Blockchain Application in
HEALTHCARE
Novel Medical Pathways

APU is a knowledge-based consultancy company providing research and analysis, data, technical and business advice and services, sought by business leaders and strategists, to help them capture tomorrow's opportunities, today.
APU delivers market research reports covering markets, industries, countries, companies and technologies.

By continuously updating our desk research, and leveraging market research publications from leading institutes and consultancies worldwide, we provide relevant, current and credible research, critical to the success of your business.

Our clients use our insights, critical analysis, statistics and forecasts to help make strategic business decisions and grow their organizations. Our approach combines deep insight into the dynamics of industries and markets to help clients build more capable organizations and sustain lasting results.

Global Business Intelligence

Trends and forecasts for 18 global industries and over 1200 industry subsectors in up to 60 economies.
Our subscription services for data, news, analysis and forecasts, help clients understand how the world is changing and how that creates opportunities to be seized and risks to be mitigated and managed.

Blockchain Application in
HEALTHCARE:
Novel Medical Pathways

10-30% of the drugs

BEING CIRCULATED AROUND THE WORLD ARE COUNTERFEIT WITH DRAMATIC CONSEQUENCES FOR PATIENT'S HEALTH

THE CHALLENGES FACING BLOCKCHAIN THROUGH THE SUPPLY CHAIN[1,2]

Blockchain has many applications and is currently revolutionizing two of the most fundamental points of the healthcare industry – namely, the supply chain and health records. According to the World Health Organization, 10-30% of the drugs being circulated around the world are counterfeit with dramatic consequences for patient's health. Furthermore, the Pharmaceutical Industry loses EUR 16.5 billion due to counterfeit drugs. Under those circumstances, more security and safety measurements should be taken as ensuring a high quality of patient care and wellbeing remains of the highest priority. The recent advancement in information systems has transformed the traditional drug supply chain approach in healthcare to more secure automated systems. One of the solutions to enabling a software platform to be used without a trusted third party is posed by Hyperledger Fabric and smart contracts.

HOW THE SUPPLY CHAIN WORKS THROUGH BLOCKCHAIN[1,3]

Regarding Pharmaceutical supply chain management, the participants involved usually include the manufacturer, packager, distributer, doctor and patient. Each of those will be identified by their unique key pair on the network. Drugs will be considered as the assets, with each of them having a unique key. The ID will be attached to the drug code. One option is to use a permission-controlled blockchain. The next step is to save the transactions record, depending on the developer's choice. One type among the five blockchain networks currently available on the market is Hyperledge. This modular blockchain framework allows for a user-friendly mobile APP (application), enabling participants to complete transactions to the blockchain. When a new product arrives on the market, a unique hash is automatically generated and assigned to it.

The product will be registered on the blockchain using its unique ID. If a healthcare professional, for example, requires the corresponding pharmaceutical products, they can access them via a distributor through the blockchain by using the product's unique ID code, to confirm all of its journey from manufacturer to the pharmacy. This procedure controls the identity of the drug, its date and location of manufacture and so on. Once the healthcare professional is assured about the legitimacy of the pharmaceutical products offered, they will be able to purchase the product. In addition, other health care providers (such as nurses, pharmacists and carers) and the patients themselves will also be able to track the source of the drugs.

HYPERLEDGER PROJECT[4]

A number of major pharmaceutical companies, including IBM, Cisco, Accenture, Intel and Bloomberg, were involved in a research network investigating drug counterfeiting. Today, every drug which is manufactured is issued with a timestamp on it. In a blockchain technology, every drug produced is traceable, and can be identified through its origin and manufacturer details, thus decreasing the risk of drug counterfeiting. The process of implementing Hyperledger Fabric in the industry took just a couple of months. Since January 2018, the test network demonstrated the ability to process up to 50 million transactions a day, at a throughput rate of up to 550 transactions a second. Such a high turnover capacity may assist in managing all claims activities that occur across the Change Healthcare Intelligent Healthcare Network.

BIG PHARMA'S POSITION[4]

Medical blockchain manages and updates the complete supply chain, storing data related to the prescribed drug, pharmacy, pharmacist, medical prescription, doctor, patient, nurse and medication dosage. The drug-delivery data lakes are referred to as a stored-off blockchain. Such a data source is beneficial not only for the hospital involved in a particular patient's care, but also for other healthcare-related organizations that require medical data for their daily transactions. The patient's personal information could only be viewed by doctors with permission, and the patient can also choose to share their data with any doctor connected to the network. These permissions can be set by defining the access control policy in the smart contract in order to maintain the privacy and integrity of patients' data.

SMART HOSPITALS BASED ON HYPERLEDGER FABRIC[4,5]

Transparency, security, and privacy of smart contracts, in combination with permissioned blockchain architecture such as Hyperledger Fabric, help users keeps track of individual drug records through blockchain technology. Doctors, nurses, patients, and pharmacists are able to manage, access and share personal medical records. In addition, they are able to ensure that an individual drug life cycle is completed in a secure and accountable way. A web application is designed to interact with the blockchain platform and a number of experiments were carried out so performance analysis of the system responds in time to required actions. Using blockchain technology increases the performance in terms of throughput and also minimizes latency of the proposed system with less utilization of resources. The potential future perspective of this application is to increase the network size and then to check the performance through an applied environment. Hyperledger Fabric differs from many other ledgers in that it enables multiple ledgers to operate within the same network, via the segmentation of the network into different channels. This feature enables organisations that operate on the same network to keep private information within their own peers, by maintaining their own distributed ledger.

