BLOCKCHAIN

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An interpretation of thoughts covered by authors of the Harvard Business Review series on blockchain, NFTs and cryptocurrency.

CHAPTERS

INTRODUCTION

You have most likely heard the term "blockchain" or some of its technology, such as the popular cryptocurrency Bitcoin. Maybe you are unaware that Bitcoin is blockchain technology, as are non-fungible tokens or NFTs (digital forms of artwork). There are many misconceptions about blockchain including that it is just a new buzzword. Those who don't fully understand it may see blockchain as an industry disrupter. It does have the potential to change the social constructs of industries like finance and legal services. However, blockchain technology isn't as much a disrupter as it is foundational technology[1].

Much like the internet, which took thirty years to become a significant driver of business competition, blockchain is in its infancy. And just like the internet, blockchain will affect our economic and social systems. It still has decades to go before its true impact reveals itself. Many of us don't have to understand how the internet works in detail or its technicalities to see the potential and reap the benefits. The same is true of blockchain.

Rather than thinking of blockchain as an industry disrupter or cryptocurrency as just a fad, this article aims to discuss the history, benefits, and downsides of blockchain technology while simplifying the concepts to showcase the potential business impacts and use cases for non-technical laypersons. The article includes my interpretation of thoughts covered by authors of the Harvard Business Review on Blockchain[2] and takeaways from my research that reflect my view of the substantial arguments for blockchain.

"Just like the Internet, blockchain technology will affect our economic and social systems."

[1] https://hbr.org/2017/01/the-truth-about-blockchain
[2] https://store.hbr.org/product/blockchain-the-insights-you-need-from-harvard-business-review/10282

01 THE BIRTH OF BLOCKCHAIN

It is hard to believe that Bitcoin, arguably the first truly public blockchain technology, was introduced by Satoshi Nakamoto in his 2008 "Bitcoin: A Peer-to-Peer Electronic Cash System" whitepaper[1]. Nakamoto, who remains unidentified to this day[2], created Bitcoin in response to the financial crises that crippled the global economy in that year. That period saw the rise of distrust of traditional financial institutions. Out of it came the revolutionary idea for a fault-free financial system. The outcome of that revolution was a proposed peer-to-peer generated "cryptocurrency" that was decentralized and secure. This would be a currency created by people, rather than governments. It would also be monitored by the people so that it didn't need to rely on a centralized bank to verify its legitimacy.

To work, cryptocurrencies like Bitcoin need to ensure that nobody spends the same money twice. To verify this without a centralized bank overseeing each transaction, Bitcoin relies on multiple verifiers within its network. This is called "proof of work," which involves all of the computers in the crypto network solving an algorithm and agreeing that any given transaction is indeed legitimate. This process of proof of work and verification is called "mining." Whichever miner solves the problem first, receives the reward of Bitcoin or other cryptocurrency.

However the real promise and power of blockchain is not cryptocurrency. In Alison Berke's article, "How Safe Are Blockchains?[3]" she writes, "blockchain, the distributed ledger technology underlying bitcoin, may prove to be far more valuable than the currency it supports". The second wave of blockchain technology and the one with the most potential is Ethereum, called a "smart contract" and designed by Vitalik Buterin. Unlike Bitcoin, which relies on "proof of work" and mining, this second-generation blockchain requires a different approach called "proof of stake".

The main difference between the two is that proof of stake requires less energy consumption, because rather than asking all the computers in the network to verify each transaction, it chooses one computer at a time and then selects a handful of others to verify. Coinbase[4] accurately sums up the difference by stating, "the exact details vary by project, but in general proof of stake blockchains employ a network of 'validators' who contribute — or 'stake' — their own crypto in exchange for a chance of getting to validate a new transaction, update the blockchain, and earn a reward."

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[1] https://bitcoin.org/bitcoin.pdf
[2] https://en.wikipedia.org/wiki/Satoshi_Nakamoto
[3] https://hbr.org/2017/03/how-safe-are-blockchains-it-depends
[4] https://www.coinbase.com/learn/crypto-basics/what-is-proof-of-work-or-proof-of-stake

02 HOW SECURE ARE BLOCKCHAIN TECHNOLOGY AND CRYPTOCURRENCY?

Most cryptocurrencies are deemed highly secure because the verification process is public, therefore "fault proof" and almost impossible to game. This is based on Byzantine Fault Tolerance[1] which is "a computer system's ability to continue operating even if some of its nodes fail or act maliciously." In other words, as long as the "honest nodes" outnumber dishonest nodes, the blockchain network will stay secure and unaffected by attempts to hack the system.

