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INNOVATION

How the Blockchain Can Transform Government

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The blockchain is one of the most significant, fundamental advances in digital platforms since the internet and also probably the most overhyped technology in current times, according to Kevin Werbach, Wharton professor of legal studies and business ethics, at the inaugural annual Penn Wharton Budget Model Spring Policy Forum, held recently in Washington.

"In many ways, the parallels are striking," said Werbach, who worked at the Federal Communications Commission in the late 1990s during the dot-com boom. "This is a new infrastructure baseline technology that can lead to lots of benefits — also, it has lots of problems. Blockchain is now the source of a great deal of fraud, of illegal activity and regulatory arbitrage, but it is also sparking innovation across the world in all sorts of areas."

While most people use the terms Bitcoin and blockchain interchangeably, they are very different things. "At bottom, blockchain is not about money, even though this is the technology underlying Bitcoin and other cryptocurrencies — and it's not fundamentally about destroying governments and replacing them with purely private, decentralized systems, even though it is a system that creates a new kind of decentralized infrastructure," Werbach said. "Fundamentally, blockchain is about something deeper than all of that. It's about trust."

Equifax and the Role of Intermediaries

Last fall, a company most Americans don't know much about was hacked and the private data of 145.5 million people — including their Social Security numbers — was exposed. With its rich repository of private data, credit bureau Equifax became a target of hackers. And the reason why the company and other credit bureaus exist in the first place is due to a lack of trust. Equifax provides credit scores so a bank, car dealer or other lender will have a sense of whether a borrower will pay back a loan.

"The point of Equifax and credit bureaus is not to have credit bureaus," Werbach said. "It's to have a mechanism so that a distributed world of actors, companies and individuals can engage in loan transactions with some sense of what people's creditworthiness is." But imagine if those same transactions can be done without central, trusted intermediaries, "it would be much more secure and be much more efficient," he said. Firms like Equifax charge fees for being an intermediary and going through them also adds delays to a transaction.

The basic idea behind blockchain is that one can trust the system as a whole without necessarily trusting any of the participants, Werbach said. The blockchain is a ledger — record of transactions in a database — distributed to people in a network. Everyone on that network has their own copy of the ledger and be "actually confident, based on mathematical structures of cryptography, that every copy is the same." So even though there is no central intermediary — like Equifax, a bank or the Federal Reserve — all the players in the blockchain network can trust the information.

There is only one ledger in any given blockchain network and everyone works off that record. Each participant gets a copy of the ledger and additions to the record cannot be changed. With all eyes on it, there is no need for a trusted institution to be in the middle to charge fees or delay transactions. "Everyone can maintain their own copy even across different organizations and across different countries," Werbach said. "This seemingly basic abstract idea is what has led to all the excitement and adoption around blockchain and cryptocurrencies."

The excitement around this innovation has pushed the value of Bitcoin to $100 billion around the world while cryptocurrencies in circulation are worth around $300 billion, though down from a high of $750 billion in December 2017, Werbach said. More than $15 billion has been raised in crypto-token offerings in 2017 to 2018. He also cited figures from Gartner projecting that the blockchain is expected to add $176 billion in business value by 2025 and $3.1 trillion by 2030.

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But there are issues to overcome. "It's incredibly early. This is not a mature technology. There's great uncertainty, there are all sorts of problems, even basic technical programs that need to be worked out, and there are all sorts of non-valuable applications," Werbach said. There are "people using this, for example, to commit fraud, or using this capability to engage in money laundering and illegal transactions — and all sorts of regulatory uncertainties." However, he believes that these challenges are "not indications that this technology is fundamentally flawed or is fundamentally fraudulent or a Ponzi scheme at the heart."

Why Blockchain Shows Promise

To be sure, one doesn't need the blockchain to keep a record of transactions. Any centralized database can do the job. "However, there are large swaths of activity where no database will actually get deployed, or actually be successful, because of basic trust problems," Werbach said. Sometimes the level of trust is too limited. For example, two companies that enter into a transaction typically will not trust each other. So, they each maintain a record of the transaction. If it's a more complex deal, they have more copies and have to reconcile them back and forth, he said. That leads to delays, duplication, additional costs and errors.

One example of how the blockchain can improve operations is in supply chains — where goods and services flow among many different organizations around the world. Delays come when the companies in the supply chain are not willing to share their data with each other so there's a lot of back and forth involved. But the blockchain can solve this problem. Werbach pointed to Walmart's use of blockchain to track its produce. Before, if someone got sick from the produce, it would take the retailer 6.5 days to find out which farm it came from. After using the blockchain, "Walmart got it down to 2.2 seconds," he said.

The other potential value of the blockchain is that once a network is set up, it can be a platform for 'smart contracts' to run on top of it, Werbach said. These are software applications that automatically execute the rules programmed into it. For example, a smart contract on a car loan gives the driver ownership rights while he continues to make payments. If he misses payments, the contract would trigger a process to repossess the car and the ownership would revert to the lender — all done without an intermediary such as a repo agent or collection agency.

For the government, smart contracts can have implications on how it can regulate more efficiently. For instance, auditing functions can be embedded in the smart contract itself. "So, audit doesn't have to come in by a third party forensically," Werbach said. "The transactional data can be readily available on the blockchain itself, including to regulators." The government does not have to rely on records a company provides to audit transactions because it can see the record on the blockchain.

