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BLOCKCHAIN: The Technology That Changes the Way We Do Business

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Abstract

With the introduction of Bitcoin by Nakamoto came a key underlying technology that holds great disruptive promise to many crucial industries: blockchain. Blockchain is a decentralized, distributed ledger that has the potential to improve businesses operations. Based on trust, blockchain allows the parties involved in a business transaction to transact without the need to know each other. Blockchain can reduce costs, saves time and reduces business risk. More institutionalized businesses utilize cryptocurrency as a hedging strategy to reduce risk. We examine how blockchain works and shows how blockchain's attributes can benefit businesses in every industry.

Keywords: Blockchain technology, Blockchain in business, Risk management, Decentralized database, Business value maximization, Business efficiency, Bitcoin cryptocurrency hedging.

1. INTRODUCTION

With the creation of the cryptocurrency such as bitcoin by Nakamoto in 2008, the concept of decentralized trust has gained traction. It is the trust that is distributed and dispersed – where no one centralized entity is in full control or governance. Blockchain technology provides a platform for secure, non-repudiated and immutable transactions that are logged in blocks that form a chain. The non-repudiated and immutable nature of blockchain disallows any tampering of transactions once they are made. These attributes of blockchain reduce risk and provide data security and integrity that businesses need. These attributes also reduce fraud by increasing transaction visibility and transparency. Blockchain is based on a peer-to-peer (P2P) architecture where parties can directly transact with the entity on the other side of the transaction. Being directly in contact with each other allows entities to reduce or even eliminate the need for a middleman. Businesses would also save costs with the use of smart contracts where commands are executed based on predetermined conditions. Blockchain offers additional benefits, trust, transparency, decentralization, confidentiality, integrity and availability. All of these benefits can boost a business's public perception. Blockchain's features have allowed the development of cryptocurrencies. Bitcoin, for instance, has changed the banking industry, the current financial system and the global economy. Blockchain has the potential to transform numerous other industries. This paper shows that incorporating blockchain into the banking industry is just the beginning; blockchain will impact the insurance industry, the transportation industry and many others. This paper starts with a brief review of blockchain technology. It then examines how blockchain's attributes can prove advantageous to various types of businesses by way of improving efficiency through saving cost, saving time and reducing risk.

2. BLOCKCHAIN TECHNOLOGY

According to Iansiti & Lakhani (2017), there are five basic principles in the underlying technology that allows blockchain to function: (1) distributed database, (2) peer-to-peer (P2P) transmission, (3) irreversibility of records, (4) computational logic, and (5) transparency with pseudonymity. Figure 1 below shows how blockchain works and how these principles are integrated and utilized.

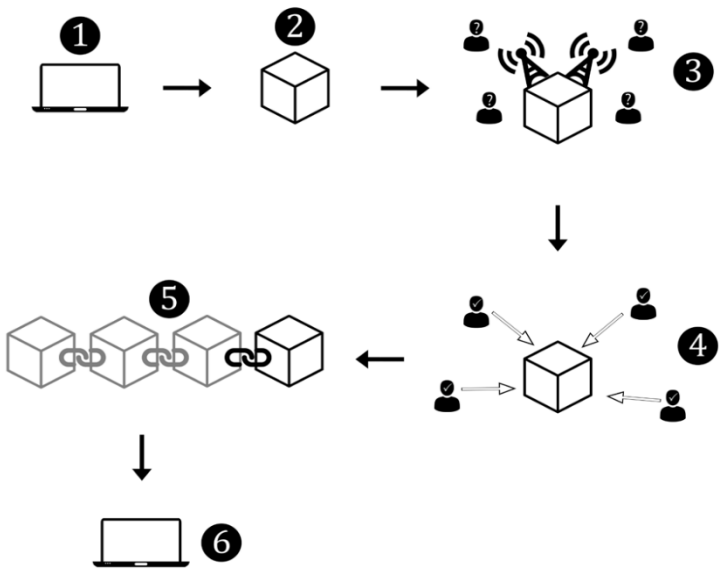

Figure 1. A Simplified View of How Blockchain Technology Works

The figure shows how blockchain works. In step 1, the process starts with one party initiating a transaction. For example, Alice would like to send money to Bob. In step 2, information about this transaction – such as the sender, the receiver, the amount to be sent, the date and time of the transaction, the hash of the previous transaction – are then converted into a new hash using a known algorithm such as SHA256. These algorithms are usually one-way functions where the resulting hash is impossible to be reverse engineered to result in the original input that was used (Shinder & Cross, 2008). Blockchain's network is dependent on these hashes. Hashing is the process of converting data into an output of a string of characters of a fixed length (Rothrie, 2018). This hash then becomes part of a block. Step 3, the block then broadcasts this transaction to a P2P network of nodes via the ledger. A *peer-to-peer (P2P) transmission* occurs when two or more nodes in a network are connected to distribute resources without the need of an intermediary node (Cope, 2002). With a *distributed database*, all parties have access to the entire database but no one particular party has full control of the entire database. Step 4, the other nodes in the network forms the consensus. The transaction is then verified and approved by this consensus using "consensus mechanisms" (Rosic, 2018). The majority of nodes in the network has to agree – this is all done without the need of an intermediary.

