Recording of Student Attendance with Blockchain Technology to Avoid Fake Presence Data in Teaching Learning Process

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A B S T R A C T
University operational activities are a routine part of university operations and supervisory control and monitoring function. The low controlling and monitoring of operational activities can cause irrelevance in the teaching and learning process. A graduate may have a graduation document but has never attended the teaching and learning process. An official institution can issue this graduation document, but it is fake because no teaching-learning activity occurred. It happens because the data is easily being manipulated and changed in the current system. From the problem, this is what drives this research to be carried out. With the characteristics of distributed, secure, and traceable information, Blockchain will solve this problem. Based on a previous study, blockchain technology facilitates university operational activities so that it will solve the current problems. This research uses qualitative research methods. The research process starts with literature studies and forum group discussions conducted on nine universities in Indonesia (public and private universities). This study used the User-Centered Design Technique. This research focuses on the user, so the results possibly are applied. The research results prove that Blockchain technology can record student attendance as part of the graduation process's teaching and learning process. Blockchain's immutable, unchangeable, and distributed characteristics will ensure the student attendance record's validity in the teaching and learning process.

1. Introduction

The problem of graduation documents forgery has risen in various countries. Several previous studies have reported that graduation documents forgery requires a new solution, Blockchain technology uses to be a solution [1], [2]. Other research states that Blockchain technology uses record operation activity in a university to protect information [3], [4]. This research tried to simulate the use of Blockchain technology (multichain) [5] to record student attendance because Blockchain characteristics such as distributed [6], secure, and traceable information [7], [8]. Blockchain will be a new solution to this problem [9], [10]. To prevent the falsification of graduation documents issued by the Institution (such as fake attendance report). The irregularity was found because several universities issue original graduation documents, but the graduate had never conducted academic activities [11]. The early research stated a similar issue regarding fake attendance [12].

Blockchain technology is expected to provide a solution to this problem. This qualitative research was conducted by involving 9 universities, private and public universities, to obtain input and validation of the simulation result. The technique used in the research is user-centered design (UCD) [13], [14]. By using the
UCD technique, the research results will prioritize the user needs. This study aims to test blockchain technology for student attendance recording. The simulation results found blockchain technology can facilitate record student attendance during the lecture process, which is very important as a control and supervision function over university operations. The limitations of the existing system capabilities such as user easily to update the data. But with Blockchain technology, which can record data and not easily be manipulated and changed, even the data will always be immutable. After obtaining validation from 9 universities, the final result of this study stated that blockchain technology can be used for recording the attendance lists. This systematic writing of this paper starts with an abstract, introduction, literature, method, result and discussion and finally, the conclusion. The research stages can be seen in Figure 1 below.

2. Literature Review

This session will describe some of the theories used in this study.

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2.4. Previous Research

Previous research searches have been carried out using Publish and Perish applications[22] at Scopus database, with keyword attendance in the title paper, with a range of 2015-2021, and found 1 article discussing student attendance. The problems presented are the same as the problems found, such as manipulating attendance being the problems found[12]—solution found by using IoT. However, manipulation on the database level possibly occurred.

3. Methodology

The methodology used in this research is the qualitative method. Some techniques used are literature studies and focus group discussions. The details of the activity can be seen in Figure 1. The research process initially started with a literature review. In this stage, two things were found, namely existing problems and previous research. The problem found at this stage is focusing on university operations for monitoring lecture activities with a student attendance system. Another finding states that blockchain technology facilitates operational lecture activities and can even be used to prevent fake diplomas.

The next step is determining the essential fields to be written on the Blockchain (multichain). Figure 4 shows the existing attendance report, from which the report can be described which fields will be used. It also shows the students list who attended face-to-face meetings and made class attendance in rooms 521 and 523 on October 23, 2017, with subject codes comp6049 and comp6045.

Mapping fields will be written on the Blockchain (multichain), after mapping the fields, the attendance scenario is created. After the scenario is complete, the simulation is carried out using multichain.

