Chapter 1
Blockchain and IoT in Pharmaceutical Supply Chains

Mohsen Aghabozorgi Nafchi
Shiraz University, Iran

Zahra Alidousti Shahraki
https://orcid.org/0000-0002-5027-7919
University of Isfahan, Iran

Abolghasem Aghabozorgi Nafchi
Sepehr Kavoosh Bakhtar Company, Iran

ABSTRACT

Pharmaceutical drugs can be considered as one of the most important needs of human societies. The spread of Coronavirus disease (COVID-19) has dramatically increased the volume of drug exchanges and the role of pharmaceutical supply chains in society for providing drugs has become recognized, but one of the most important concerns in this area is trust and confidence to the authenticity of drugs. Developing an accurate system for tracking productions in pharmaceutical supply chains is necessary. These advances can be used for improving the quality of pharmaceutical supply chains. Using IoT, it is possible to track the status of productions in supply chains. Also, blockchain technology can be used for recording and sharing data transparently. So, this integration of IoT and blockchain technology can reduce concerns about the authenticity of drugs and prevent their distribution. Given the important role of medicine for improving the health of society, this chapter explores the role of IoT devices and blockchain in the successful development of pharmaceutical supply chains.

DOI: 10.4018/978-1-6684-5747-4.ch001

1. INTRODUCTION

From the beginning of human history, one of the main concerns of humanity has been the issue of health (Rosen, 2015). So, to reach a healthy society and increase community health standards, scientists and experts in this field are always looking for the best possible solutions. One of the most important issues in the field of health is the preparation and distribution of pharmaceutical drugs that have an important role in the prevention, diagnosis and treatment of diseases (Ahmadi et al., 2020). Therefore, in the field of health, special attention has been paid to the pharmaceutical supply chain that is known as a broad network of organizations and activities that cover from the preparation of raw materials to the delivery of medicine to the customer. Also, the most important stakeholders in the pharmaceutical supply chain are drug manufacturers, distributors, pharmacy benefit managers, pharmacies and customers (Mendoza, 2021). In the pharmaceutical supply chain, one of the most important challenges is monitoring the drugs from laboratory to consumption by patients (Rayan and Zubair, 2021). Drug monitoring leads to better management of drug distribution and prevents drug shortages in the field of health by considering various policies (Azghandi et al., 2018). In addition to reduce the spread of counterfeit drugs in the societies (Haq and Esuka, 2018), analyzing the data collected from the drug supply chain will provide new solutions to decrease the costs of manufacturing and distributing drugs to experts in this field (Azghandi et al., 2018)(Enyinda et al., 2009).

With the spread of covid-19 disease, demand for drugs and vaccination of millions of people worldwide to combat this disease have grown globally. A review of the events in connection with covid-19 shows that a drug supply chain should be able to cover the entire surface of the earth in the fastest possible time. Therefore, the need to use new technologies in the field of drug supply chain on an enormous scale is very necessary and unavoidable.

In recent years, the growth of IoT devices and their applications in various fields such as healthcare (Tunc et al., 2021; Haghi Kashani et al., 2021) and drug supply chain (Safkhani et al., 2020) are undeniable. IoT devices can easily measure the temperature of products and send their records to data centers (Singh et al., 2020). On the other hand, due to the wide scope of the drug supply chain, an advanced system for storing and sharing data among stakeholders is necessary. Blockchain technology with its special characteristics such as decentralized and transparent operations, one of the technologies that has been able to have a significant impact on the supply chains (Dutta et al., 2020). So, in recent years, much attention has been paid to the use of this technology in the drug supply chain (Sylim et al., 2018).

One of the topics that has attracted supply chain experts is the simultaneous use of IoT devices along with blockchain technology to enhance the capabilities of the supply chain, especially the drug supply chain (Rayan and Zubair, 2021). Examples of Blockchain-based IoT (BIoT) applications include: Smart home (Dorri et al., 2017), wood supply chain (Figorilli et al., 2018), Healthcare (Dwivedi et al., 2019a, 2019b; Bocek et al., 2017; Shae and Tsai, 2017; Salahuddin et al., 2018), smart cities (Biswas and Muthukkumarasamy, 2016), exchange of data for cash (Warner and von Bomhard, 2014) IoT E-business model (Zhang and Wen, 2015) Peer-to-Peer Cloud Storage (Wilkinson et al., 2014), Smart Door Lock system (Han et al., 2017) heterogeneous intelligent transportation systems (Lei et al., 2017) Bodyworn Sensing Devices (Siddiqi et al., 2017), agricultural (Tian, 2016), Internet of Energy (IoE) (Kafle et al., 2016; Blanco-Novoa et al., 2017; Fernandez-Caramas, 2015), Thing-to-Thing Electricity Micro Payments (Lundqvist et al., 2017).But using IoT devices and blockchain technology at the same time, in