Once the transaction is verified, in step 5, this block is then linked to the previous block to form a chain. The link occurs because the hash from the previous block has been used (from step 2) to create the hash in this new block (with the exception of the "genesis block"). The genesis block is the first block that establishes the foundation of the blockchain, all subsequent blocks in that blockchain must use the hash of the previous block to form its hash. Therefore, each transaction is linked with each other moving forward in a chronological order, creating a "chain." This linkage provides the foundation for the *irreversibility of records.* With the digital nature of the technology as explained by Iansiti & Lakhani (2017), blockchain transactions are tied to *computational logic*. Therefore, rules and algorithms can be set up in a way that can automatically trigger and execute transactions between nodes.

The structure of data enables a tamper-proof digital ledger that stores transactions made by different nodes. Step 6, since each transaction is made visible to all parties involved, anyone can identify who made which transactions using a unique alphanumeric address that identifies the sender and receiver – similar to the functionality of an ID number. The use of public-private key cryptography can be used to generate a unique address representative of the actual public key (Tanya, 2019). Parties in the blockchain can either opt to remain anonymous or provide proof of their identities. According to Abeyratne & Monfared (2016), actors can add data automatically or manually. However, they must authenticate themselves using their private key to connect to the network. The use of a private key also ensures that the data is entered by that particular entity – since private keys work as signatures to sign the data being entered. This provides *transparency with pseudonymity*. The money that was sent from Alice now belongs to Bob, and the transaction is completed.

3. BLOCKCHAIN FOR BUSINESS

Blockchain's potential for business spans far and wide as the technology becomes more mainstream. According to the World Economic Forum (2015), 10% of the global GDP will be stored on blockchain technology by 2027. There are several reasons why this technology has picked up steam in the business community. As blockchain inhibits features such as decentralized, transparent and immutable, businesses can utilize these attributes to their advantage. Using blockchain technology also contributes to boost profits by decreasing costs, saving time and reducing risk by enhancing data security and by reducing fraud.

3.1 *Save Costs*

Blockchain has the potential to eliminate the middleman by allowing the consensus of nodes in the network to verify transactions. Deloitte (2016) states that "blockchain can reduce overhead costs when parties trade assets directly with each other, or quickly prove ownership or authorship of information—a task that is currently next to impossible

without either a central authority or impartial mediator." Currently, most financial transactions are done through banks and other financial institutions that act as a central authority to verify transactions – as an intermediary or middleman of sorts. These intermediaries can sometimes charge hefty fees. Transaction costs can add up to one percent to the overall cost of a transaction (Bashir, 2017; V. Gupta, 2017; Schuetz & Venkatesh, 2019).

In an example, fewer middlemen could benefit the transportation industry where freight brokers assist in transactions of loads via shippers to carriers with additional markups. This process results in more costs to the carriers which are pushed downstream to each link in the supply chain and ultimately the end consumer. The large number of intermediaries in the network makes this an even more challenging issue to tackle. Blockchain can reduce the need for freight brokers with the introduction of "smart contracts." These contracts reduce the need for a third party by being automatically triggered when a specific action takes place (Christidis & Devetsikiotis, 2016; Cong & He, 2019). Blockchain's impact will extend further than simply the transportation industry; studies state that blockchain will revolutionize international trade (McCrea, 2018).

The use of blockchain can help improve inventory management, reduce costly data errors and delays, and shorten resolution time when disputes occur. Huebsch (2020) shows that a firm is more efficient when overhead is lowered through the reduction of excess inventory holdings. Good inventory management also reduces costly data errors and delays. With blockchain, sellers would also have the ability to accurately track capacity and costs, estimate delivery times for multiple routes and make smarter decisions overall; great supply chain visibility further minimizes costs for businesses (McKinney, et al., 2015).

