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Department of Computer Science and Engineering

Topic: Counterfeit Drug Identification using supply chain

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Introduction

A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. Supply chains exist in both service and manufacturing organizations, although the complexity of the chain may vary greatly from industry to industry and firm to firm.

We are using the blockchain and technologies in computer science to build a supply chain management system for pharma industry using which we can identify counterfeit drugs.

According to WHO(World Health Organization) the word "Counterfeit" has been used in accordance to the following definition: "A counterfeit medicine is one which is deliberately and fraudulently mislabelled with respect to identity and/or source. Counterfeiting can apply to both branded and generic products and counterfeit products may include products with the correct ingredients or with the wrong ingredients, without active ingredients, with insufficient active ingredient or with fake packaging."

Our application stores the supply chain location history, drug manufacturer details and other required details in the blockchain. The blockchain provides transparency in system. We are trying to build a application where any type of user in this world can identify counterfeit and authentic drugs just in time at their place.

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Literature survey

1) **Bitcoin: A Peer-to-Peer Electronic Cash System** – Sotoshi Nakamoto , published at bitcoin.org . Link : https://bitcoin.org/bitcoin.pdf (2009).

2) **Ethereum : Ethereum Homestead Documentation-Ethereum community** Link: https://media.readthedocs.org/pdf/ethereum-homestead/latest/ethereum-homestead.pdf

3) **The Business of Counterfeit Drugs in India: A Critical Evaluation** -Saurabh Verma, Rajender Kumar and P.J. Philip
Link:https://www.ripublication.com/ijmibs-spl/ijmibsv4n2spl_04.pdf

4) **How counterfeit drugs enter the supply chain Link:**
http://www.globalpmsystems.com/how-counterfeit-drugs-enter-the-supply-chain/

5) **Issue in supply chain** -Douglas M. Lambert Martha C. Cooper
:Link http://www.hatfieldandassociates.com/pdf/issues_in_scm.pdf

Problem Identification

Problems to be addressed in supply chain

This research highlights and prioritizes the top global health pharmaceutical supply chain challenges:

1) Lack of coordination
2) Shipment management
3) Inventory management
4) Absent demand information
5) Human resource dependency
6) Order management
7) Expiration

Challenges of counterfeit drugs:

Counterfeit drugs are a worldwide concern. This organized crime has deterrent effect on public health and on pharmaceutical business across the globe. Lack of comprehensive standardized definition of counterfeit drugs with global acceptance, higher benefits of cost ratio and intercomplexity of market and globalized network are the major reasons behind this.

Lack of suitable methods to differentiate authentic and counterfeit drugs is still a challenge we are trying to address this problem using blockchain and computer science techniques.

Challenges posed by counterfeit medicines

The large counterfeit trade in India has created a number of complex challenges for the health care and life science industries.

1) **Lost business opportunities:** the presence of counterfeits can result in the loss of market share and business opportunities for manufacturers of genuine pharmaceutical products. It is estimated that counterfeit medicines contribute to a loss of $46 billion annually to pharmaceutical companies worldwide.

2) **Undermining the adoption of generics:** an estimated 90 per cent of the value of India's drug market is dominated by branded generics.8 In order to reduce health care costs, many governments promote the use of less expensive unbranded generic medicines, but the availability of counterfeits is an obstacle to uptake.

3) **Increasing the economic and social burden:** the use of counterfeit medicines results in an increase in cost to the health care system due to the need for further interventions for unwanted side effects and/or advanced disease progression. This is a particular issue for Indians, where out of pocket drug spending is already high at almost 70 per cent, and affordability levels are low.

4) **Resourcing:** to tackle the issue of counterfeits, the Indian government has employed various anti-counterfeiting strategies, but with limited impact, largely due to India's Central Drugs Standard Control Organization, the country's drug regulator, having only 323 employees in 2014, about two per cent the size of the FDA. This under-resourcing is likely to undermine the success of any future strategies.

Requirements

1) **Etherium**: Using etherium to store the medical supplement data from the supply chain. Etherium is an open source block chain based distributed computing platform.

2) **React js**: Using react js to create responsive and simple user interface. It can be used as a base in the development of single page user interfaces.

3) **Web3 js**: web3.js is a collection of libraries which allow you to interact with a local or remote ethereum node, using a HTTP or IPC connection.

4) **Truffle**: A world class development environment, testing framework and asset pipeline for blockchains using the Ethereum Virtual Machine (EVM), aiming to make life as a developer easier.

5) **Ganache**: A personal blockchain for Ethereum development you can use to deploy contracts, develop your applications, and run tests. It is available as both a desktop application as well as a command-line tool (formerly known as the TestRPC). Ganache is available for Windows, Mac, and Linux.

Objectives

Using our application we are trying to prevent fraud and fake drugs in in supply chain, using a common man can differentiate between fake and authentic medical supplements.

We also focus to provide a secured storage of supply chain data so that nobody can manipulate the data in the blockchain. If and counterfeit drugs are identified the respective authorities are notified so that they can take action. Using this data the supply chain can also be strengthen by knowing possible weak points in the supply chain.