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Work-in-Progress: Piloting Smart Blockchain Badges for Lifelong Learning

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Abstract. This paper presents work-in-progress regarding the definition and deployment of a pilot case study, which aims at supporting lifelong learning through the use of Blockchain technology. This pilot case study uses Blockchain technology in order to provide lifelong learners with transparent and immutable educational accreditation in the form of Smart Blockchain Badges. Additionally, within this pilot case study lifelong learners are provided with personalised recommendations that help them reach their personal and professional learning goals. This paper presents the latest findings from piloting Smart Blockchain Badges with stakeholders from the education community in the context of this pilot case study.

Keywords: Lifelong Learning, Blockchain, Decentralisation, Smart Blockchain Badge, Personalised Recommendation.

1 Introduction

The first Blockchain was conceived by Nakamoto [1] as the basis for Bitcoin, the most well-known Blockchain-based cryptocurrency. A Blockchain is a publicly shared immutable ledger, which uses crypto-currency techniques to minimise any security risk. Blockchain technology can act as a provenance protocol for sharing data across disparate semi-trusting organisations, without the need for any central control. The value of Blockchain technology at documenting, verifying, and sharing data across diverse stakeholders can be a particularly valuable asset in today's fast-pacing economy, which is largely driven by continuous learning and credentialing.

The emergence of Blockchain technology promises to revolutionise not only the financial world, but also education and lifelong learning in various ways. Blockchain technology offers a decentralised peer-to-peer infrastructure, where privacy, secure archiving, consensual ownership, transparency, accountability, identity management and trust are built-in, both at the software and infrastructure levels. This technology offers opportunities to thoroughly rethink how lifelong learners find educational content and tutoring services online, how they register and pay for them, as well as how they get accredited for what they have learned and how this accreditation affects their career trajectory.

Blockchain technology has the potential to decentralise and transform education, which is still largely centralised and controlled by educational institutions. This poses

significant difficulties in recognising lifelong learning achievements in informal and non-formal types of education. As a result, a lifelong learner's transition from formal to informal education and vice versa can be hindered, as the achievements acquired in one type of education are not easily transferable to another [2-5]. This indicates the need for a decentralised model across all types of education, offering learners with a framework for fully controlling how they are learning, how they acquire qualifications and how they share their qualifications and other learning data with third parties, such as educational institutions or employers [6].

This paper investigates how Blockchain technology can be used for offering support to lifelong learners throughout their learning journey and their career trajectory. In particular, the remainder of this paper is organised as follows. First, we introduce the pilot case study for supporting lifelong learning, which is conducted in the context of the QualiChain project. We then proceed to discuss the results obtained so far from deploying this pilot case study within the education community. Finally, we conclude this paper and outline the next steps of this work.

2 The QualiChain pilot case study

The QualiChain¹ research and innovation project targets the creation, piloting and evaluation of a decentralised platform for storing, sharing and verifying education and employment qualifications. QualiChain focuses on the assessment of the potential of Blockchain technology, algorithmic techniques and computational intelligence for disrupting the domain of public education, as well as its interfaces with private education, the labour market, public sector administrative procedures and the wider socio-economic developments [7, 8]. As shown in Fig. 1, QualiChain is targeting four key areas for exploring the impact of decentralisation in: (i) lifelong learning; (ii) smart curriculum design; (iii) staffing the public sector; (iv) providing HR consultancy and competency management services.

Within QualiChain, we are conducting a pilot case study in order to facilitate the learning journeys and career trajectories of lifelong learners. In the context of this pilot case study, we are investigating how the use of the Blockchain-based QualiChain platform can support lifelong learners in navigating their learning journey and in advancing their career. In particular, the objectives of this pilot case study are the following:

- Awarding lifelong learners with **transparent and immutable educational accreditation**.
- Offering lifelong learners **personalised recommendations** based on their learning achievements.
- Supporting lifelong learners in reaching **their personal and professional learning goals**.

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¹ <https://qualichain-project.eu>

Fig. 1. The key areas targeted by the QualiChain project.

According to the use case of the lifelong learning pilot case study, lifelong learners have their personal ePortfolios within the QualiChain platform. Lifelong learners are awarded Smart Badges by educational institutions, upon reaching certain milestones in their studies, e.g., completing part of a course or an entire course. Smart Badges are stored on the Blockchain, thus ensuring the validity of the awarded accreditation and eliminating the risk of fabricated qualifications. Smart Badges include data about the key skills that learners have acquired upon obtaining these badges. As learners continue to earn Smart Badges, they start receiving personalised recommendations about the latest job offers that match their skills. They also receive recommendations on what to study next, based on the skills they need for the job market. These recommendations assist lifelong learners in taking decisions about their personal and professional progression. This use case is illustrated in Fig. 2.

Fig. 2. The use case of the lifelong learning pilot case study.

