Chapter 11
A Survey on Blockchain Technology and Its Applications for Education

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ABSTRACT

Researchers are delving into blockchain technology (BT) due to its attributes like reliability, decentralization, data veracity, and security. However, its application in education remains underexplored, with gaps in understanding its potential to address sector-specific challenges. Certificates are crucial in education, serving as essential records for professional careers, making their integrity and longevity vital. Yet, many educational institutions and certification authorities still rely on paper-based certificates, which are inefficient, prone to loss, and susceptible to fraud. These outdated methods highlight the urgent need for digitization. The proposed blockchain platform for education, built on the Ethereum blockchain, uses smart contracts to automate and enhance the certification process. This approach creates a transparent, efficient, and reliable framework for managing, sharing, and verifying credentials. By integrating BT, the education sector can improve the accuracy, security, and accessibility of certifications, paving the way for a modernized and trustworthy system.

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1. INTRODUCTION

Blockchain is the foundation to build Bitcoin cryptocurrency, through the continuation of absolute dispersed registers in millions of systems (Nakamoto 2008). It has been measured as a branch of the 4th manufacturing rebellion as the innovation of electricity, engine, and IT (Information Technology) (Chung and Kim 2016; Schwab 2017). The present methodology has had a major effect on institutional functions, public authority, education, and trading operations in the 22nd century. BT is anticipated to reform the working style of education, business, and commerce in addition to encouraging the quick enlargement of an information-based financial system on a universal range. Owing to its intelligibility, trustworthiness, and immutability for all communications achieved in a Blockchain Network (BN), this modern machinery has a set of suppressed appliances (Underwood 2016).

In the early stages, BT was not intelligent to represent a bunch of awareness. Conversely, since Bitcoin persists to travel securely and gradually all the time, the public has got conscious of the massive growth of the essential techniques of this innovation in its purpose not only in cryptocurrency and possible in different domains (Collins 2016). BT has developed into a major subject matter for more institutions, nations, researchers, and endeavors. Currently, BT has been used in a variety of meadows such as cryptocurrencies in the economy, it comprises Ethereum, Bitcoin, and Zero-cash, etc. Initially, Bitcoin is the PTP recompense net system of digital currency established with the BT. The major essential importance of BT is the number of systems in a distributed BN that keep the agreement and the Bitcoin BN accepts a hash value based Proof-of-Work dispersed agreement method (Nakamoto 2008).

Zcash is a de-centralized license-free cryptocurrency. Conversely, it provides enhanced privacy and simplicity of dealings using a proof-of-zero facts agreement algorithm. The expenses of Zcash are placed on a community blockchain, except the receiver, dispatcher, and quantity of a business stay confidential (Peck 2016). Ethereum is a license-free blockchain-based dispersed computing environment providing agreement methodology using a proof-of-stake agreement method (Beck et al., 2016).

2. BACKGROUND

Protocols for dispersed appliances and dispersed digital coinage were alleged from the time of 1980s, however, the idea of blockchain and the triumphant first dispersed digital coinage came out with the Bitcoin whitepaper delayed in 2008. In the beginning, e-cash procedures were typically dependent on a cryptography prehistoric identified as Blind Signature; it was established by Chaum (Chaum 1983).