational plans that need to be developed dynamically and actively move according to conditions that occur in society [7]. The curriculum can be interpreted as a set of plans and appropriate arrangements, basic competencies [8], material standards and learning outcomes and can be used as new organizers of learning activities to achieve basic competencies and educational goals. In achieving the expected goals, relevant media for the curriculum are needed [9]. An educational program that is planned, programmed, and designed in such a way that it systematically contains teaching materials and learning experiences so that the educational program has a direction and goals to be achieved and the results that can be achieved can be revised again [10]

Therefore, the authority in a country's higher education system must be in terms of the number of unemployed, while on the quality of services and those provided by the academic institutions themselves which are fair in terms of looking for work when they graduate [11]. It is not known, the current educational orientation is still not very clear, especially in determining certain undesirable patterns, directions, and achievements so that education can be recognized internationally [12]. For this reason, in facing the era of globalization, there is a need for a movement in educational reform efforts that are in accordance with the current order and changes in society, there is a need for systematic and fundamental planning, namely changes in conception, content. , practices, and educational programs to reform efforts [13]. Therefore, the linkage between tertiary institutions and the market forms the existing training curriculum in syringe education institutions with criteria that are regulated and filled without considering existing ones [14]. Even these considerations do not attract attention, making it a less attractive and outdated technology field. Proponents of higher education credentials are largely unsupported by technology that requires conventional (paper) documentation and time-consuming manual processes to exploit, so this is a helpful challenge between higher education and the employment relationship. This is related to the fact that universities store student data in a centralized database with an online system that cannot be called other applications or can be called interoperability [15].

In general, an assessment of the quality of a nation's education accreditation can be seen from the quality of the nation's human resources as an effort that can be made to overcome these problems through improving educational accreditation [16]. The increase in the education accreditation of a nation is determined by the readiness of human resources involved in the education process. In this case, educators are one of the determining factors for the level of education quality, so that every effort to improve the quality of education needs to be followed by paying attention to improving the professional attitude of educators [17].

Therefore, a fundamental change must be made in accordance with the workings of a limited liability company (PT) to obtain a more efficient curriculum design and good and reliable university accreditation [18]. Thus it can be concluded that the main problem is the lack of information technology (IT) infrastructure that can direct efficiency procedures by providing automated data structures at the tertiary level, apart from the existing IT infrastructure system there are also innovative technologies that can be used to develop problems [19]. that. In particular, in Blockchain technology, there are information repositories that have distribution processes, are decentralized, permanent data, and cannot be manipulated by anyone without a third party so that academic credentials can trust them, and can solve archiving problems, while computing intelligence is invented. In the domain of algorithmic engineering technology, data analysis, there is semantic analysis that can facilitate decision making and optimize work practices related to administrative processes, course updates and much more [20].
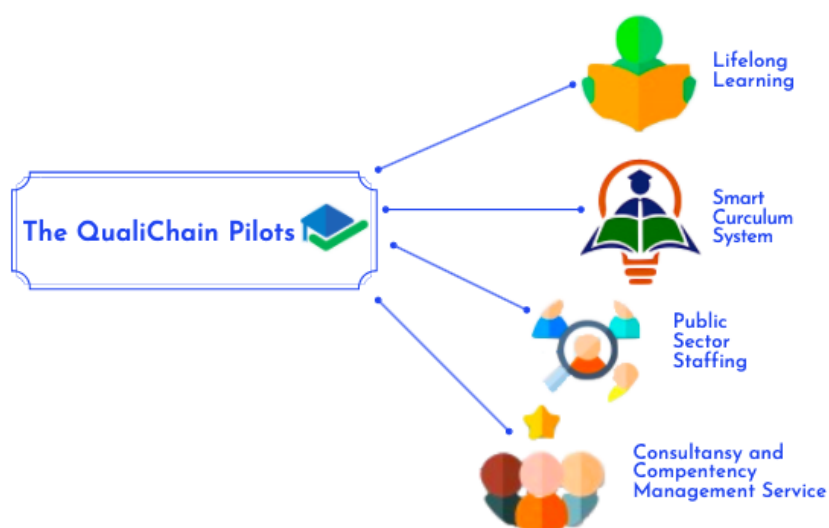
Figure 1. There are 4 areas in the QualiChain pilot