3.2 *Saves Time*

Blockchain technology can reduce processing time to almost instantaneous transactions. The technology's peer-to-peer structure reduces the so-called "interaction frictions." It is designed to decrease the amount of exchanges between parties or even the number of parties needed to complete a transaction (M. Gupta, 2017). Given that "time is money," costs savings and time savings work hand in hand. By optimizing business flows, businesses would streamline their processes and therefore realize savings both in the short term and in the long term. Additionally, transactions done with cryptocurrency are almost instantaneous. The transfer is posted instantly while the payment is validated in the blockchain in a matter of minutes or even seconds, as opposed to taking days like a conventional payment. Traditional payments require clearing houses or trusted third parties to process due to the risk of default or non- performance of the party, which may take days to clear. According to Winnesota (n.d.) some companies wait an average of 42 days before receiving payment for an invoice. As stated above, transactions done with cryptocurrency are almost instantaneous. With faster transaction time, businesses are able to complete their processes at a more efficient rate and improve their liquid asset turnover rate.

3.3 *Reduce Risk with Data Security*

Since blockchain is based on cryptography, it provides an inherent layer of security not seen with conventional systems currently in place. With blockchain, cryptology replaces third-party intermediaries and the risk inherent in using these intermediaries (Deloitte, 2016). The data from users are not stored locally on a single server, but rather distributed across a network of servers – this reduces the risk involved if any particular node is hacked (Chandran, 2018). And given the decentralized nature of blockchain, a hack would still render fewer sensitive data as it may not be easily identifiable. In a decentralized system, the transactions are processed and verified by a consensus of the parties involved (Bauerle, n.d.).

Decentralized control eliminates risks associated with centralized control. In a centralized database, any entity can destroy or corrupt the data in the system given the sufficient access. In contrast, a decentralized system does not exhibit this problem – process and verification of transactions is done by a consensus of parties involved rather than on the central authority (Bauerle, n.d.). Thus, risk of a single point of failure, a central control being hacked, is eliminated; if one node is compromised or fails, the entire system does not fail (Raval, 2016). Central databases that financial institutions, such as banks, are currently using can be tampered by hackers. According to Harmon (1995), Russian software engineer, Vladimir Levin, and his accomplices stole over $10 million from Citibank's computer system located in New York – of which $400,000 were never recovered. Additionally, data theft could be detrimental to both individuals and businesses. Stolen business information such as proprietary material can mean losing the competitive advantage in a particular industry. Case in point – Capital One was breached in 2019. But rather than money, software engineer Paige Thompson was able to steal a large number of customers' personal information including credit card applications, social security numbers, court documents and other sensitive information (Cowley & Perlroth, 2019). If bank or credit card data is stolen, hackers could use them to make fraudulent purchases. If the stolen data included login credentials, more accounts could be compromised. Blockchain precludes this type of behaviour. With blockchain, a modification to the data in the blocks would render a change in the hash (see figure 1 for explanation of hash). When a block is changed, other blocks must also be modified. The nature of blockchain prevents problems with unauthorized changes. With multiple participants in the chain trying to verify and authenticate the information entered, there is a consensus to verify and agree on the transaction itself.

Furthermore, a 51% consensus prevents any sort of double payments or "bouncing payments" as each transaction is validated by the consensus of parties in the blockchain. The larger the blockchain network, the less likely any one particular hacker would be able to gain the necessary 51% control. In order to reach 51% control, an enormous amount of processing power would be required. This makes it virtually impossible to alter the data that has already been entered – particularly in larger blockchains. In the construction industry, an estimated 95% of building construction data can be lost when transferred from one person to another (Tapscott & Vargas, 2019). Although this data loss can be a result of a number of reasons including carelessness, or negligence, using blockchain is inherently secure since it is immutable and it does not allow any sort of tampering or modification to any transactions. However, if the data entered was faulty or inaccurate due to human error or otherwise, the data will be displayed with such error.

Blockchain raises trust and strengthens transparency. When using blockchain, altering any information is virtually impossible. All participants have a copy of the entire blockchain rendering any modification difficult (Goldman Sachs, 2019). Blockchain does not allow for any stakeholder to have the power to implement rules without the endorsement of other users (Hill et al., 2018). Furthermore, blockchain can be permissioned with an extra layer of security via Role Based Access Control (Mauri, 2017). This means that blockchain is set up in a way that allows only certain members of the network to access the chain – and by extension, only certain members would have certain "roles" within the blockchain.

