

Blockchains for Good

Introduction

Blockchain technology was first notably used in Bitcoin cryptocurrency. The technology enables Bitcoin to create a Peer-to-Peer Electronic Cash System, allowing online payments to take place without a third-party institution (Nakamoto, 2008). The application of blockchain is not constrained to cryptocurrency, it can also be used to store information and data. The use of blockchain technology is becoming more and more popular. Not only are people starting to apply them to cryptocurrencies, but also for sustainability and social justice. Blockchain technology is inherently decentralized, anonymous and immutable, unlike traditional centralized and bureaucratic approaches. It omits the requirement of having to trust a third-party organization, the verification of transactions is done automatically through consensus algorithms. The technology represents a "transition from trusting people to trusting mathematics" where people no longer need to trust any third parties but instead the system (Antonopoulos, 2014). This creates a fair and equal environment with increased transparency and greatly reduced fraud and corruption. This article covers the application of blockchain, examples of 'blockchain for good' projects, and how they can be beneficial to society.

Decentralized alternative to existing structures

For a long time, the traditional political and economic ideological confrontation was based on capitalism and socialism. The "Capitalist West" is based on private ownership and driven by the market, while the "Communist East" is based on state ownership and driven by the government. In fact, very few countries rely entirely on capitalism or socialism. Different countries will construct their capitalist and socialist models according to their own economic and political environments, cultural and historical factors (Heywood, 2019). Therefore, the basis of the debate is the degree of integration of capitalist and socialist ideas. This creates tension between the two ideologies, undermining the social goal of improving humanity.

The rationale for both systems have its problems in controlling abusive systems that deprive people of life, liberty, and property. The power of the people usually rests with a small group of people, which only leads to oligarchy (Mukherjee, 2020). This creates a lack of clarity and trust. Access to information becomes more difficult and opaque as power is concentrated in one agency. Systems

become isolated and lack clarity. In the case of Bitcoin, it is neither capitalist nor socialist. It enables transparent payment methods without a central financial institution (Nakamoto, 2008). Everyone in the network has the same public transaction history, which improves clarity.

Blockchain projects believe in decentralization as an alternative to existing structures that mix concepts of socialism and capitalism. They argue that centralized structures driven by markets or governments should be minimized in order to unleash human potential and improve society. The technology emphasizes a technology-enhanced form of individualism that allows trust to rely on collective human behavior facilitated by technology and thus belong to the majority and not be undermined by corruptible or error-prone institutions (Kaal, 2020). The technique combines some ideas from capitalism and socialism. On the one hand, a decentralized economy promotes freedom from government interference. On the other hand, the blockchain network breaks the capitalist monopoly and redistributes rights and property to the people.

Application on healthcare

Healthcare is an important topic for sustainability which is included in Sustainable Development Goal 3. The notion of SDG 3 is "To ensure healthy lives and promote well-being for all at all ages." (United Nations, 2020). Traditionally the exchange and use of medical data have been based on three procedures: pull, push and view (Halamka et al., 2017). Pull is the processing of requesting information from a provider. Push is the transmission of encrypted medical data from one provider to another. View is the process of viewing medical records. However, the exchange of medical data has never been standardized and varies under different policy and institutional differences.

Blockchain can standardize the procedures of medical information sharing while keeping the record safe and secure. The medical record will be stored in the blockchain under a decentralized data management system. Everyone joining the system will have the same copy of the blockchain and will be able to use digital signatures to obtain data (Kaal, 2020). It does not require a third party to manage the data, everyone participates in the network, but no one owns it exclusively (Halamka et al., 2017). Digital signatures are based on public key encryption and ensure that data is sent securely from one provider to another. In most countries, such as Hong Kong, digital signatures have the same legal status as wet ink signatures (DocuSign, 2021). This allows for more

efficient coordination between patients and healthcare providers while protecting their personal information.

