Chapter 3
Blockchain Framework for Sustainable and Secure Online Learning Platform

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ABSTRACT

Online learning platforms have reshaped higher education, with digital certificates becoming a key qualification method. However, these certificates are vulnerable to forgery and falsification. This chapter examines the use of blockchain frameworks to enhance the security and verification of digital certificates at Universiti Teknologi MARA (UiTM), Malaysia. Blockchain technology, with its secure and decentralized nature, utilizes a distributed ledger to prevent tampering and unauthorized changes. By employing cryptographic hashes and interconnected blocks, the framework ensures transparency and tamper resistance. This decentralized approach revolutionizes certificate issuance and verification, securely recording transactions across a network of computers and enhancing the integrity of the process. The proposed framework offers a reliable solution for stakeholders to verify certificate authenticity confidently. This blockchain framework aims to instill trust in the certification process, making digital certificates symbols of security and transparency in online education.

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INTRODUCTION

Online learning platforms have seen significant growth in the last decade due to the paradigm shift towards remote learning. The surge of remote learning has reshaped the higher education landscape, introducing digital certificates as a novel form of qualification.

Ensuring the credibility of these certificates necessitates innovative solutions. This paper explores the potential of blockchain technology as a tool for enhancing the issuance and verification process of digital certificates.

One important element of these platforms is the issuance of digital certificates upon successful course completion. However, the integrity, security, and authenticity of these certificates are often questioned due to risks like forgery and falsification. Globally, academic institutions such as Massachusetts Institute of Technology (MIT) have used blockchain technology to address similar issues. The developed system by MIT allows students to receive secure and verifiable digital certificates for their coursework and achievements.

Blockchain technology, known for its ability to create secure, decentralized digital ledgers, presents a promising solution to these challenges. This paper proposes a blockchain-based framework for issuing secure and verifiable digital certificates in online learning platforms.

Adopting blockchain technology to verify the integrity of digital certificates in universities addresses the inherent vulnerabilities in the current systems, providing a secure, transparent, and tamper-proof solution that enhances trust and reliability in the credentialing process.

Problem Statement

Tampering in certificates is becoming an increasingly prevalent issue, posing a serious threat to the credibility of digital credentialing systems and undermining trust in certificate-based verification processes. Alterations of certificates are on the rise, creating significant challenges for verifying academic qualifications, professional certifications, and official documents (Garima Sethia et al.). The lack of effective mechanisms to prevent, detect, and address tampering incidents contributes to an environment where stakeholder confidence declines and systemic vulnerabilities are exposed

The impact of certificate tampering extends beyond individual credentials, affecting institutions, employers, and regulatory bodies responsible for verifying the authenticity of qualifications. The counterfeit certificates and falsified academic records not only threaten the reputation of educational institutions and professional organizations but also undermine the trust placed in governmental agencies tasked