However, just like cash, cryptocurrency can be stolen or lost. Take for example the case of James Howell[2], who in 2013 accidentally threw away a harddrive that had his bitcoin encryption keys. Howell claims the drive contained 7,500 bitcoins, worth more than $280 million today. Personal digital wallets have also been hacked and cryptocurrencies have been stolen. Some advisors recommend storing cryptocurrency offline or in "cold wallets[3]" to protect them from hackers. Storing cryptocurrency offline still poses the threat of being lost, damaged, or thrown out as in Mr. Howell's case.

"Blockchain is based on Byzantine Fault Tolerance - a computers systems ability to continue operating even if some of its nodes fail or get hacked."

[1] https://www.fool.com/investing/stock-market/market-sectors/financials/cryptocurrency-stocks/byzantine-fault-tolerance/
[2] https://www.cnbc.com/2021/01/15/uk-man-makes-last-ditch-effort-to-recover-lost-bitcoin-hard-drive.html
[3] https://www.bitcoin.com/get-started/setting-up-your-own-cold-storage-bitcoin-wallet/

03 THE FUTURE OF BIG BANKS AND MONEY AS WE KNOW IT

Remember the days when your physical bank was closed after business hours or on weekends? Over time the branches extended their opening hours to adapt to the demand of their customers. Shortly after, on-line-only banks like Tangerine came into the picture and offered no-fee banking and lower interest rates.

Like any business, financial institutions need to stay competitive, for example by offering opportunities for their customers to invest in cryptocurrency. Many of the traditional banks have been slow to release crypto products while newer, digital native companies like WealthSimple have even released a Visa Cash Card[1] that offers rewards in crypto.

Traditional bank transfers can be slow and expensive. However, while cryptocurrencies like Bitcoin may reduce transaction costs to the end user, its environmental impacts are large and first generation block-chains take a lot of compute power to mine. Bitcoin as it's run today is just not sustainable. The damage would escalate if it were to become the standard currency. But if you don't think blockchain is going to drastically impact the financial industry, think again. The New York Stock Exchange is among one of the largest investors in blockchain ventures.

[1] https://www.wealthsimple.com/en-ca/product/crypto

04 THE HARSH ENVIRONMENTAL IMPACTS OF MINING CRYPTOCURRENCY

There are some hard truths about the sustainability of Bitcoin, especially in a world where we are trying to be more conscientious of our environmental impacts. According to the Cambridge Bitcoin Electricity Consumption Index, Bitcoin mining operations worldwide equal the entire annual electricity consumption of Sweden. Just to create a single Bitcoin uses the same amount of energy as an entire American household does every month[1].

This is because the verification process for proof of work requires many computers in the network which in turn require a large amount of energy. Each computer or node uses an algorithm to verify transactions by committing software and hardware resources to solving the cryptographic puzzle. These work much like the Bombe Machines[2] or 'turing machines' did in World War Two, but now there are thousands across the world. The user/machine who solves the puzzle first is rewarded (with a Bitcoin) and the answer to that puzzle creates the next puzzle.

A solution for limiting the environmental impacts of first-generation blockchain technology like Bitcoin, is to swap the energy source from electricity or coal to solar or other clean, more sustainable energy sources. Proof of stake or second-generation blockchain technologies could also favor or award only "green miners[3]" and possibly deny payment or rewards without proof of sustainable energy consumption.

"Just to create a single Bitcoin uses the same amount of energy as an entire American household does every month."

[1] https://www.newyorker.com/news/daily-comment/why-bitcoin-is-bad-for-the-environment
[2] https://en.wikipedia.org/wiki/Bombe
[3] https://www.forbes.com/sites/christopherhelman/2021/08/02/green-bitcoin-mining-the-big-profits-in-clean-crypto/?sh=ad6655034cee

05 IDENTITY THEFT AND EDUCATION VERIFICATION

One of the benefits of blockchain technology is that it is hard to modify or delete blocks that have been added to the chain. This can play an important role in fraud and identity theft. When we think of the ways blockchain can improve the security of personal identification, we can start redesigning personal IDs with the underlying blockchain technology. These would serve a similar purpose as traditional IDs, like social insurance numbers, driving licenses, and university diplomas.

Many companies perform background checks on new hires, not just for criminal records, but also to confirm that the education stated on their resume is valid. Incorporating a proof of stake blockchain technology to issue certificates or diplomas would not only significantly reduce the volume of fraud attempts, but could also provide an immediate proof of validity without the need to hire a company or use software to validate education.