In its current state, the EU-funded Quali Chain can present projects targeting the creation, testing and evaluation of distributed platforms for storing, sharing and verifying qualifications of academic and employment data [21]. Therefore, to inspire confidence in the platform on which it works, QualiChain will leverage the inherent properties of Blockchain technology to become a decentralized system, protect and maintain data security [22]. One of the target goals of this project is to demonstrate that by bringing together various innovative technologies (semantic programs, data analysis, decision support algorithm systems, etc.) to improve services on top of a trustworthy Blockchain infrastructure, not only accredited students can have the potential to optimize the wider higher education process. To validate and test a projected platform in education, Quali Chain engages pilots who can target student accreditation, curriculum design, and process optimization in Higher Education Colleges [23]. In line with the discussion above, this research will provide a

comprehensive use case of how Blockchain technology can lead to the optimization of university processes [24].

The first part introduces and discusses the scope of this research and presents the current situation in Higher Education and provides an explanation of how Blockchain technology and innovative technology can lead to more effective, efficient and secure system solutions. The second part describes in more detail how the challenges facing universities today and provide and overcome Blockchain technology solutions that have been implemented [25]. The third part introduces the concept of the QualiChain system and explains how to use and test it for application in Higher Education. And finally, the fourth section provides conclusions about this research and describes the future actions that will be taken to realize the envisioned project goals.

2. Research Method

This article was prepared using the Systematic Literature Review method, namely by first collecting study materials related to educational accreditation in the form of books, articles, and other sources. After the study material has been collected, then the material will be researched and studied, then the author will try to conclude a new knowledge from the results of the analysis of the study material carried out [42].

QualiChain is a project that aspires to the situation and provides evidence regarding the impact of influential technological changes, such as Blockchain, data analysis, gamification, and educational semantics in the public domain, as well as linking the latter to the private education sector [43]. Labor market and public sector administrative procedures. The project concept and focus lies more specifically at the entire design, implementation, trial and evaluation phase in terms of benefits or uses, the presence of risks, and other potential implications of QualiChain's technology solutions, a distributed platform monitoring services, and gauges of academic and professional qualifications [44]. At this time, attention should be paid to the fact that it is fundamentally inspired by the field of public education and the need to change certificate archiving and management, as well as to tackle the scams surrounding educational awards, QualiChain has practically done a lot about the concept of education [45]. There is some scope for greater scope, as its services go beyond validating training certificates and provide solutions to challenging public and private needs, such as life learning, recruitment, mobility, better linkages between education and the labor market, etc [46]. There are several needs of stakeholders [47]. The project consortium will pilot QualiChain's innovative technology combination in a set of four representative arrangements, this way to demonstrate the impact of the proposed solution on the full spectrum of stakeholders (public administration selection procedures, education providers, human resources consulting for private companies, citizens country as a student or job seeker). In the next section, a pilot case which will have the QualiChain solution applied in the Electrical & Computer Engineering School which is based from the National Technical University of Athens will be described.

Qualichain's pilot objectives in relation to the public sector. Some of the recruits in public sector administration include the following:
- There is a demonstration and value of the QualiChain system concept and there is a solution to technology, by experimenting with a combination of technology change involved in the context of staff in the public sector.
- There are value impacts, such as benefits, risks of QualiChain technology solutions in full with the spectrum of stakeholders that are addressed and handled in the

public administration sector.

QualiChain's public sector recruitment and competency management services will be utilized to enhance not only the examination of the stated qualifications of students, but also their screening leading to a list of those with the best scores and ultimately to accessing the best graduates for the role. In particular, To provide personalized student notifications for job vacancies by matching personal profile data with jobs available in the public sector [48]. Leveraging ledger Blockchain-based digital solutions to validate academic and professional workforce candidates. To improve the efficiency of the selection process on time requirements and credibility [49].