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Werbach said two broad approaches comprise the blockchain innovation. One is the crypto-economic system, such as Bitcoin and other cryptocurrency tokens. In this system, the goal and incentives are the cryptocurrency itself. For example, Bitcoin 'miners' expend plenty of electricity and computing power to secure and validate blocks of transactions in a blockchain network. Their reward is Bitcoins. "Bitcoin depends on Bitcoin to incentivize miners who are investing their resources," he said. "Their tokens become an incentive for behavior."

The other approach is what's called "permissioned systems," Werbach said. In this set up, the participants all know each other so there is no need for all the "overhead" of the mining and validation process, he added. "You can create a shared environment. No one's in control [and everyone has the same copy of the ledger]. It's still decentralized but [participants can] much more efficiently use that shared ledger."

Applications for Government

Werbach said at a time when trust in the government is "at an all-time low," systems that don't rely on trust have "tremendous potential." Also, government resources are constrained and so blockchain-based solutions that wring costs out of the system are helpful. Moreover, blockchains tend to be "incredibly secure systems because they decentralize out this process of security and create an alignment of incentives to secure the network," he added. "They're designed around an information security and cryptography paradigm that puts security at the core, and ... they allow for this integral accountability in the system itself."

Critics might question the security of Bitcoins after high-profile thefts at several cryptocurrency exchanges. But Werbach said the blockchain of Bitcoins is quite secure. "Bitcoin is a public $100 billion bank vault. It's out there. Anyone could hack the Bitcoin network. Nobody has been able to do that in nine years of trying," he said. Where Bitcoin has been stolen is "at the edges." For example, when Bitcoin leaves the blockchain vault and goes to an exchange and the exchange gets hacked.

Werbach said using blockchain makes sense for the government because much of what it does is actually record-keeping. "These can be put on a blockchain to make them more secure and more accessible." For example, Cook County in Illinois put its title registration on a blockchain. Once it is recorded, no one can change it. This can be the foundation for smart contracts to handle liens on properties or the need for additional information.

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In Delaware, the blockchain is used for corporate share issuance. When an investor buys a stock, it is technically owned by the Depository Trust and Clearing Corp. "If you owned that stock, the system would grind to a halt because you'd have to trade the physical stock certificates back and forth each time," Werbach said. That's why Delaware used the blockchain. And the company has the added benefit of seeing all its investors in real time.

West Virginia just did a pilot test to use the blockchain for voting in its recent primary. The target was military service members deployed overseas. "If someone's on an aircraft carrier, it's hard to get them an absentee ballot to vote in a primary," Werbach said. The state hired a vendor to create a system that lets overseas military securely vote using a mobile device and it's all recorded on a blockchain. "This potentially uses the immutability of the blockchain as well as native digital accessibility," he said.

But Werbach acknowledged that security experts have concerns about using it for voting. "The question is, where is the real challenge? Is the problem of information security in elections the core record, or all the things around the edges?" The blockchain might be secure, but if there's malware on a voter's mobile phone that is used to cast a ballot, maybe it could change the vote. "Blockchain at the core doesn't necessarily solve that problem."

Another use of the blockchain by government is for distribution of benefits. Here, Werbach cites the example of the United Nations World Food Programme that provided cash transfers to Syrian refugees in Jordan. Not only did the blockchain system save money by avoiding bank fees, it enabled the refugees to buy food from local merchants through a biometric scan of their eye. They didn't need any physical cash, vouchers or electronic cards.

Compliance is another area where governments using the blockchain can boost efficiency by eliminating some of the intermediaries, Werbach said. For example, tax collection goes through several intermediaries and steps. "Putting it all on one ledger potentially eliminates those and creates this environment where regulators can get direct access to the transactional data," he said. It has "great potential for a whole variety of regulatory contacts where traditionally the process of keeping track of activity was something that had to happen after the fact."

Government borrowing also can be transformed by the blockchain, Werbach said, citing the example of Berkeley, Calif. In May, city officials voted to issue 'micro-bonds' in denominations of $10 to $25 to raise money for community projects. The typical muni bond size is $5,000 at the minimum. Typically, finance fees for issuing muni bonds is such that it would not be feasible for small amounts. But the blockchain cuts those costs because it lets the government deal directly with the buyer. Vice Mayor Ben Barlett reportedly said combining 'micro-bonds' with blockchain is "meant to get around Wall Street."

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The Berkeley pilot doesn’t “require centralized intermediaries, the value transfer happens directly and potentially allows for much more efficient transactions and allows for much smaller value transactions with direct maintenance and tracking of the information,” Werbach said. “Smart contracts … can be used to manage, track and implement the interest rate process, the repayment process and securitization process of these bonds.” Indeed, government using the blockchain platform for all types of functionalities could yield “new kinds of innovation,” he said.

To be sure, blockchain is still in its early stages. “Many of these will fail. But if you could go back 25 years ago, to the early 1990s, and you knew what the internet was going to become … what kind of bets would you make? It took 20 years for all this to unfold,” Werbach said. “Something similar will happen with blockchain. We’re at that point now where we can start to see the potential, and so therefore this is the time for public sector agencies as well as enterprises in the private sector to start to experiment and figure out where the real opportunities are, where this technology can actually solve problems in new kinds of ways. So that’s where we are today and it’s a very exciting time.”
