Chapter 15
A Comparative Study of Smart Contracts-Based Blockchain

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ABSTRACT

Smart contracts are altering traditional industries and business processes. Smart contracts, which are entrenched in blockchains, allow the contractual requirements of a contract to be enforced automatically without the participation of a trustworthy third party. As a significance, smart contracts can minimise administration and service costs, improve business process efficiency, and reduce risks. Although smart contracts have the potential to spark a new innovation wave in corporate operations, they face a number of complications. This chapter offers an overview of smart contracts. This chapter provides an overview of smart contracts. The authors initiate by discussing blockchains as well as smart contracts. The problems of smart contracts are then discussed, in addition to contemporary technological breakthroughs. In addition, the authors assess common smart contract platforms also to provide a classification of smart contract applications, together with some exemplary instances.

INTRODUCTION

Blockchain is the technology that has recently sparked widespread attention in academia and industry. Blockchain, a distributed software system, allows for the execution of transactions without the need for a trustworthy third party (Mohanta, Panda, & Jena, 2018). As a result, corporate operations can be accomplished in a cost-effective and timely manner. Moreover, blockchain immutability confirms distributed confidence as it is nearly difficult to modify with any transactions kept in blockchains as well as entirely past transactions are independently certifiable (Fauziah, Latifah, Omar, Khoirunisa, & Millah, 2020).

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Smart contracts, which were first proposed by Nick Szabo in the 1990s (Macrinici, Cartofeanu, & Gao, 2018), are made possible by blockchain technology. A smart contract's computer program-based clauses will take effect automatically when certain conditions are satisfied. Smart contracts made consisting of transactions are basically saved, copied, and modified in distributed blockchains. Traditional contracts, on the other hand, call for centralised fulfilment by a trusted third party, which adds time and cost to the execution process (Amir Latif et al., 2020). The notion of a "peer-to-peer market" will become a reality thanks to the integration of blockchain technology and smart contracts.

In fact, a key element of any blockchain-based application is the smart contract which refers to an agreement concluded between the numerous stakeholders engaged in the structured framework (Chang et al., 2019). A smart contract is a computer protocol that follows to predetermined rules, protocols, and boundaries set by all network users. For instance, the terms and limitations negotiated by each party involved in the process are all included in the smart contract covering banking transactions and financial reasons (Treleaven et al., 2017). Because traditional contracts are created through writing or other actions, they are generally believed to be time- and resource-consuming. On the other hand, smart contracts are digital programmes that run on computers and only self-execute when certain conditions are met. Medical systems make it possible for a range of stakeholders to collaborate effectively and extend medical services (Ahram et al., 2017). As a consequence, it will be crucial to establish appropriate rules for smart contracts in the healthcare industry, and the agreement of all relevant stakeholders will be necessary. The patient and other network stakeholders must provide personal information and sign a contract indicating their acceptance of the terms in the healthcare blockchain in order for the requirement to be established in the smart contract. For instance, which hospitals may store and exchange patient data, which physicians may access and edit the data, and what categories of data are accessible to both laboratories and pharmacies.

Figure 1 shows a smart contract application in a blockchain-based healthcare system with many service providers (Khatoon, 2020). The coding procedure of the smart contract begins by verifying the data contained in the transaction. It checks the appointment status, patient, healthcare provider, and pharmacy data. If all the data matches what is in the contract, then the contract is considered valid and the procedure continues.

Figure 1 depicts some of the essential features that smart contracts for healthcare may incorporate. The *address* identifies where the patient's data is stored in the database, and the address itself may be stored in blockchain. Using an *access code*, a patient can specify who has access to their information, including their doctor and any other parties like family and friends; *State* defines the system's variables or functions, and code specifies the agreement that stakeholders agreed to sign as well as additional tasks that must be carried out. After they have reached an agreement, the accounting records will be entered into the system and the other companies will be given access to the transaction data.

ETHEREUM SYSTEM DESIGN AND DEVELOPMENT

Smart contracts operate on their own. Human manipulation is not required, similar to the situation with paper contracts. There aren't any intermediates, and trust is not required because the blockchain executes the contract instantly whenever the terms are met. The blockchain smart contract framework for the healthcare sector has been created using Ethereum (Vujičić et al., 2018). With a lively community and a sizable public DApp repository, this open-source network is one of the current largest public blockchain