2.1 Pilot Concept in the Optimization Process at the University

In order to overcome the challenges described in Part 2, that this use case will be implemented through QualiChain's technical solutions at the Electrical & Computer Engineering School from the National Technical University of Athens [50]. The first objective of conducting this trial is to take advantage of the Blockchain technology platform for degree verification as well as to support skills, student awards, etc. What will be accepted are students during their attendance at the School through a smart plan [51]. A means of enriching the educational profile of students is a new idea introduced during the early stages of the project to enrich the scope of this particular pilot case that will use smart badges [52]. On the other hand, the National Technical University of Athens, being the oldest technical education academic institution in Greece, is committed to continue to be at the forefront of technical developments and even offer high quality educational services to its students [53]. In addition, the Computer Engineering School from the National Technical University of Athens has many thematic areas so that students can freely choose between them, from computer science software development to energy efficiency and management [54]. Therefore, in a pilot use case this will allow the consortium to pilot QualiChain's Consultation & Decision Support function in an existing College and have many different potential career possibilities for alumni which will allow targeting a large part of the job market and include related courses [55]. technology from various fields. As a result, conducting this trial will be utilized by data analytics from QualiChain and has a DSS function to conduct an analysis of labor market requirements around the Computer and Electrical Engineer profession, as well as mapping in the current School training curriculum and identifying gaps and areas of knowledge that are under-addressed. or attention, so as to provide guidance and teaching and decision support for the latter's improvements in line with labor market needs [56].

2.2 There are Stakeholders Involved

In accordance with the regulations concerning the preparation of accreditation documents and curriculum, a survey of stakeholders is also absolutely necessary [57]. Meanwhile, in its implementation, the survey requires a lot of money and human resources. In this particular pilot case, it has revolved around three stakeholder groups at the National Technical University of Athens, namely that there are students, teachers, and the School of Electrical & Computer Engineering [58]. It should be noted that the School of Electrical & Computer Engineering is a stakeholder covering various areas of administration and decision making such as school committees, school secretariats etc [59].

To conduct this trial, students of the Electrical & Computer Engineering School will be divided into two groups, namely undergraduate students and Ph.D. For undergraduate students, the main requirement they take is to find and choose the subjects most interested in by students and to improve and develop their skills and knowledge so that students are

better prepared to enter the world of work after graduating and completing their education [60]. Until now, students cannot choose specific subjects, the curriculum needed by the job market includes general schemes related to unmanaged school curricula [61]. In addition, students do not have personal profiles where these students can study their knowledge curve so that they can make more precise plans for the student's future. Finally, on a Ph.D. Students have no way of choosing the type of services provided to the school such as management examinations, etc [62]. And thus, the roles and experiences that students get working in schools cannot be validated by the system. PhD student engagement conducting this special trial aims to demonstrate that they must also act as good workers in a university faculty, researcher or administrative body and therefore students' work experience in academia must have a professional profile [63].

Professors from QualiChain will receive about the added value that revolves around updating student courses to include the latest reforms in the appropriate technology field and some general skills required by professions closely related to their specific courses, as new technology is very useful in providing an environment that is not creating stress for students and can freely express opinions and thoughts [64].

Currently, professors will account for their personal work and perceptions to recognize progress and changes in the scientific domain supported by a particular course. In this particular case, they can interview with domain professionals or employer representatives to identify relevant market requirements but the whole process is manual and time consuming [65].

Finally, it has found the main need of the Electrical & Computer Engineering School is to optimize the process of the administration stage and its role which can be seen as a mixture of actions that the professors and students of the Electrical & Computer Engineering School will take to participate. The final goal of the school is to be represented by the committee, as it is related to this pilot, it is necessary to modify the current curriculum in a way that will have a positive impact on the skills and career paths of future graduates, increase the higher education ranking scores and improve one's abilities [66].

Currently, the way to change the formal curriculum is to follow existing procedures and be implemented with very strict requirements and is usually carried out in school committee meetings. This curriculum is decentralized based on the characteristics, needs, and development of the area as well as the capacity of the school or school [67]. Thus, the curriculum in particular contains very diverse contents, each school or region has its own curriculum, but this curriculum is quite realistic. Decentralization or Centralization Centralization allows for a more concentrated application of the approaches. The emergence of a centralized education system to support the learning system does not necessarily undermine the decentralization needed for public Blockchains. Centralization generally stems from the poor performance of the local activation of an education platform, resulting in difficulties in getting an overall picture of the content and quality of the number of existing education platforms that did not come Decentralization can result in greater service entitlements, population, and quality of education services, but also on increasing fragmentation and uncertainty, which may require complex negotiations between the actors involved [68]. It is ensured that decentralization rather than centralization can work best because it reduces the accumulation of service center jobs. education, the relationship between educators and students can increase enthusiasm for learning, improve. In the development of technology, there is something called trustless, but a tertiary institution that is engaged in education is run based on trust. Higher education institutions need to realize student trust and study status that are considered not subject to the verification method. To create trust in the learning system by being safe, public, and permanent [69]. By treating