3 Deployment of pilot case study

The deployment of this pilot case study involves the engagement of stakeholders, i.e., researchers, lecturers, technologists and professionals from the education sector, in order to collect their feedback and requirements. We have previously collected requirements for this pilot case study via a series of consultation workshops, the outcomes of which have been reported in [9]. More recently, we have conducted a series of pilot workshops, which have served a two-fold purpose:

- Dissemination of the QualiChain approach and platform.
- Collection of preliminary evaluation data via logs, questionnaires, and feedback from discussions with participants.

This series of pilot workshops has taken place in the context of the following international conferences in the fields of open education and educational technology:

- The 9th eSTeEM Annual Conference, April 2020.²
- The 23rd International Conference on Interactive Collaborative Learning (ICL2020), September 2020.³
- The Open Education Global 2020 conference, November 2020.⁴

During these workshops, participants were first introduced to the QualiChain project and the lifelong learning pilot case study. They were then asked to perform certain tasks on an early prototype of the QualiChain platform, by accessing the platform's web-based interface on their devices. The various functionalities offered by this prototype platform are reported in [10]. In particular, the following sequence of tasks were performed by the participants of the workshops on the QualiChain platform:

1. Register an account on the platform.
2. Receive a Smart Badge.
3. View and download their Smart Badge.
4. Verify their Smart Badge.

At the end of each workshop, participants were asked to respond to a short questionnaire, in order to collect evaluation data about the QualiChain platform and the overall QualiChain approach. It should be noted that the early prototype of the QualiChain platform used in these workshops offered mainly the functionalities of issuing and verifying Smart Badges. It was, therefore, not possible to collect evaluation data about job and course recommendations.

The pilot workshop series had an average of 20 participants per workshop. A total of 26 participants responded to the questionnaire (response rate approx. 43.33%). The majority of respondents to the questionnaire had a very good research and teaching background in education and/or educational technology. As shown in Fig. 3, approximately half of the respondents had no prior knowledge of Blockchain technology and had not used any other badges or badge platforms. The majority of respondents were

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² <https://bit.ly/3oKO8TG>

³ <http://icl-conference.org/icl2020/>

⁴ <https://conference.oeglobal.org/2020/>

able to view, download and verify the Smart Badges awarded to them, as shown in Fig. 4. Additionally, the majority of respondents rated their overall experience with the prototype QualiChain platform as either good, very good or excellent, as shown in Fig. 5.

The feedback collected via the dedicated questionnaire and via discussions with participants during the workshops has been generally positive towards the objectives and the use case of the lifelong learning pilot case study, as well as towards the decentralisation approach of the QualiChain project. Indicatively, some comments received by participants were the following:

“I like the concept of formalizing and verifying badges.”

“Very useful but I am wondering how sustainable it is - i.e., how portable across the different providers or in relationship to the SOLID project.”

“It is interesting, but the purpose needed to be made clearer - what is the USP of this system over other badge systems.”

“This could be the future of higher education.”

Fig. 3. Prior knowledge of respondents in Blockchain technology and experience with badges/badge platforms.

Fig. 4. Percentages of respondents successful in viewing, downloading and verifying their Smart Badges.

Fig. 5. Ratings of user experience with the prototype QualiChain platform.

The participants of the pilot workshop series did not face significant difficulties in using the QualiChain platform, even though this was in an early prototypical state. As indicated by the questionnaire responses, the majority of participants were able to access and verify the Smart Badges awarded to them. Some suggestions for improving Smart Badges and the QualiChain platform were about badge recipients being able to personalise their Smart Badges. Participants were also interested in receiving personalised recommendations about suitable courses and job positions, a feature not available at the time of piloting the platform within these workshops.

As mentioned before, the purpose of this series of pilot workshops has been to disseminate the QualiChain project and collect preliminary evaluation data. Although preliminary, the collected evaluation data will help further drive the development of the QualiChain platform, by understanding and prioritising the functionalities needed by stakeholders.

4 Conclusions and next steps

This paper has presented a work-in-progress pilot case study for supporting lifelong learning via Smart Blockchain Badges and personalised recommendations. We are using Blockchain technology for providing lifelong learners with transparent and immutable educational accreditation. We also employ personalised recommendations for helping lifelong learners reach their personal and professional learning goals. This pilot case study is conducted within the wider QualiChain initiative for decentralising education and employment qualifications using Blockchain technologies. The initial deployment of this pilot case study has received positive feedback from stakeholders, as well as an insight into their views towards Blockchain technology and decentralisation.

The next steps of this work will be focused on further engaging stakeholders to collect their feedback via dedicated pilot workshops, as well as via other opportunities and online channels, such as open online courses and webinars. As the QualiChain platform is further developed and enriched with additional functionalities for supporting lifelong

learning, it is important that we continue liaising with the communities of stakeholders, in order to better understand and address their needs.

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