Application on supply chain

In Sustainable Development Goal 9, the goal emphasizes promoting sustainable industrialization with innovation. Blockchain in supply chains is a new form of application that has become increasingly popular and companies such as Walmart have started to apply the technology.

In recent years, the traceability and transparency of the product have become more important. Blockchain can help keep track of the details of the goods such as the quality, geolocation, and price. The data is then distributed and broadcast to all blockchains, which ensures that everyone has the same information, allowing companies to reduce the risk of data loss, corruption and fraud. The information from the blockchain is transparent to companies, consumers and farmers, creating a general level of trust in them. Last year, a Singaporean oil trading group was accused of making false records in oil quality inspection documents (Lin, 2021). Using blockchain technology, the authenticity of the document is proven, and once recorded in the blockchain, it cannot be destroyed or altered. This ensures that no one can corrupt or manipulate data already on the blockchain.

Moreover, the technology can ensure that food producers around the world are treated fairly and sustainably. For example, the company BanQu operates in developing countries and provides a blockchain platform to store information in the supply chain. In each transaction, the producer will receive an SMS message to confirm the quality, quantity, and the price of the crop (Bloomberg, 2022). Additionally, the use of smart contracts can automatically calculate the price so no one can manipulate the price. This increases transparency and protects farmers' rights. And since the data is well preserved under blockchain, it allows farmers to provide evidence of sales to banks and enables them to borrow money at low interest rates. This opened up tremendous opportunities for producers in developing countries.

Application to sustainable environment

Although cryptocurrency mining requires a lot of computational power which uses huge amounts of electricity, the technology is now planning to solve the problem. Cryptocurrency such as

Ethereum is working on developing its technology on proof of stake instead of proof of work (Kim, 2022). This new validation mechanism, it is less energy-intensive and requires less computational power to verify each transaction. The development of cryptocurrency is becoming more sustainable and environmentally friendly. Some cryptocurrencies such as SolarCoin are distributed to solar energy producers as a reward (Andoni et al., 2019). A SolarCoin will be issued for every 1 MWh of electricity produced, which is a new way to incentivize people to install more solar panels and encourage the development of solar energy.

Carbon footprint in the production process was difficult to track and calculate in the past. According to green marketing theory, tracking carbon footprints is critical as consumers will be more likely to choose to buy products with the lowest carbon footprint. Providing a record of carbon footprint can promote responsible consumption and production which is related to SDG 12 (United Nations, 2020). With blockchain technology, the carbon emission data can be measured and stored throughout the process of production, transport and storage (Rosado Da Cruz et al., 2020). This allows consumers to access product carbon footprint information and become responsible consumers. Furthermore, companies can enhance the reputation of their products and build a sustainable business model, thereby improving their image and boosting their sales.

For the energy sector, blockchain technology can provide new innovations for the decentralization and digitization of energy systems. The decentralized nature of blockchain can provide solutions for complex energy systems and microgrids (Andoni et al., 2019). Blockchain technology can provide a P2P energy trading platform, letting prosumers and consumers trade their excess energy in the community. The technology can encourage local power generation which reduces energy loss during transmission. Blockchain can also securely store the information on the energy supply and consumption, making the energy market more transparent and efficient. For example, the Brooklyn Microgrid Project experimented in the city to decentralize and provide electricity (Lempriere, 2017). The project is built on a P2P network through blockchain technology, allowing residents with solar panels to sell excess energy to neighbors. Since the project operates as microgrids on a small scale, it is estimated that only 5% of electricity is lost during energy transmission (Lempriere, 2017). The information on production and consumption is recorded by meters and computers and stored in the blockchain. The idea of blockchain application for energy

trading is similar to a market-driven shared economy such as Uber and Airbnb. The idea of applying blockchain on microgrids allows energy trading without third-party institutions, facilitating localized energy production that is sustainable and revolutionary.

