Deploying Real World Blockchain Systems

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Abstract

Blockchain technology is a decentralized and open database maintained by a peer-to-peer network, offering a “trustless trust” for untrusted parties. Despite some researchers consider blockchain is a bubble, blockchain technology truly has the potential to solve the problems across industries. In this article, we overview the blockchain development in 2018 and point out the challenges of deploying the blockchain based application to the real world from the Human Computer Interaction aspect. We propose that the blockchain practitioners should design the blockchain applications from the users’ perspective, think about who is the users, and what they need. Furthermore, we also lay out possible future trends for blockchain.

Keywords

Blockchain, Human Computer Interaction, decentralized

Introduction

Blockchain technology is known as the technology supports the cryptocurrencies. Still, the cryptocurrency is just one application of variety blockchain-based applications. Blockchain technology is a distributed ledger, which verifies and perpetually records the transactions on the blockchain network by a peer-to-peer network. Blockchains are used to solve the trust problem between different parties. Researchers and practitioners utilize blockchain technology to solve existing difficulties in different areas, such as financial institutions, manufacturing industry, and public governance.

Despite blockchain technology has great potential to revolutionize internet systems and reformulate the industry and economies, only few blockchain-based systems successfully developed (Lavazova, Dehling & Sunyaev, 2019). People seldom use blockchain-based systems and blockchain technology does not play an important role in the real world. Currently, most blockchain researchers focus on introducing blockchain technology to different scenarios or improving the deep infrastructures of blockchains, while the researches about the users and potential users of the blockchain systems are limited. However, humans are one of the most important players in a system. A system will be valueless until people use it.

The state of affairs has attracted the attention of numerous Human Computer Interaction (HCI) researchers to form workshops to identify the fundamental human challenges requisite in interactions with blockchain and distributed ledger technology (Elsden et al., 2018; Lavazova et al. 2017). The goal of both workshops is to help blockchain based system to address users' (including developers and end-users) need. Still, the need to integrate blockchain technology into user-centered interactive systems is an essential challenge for design and engineering. In this commentary, we will review key developments of blockchain technology and provide a guideline for the upcoming blockchain features in 2019 from the aspect of HCI.

Blockchain Technology

The concept of the blockchain came from the research by Nakamoto (2008). It uses cryptography to link the current transaction data, called block, to the previous block by recording its cryptographic hash and timestamp. Blockchains asks different computers in the network to help to verify the transactions and maintain the network, and these computers are called "node". The blockchain technology cannot be dissociated from the electronic cash system until Buterin (2014) proposed Ethereum that allows developers to create consensus-based applications. The applications, also known as smart contracts, allow the performance of credible, trackable and irreversible transactions without third parties. Due to Ethereum reduce the difficulty to develop applications on blockchains, blockchain technology started to develop vigorously.

Blockchain technology aims to provide "trustless trust." Blockchains can be separated into two kinds of protocols based on the difference of participants in the blockchain network: "public blockchains" and "permissioned blockchains". Public blockchains, like Bitcoin and Ethereum, allow anyone becoming the nodes to verify the transaction. While permissioned blockchains, such as Hyperledger, only allow the parties which are identified and have permission joining the network. Permissioned blockchains have better capacity and higher speed than the public blockchains. However, it hard to say which protocol is better than the other, because the node sizes and end-users are different.

State of Blockchain in 2018

Compared to the early years of blockchain technology, enterprises focused more on apply blockchains than explore it (Deloitte, 2018). Blockchains kept growing in popularity as people

across multiple industries found new applications for it in 2018. Researchers and practitioners announced that they had advanced in blockchain applications. Both public and permissioned blockchains made remarkable headway. In the following section, we outline several impressive blockchain applications in different industries in 2018.

Blockchain in Financial services

Financial service is the first industry to explore blockchain technology. Beyond cryptocurrency, blockchain technology can be used in other financial services, such as foreign exchange, insurance, and loan. Both public blockchain and permissioned blockchain had a breakthrough. For permissioned blockchains, banks tried to union each other to create blockchain platforms to reduce the operation fee of foreign exchange and bilateral payments. For example, Goldman Sachs and Morgan Stanley used IBM's permissioned blockchain to reduce the cumbersome bilateral payments operations (Baydakova, 2018). Blockchain researchers also used blockchain and IoT for car auto-insurance claim and adjudication (Oham et al., 2018).

Blockchain in Government

Governments also have a lot of interest in Blockchain technology. They used the technology for voting, land registry, and digital identity. Due to blockchains cannot be manipulated by any single party, even the government, it helps citizens trust the governments more and reduce the corrupt officials. For example, West Virginia government allows its citizens who serve outside to mobile vote through blockchains and digital identity technology (Nguyen, 2018). India also used blockchain for land transform, avoiding local official accepting bribes(Kshetri, & Voas, 2018).

The use of Blockchain technology in the public sector represents one highly effective way of providing reliable services, at low cost, based on open and transparent technology for all participants, gaining trust (where is not) in public institutions and effectively combats corruption.

Blockchain has been applied to public policy solutions also in Mexico. In March 2017, the World Economic Forum (WEF) presented a case study on corruption in Mexico, where it issued as a recommendation the development of applications based on Blockchain technology, with the aim of increasing transparency, ensure the authenticity of public information and improve public confidence in the government (World Economic Forum, 2017).

Within the framework of the Dubai World Government Summit 2018, the "Intelligent Tenders" project was prized the third place in the category "Government Transformation Services." This was the first case of use in Mexico that is being worked on within the framework of the BlockchainHACKMX initiative: "Tenders Intelligent " which proposes to generate a federal government contracting system based on the Blockchain technology and the Open Contracting

Standard (Open Contracting Data Standard, 2017), adding the citizen figure of independent evaluators in the bidding process, through smart contracts.