data sharing as a venue for transactions, tailor-made Blockchain applications have the potential to be flexible and resilient to solve the difficult problem of sharing student data in untrusted educational institutions. Blockchain creates a belief system in the education sector. And this ensures that the box cannot be deleted, and the data in the box cannot be changed. Blockchain resilience or irreversibility is known that transaction data in the education sector on the Blockchain has never been tampered with, this history cannot be deleted or mutated. Using the immutable cellular concept would show that although the digital map of the mobile interface is immutable from the learning system at Aini et al. Universities, a subtle but important change has taken place where eternity lies. Immortality has optimally revolutionized previously mutable data in the education sector [70].

2.3 Literature Review

Blockchain for educational technology has created an infrastructure to be able to document, store, and manage credentials and provide students with an ongoing record of achievement that can be controlled independently [26]. This is also beneficial for educational institutions in reducing administrative and bureaucratic costs (Jirgensons and Kapenieks). The current education model still faces many obstacles in terms of credibility, credit, certificate certification, student privacy, and various courses, so a solution using Blockchain technology is proposed [27]. Previous research has shown that Blockchain technology integration is a promising trend as a medium for online education development (Sun et al.) Currently the education sector is urgently needed to support campuses in various cities and countries [28]. Therefore, securing transaction data such as student profiles and certification is considered a significant level for the security process, so Blockchain is starting to be used in every different sector such as banking, government, defense and education, (Harthy et. Al.). In this work, not only an overview of Blockchain technology, but many details are described when implementing Blockchain technology in education not only by individual institutions, but also by groups of institutions or at the national level Albeanu. The philosophy of Blockchain technology relates to Blockchain for education, how it can be characterized, applied and worked on in education, can evolve over time and because Blockchain can be considered a very complex system Schwab [29].

In addition, it can be said that it is difficult to assess the level of knowledge skills acquired by students in an effort to optimize future job opportunities, because the management of education in the field of education requires revolutionary new tools. This study evaluates the benefits of Blockchain technology and proposes a Blockchain characteristic model for trust transactions based on academic cryptocurrencies [30]. Lizcano et al. (2020) Conversion from student achievement evaluation to post-job competency evaluation results, which realizes continuous curriculum improvement that can be optimized using Blockchain technology. This success is also based on an index of graduation requirements in the field of education, with professional certification and using automatic evaluation software as the medium Duan et al. (2017)

2.3.1 Support For Educational Curriculum

To support the accreditation process in the Higher Education program, the accreditation system must determine the feasibility of the program in education units with formal and non-formal education pathways at each level and the type of education for the preparation of a new curriculum that is prepared based on the competency approach of study programs in the era of globalization. The higher education curriculum consists of a Core Curriculum and an Institutional Curriculum. Character as below:

- The basis for achieving graduate competence.
- Minimum standard reference for implementing program accreditation programs.

● Valid National and International

2.3.2 Current challenges for education

In Higher Education has more complex and competitive operations in an academic environment. They are under pressure that can enhance and eliminate consistent economic, political and social changes such as enhancing the character of students for disciplined knowledge, instilling workplace attributes in graduates and ensuring that the quality of learning programs is relevant nationally and globally, especially in an era of fast technology change [31]. It was about that, about the number of corruption and fraud, the academic and higher education credentials that can shake confidence in the current education system. As a result, stakeholders such as academia, private or public sector, public administration and others. It is hoped that higher education institutions can increase transparency and accountability as well as demand for regulations[32].

