



The Blockchain Revolution

Publish Date:

December 2017

Economists explain the far-reaching implications of blockchain technology on society and on how we are governed.

A blockchain is a digital, decentralised, distributed ledger. This year saw a meteoric rise in interest in cryptocurrencies and the blockchain technologies that power them. Even the government is now interested. There's now a Commonwealth Parliamentary Friends of Blockchain group, and one blockchain energy start-up received an \$8 million 'Smart Cities and Suburbs' grant.

But what is blockchain technology, and why does it matter? Most explanations for the importance of the blockchain start with Bitcoin and the history of money. But money is just the first use of the blockchain. And it is unlikely to be the most important.

It might seem strange that a ledger—a dull and practical document associated mainly with accounting—would be described as a revolutionary technology. But the blockchain matters because ledgers matter. Blockchains have the potential to make markets more efficient, to



decrease the size and scope of government, and generally improve our lives.

LEDGERS ALL THE WAY DOWN

Ledgers are everywhere. Ledgers do more than just record accounting transactions. A ledger consists simply of data structured by rules. Any time we need a consensus about facts, we use a ledger. Ledgers record the facts underpinning the modern economy.

Ledgers confirm ownership. Property title registers map who owns what and whether their land is subject to any caveats or encumbrances. The firm is a ledger, as a network of ownership, employment and production relationships with a single purpose.

Ledgers confirm identity. Businesses have identities recorded on government ledgers to track their existence and their status under tax law. The register of Births, Deaths and Marriages records the existence of individuals at key moments, and uses that information to confirm identities when those individuals are interacting with the world.

Ledgers confirm status. Citizenship is a ledger, recording who has the rights and is subject to obligations due to national membership. The electoral roll is a ledger, allowing (and, in Australia, obliging) those who are on that roll a vote. Employment is a ledger, giving those employed a contractual claim on payment in return for work.

Ledgers confirm authority. Ledgers identify who can validly sit in parliament, who can access what bank account, who can work with children, who can enter restricted areas.

At their most fundamental level, ledgers map economic and social relationships.

Agreement about the facts and when they change—that is, a consensus about what is in the ledger, and a trust that the ledger is accurate—is one of the fundamental bases of market capitalism.

THE EVOLUTION OF THE LEDGER

For all its importance, ledger technology has been mostly unchanged ... until now.

Ledgers appear at the dawn of written communication. Ledgers and writing developed simultaneously in the Ancient Near East to record production, trade, and debt. Clay tablets baked with cuneiform script detailed units of rations, taxes, workers and so forth. The first international 'community' was arranged through a structured network of alliances that functioned a lot like a distributed ledger.

The first major change to ledgers appeared in the fourteenth century with the invention of double entry bookkeeping. By recording both debits and credits, double entry bookkeeping conserved data across multiple (distributed) ledgers, and allowed for the reconciliation of information between ledgers.



The nineteenth century saw the next advance in ledger technology with the rise of large corporate firms and large bureaucracies. These centralised ledgers enabled dramatic increases in organisational size and scope, but relied entirely on trust in the centralised institutions.

In the late twentieth century ledgers moved from analog to digital. For example, in the 1970s the Australian passport ledger was digitised and centralised. A database allows for more complex distribution, calculation, analysis and tracking. A database is computable and searchable.

But a database still relies on trust; a digitised ledger is only as reliable as the organisation that maintains it (and the individuals they employ). It is this problem that the blockchain solves. the blockchain is a distributed ledger that does not rely on a trusted central authority to maintain and validate the ledger.

BLOCKCHAIN AND THE ECONOMIC INSTITUTIONS OF CAPITALISM

The economic structure of modern capitalism has evolved to service these ledgers.

Oliver Williamson, the 2009 Nobel laureate in economics, argued that people produce and exchange in markets, firms, or governments depending on the relative transactions costs of each institution. Williamson's transactions cost approach provides a key to understanding what institutions manage ledgers and why.

Governments maintain ledgers of authority, privilege, responsibility and access. Government is the trusted entity that keeps databases of citizenship and the right to travel, taxation obligations, social security entitlements, and property ownership. Where a ledger requires coercion in order to be enforced, the government is required.

Firms and governments can use blockchains to make their work more efficient and reliable. Multinational firms and networks of firms need to reconcile transactions on a global basis and blockchains can allow them to do so nearinstantaneously. Governments can use the immutability of the blockchain to guarantee that property titles and identity records are accurate and untampered. Well-designed permissioning rules on blockchain applications can give citizens and consumers more control over their data.

But blockchains also compete against firms and governments. The blockchain is an institutional technology to maintain ledgers— that is, coordinate economic activity—distinct from firms and governments.

Blockchains can be used by firms, but they can also replace firms. A ledger of contracts and capital can now be decentralised and distributed in a way they could not before. Ledgers of identity, permission, privilege and entitlement can be maintained and enforced without the need for government backing.

THE ECONOMIC CONSEQUENCES OF THE BLOCKCHAIN



Blockchains are an experimental technology. We probably haven't yet seen the blockchain 'killer app' yet—the application which will launch blockchain technology into the mainstream. But we know the global economy faces (what we expect will be) a lengthy period of uncertainty about how the facts that underpin it will be restructured, dismantled, and reorganised.

The blockchain economy puts pressure on government processes in a whole host of ways, from taxation, to regulation, to service delivery.

The implications for big business are likely to be just as profound. The ability to write 'smart' contracts on the blockchain means that entrepreneurs and innovators will be able to maintain ownership and control of their human capital and profit at the same time. The nexus between operating a successful business and access to financial capital has been weakening over time, but now might even be broken.

THE BLOCKCHAIN ECONOMY PUTS PRESSURE ON GOVERNMENT
PROCESSES IN A WHOLE HOST OF WAYS, FROM TAXATION, TO REGULATION,
TO SERVICE DELIVERY.

How that unfolds is unclear at present. Entrepreneurs and innovators will resolve uncertainty, as always, through a process of trial and error. No doubt great fortunes will be made and lost before we know exactly how this disruption will unfold.

But ledgers are so pervasive— and the possible applications of the blockchain so all-encompassing— that some of the most fundamental principles governing our society are up for grabs.