

Blockchain Technology

by

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1. Blockchain technology's effects on the society and economy:

Blockchain is a technology like many other technologies has both positive and negative impacts related to society and the economy, though it is bringing change to many markets, for example, the banking industry. However, some of the positive impacts of blockchain technology are improving communities, developing a new system and SME solutions. On the other hand, it has a bad and ugly impact on the society and economy: the consequences of PoW concerning the environment and mining activities may lead to a trust crisis.

First of all, communities are better with blockchain technology. Blockchain technology has contributed to developing many existing systems, helped them and enhanced their function. Hence, since the crisis of 2008 blockchain technology was playing a major role. Also, there are many goals that the UN acknowledged that blockchain technology could contribute toward empowering the community and supporting sustainable infrastructure goals number 1 and 9 respectively. Allen and Balkstad wrote about the system of blockchain technology could contribute to these two UN goals (Blackstad and Allen, 2018). With blockchain technology, it is more time and energy-consuming to hack the network. In other words, the gain and profit from a such process would be nothing. The cost of doing so is more than the potential profit. Moreover, through the decentralized, incorruptible and transparent history records, the number of frauds would be reduced which is an impact that is positive for the society and economy.

Next, blockchain technology helps in developing systems. This technology developed the P2P trade for clean energy. For example, the introduced model of energy prosumer service using the technology of blockchain, big data and the Internet of Things facilitate energy sources for both users and producers (Hwang, et al., 2018). Hwang suggested that blockchain technology could improve the efficiency of the project of renewable energy. On the same hand, blockchain technology improved the electrified use of the chemical industry through M2M, machine-to-machine interactions (Sikorski, et al., 2017).

Last but not least, for Small and Medium Enterprises (SMEs), blockchain could help SEMs by informing them about their existing eco-system to unleash the network effect of sharing and collaborative economy. Blockchain technology could help SMEs in many aspects such as the scale of equipment, materials and services cost which tend to be not profitable due the inability of being able to benefit from the scale discount. Therefore, SMEs could have the chance to reduce the opportunity cost by such an eco-system relating to their small scale.

Furthermore, through crowdfunding options, SMEs have more chances to show the case of a project to attract more investment from potential customers. Hence, detail of these projects could be automatically shared among all SMEs and also with major financial intuitions stakeholders such as banks and government bodies allowing maximum visibility (Chuen, et al. 2018).

On the other hand, the negative side of blockchain could be categorized into two major issues. First, the environmental consequences of PoW and the activities of mining may lead to a trust crisis.

Firstly, one negative impact of blockchain technology is its mechanism of cryptography by PoW, Proof-Of-Work. PoW is the activities of mining that are done by nodes, members of a pool/network that requires high energy. An article by Christophe Schinckus in 2020 showed that mining activities have increasingly demanded electricity as it consumes more than some advanced countries. For instance, Switzerland or Denmark. Also, the amount of energy consumption is equal to the amount of Austria (Schinckus, 2020). Furthermore, the electricity is measured by the hash rate which is the computational consumption of the mining activities not the number of transactions (Dittmar and Praktiknjo 2019., Masanet, et al. 2019). However, this problem of high energy consumption involves the validation of PoW that may be generated by polluting electricity plants similar coal. Also, the lack of an alternative protocol similar the PoW, even, though, PoS, Proof-Of-Stake, by Ethereum needed to be tested from the point of security. However, the environmental problem of high energy consumption also may lead to an increase in global temperature by 2034 by 2 °C (Mora, et al. 2018).

Finally, the ugly side of blockchain technology is that society may worry refers to trusting in the technology of blockchain. The mining industry is composed of agents, however, in case one pool can control 51% of the computational power of the industry it may lead to undoing new transactions and double-spending. Hence, the nature of the blockchain network would be destroyed. The four-firm concentration index (FFCI) showed an increase from 51% to 65% from 2018 to 2019. Furthermore, the validation of a bitcoin difficulty is increasing due the perpetuity of the information chain lengthening in the blockchain which means that more power is required to solve a cryptocurrency enigma (Schinckus, 2020).

2. Sustainability of blockchain technology:

There are two main reasons that blockchain technology might not be sustainable in the future: technical and also legality issues. These two challenges included many other relevant issues similar to SCs issues; like whether the quantity demand would increase in the long future or decrease. Moreover, SC's fundamental software has, for example, a correctness problem (Leible et al., 2019). However, legality included its existence, which included the creation of cryptocurrencies like Bitcoin.