Application on government organization

The current government organizations have many inherent problems. Many organizations work independently without enough integration with each other. The bureaucratic model of government is characterized as a rational, efficient, highly organized system. However, this creates too much "red tape" for government agencies and contains a suite of rules and regulations. The decision-making in the bureaucracy system is inefficient and slow. Blockchain can link different government data together and allow different organizations to access the data (Kaal, 2020). This can facilitate the flow of information within government organizations and increase efficiency.

For example, the United Nations launched a blockchain network and used iris recognition technology to distribute coupons to people in refugee camps in Jordan (Juskalian, 2020). These refugees lost their identities when they fled from their homeland. They can regain their identities with their digital wallet which contains their government ID, transaction history via a blockchain-based identity system. Their coupons can be used in refugee camps by scanning their eyes, which ensures they can access financial aid without being lost through corruption. The application of blockchain technology to refugee policy can make sure they can receive aids directly from the UN, and the information stored in the blockchain can help regain their identities, allowing them to re-enter society. This information is stored on the blockchain, making it easier for government agencies to obtain and improving their efficiency on refugee issues.

Application on law

Blockchain can prove one's intellectual property ownership. For example, artists and musicians upload their digital artwork or music file to the blockchain, the digital file will be converted into a form of NFT. The ownership of the digital assets will be recorded on the chain, the owner of the property can therefore trade them without a third-party such as an Auction center. This ensures that the artist can earn their profit without the need of paying commission.

Moreover, the technology can also act as a self-sustainable legal registry. In developing countries such as Ghana, the land registry department is not standardized and traditional (Kaal, 2020). Land information, transaction records are often lost and incomplete. Building a blockchain system on top of existing land registry structures can better preserve data and transaction history between land developers, banks, real estate buyers, and more.

At last, wealth has traditionally had an advantage in legal services, creating an unfair legal environment. To promote fairness in the legal system, the cost of legal services must be minimized. Using blockchain technology to facilitate Alternative Dispute Resolution (ADR) to resolve disputes can reduce unfair legal situations. Combined with smart contracts, disputes can be resolved automatically without the need for third parties such as courts. This makes legal solutions more accessible to the public to protect the human rights of vulnerable groups in the legal system.

Limitation

Blockchain is still a relatively new concept, and the centralized trust system is still the mainstream trust model (Antonopoulos, 2014). The transition from a centralized trust system to a decentralized trust system will take a lot of time. However, the growing lack of trust between individuals and organizations has led us to rethink the model of centralized trust systems. For example, we used to believe news from the media, but in recent years there has been an increase in fake news, making news information untrustworthy and biased. Social media has become a political tool rather than a search for truth and justice. Over the years, the economic and political sphere of trust has shifted, with the trust model gradually shifting towards a decentralized model.

Another limitation is still immature technology. The development of blockchain is still at its early stage, this causes risks to security and is prone to cyber-attack (Andoni et al., 2019). It is also worth noting that no central organization is legally responsible for these negative consequences or accidents. Because it's decentralized and everyone is part of the network, liability issues are still unknown and trust lies in the technology rather than any organization. However, it is believed that the technical issues are becoming more and more mature, and once the technology is standardized and developed, the technology will become more reliable and the risk will be greatly reduced.

Conclusion

The blockchain technology can potentially be the solution to many sustainable and justice issues. Its decentralized nature provides an alternative political environment for socialism and capitalism. Individuals in society no longer need to trust a system or other organization, and blockchain promotes individualism, giving people in the network greater control over their data and assets. In reality, we see many people suffering in an environment of injustice and corruption, where governments and markets are unreliable and rigged. Nowadays, the state has become a Leviathan, most countries are controlled by a strong, centralized government. Citizens' rights and property are restricted and monitored in every aspect of life. Although people doubt that the decentralized nature of blockchain is unregulated and dangerous, it is also believed that individuals can protect their own rights effectively without third-party regulations. The application of blockchain in healthcare, supply chain and law can be a game-changer, reduce the influence of middlemen and centralized authorities, and solve some of the problems inherent in government agencies such as bureaucracy.

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