

INDUSTRY 4.0 – THE BLOCKCHAIN WAY OF SOCIETAL IMPACT

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ABSTRACT

The ongoing fourth generation industrial revolution, popularly referred to as Industry 4.0, is embedded in smart technology. It is characterized by Machine-to Machine communication (M2M) and Internet of Things (IoT) for increased automation, improved communication, and machine aided monitoring that needs less or no human intervention. In this digital industrial era, blockchain technology comes as a platform to digitally record transactions. The name comes from its structure, in which individual records, called blocks, are linked together in single list, called a chain. Blockchains are used for recording transactions made with crypto currencies, such as bitcoin, and have many other applications. Every transaction which gets added to a blockchain is validated by multiple computers on the Internet. These systems are specially configured to monitor specific types of blockchain transactions which form a peer-to-peer network. They work together to ensure that every transaction is valid prior to getting added to the blockchain. This decentralized network of computers ensures the dismissal of invalid blocks from the chain; in fact even a single system cannot add any invalid blocks.

The paper rests on successful or piloted case studies gathered from various sources from MNCs and Organizations and the way they have grown their profit and created a societal impact. There are many other case studies and applications of blockchain in several other sectors that are also impactful. However, they have not been considered here. This is a qualitative study and uses cases as examples.

Keywords: Blockchain, Industry 4.0, Bitcoin, Societal Impact

Introduction

Blockchain is a distributed ledger technology, digital and decentralized that provides a historical record of all transactions that have taken place across a peer to peer network. Best known as the technology behind the Bitcoin crypto currency, blockchain takes records like proof of ownership, confirmed transaction and contracts – and stores them as blocks and each block is chronologically combined to form a chain. Blockchain is making the impossible possible by allowing people to secure digital relationships. Apart from being a useful unit (like a bitcoin), blockchain won't store any digital information, including code. That snippet of code might be programmed to execute

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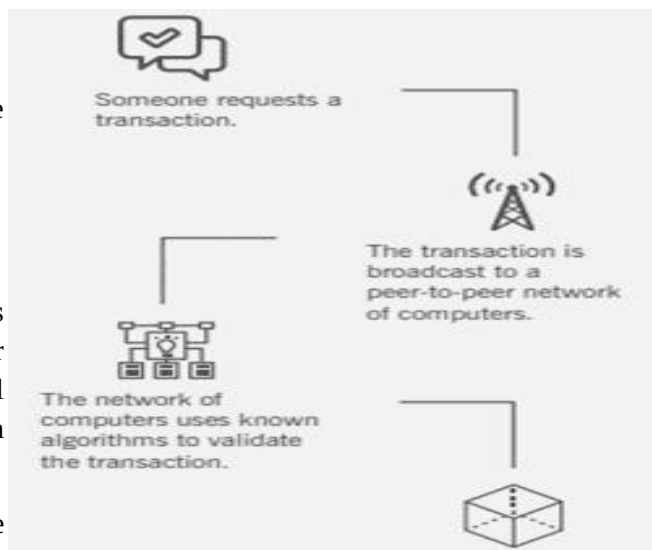
whenever certain parties enter their keys, thereby agreeing to a contract. The same code could read from external data feeds — stock prices, weather reports, news headlines, or anything which will be parsed by a computer, really — to make contracts that are automatically filed when certain conditions are met. These are referred to as “smart contracts,” and therefore the possibilities for his or her use are practically endless.

How Blockchain Works

How Blockchain Creates Trust

There are three key elements needed to determine trust:

- 1) Identity, or who's who;
 - 2) Ownership, or who owns what; and
 - 3) Verification, or what's true. Blockchains allow users to simply prove their identities, protect ownership of digital assets, and verify transactions without a high-cost intermediary.
- Who's Who: Block chains solve the identity problem through the use of digital signatures. Each user is given a set of two digital codes Block chains allow users to simply prove their identities, protect ownership of digital assets, and verify transactions without a high-cost intermediary.
 - Who Owns What: Block chains solve the ownership problem through a technology called “cryptographic hashing.” A cryptographic hash is simply a piece of data that has been run through a math function and transformed into a shorter piece of knowledge. In a block chain, each block contains a hashed representation of the info within the previous block. If you modify any previous pieces of knowledge, that change will get reflected throughout the chain, making it easy for the system to ascertain and reject fraudulent attempts to manipulate the data. This allows block chains to create tamper proof records where immutable data is created.
 - What's True: In block chain terminology, there is something called “distributed consensus”, where the block chain solves the verification related issues and concludes that transaction is true. The ability for block chains to verify transactions with fewer intermediaries may be a key benefit which will cause lower costs for several applications during reporting.



Blockchain in Use

The development implementers exploring the utilization of blockchain technologies for international development programs include Mercy Corps, Tetra Tech, RTI International, Development Alternatives Incorporated (DAI), and Save the youngsters. Some implementers, like Creative Associates International, Abt Associates, and Chemonics, have established their own in-house labs to specialize in the applications of blockchain (and other technologies) in their development programs.