According to the national education standards, there are 8 standards used for the education system. The following below:

● Content standards, related to material and minimum graduate competencies for the type and level of education in which there is a basic framework framework and curriculum structure, learning load, education unit level curriculum, and educational calendar. In the standard content framework curriculum framework and structure, learning load, education unit level curriculum, and educational calendar.
● Graduate competence standard.
● Educational process standards.
● Standard facilities and infrastructure.
● Management standards.
● Education financing standards.
● Educational Product Standards.
● Standards of educators and education personnel

Recalled by the challenges described above, there is digitalization of the education sector which is the main concern of Higher Education Universities, even though the information technology in Higher Education supports most of the logistical processes, such as scheduling courses and students, their administrative administration is often at the center centralized data within the university, with limited access to its IT professionalism [33]. However, the data reflects how students learn and how higher education institutions can work and if they do analysis, they can generate knowledge that can help respond to changes that are taking place inside and outside them. Another disadvantage of current information technology systems is that they rarely provide the benefits and interoperability of sharing educational credentials [34]. These documents generally come on paper and require a time-consuming process of leveraging them. So that students may have difficulty transferring to other Higher Education Colleges or applying for jobs due to the lack of standardization of their records and inaccessibility. Although there are ways of digitizing among universities and of course there are universities that have a more modern process than others, current challenges are emerging from the clusters of higher education institutions as well as variables with the labor market. While the comments that have been made throughout this document may feel more generalized they should, they should, indicate that there is a need to standardize data and general processes in the sector [35].

2.3.3 Blockchain's Ability to Optimize Higher Education Processes

To overcome the challenges described in the previous section, a fundamental change is needed for Higher Education in the way it operates. At the same time, new

possibilities for higher education and learning in general have been revealed by innovative technology. Blockchain is a technology that is widely used by several higher education institutions which aim to design different solutions and approaches related to higher education [36]. In particular, the University of Nicosia, which has a leading role in academia-oriented Blockchain initiatives, is the first higher education institution to issue an academic certificate whose authenticity can be verified via the Bitcoin Blockchain in 2017. In addition, Sony Global Education has developed a Blockchain to store academic records. , leveraging the secure properties of Blockchain to realize encrypted transmission in 2016. Sharples and Domingue in 2016, based on their previous research on reputation management for the education system, proposed a permanent distributed record of intellectual endeavors and associated reputation rewards, based on Blockchain, that create and declare an educational reputation outside the academic community. In a more recent approach, Rooksby and Kristian of 2017 have implemented a Blockchain system based on Ethereum for use by universities to store student grades and to provide cryptocurrency. In addition, Skiba 2017 leverages Blockchain as a distributed ledger to allow students to own their credentials and in combination with new forms of digital credentials (badges, certification documents) makes the job of checking and validating transcripts for courses attended at various universities / colleges easier by provides a more secure and reliable system that eliminates the task of intermediaries to verify transactions. Lastly, Turkanovic proposed a global higher education credit platform, named EduCTX, which is based on the European Credit Transfer and Accumulation System (ECTS) concept, while Gräther in 2018 developed the Blockchain for Education platform as a practical solution for issuing, validating and sharing certificates [37].

In the field of education, which has been explained by Krehbiel et al, that individuals and interactions as educators can appreciate anything that can be accessed by an uncertain environment. Therefore, the needs of students that need to be ensured are met and properly without the need to enforce strict rules or regulations (Hazzan and Dubinsky). Work products where you don't have to rely on documentation alone, because every job must always be rolling. Many things can be applied if the application of this methodology is successful and good [38].

to support your research, if you use data collection such as an hypotheses in your research, you can write hypotheses from your research in this section.

Individuals and interactions

As educators, students can appreciate the ability of students to work in an uncertain environment. Therefore, students' needs need to be ensured and properly met without the need to enforce strict rules or regulations.

Work product

Where you don't have to rely on documentation alone, because every job must always be rolling. Many things can be applied if the application of this methodology is successful and good. And, that the resulting product is indeed running and good.

Customer Collaboration

Communication is urgently needed to be more transparent between all parties, including the ability to listen effectively and to provide positive feedback. Can become experience and produce better results that can be achieved by any individual, Responding to changes is also important because every learning system does not have to always follow the existing plan, in the era of the industrial revolution 4.0, all fields including education must be more flexible and able to follow its development towards a better and more creative.

Respond to changes

It is also important because any learning system does not have to always follow the

existing plan, in this era of industrial revolution 4.0, all fields including education must be more flexible and can follow its development in order to lead a better and more creative direction Hastuti and Tinggi.