As an example, Google Cloud uses a company called Accredible[1], a comprehensive digital badge and certificate platform built on blockchain to handle its certification programs[2]. It's no surprise that the most advanced universities, including Harvard and UC Berkeley also use blockchain for accreditation.

Although blockchain's 'permanent records' have proven extremely beneficial in verifying identities and reducing fraud, the technology also poses the risk of non-deletable personal data. For example, an individual with a low credit score because of bad financial decisions in their early twenties, shouldn't have to suffer the consequences in their thirties when they are more financially responsible. The current credit score system allows an individual's score to improve over time because it 'forgives and forgets' after years of good financial hygiene. Blockchain is permanent and never forgets, which could negatively impact your credit score forever.

Blockchain may be able to provide a sensible, inexpensive and global means of proving personal identity, but there is potential to do more harm than good to an individual's online identity. Using a technology that never loses data could materially alter the way society views identity and could create an even larger gap between the 1% and the 99%.

[1] https://www.accredible.com/
[2] https://cloud.google.com/certification

06 SUPPLY CHAINS AND CONSCIOUS CAPITALISM

One of the most impactful use cases of blockchain to everyday consumers is supply chain transparency. From verifying that your engagement ring is not a blood diamond to tracing the outbreak of E.coli to the exact seedling on lettuce farm. Blockchain offers the possibility to make this information accessible and verifiable

In 2015, Chipotle, a well known fast food restaurant, had outbreaks of E. coli, salmonella, and norovirus affecting 510 people across the United States. Unfortunately, Chipotle could neither prevent the contamination nor contain it.

Even the FDA conducted tracebacks of multiple widely-distributed ingredients in the Chipotle case[1]. They also conducted investigations of some of their suppliers, but could not find any evidence that those suppliers were the source of the outbreak. Because of this problem, companies like Wal-Mart are already asking their suppliers to start incorporating blockchain to prevent and contain future outbreaks as soon as they present themselves[2].

Conscious capitalism is rising in popularity. Consumers are demanding ethical and environmentally friendly products. Many companies may aim to be sustainable and avoid unethical practices like child labor, but many also exaggerate these values for marketing purposes. Everledger[3], a digital transparency company using blockchain, aims to solve this dilemma by providing technology solutions to increase transparency in global supply chains. One of Everledger's solutions verifies diamonds to eliminate conflict stones, using blockchain to bridge consumption to consciousness in the jewelry industry[4].

" *Blockchain can be used to eliminate conflict diamonds and bridge the gap between conscious consumption many consumers are demanding.*"

[1] https://www.fda.gov/food/outbreaks-foodborne-illness/fda-investigates-multistate-outbreak-e-coli-o26-infections-linked-chipotle-mexican-grill-restaurants
[2] https://fortune.com/2018/09/24/walmart-blockchain-e-coli-salmonella-outbreak-lettuce/
[3] https://everledger.io/
[4] https://everledger.io/how-blockchain-will-bridge-consumption-to-consciousness-in-the-jewelry-industry/

07 IMPROVING MARKETING AND CUSTOMER EXPERIENCE

Many companies are already using data analytics and AI to suggest personalized products to customers. Blockchain is the next evolution in this competitive practice. According to the CMO Survey, only 8% of firms rate the use of blockchain in marketing as moderately or very important. Before becoming overwhelmed, keep in mind that you don't have to build blockchain, but you do have to understand its potential.

To understand how blockchain could help marketers, we first have to understand those marketing tactics or areas it can improve. The goal of any marketing campaign should be to enhance customer experience by being more relevant and less intrusive. Irrelevant email blasts that feel spammy and not personal and almost all pre-roll video advertisements before the video we want to watch are examples of ineffective tactics.

Marketers are well aware that the future of advertising is not "spray and pray" and they need to move beyond spamming people. BUT there also needs to be a shift in the way marketers think about WHO should benefit from their advertising dollars. In the next couple of years we will see more companies like Brave[1], a browser company that blocks cookies and advertisements to its users, while also offering cryptocurrencies to those who agree to watch advertisements. This signals a possible future where advertising involves paying consumers directly for their time. Marketers already provide gift cards and incentives to attend webinars or events, expect this approach to become even more important to your marketing strategy as more companies like Brave enter the market.

" Only 8% of firms rate the use of blockchain in marketing as moderately or very important."