3.1 Simulation Testing

This study using simulation techniques. This simulation technique uses because this technique has similarities to the actual situation or is close to the actual situation. This technique is also very quick and inexpensive to perform and makes it easy to judge whether it is appropriate [23].

3.2 Simulation Stages

The first step in this research is to look at the attendance reports generated from the running system by taking several samples and then analyzing the current system’s attendance report. Map the running system’s fields based on the log report to the Blockchain (multichain) fields that will be used. Enter data into the Blockchain (multichain) based on the information in the current attendance log report. The final step is to show the Blockchain results (multichain) to the expert as part of the result validation.
3.3 User-Centered Design (UCD)

This qualitative research study uses the User-Centered Design (UCD) approach. This technique is chosen to ensure the simulation results are more focused on the user (user) and industry [7]. The UCD technique creates simulation scenarios where user interaction occurs by communicating with experts in operational fields. For details, see figure 3.

4. Result and Discussion

This research using the simulation technique begins with data collection from the current system to record student attendance. Figure 4 shows the attendance log of the student’s attendance, and the detail is students with the id "2101675432" attend courses with the code "COMP6049" and class code LC01 on October 23, 2017 (10/23/2017) present in class at 3:24.24 in room ANG523 face to face “F2F”.

From the attendance log report, Figure 4 is then simulated into the Blockchain (multichain) application. There is no customization on multichain used.

The lab configuration can be seen in Figure 5, which shows a node with the name chain1 and the multichain version 1.0.9 using the 10011 protocol.

The address configuration represents a university and student entity. In this case, the entity functions are to send assets that record attendance transactions that occur during the teaching and learning transaction.

The address configuration shows in Figure 6, which describes all entities' addresses for simulating attendance transactions.

After address configuration, the next configuration is asset formation. Assets represent courses, classrooms, and schedules in face-to-face mode (model).

Figure 7 explains the teaching and learning preparation (courses, classrooms, and the schedule) by the lecturer (KD_Lec), lecture schedule shift (15:20-17:00), and student classes.

Figure 8 shows the success of recording the program schedule, which is represented as an asset on the multichain.

![Figure 5: Multichain Node](image5)

![Figure 6: Multichain Addresses](image6)

![Figure 7: Input Dashboard 1 – Comp 6049](image7)

![Figure 8: Success Result Input](image8)
Figure 9 shows a simulation for filling the lecture schedule of COMP6065 course in classroom 521 on December 22, 2017, by KD_Lec (D3730) teachers with a face-to-face model and class LC01 student classes.

Figure 10 illustrates the lecture schedule that has been successfully recorded on multichain (Blockchain) as assets. Figure 10 shows the number of students in the class so the assets can be sent to students present, while the attendance date follows the recording date on multichain.

Figure 11 shows attendance transactions for a student 2101684765 - Name 3 with attendance at the COMP6049 course, on ANG campus with classroom 523 on October 23, 2017.

The simulation results reported in this paper are not all transactions shown in Figure 5, but the simulation is carried out thoroughly. The simulation involves experts from 9 universities, and all universities agree that the student attendance recording transaction can be done on the Blockchain (Multichain).

This research will complement previous research were using Blockchain (multichain) to become a database in recording student attendance transactions will be more robust because student attendance records cannot be manipulated.

5. Conclusion, Limitation and Future Research

This research uses qualitative methods using several techniques, such as FGD with experts and literature reviews. The simulation results are carried out directly by comparing the existing system's attendance logs with multichain results.

This research produces a product that can be used to implement and become solutions in recording student attendance.

Other things that still need to be improved such as multichain configuration using only one node (single node), which should be at least 3 (three) nodes (best practice). Another thing is that there is no wallet created so that students cannot see the simulation's results. It can be used to be developed in future research.
Conflict of Interest

The authors declare no conflict of interest.

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