First of all, when reflecting on the technical side of the algorithm behind this technology, Blockchain Technology (BT), many elements could affect this side of the blockchain progress. Saying so, this problem related could include the Risks and Validation of Smart Contracts. For example, the most driver of BT is trustworthiness which is a key element. However, referring technical issues included the creation of the SCs due the possibility that malicious attacks and coding errors within their development. For illustration, process crashes give hackers a chance to steal data of resources included in the digital contract (Bigi et al., 2015; Atzei et al., 2017). Therefore, SCs still yet to be developed well on how their systematic mechanisms work from the way it designs, implement, programme and validated is not clearly advanced yet. Moreover, the internet appeared in the 1990s, some said BT is the next internet, but the internet market (products that must use the internet) always has uncertainties, also the 51% and more, therefore, there is an amount of trustworthiness in consumers, entities and others needed to be built in a strong third party, but also without third party which is one core idea of this technology to eliminate the intermediary. However, to solve this problem of trust there must be research done on how to build this trust in the market, increasing the trust and lowering the barriers to the market, which is also part of this BT features, the transparency in it. For instance, by limiting the underlying programming language expressive, SCs lessen vulnerabilities.

The next issue of BT related to its sustainability in the future is its legal uncertainty. There is much research has been done about blockchain-based cryptocurrencies and SCs in matters of legal issues, problems and topics (Ponsford, 2015; Savelyev, 2017; Gikay, 2018; Dell'Erba, 2018). However, there is still clarification demanded and demand for further work (Werbach, 2018). For example, timestamps dashcam recorded video of an accident. In other words, the blockchain as this recorded video is evidence in a lawsuit. The video on one hand would be as legal evidence. While BT is not juridically secured (Gipp et al., 2016). Moreover, SCs regarded as legally unspecified. Due the programme code is hard, much work must be done to reflect the real-life case. For example, the difference between SCs and traditional in

the juristic system, whether it is securing the contracting parties and the unforeseen events of the future (Savelyev, 2017). Hence, one solution would not function well. Each country has its laws and courts. Therefore, no global consensus but rather geography specifications would reduce several legal uncertainties.

3. Blockchain adoption impacts:

The adoption of blockchain could lead to changes in the economy, society, technology, policies or regulations. A research article was done by Daniel, Fontana and Elisa that investigated the impact of BT on firms' organization, innovation and strategies which concluded that the adoption of BT could lead to change over many dimensions in Europe (Levis et al., 2021). BT projected that by 2025 would store 10% of the world GDP which is around \$88tn in 2019 (Zalan, 2018). This shows how BT has been understood by players, firms and other that it is vital and important due its disruptive capabilities. Some believe that BT would disrupt businesses as did the internet in the 90s (Leible et al., 2019). However, there are many domains affected by this BT similar logistics, finance and healthcare (Cocco, 2017; Angraal, 2017; Kuo, 2017; Cai, 2018; Buchak, et al., 2018; Dujak, 2019).

The financial market implementation of BT would provide new tools to investors to exchange value and capital without intermediaries and central authorities. Hence, solving many problems in the financial market where many believe that BT would become the mainstream financial technology near in the future (Jagtiani). However, BT could lead to decreasing information asymmetries and lead to reducing transactional costs. For example, initial coin offerings (ICOs) which is financing blockchain-based applications (Block, 2018).

The healthcare industry needs to exchange huge amounts of information to function effectively and efficiently. Therefore, disintermediation is crucial for the healthcare industry. For example, information needs to be exchanged from one department to another to patients, hence, exchanging data trustfully. BT could enable a trustful exchange between players including the central body entrusting the transaction. Furthermore, enhancing the security and traceability of goods within the supply chain. (Dujak et al., 2019 and Francisco et al., 2018) Moreover, concerning education, it could manage to certify acquired skills by students and lowering degree fraud (Chen et al., 2018).

Nevertheless, the adoption of BT would lead to change around three elements which are efficiency, security and innovation. For example, it would be easier to exchange

information in the future than today which reflects that efficiency would boost and uncover innovation. To be more specific, technology is faster than policy. Moreover, cybersecurity is a field also where BT could bring consistent advantages. For example, more companies would invest in distributed ledgers to lower the cost and cybersecurity risk as a form of contingency budget. Additionally, many industries have been affected by the adoption of BT. For instance, the technology behind the transaction, equity share and offering would mostly be BT. Hence, individuals would refer to BT as they refer now to browsers like Firefox, Internet Explorer and Chrome.