So after seeing the workings of QualiChain, it can be believed that the Blockchain technology-based education sector is able to adopt the system so that it can develop in a better direction. With increasing human populations and dwindling civilian resources, there is an acute need for systems that can provide substantial quality improvements in collecting and assessing data that are sustainable and comprehensive, Raju et al. (2017). The proposed model, based on Blockchain for education technology based on Blockchain characteristics, is believed to be able to shift educational assessments from an analogue and physical world-based credit reward system to be more efficient globally, more transparent and universal Bajwa (2018). In addition to staff and educators, students will also benefit from the advanced Blockchain technology for education, an open and transparent accreditation system because students can receive job recommendations that match their skills and have the potential to advance their careers [39]. Consequently, the Blockchain for education system and this characteristic Blockchain methodology contribute to closing the data science skills gap by linking education data science to the Micro-Canadian industry. (2018) In the field of education, it can be collaborated with Blockchain technology [40]. So that both the teaching and administrative aspects can be managed effectively and efficiently, the goal of developing educational activities that help educators facilitate teaching can be achieved with Blockchain technology [41]. Several Blockchain for education applications have been presented in the elaboration of 10 previous studies.

3. Results and Discussion

The pilot will utilize the Blockchain platform technology ledger for skill levers and micro-accreditation (via smart badge) students receive from Participation in seminars, hackathons, special lectures, etc. Which is regulated under the scope of school activities. In addition, the Blockchain platform will be used to create and validate the roles of lecturers, Ph.D students. and have other stakeholders in the school (other than students and professors) for the services they may offer to the Electrical & Computer Engineering School. The correct process in this subsection is in addition to conducting this trial to broaden its scope and take advantage of the platform functions being undertaken to improve the Tertiary Education process and enrich student profile data. Specifically, this process can be seen in Figure 1 and will be seen below:
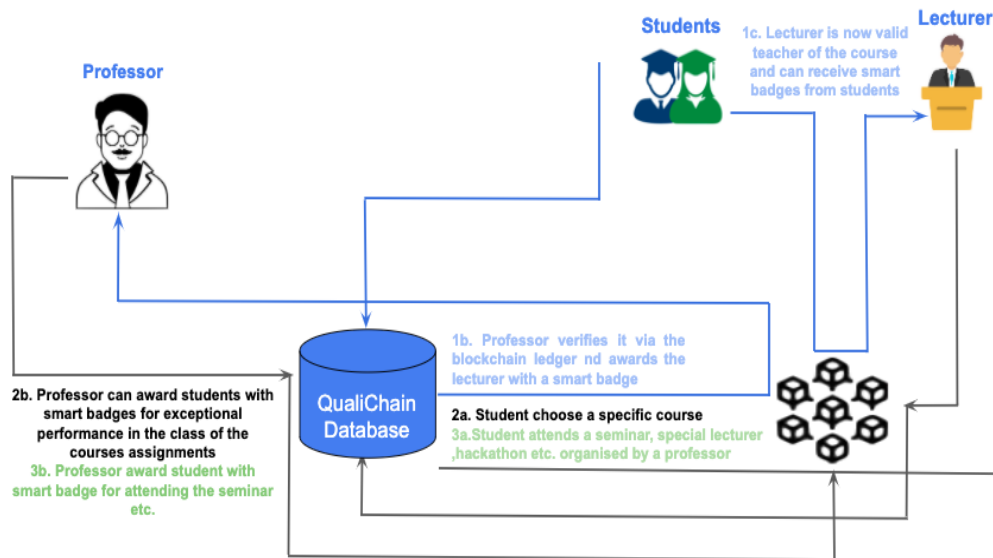
Figure 2. Smart badge endorsement

We can see in Figure 1 that smart badges will be given mainly from professors to undergraduate students. Given that some courses have group assignments or are personal in nature, the lecturer of a course will be able to give smart badges to students or groups of students who have achieved the best score. These results may include, but are not limited to the most efficient algorithms in the software-related course, best results in group assignments, etc. In addition, students will be given smart badges to attend work performances, seminars, hackathons, special lectures, and other activities that are not in the school curriculum but are regulated by the school and are included in the general scope of activities. Such a badge will usually be awarded and verified by the professor who organizes the activity.