In the healthcare industry, accurate documentation and proper data management of large sets of sensitive data is crucial. Medical institutions have an obligation to keep this data confidential and accurate without any tampering. This becomes a complex issue when patient data needs to be examined by more than one medical institution. And in situations where patient data must be available instantaneously to save a life, a delay cannot be tolerated. Patient data stored on the blockchain would allow for authorized and permissioned parties shared access to the data across medical institutions and treatment sites (Ekblaw et al., 2016). It also reduces cost as less administrative costs are needed to allow for this data access to occur. Private blockchains like the example above allow access only to parties who have been permissioned to access the data; this prevents any possible unauthorized access to the patients' data. (Dagher et al., 2018; Hyla & Pejaś, 2019).

3.4 *Reduce Risk of Fraud*

As more corporations place more focus on stakeholders, these corporations can no longer see fraud as a cost of doing business but instead as a real tangible problem. The increasing risk and the growing number of problems related to fraud have reached a point that corporations can no longer sweep them under the rug. The costs associated with fraudulent behaviours extend well beyond direct costs. The indirect costs of fraud include employee morale (Mauri, 2017), the company reputation, customers' trusts and so on. Every year, fraud accounts for billions of dollars that could have been prevented with the use of blockchain. According to the Association of Certified Fraud Examiners (2014), "global fraud surveys found that a typical business loses five percent of its revenues each year to fraud." Fraud is a significant problem in the insurance world. Blockchain will decrease fraud by preventing multiple payouts for the same event and by reporting suspicious behaviour (Georgiou, 2018). Interestingly, the food industry is submitted to the same problem. Businesses in the food industry pay large sums of money for illegitimate fraud claims – whether that is restaurants or food suppliers.

Knowing or unknowingly, many restaurants serve customers food that is mislabelled. In one case, a customer was served horse meat instead of beef due to mislabelling (Parool as cited in van Ruth et al., 2020). In another case, sushi bars were using cheaper fish species that were labeled as more premium species (Christiansen et al., 2018). According to Juniper Research (2019), "blockchain will enable $31 billion in food fraud savings globally by 2024 by immutably tracking food across the supply chain. Substantial savings in food fraud will be realized from 2021 and compliance costs will be reduced by 30% by 2024." Given the distributed nature of blockchain, having a shared digital ledger would reduce fraud by increasing the visibility and transparency of transactions – and the history of those transactions with information that would include the transfer of assets – between members or nodes of a business network (Iansiti & Lakhani, 2017; Mauri, 2017). Any fraudulent transactions would be rather easy to identify.

3.5 *Reduce Risk via Hedging Strategy*

Institutions have also turned to cryptocurrency, particularly Bitcoin, as a way of inflation hedging medium due to the limited supply available (Carpentier & Ho, 2021). With the recent influx of trillions of dollars into the economy through three rounds of stimulus packages, fears of inflation to soar has been on the minds of business leaders. If inflation does indeed rise, Bitcoin will not be affected since the cryptocurrency is not tied to the US Dollar or any fiat currency of any particular country.

Cryptocurrency, or simply "crypto," has become a rather attractive asset class for businesses as it has very little co-relation to the US stock market as well (Bouri, et al., 2020; Zinoviev, 2021). This very attribute allows businesses to effectively diversify their portfolio against risks that are present with conventional investing mediums.

Additionally, cryptocurrency is an asset that is in its liquid form (to a certain extent) – without having the need to first converted it to cash to spend on company expenditures. Some of the world's largest companies, including Tesla, PayPal, Shopify, Apple, Amazon, Expedia, Microsoft and many others, can now accept crypto as a form of payment for goods and services despite the potential volatility (Teyeb, 2021; Nicolle, 2021).

4. CONCLUSION

The value and impact that the blockchain technology holds can be akin to what the internet had with the 80's and 90's. Blockchain has great potential to change our lives in profound ways. Blockchain offers a unique opportunity for a lot of industries from supply chain to healthcare, financial institutions, food industry, transportation, and others. We reviewed what blockchain is and how blockchain it works. We emphasized that due to its transparent and immutable nature, blockchain is inherently grounded in trust, decentralization, and data security. All these characteristics are significant for businesses since they translate as cost savings for businesses, time savings for businesses, risk reduction and better data security. We hope this article will help businesses understand blockchain and make informed decisions of what the technology can bring. Note that integrating, implementing and maintaining blockchain technology for early adopters can be capital intensive. However, blockchain's infrastructure and framework can be reused and repurposed to meet the needs of an array of purposes. Blockchain will continue to impact our lives. We are already imagining that blockchain will impact elections since voters' identities and vote counts have been challenging. We can also envision that blockchain will impact us in academia where we need to be able to process admissions, eliminating fraud and checking credentials.

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