Other notable development institutions with their own blockchain labs include the planet Bank, which has established its own Blockchain Lab to function a forum for learning, experimentation, and collaboration on distributed ledger technology, and GIZ, which has established a blockchain lab to figure on increasing the maturity of governance frameworks for blockchain applications.

Various cryptocurrencies including Zcash, Bitcoin, Ethereum, Dash, Litecoin, and Ripple have recently started their own foundations. While a number of these foundations specialize in promoting the acceptance and reach of their respective cryptocurrencies, they also advocate for several social-oriented ideals, including financial privacy, security, and inclusion, and a more accessible and trustworthy internet. Another notable example of a foundation promoting blockchain for social impact is that the Energy Web Foundation in Switzerland, which may be a global nonprofit organization focused on accelerating blockchain technology across the energy sector.

Method of Study

This paper rests on successful and pilot case studies gathered from various sources from MNCs and Organizations. The cases indicate the way these organizations have grown their profits and have created a societal impact. This paper illustrates **Modium.io; Edgecoin; Mojaloop; Grid Singularity; and ME SOLshare**. There are many other case studies and application of blockchain in several other sectors that are equally impactful however, they have not been considered here.

Case Studies on Blockchain Impact: Time to Move beyond the Hype

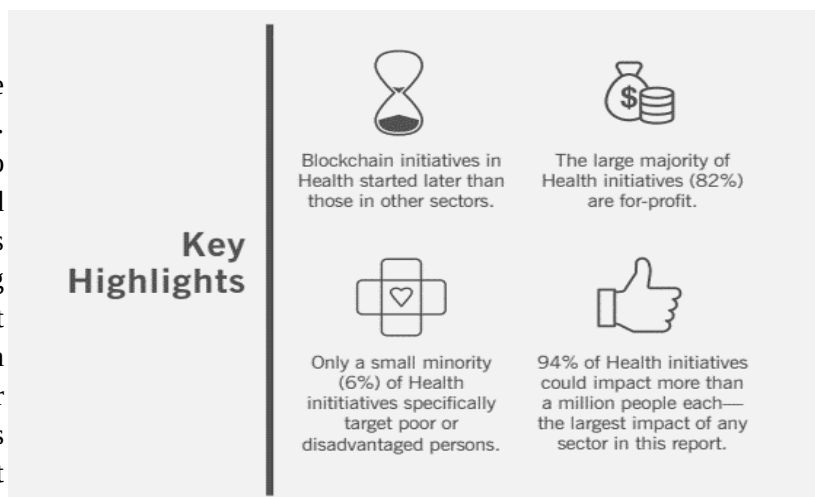
Blockchain in Health

Applications for blockchain can be viewed in Health as digital health records exchange and pharmaceutical supply chain management. In many of those areas, blockchain offers a safer, decentralized, and efficient solution than would rather be possible.

Modium.io:

Modium.io was founded in the year 2016 at Zurich. Modium.io uses blockchain to ensure that the data originated from a particular sensor and has not been tampered with along the way. Additionally, smart contracts on the blockchain automate notifications to sender and receiver that the products being shipped have met requirements and are ready to

be sold to consumers. Secure data is vital for Modum.io's customers i.e. the Pharma distributors, and the top users, who have assurance that their medicines will work as intended. It offers an alternative passive monitoring system. Its hardware sensors placed in each package, track temperature conditions of a medicinal product while in transit. The sensors can track packages for weeks at a time and are intended to be reused.



Blockchain in Education

Education projects are enabling secure record-keeping to replace outdated methods of issuing certificates and transcripts. Most of the cases in Education are still in pilot stages and will take time before they reach significant traction and scale.

Edgecoin is an example of a newer organization focused specifically on education. A further permutation of the appliance to student records involves a portfolio approach, allowing a more comprehensive overview of all information associated with each student throughout their academic career.

The use of tokens to recognize learning and accomplishments would potentially diversify opportunity for those whose skills are not reflected in their degrees or previous work experience and give employers access to a wider pool of relevant talent. BitDegree is starting to add this direction with a blockchain-powered online education platform.

Blockchain in Financial Inclusion

Given the dimensions of the market and blockchain's potential in delivering impact, there are significant efforts to use blockchain for financial inclusion. With 25 initiatives identified in our research, financial inclusion is one among the foremost mature applications of blockchain.

Mojaloop - A Gates' Foundation Level One Project

Founded in the year 2014 and applied in payments and money transfer, Mojaloop employs Inter-ledger, a protocol for connecting different ledgers, including digital wallets, national payment systems, and blockchains. Mojaloop allows

Key Highlights



These initiatives comprise more program-stage projects than any other sector.



For almost half of these projects, reaching more people is a primary benefit of using blockchain.



44 percent of Financial Inclusion initiatives are on track to reach more than a million people each before 2020.



More than half of the for-profit Financial Inclusion projects are reaching more than a thousand people.

for completely traceable transactions which will be audited by a regulatory body alongside satisfying regulatory musts like the KYC norms in any financial institution. Using Inter-ledger, Mojaloop is able to do clearing in milliseconds and deferred net settlements in seconds, also as lower costs related to transfers.