To conclude, BT is known for its immutability, traceability and security. Many investors invest in it hoping to bring services satisfying new market needs. For example, self-enforcing SCs, to tokenized nature, easing it and increasing transparency. Furthermore, accessibility to the market by everyone and the ability of tools to everyone. Therefore, Fintech is similar to the digitization of the asset and interrupting to change the business models by BT due its benefits, advantages and features which would increase the traceability and immutability of the transaction. Hence, BT would contribute to a more democratic ecosystem in terms of information, reducing information asymmetry (Levis et al., 2021).

4. Recommendation of Blockchain usability in a country:

BT could improve the finance sector and others. However, to develop fintech projects and implement this technology in all sectors needed that to keep up with current market demand. To do research on this topic studying its benefits and develop a systematic method of usability of BT to rebuild, support and enhance the financial sectors and others in a country to improve and enhance the well-being of society and economy. Hence, BT can open a new gate, for example, to create a digital currency that is authorized by the government to help in stabilizing the rate fluctuation. Moreover, BT will create equality i.e., access to financial services for free by allowing individuals to participate more easily and at a lower cost. Also, it could be used in supply chain and charity projects. Basically, BT could rebuild the trust that was long gone in the economy.

5. Blockchain and circular economy:

BT could contribute to the concept of circular economy to maximize resource usage and reduce waste. The circular economy from its name is not linear rather it circularly departed from the practice of 'produce, use, dispose' to the three Rs; 'reduce, reuse and recycle' (Murray et al., 2017). A circular economy is a system in which the production and consumption included

the concept to share, lease, reuse, repair, refurbish and recycle both materials and products as much as is feasible, to the greatest extent and as much as possible (Lüdeke-Freund, et al., 2019). Moreover, a circular economy looks at a wider range to integrate the activities of an economy concerning environmental welfare sustainably, looking to sustainability and social responsibility issues and looking to economic growth while protecting the environment and also creating equality socially. In other words, a circular economy creates a closed-loop economy which is a model of an economy that has no waste (Mathews and Tan, 2011; Xue et al., 2010). For example, the circulation of materials, products and outputs as much as it can through preserving their value (Bocken et al., 2016).

However, a circular economy could benefit from BT in terms of closing the loop, for example, the principle of decentralization (Narayan and Tidstrom, 2020). This feature of BT would lead, help and aid the circular economy in reaching and achieving its aims towards the environment, sustainability and social responsibility. For instance, social responsibility and sustainability would be achievable by business models enabling decentralisation and circulatory value creation of products and services, hence, the circular economy goal is to eliminate waste or reduce it to a minimum (Schulte, 2013). Therefore, keeping products and services in circulation.

Nevertheless, sustainability terms include the three core of economic, environmental and social aspects, hence, circular economic focuses on sustainability (Purvis et al., 2019). However, BT is a distributed ledger application, for example, private blockchain replaced the traditional recording, paper-based transaction in banking sectors (Iansiti and Lakhani, 2017). Moreover, in the financial sectors transaction and trading globally i.e. forex, blockchain and smart contract jumped many barriers similar transaction reports, recording, resolution, audit, processing and initiation (Schmitz and Leoni, 2019). For illustration, SCs facilitate the automation of transactions, hence, BT enhanced the system through stopping fraudulent transactions and contributing to social responsibility (Iansiti and Lakhani, 2017). Moreover, BT made the investments more sustainable (Schulte, 2013). More specifically, crowdfunding provides equal access to society to raise capital in an equitable manner (Dierksmeier and Seele, 2020; Greenberg and Mollick, 2017).

Nonetheless, BT with a supply chain would contribute towards circular economy goals by enhancing efficiency, reducing costs and saving time. In other words, BT changed the way of producing, distributing and consuming. Traceability, SCs and circular economy

respectively. For example, traceability is the ability to trace the history of an entity i.e. production and distribution of goods. More specifically within the supply chain, BT helped to reduce the traceability method time of Walmart to 2.2 seconds compared to 7 days with the ordinary method. Furthermore, SCs reduced the cost of the transaction by removing intermediaries. Therefore, BT developed a circular economy changing the way of consumption through its feature of a trusted network enabling individuals to buy/sell goods and services.

Walmart is an example that implemented BT by partnering with IBM and developing a proof of concept (PoC). It developed a blockchain in Chinese related to putting pork and mangoes traces in US stores. Both of the projects were a success and improved transparency and traceability which is the goals of a circular economy towards sustainability including environmental and social responsibility (Kamath, 2018).

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