If seen from the other side, there are many courses not only by professors but also by lecturers (usually referred to as Ph.D. candidates) whose interactions are not known with the courses being undertaken. QualiChain, through this trial, innovated as follows: professors will first verify with smart badges will involve lecturers in the course. During lectures, students will be able to reward lecturers who are smart because they are communicative, how to teach, and others. I be made and her contribution as well as increasing her profile data in QualiChain.

3.1 Case Description

After this research explains the role of smart badges in the context of this trial, the next step is the overall flow process between the trial stakeholders. The results of the invention research in Figure 2 show the process that the pilot testing stakeholder will follow. In addition, there are drawings and methodologies that interact with the stakeholder interactions with the modules that have been projected from the platform and will thus be used as input by the project technical team for compiling the input flow and output data from the platform, as well as the design. and developing modules and services. The most important thing occurs between lecturers, professors, students, and the QualiChain platform and the final results from this interaction will be used by the Electrical & Computer

Engineering School committee to make curriculum changes. The first step of this process is that students are required to create their profile data on the platform. Thus, students will use the Intelligent Profiling module which retrieves data from the database platform (verified credentials, smart badges) and the web (labor market data, technological developments, etc.), they create an account and pass on the QualiChain platform. Thus this step is part of another procedure because student data must be stored in the QualiChain system in a structured way which will be used as input for some of the analyzes to be carried out.
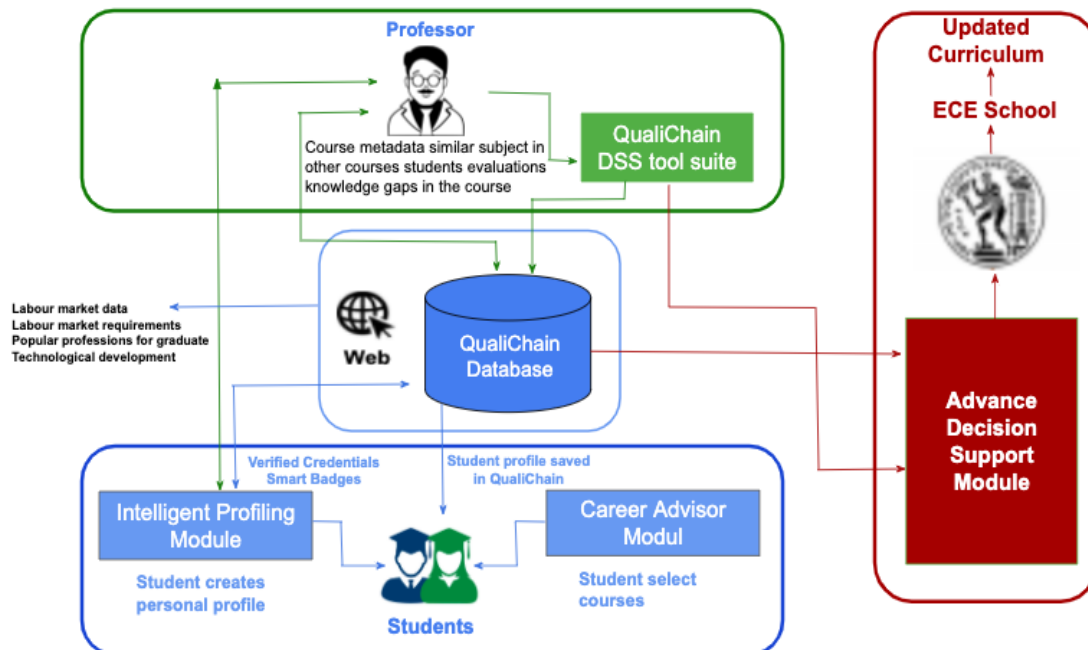

Figure 3. Process flow between stakeholders

The next step is of a process that requires professors to use the platform's suite of Decision Support Systems (DSS) tools to update their courses. As such, they have to enter data into the information platform about their course (metadata course). In addition, activities carried out in connection with the process of determining the value of a previous lesson which is usually collected with the final semester will be semantically enhanced and provided according to the existing structure so that it can be analyzed and translated together with other course data. To use information such as input on the QualiChain platform, the data held by the university will be semantically enhanced so that the professors' data entry process is as automated as possible. Keep in mind that QualiChain's data analysis and DSS suite of tools will retrieve data from QualiChain (student profiles, smart badges, course metadata, course evaluation, etc.) and on the web (labor market data, technological developments) and have the ability which resulted in various analyzes. Such analysis can be used by professors for course updates or by students to support decisions in course selection.

