Working as a layer on top of the internet, blockchain is an instrument of change

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The blockchain is simply part of the continuation of the history of Internet technology, represented by the Web, as it carries on its journey to infiltrate our world, businesses, society, and government. Whereas the Internet was first rolled out in 1983, it was the World Wide Web that gave us its watershed evolutionary moment, because it made information and information-based services openly and instantly available to anyone on earth who had access to the Web.

At its core, the blockchain is a technology that permanently records transactions in a way that cannot be later erased but can only be sequentially updated, in essence keeping a never-ending historical trail. This seemingly simple functional description has gargantuan implications. It is making us rethink the old ways of creating transactions, storing data, and moving assets, and that's only the beginning.

To fully understand the blockchain, you need to look at it simultaneously from a business, technical and legal perspective. Technically, the blockchain is a back-end database that maintains a distributed ledger that can be inspected openly. Business-wise, the blockchain is an exchange network for moving transactions, value, and assets between peers, without the assistance of intermediaries. Legally, the blockchain validates transactions, replacing previously trusted entities. Let's dive further into the technology aspect of the blockchain.

Blockchain as a Meta Technology

Blockchain is not just any new technology. It is a type of technology that challenges other existing software technologies, because it has the potential to replace or supplement existing practices. In essence, it is technology that challenges and changes other technology.

Therefore, the blockchain can be seen as a "meta technology" because it is made up of several technologies itself. It is as an overlay of computers and networks that are built on top of the Internet. When you examine the architectural

layers of a blockchain, you will find it is comprised of several pieces: a database, a software application, a number of computers connected to each other, clients to access it, a software environment to develop on it, and tools to monitor it.

The last time we witnessed such a catalytic technology dates back to the Web's arrival. The Web changed how we wrote software applications, and it brought along with it new software technology that challenged and replaced previous ones. In 1993, HTML, a markup language, changed publishing. In 1995, Java, a Web programming language changed programming. A few years earlier, TCP/IP, a computer network protocol had started to change networking by making it fully interoperable, globally.

From a software development point of view, one of the biggest paradigm shifts that the blockchain claims is in challenging the function and monopoly of the traditional database as we currently know it. Therefore we need to deeply understand how the blockchain makes us rethink the existing database constructs.

The blockchain is changing how we write applications via a new form of scripting languages that can program business logic as smart contracts that are enforced on the blockchain.

The Web could not exist without the Internet. And blockchains could not be without the Internet. The Web made the Internet more useful, because people were more interested in using the information, than figuring out how to hook up computers together. Blockchain applications need the Internet, but they can bypass the Web, and give us another version that is more decentralized, and perhaps more equitable. That is one of the biggest promises of blockchain technology.

The Arrival of Blockchain Applications

Another way to see continuity in technology's evolution is by depicting the various phases of the Web's evolution, and seeing that the blockchain is yet another new phase, focused on peer- to-peer, trust-based asset transactions. Let us remember the key mini-revolutions that the Internet brought us since 1994: personal communications, self-publishing, e-commerce, and the social web. In hindsight, each of these four phases was defined by the functions they disrupted: the post-office, print media, supply chains/physical stores, and the real world.

The irony of this situation is that blockchain-based applications can replace any Web application. Although we think the Web brought us information publishing, communications and e-commerce, those very functions will be threatened by new versions that rest on peer-to-peer protocols anchored by blockchain technologies.

There is more than one way to build blockchain applications. You can build them natively on a blockchain, or you could mix them in an existing Web application, and we will call that flavor "hybrid blockchain applications."

Since the Internet is comprised of a public version and several private variations, blockchains will also follow that path. Therefore, we will have public and private blockchains. Some will be natively bolted to a blockchain, whereas others might be a hybrid implementation that is part of an existing Web or private application.

Here are some leading examples from these 4 categories:

- *Public Native Apps:* OpenBazaar, a peer-to-peer, decentralized e-commerce protocol that allows any one to buy or sell goods and services without central intermediaries or gatekeepers.
- *Public Hybrid Apps:* Steemit, a decentralized Reddit that has its own blockchain and tokenized incentives, but also depends on the web's social media networks.
- *Private Native Apps:* Clearmatics, a new decentralized clearing network that will allow custodians and end-users to settle securities trades in financial OTC markets, supported by smart contracts.
- *Private Hybrid Apps:* R3, a consortium of financial services organizations that is deploying distributed ledger technology inside the existing financial networks between institutions.

These are just a few lighthouse examples, but they represent the direction for where blockchain applications are going.

Implementing the blockchain is still a new competency. The uncertainties, however, cannot be used as an excuse to hold up what must be done. Blockchains are instruments of change. If we miss their higher calling, we would be falling short of realizing their fullest potential.

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Notes:

- *This article is based on the book* **The Business Blockchain: Promise, Practice and Application of the Next Internet Technology** *(Wiley, June 2016)*
- *The post gives the views of its author, not the position of LSE Business Review or the London School of Economics.*
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