The Level One team has carried out discussions in multiple countries (Tanzania, Uganda, West African Economic Union, Myanmar, South Africa), and so far Mojaloop has been well received. The next phase of the project involves discussions with organizations round the world to implement the solution; the primary deployment is predicted sometime in 2018 or early 2019.

We Trust

Founded in the year 2016, We Trust's first product, Trusted Lending Circle, uses the Ethereum blockchain to significantly reduce overhead fees by eliminating the need for a trusted third party, such as a bank, and to improve transparency of transactions within these groups. This makes banking cheaper and accessible, particularly for those with small transactions. The autonomous and decentralized nature of the platform has the potential to enhance financial inclusion on a worldwide scale through digitization of what were previously cash transactions. It also enables the creation of a credit and transaction history.

Blockchain in Energy, Climate and Environment

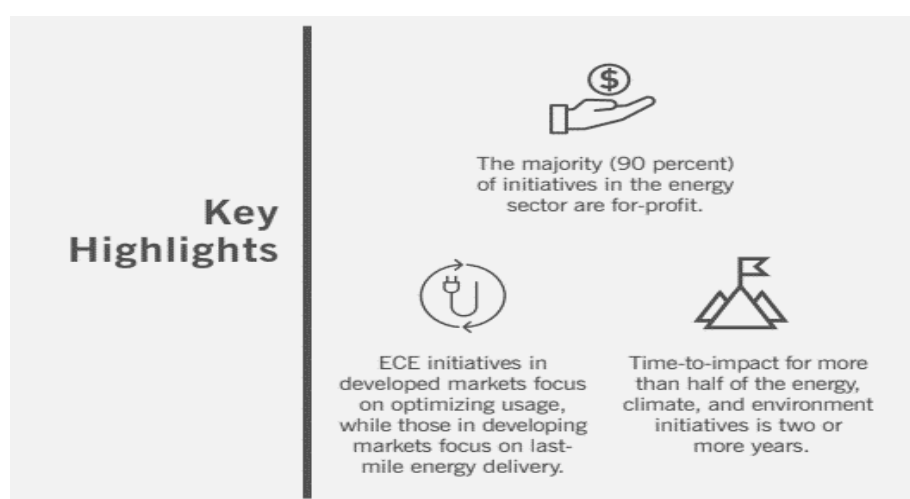
The energy sector has many known inefficiencies. In most countries, utility companies operate in a highly regulated market, often with significant overhead and energy losses during transmission. Globally, only 85% of the world's population has access to electricity, and it's not always affordable, reliable, or clean. Blockchain can improve the efficiency of existing grids through a decentralized platform with more data control and micro-optimizations of energy at the facilities level. It also can facilitate peer-to-peer transmission and support the creation of micro-grids.

Grid Singularity

Grid Singularity is initiating the transition to a replacement distributed energy utilities system, where energy is often sourced and distributed during a decentralized, more efficient way. The company is creating a blockchain layer where

all transactions are going to be securely stored. This platform is going to be invisible for end-users, but will allow other companies (including utilities) to develop applications on top of this infrastructure to support, for instance, micropayment channels, data analysis and benchmarking, green certificates, smart grid management, and energy trade validation.

- In parallel to its new platform, Grid Singularity cofounded the non-profit Energy Web Foundation to debate, finance, and implements these changes. The energy utilities space still operates in an old-fashioned way. Electric grids were built decades ago, companies barely share or analyze data for reducing costs, and customers pay a premium price for unexpected energy peaks — all of that in addition to the high costs charged by utilities companies, which intermediate all the processes.
- It's a crucial step in transforming energy consumers into energy prosumers — meaning that every household are going to be ready to buy and sell energy through this network. In order for the transition to achieve success, all stakeholders must agree on market standards and the way the technology will grow.



ME SOLshare

- SOLshare's mission is to bring electricity to remote regions of Bangladesh by using clean and reliable solar panels.
- SOLshare already uses blockchain for distributed ledgers and is in the process of developing a tokenization model for increased transparency and grid management efficiency. The company has found out 10 micro-grids in Bangladesh and envisions fixing 10,000 grids by 2030, reaching over 1 million users.
- SOLshare creates a small local energy grid that allows these households (micro-grids) to produce and trade electricity with each other, without having to rely on local utility companies. Their product, SOLBox, may be a device that permits homeowners to shop for electricity generated from solar panels, by paying for tokens via mobile SMS. Customers can finance this investment through micro-credits, with repayments of 24- to 36-months.
- Blockchain technology allows the decentralized trade of energy and payments, shifting power to local households, which make electricity affordable and accessible to everyone. With the increased advantage of becoming micro-producers and potentially having a replacement source of income, the people have immensely benefitted from the blockchain technology.

Conclusion

It's important to notice that for the blockchain to figure, the node-to-node network must be motivated and comply with work under ethical standards. Once, and as long as, these standards are adhered to, the blockchain could become a strong tool for improving business, conducting fair trade, democratizing the worldwide economy, and helping support more open and fair societies. It may be too early to inform how prolific the expansion and adoption of blockchain applications for social impact are going to be, but initial analysis shows that potentially transformative blockchain applications for social impact are already emerging.

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