When an expert professor has used the above services to update an update, that course will be saved by QualiChain and will do a course description which will then be corrected by the Advanced Decision Support Module which provides suggested updates for other courses. Not only that, if there is a limitation of existing knowledge in the curriculum then it has been overcome in this course, with the system that will stop changing the same rules for other courses. Students can then use the projection of the Career Advisor module

which can analyze student profile data along with easy course descriptions that provide advice on course selection. And finally, the number of courses that will be followed, knowledge input, different subjects in different courses are included in the Advanced Decision Support module which is the recommendation for the new or changed curriculum for the whole school.

3.2 Blockchain Ability in Optimizing University Processes

The use cases presented in the previous section promise to have a positive impact on the Electrical & Computer Engineering School and its students, professors and other personnel. On the other hand, students will have a holistic personal profile data where they can track their learning curve activity, set goal sections, as well as receive personalized recommendations, validate their skills and activities through smart badges for the certification stage. In addition, the renewable curriculum will include a more engaging set of courses that will provide them with a comprehensive set of skills they need from the labor market.

School professors will be provided with tools to help students optimize their course renewal process. Not only that, they will be able to make and validate the participation of each lecturer and Ph.D. For students who take courses and other activities through Smart Badge Accreditation. In addition, the school secretariat will avoid the time-consuming process of leveraging the degree and there are other administrative problems, considering that the document is already linked and will be on the QualiChain platform, so that security will be created and leverage has been carried out. So in the long run, all the things that have been really mentioned above can increase the total reputation of the school and will reduce the time for graduate students to enter the world of work.

The case that has been used as a pilot, then what is presented here proves that the main value of Blockchain technology is that it is useful for the purpose of accrediting smart badges through which an infrastructure that cannot be trusted and cannot be manipulated, so that it can be proven that the existence of Blockchain technology is more useful. However, this happened because this pilot focused on internal school processes. It is well known that using Blockchain technology for leverage and student skills or abilities can also assess ties between universities (e.g. student exchanges) as well as between academics and the labor market and will create an ecosystem where stakeholders can perform daily tasks more effectively than previous. On the other hand, public and private organizations have used their own information systems which are being projected and it can be said that they cannot have a QualiChain system. However, this QualiChain is the role that Blockchain technology will play according to educational procedures, this research project already has an administration in the future so that it is easier to consider with many other systems and thus will be the final solution which will be projected into a Blockchain-agnostic. The role of Blockchain technology will temporarily serve as an integral part of the pilot projected totally by QualiChain.

4. Conclusion

This era of rapid digitalization can affect the education sector, so that the desire to change the educational paradigm from conventional to date has used a lot of technology, but at this time it is still looking for the right and good digital level and method. As a result, nowadays most universities have student documents in paper form and do not have the funds to make flexible digital as it is today, which will later be integrated into the labor market, but it is shown that at this time most universities have infrastructure technology that is still out of date. era. Therefore, using the research project system that presents

QualiChain, this problem has been found and it will be planned to solve it and develop an innovative platform that will be combined with other technologies such as Blockchain, semantic systems, data analytic systems, and algorithmic techniques used as systems. decision support. Finally, this trial will be carried out at the School of Electrical & Computer Engineering at the National Technical University of Athens which aims to demonstrate that QualiChain can be utilized for the University's real life environment and will collect feedback that will be used to develop the system platform. At this last stage, the project has carried out the tasks according to the task from the initial stage and up to the requirements stage. Project steps for the future have already been issued which will submit the technical requirements, a data stage for a pilot case and an initiation stage for platform development. In particular, to carry out this pilot in this paper, that is, future work will be presented, is the current school curriculum and for the identification process between the needs of the labor market and the skills that have been developed in the courses carried out. In addition, technical specifications, such as the ontology that will be used to enhance school data in a semantic system, and a profile data model that will include all current user-related identity information. Thus in that context, there is an additional step, namely by entering and then selecting the appropriate data mining technique and multi-criteria decision support algorithm that will be used in the module in the form of visualization type, this process will be given to the user to facilitate a complete picture of the profile data they project.

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