Blockchain in Social Good

Blockchain, not only implement for commercial usage, but also makes some contributions in social good. Charity or government use public blockchain to trace how they use the funding for helping those in difficult situations. For example, Mexican immigrants remit a lot of money to their hometown for community development, but they have low faith in the government, and thus the contribution is limited (Chiang et al., 2017). Therefore, researchers built a blockchain cooperation platform for community developments (Chiang, Betanzos, & Savage, 2018). The platform helped the immigrants, citizens, and governments supervise the process of community development.

Blockchain in Supply Chain

Blockchain records all the transactions, and the records cannot be removed. Companies integrate IoT with blockchain to record the production steps. They build accountable systems for the supply chain. It is easy to find out which process is wrong when customers receive poor quality products. For example, Walmart collaborate with IBM, asking its suppliers to record the water quality, temperature when plant and transport mango (Kamath, 2018)

Challenges about blockchain

Despite researchers and practitioners promise a great vision for the blockchain applications, the public seldom use the application based on the blockchain technology. Not only the blockchain infrastructures but also user adoption is also a key issue that blockchain practitioners have to consider. In this section, we present the challenges of blockchain's widespread adoption from the HCI perspective.

Users of blockchain applications

Before starting the blockchain applications design, practitioners have to consider who is the end-users of the system and whether they need blockchain to solve their problems. Despite the blockchain technology are used in different industries, the common point of these applications is to solve the trust problem from the system. For example, Tian (2017) proposed a supply chain traceability system to make the end-users believes the food is safe. Even more, the original intention of blockchains is to replace centralized middleman in transactions or agreements. It is true that centralized middleman can be corrupt and can misappropriate the agreements.

However, it does not perform that the public do not trust centralized organizations. The report (Edelman, 2012) revealed that 79% of the public trusted the technology companies, and only 45% public trusted in financial institutions, but only 18% trust blockchain technology more than large financial institutions (Noto, 2017). Although blockchains promised to provide “trustless trust”, how people trust it is the main issue to spread the technology widely. If the public trust more in the system than in the blockchain technology, the blockchain applications are hard to promote.

Therefore, blockchain applications will flourish in areas where people have less faith in the original system, such as public governance, media, and financial services. Government organizations can use blockchain to build transparency, accountability, and civic participation platform to increase citizens’ trust in the governance systems (Chiang, Betanzos, & Savage, 2018).

The blockchain technology also gives great advantages to Open Government practices, and it is the reason why the Open Government Partnership (https://www.opengovpartnership.org/) recommends to the affiliate countries the investment in Blockchain Technology as a way to promote OGP principles to improve the co-creation of high-quality governance and dialogue between societies.

Blockchain for media helps the socially vulnerable groups outspeak their opinion without the bother from centralized organizations. For example, Catherine and Yudan (2018) reported that Chinese “#MeToo” activists document stories on the blockchains to avoid the suppression from the China government.

The boundary between blockchain networks and real-world

Current blockchain networks are not enough to address end-users needs. The two principal technical problems of using blockchain in the real-world are the reintermediation problem and the oracle problem. Reintermediation problem represents that the public need middleman to connect to the blockchain because they cannot easily access the blockchain networks. Use the food supply chain as an example. Kamath (2018) reported that Walmart reduced the time for tracking mango origins through IBM’s Hyperledger Fabric. Hyperledger Fabric is a permissioned blockchain network, which only allows the permission parties to verify and view the data. In other words, the public cannot discern between truth and falsehood of the information directly. The public have to rely on these permission parties, such as Walmart and IBM, revealing the information on Hyperledger Fabric to know the source of mango. From customers perception, they still have to believe centralized organizations. Using blockchain in this use case has no difference with using centralize databases or distribute databases across companies.

Oracle service is a data carrier which provides off-chain information to blockchains. Blockchain-based applications (smart contracts) generally do not have knowledge of the real

world. However, they do require such knowledge to trigger the contracts. For example, a flight insurance smart contract assure the customer's flight will not delay. If delay, the contract would compensate the customer. To trigger the contract, the application has to know whether the flight delays or not. Thus, they need oracle service to get information from external APIs. However, most oracle services are centralized, which create another reintermediation problem, and can only handle simple information provided by APIs.

To solve the reintermediation problem, the permissioned blockchain providers have to devolve their capability of control to the public, allowing the public to supervise how the data creates and inputs to the network. The public blockchains have to reduce the block sizes and improve the mobile blockchain applications so that the end users can easily access the information on blockchain without the middleman. For the oracle problem, researchers can integrate the blockchain with IoT (Internet of Thing) to provide the truth data, or probe into the design of decentralized oracle service through crowd workers. Despite researchers always employee crowd workers for simple tasks, there is some tool to train crowd workers to do more complex work (Chiang, Kasunic, & Savage, (2018)). We believe integrate blockchain with crowdsourcing can solve more complicated oracle request in 2019.

What will bring in the future?

From the HCI perception, the blockchain researchers and practitioners will focus more on the users of blockchains. Blockchain technology should not be used as "trustless trust" to replace current systems but used as "trustworthy trust" to help the users having more confidence in current systems. As Orcutt (2019) commented, "In 2019, it (blockchain) will start to become boring." In 2019, researchers will reduce the publications about how to use blockchain in some "fancy" use case, and start to make blockchain applications more practical and fit users life. From the users' need, the blockchain will have better development in public governance, media, and financial services industries. Moreover, permissioned blockchain providers will start to decentralized their control capability to the public from allowing verified customers to join the permission blockchain. Public blockchain developers will reduce the difficulties to connect to the network and provide decentralized oracle service. Most of all, both public blockchain and permissioned blockchain will integrate with IoT to provide trustful data.

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