THE HYPERLEDGER SAWTOOTH[5,6]

Distributed ledger technologies (DLT) and blockchain projects solutions are often described as personal health record systems designed to manage patient data and storage. Building on blockchain as a platform enforces the creation of trust and the management of identity. The AmChart platform is bringing medical datasets to a wider market, but more importantly, it is assisting medical professionals and organizations alike in utilizing simple and innovative technologies to manage patients EMR (Electronic Medical Records), and data through the Personal Health Record (PHR). Blockchain applications within health care settings can further revolutionize the business model, by addressing some of the most fundamental and long-standing problems of the industry as they empower doctors and organizations to provide the best possible care to patients through the supply chain.

MORE OPPORTUNITIES ARE ON THE HORIZON[7]

The MediLedger Project was initiated in 2017 to explore if blockchain could provide solutions for DSCSA compliance. A messaging network is used by a permissioned blockchain system and allows companies to securely send and respond to product identifier verification requests. If such request is cleared, the pharmaceutical product can move forward along the supply chain without the additional need for other verification procedures, since the information contained on the blockchain is trustworthy. Clients will also allow members to do rapid verification of their serial numbers, as well as answer verification requests. This will allow for anyone to create and manage a client software using the MediLedger platform, with the appropriate system specifications. Furthermore, it will continue the evaluation of a possible blockchain ecosystem with the following objectives:

(a) Key DSCSA and industry requirements being included in prototype design
(b) Providing opportunities to test data/product ownership transfer and verification between members of the Working Group as appropriate.
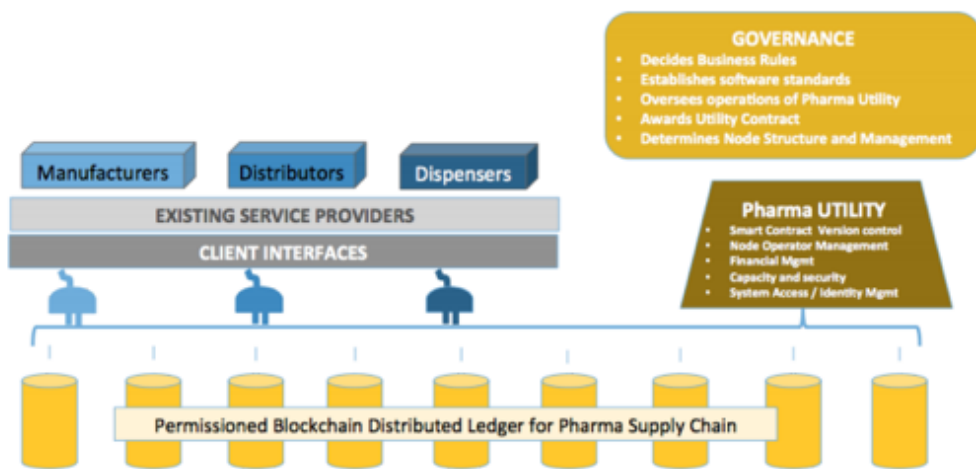(c) Providing opportunities to establish nodes and gain experience through node management.

Figure 1. A viable ecosystem to provide a potential solution for the entire Pharma industry through blockchain.

REFERENCES

1. Ijazul Haq,Olivier Muselemu Esuka. (2018). Blockchain Technology in Pharmaceutical Industry to Prevent Counterfeit Drugs. Journal of Computer Applications. Retrieved from: https://pdfs.semanticscholar.org/03f6/d5293e102ce2c2ea09e8d18164060c 036126.pdf

2. Foerster LLP (Lex Mundi member firm for USA, California). Retrieved from: https://media2.mofo.com/documents/190205-transforming-healthcare-industry-blockchain-technology.pdf

3. Faisal Jamil et al. (2019). A Novel Medical Blockchain Model for Drug Supply Chain Integrity Management in a Smart Hospital. Electronics. Retrieved from: https://www.mdpi.com/2079-9292/8/5/505

4. Morison Foerster (2019) Transforming the U.S. Healthcare Industry with Blockchain Technology by F. Dario de Martino, Spencer D. Klein, Julie O'Neil, Yiyang Huang, Lee Nisson and Mary Race Morrison &

5. Spyros Voulgaris et al. (2019). Blockchain Technology for Intelligent Environments. Future Internet. Retrieved from: https://www.mdpi.com/1999-5903/11/10/213/htm

6. Gary Leeming et al. (2019). A Ledger of Me: Personalizing Healthcare Using Blockchain Technology. Retrieved from:https://www.frontiersin.org/articles/10.3389/fmed.2019.00171/full

7. MediLedger Project. (2018). The MediLedger Project 2017 Progress Report. Retrieved from: https://uploads-ssl.webflow.com/59f37d05831e85000160b9b4/5aaadbf85eb6cd21e9f0a73 b_MediLedger%202017%20Progress%20Report.pdf