[1] https://brave.com/

08 DeFi AND RENT-TO-RENT INVESTING

DeFi is a relatively new term that is gaining popularity quickly. Its underlying blockchain technology uses proof of stake or smart contracts. The idea behind DeFi is in its name, decentralized finance. It suggests a way for people to forgo the institutions. Instead, it proposes a global, open alternative to existing financial systems. Its products let consumers borrow, save, invest, trade and many other things they could do at a brick-and-mortar bank. It is based on Ethereum (the original smart contract), which is open to everyone and does not require approval by a bank.

One of the most interesting DeFi examples is in real estate investing. Many markets like Toronto and other large cities are becoming almost impossible for first time home buyers to enter as prices surge. Many young professionals have great paying jobs, but cannot meet the 10-20% down payments on million dollar studio apartments.

An interesting and up-and-coming DeFi product is Airbrick[1], a Rent-to-Rent solution that asks for multiple investments from people worldwide into a property which it then leases on AirBnB. The monthly rental income is divided between the investors and paid out instantly though the platform's cryptocurrency. This allows people who cannot afford to get into the housing market by themselves a chance to co-invest in real estate, without the enormous upfront costs and the nuisance of legal paperwork.

"DeFi is a decentralized and alternative finance system available to everyone."

[1] https://airbrick.finance/

09 NFTs: MILLION DOLLAR VIRTUAL PETS AND DIGITAL ART

As a kid, I was obsessed with NeoPets, a virtual game where the player collects unique pets and earns NeoPoints (not real money) to buy more pets and other items. Gen Z however, took the idea of NeoPets and then evolutionized it by turning the concept into an investment game called Crypto Kitties. Here, the player purchases and "breeds" virtual cats, then sells them at auction to receive cryptocurrency. Teens as young as 13 can participate and start saving towards college, as some (very few) Crypto Kitties have sold for over 1 million dollars[1].

Similar to Crypto Kitties, and another NFT example, is NBA Top Shot[2], a market for buying and trading unique virtual NBA player cards as collectibles. NFTs can also include digital artwork and even music, which is working on solving a major threat to artists globally. Current theft of online content (using photography or music that is copyrighted without permission) is a significant problem and the creators can take little action to recoup their losses unless they want to engage in expensive lawsuits. If widely adopted, blockchain technology has the potential to help by establishing a digital ledger documenting who owns the right to individual images, allowing photographers to assert control over their work.

[1] https://www.nftsstreet.com/top-3-most-expensive-cryptokitties/
[2] https://nbatopshot.com/

10 PROTECTING DEMOCRACY AND FIGHTING VOTER FRAUD

All over the world, democracies are being tested. Some even argue that democracy itself is failing and putting our economic systems at risk. Recent elections have escalated debate over the issue of voter fraud. With the digitization of voting, one might think tabulating results would be more secure and accurate than traditional ballots that could be easily miscounted. However, anything connected to the internet opens up the floodgates to hacking which could be an even deeper risk to our democracy.

Sierra Leone was the first country in the world to recognize that the technology behind blockchain could solve voter fraud[1]. In 2018, Sierra Leone commissioned Agora[2], a secure and transparent digital voting company that anonymously stored votes in a blockchain system. The election was the first time a government election used blockchain technology and even offered instant access to the election results.

[1] thttps://techcrunch.com/2018/03/14/sierra-leone-just-ran-the-first-blockchain-based-election/
[2] https://www.agora.vote/

CONCLUSION

In conclusion, it is easy to feel overwhelmed by blockchain technology and its bi-products like cryptocurrency and legal ledgers. You don't have to understand the deep technical details to understand its potential and benefits to your business. However, you have the opportunity to learn from the current use cases and build it into a creative vision for the future of your business.

As a leader you must also be able to communicate your vision to the technical engineers who can deploy the underlying technology. However, it will take true visionaries to see blockchain's absolute potential. The internet was not designed to be a multi-billion e-commerce engine, but rather as a tool for the scientific community to share research between universities and institutions. It solved a very small need then snowballed into a force that revolutionized the entire world. Blockchain is the next foundational technology in that digital revolution.

ABOUT THE AUTHOR

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I'm Sarah Walker-Leptich – and I'm obsessed with the business impacts of data analytics, blockchain, and artificial intelligence.

For 10 years, I've been a technical product and partner marketing expert, where I've focused my time on Google Cloud, AWS, and Cisco. While at Softchoice, my most favored accomplishment has been hosting the first ever customer facing AWS DeepRacer event in Canada, which taught our largest financial customers hands-on technical experience with reinforcement learning.

Outside of work, you can find me building Lego, exploring the night sky with a telescope, or with my head in a book.

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