Chapter 1
Introduction

Distributed ledger technology (DLT), more commonly called "blockchain," has captured the imaginations and wallets of the financial services institutions. A blockchain is defined as a decentralized, continuously growing list of records, called "blocks," across a peer-to-peer network that are linked and secured using cryptography. Each block typically contains a cryptographic hash of the previous block, a timestamp, and transaction data, and contains the information from all previous blocks and transactions to create a network or chain. Once the blockchain processes the information, every computer in the network locks in at the same time, creating a permanent, hard to alter digital record. Each blockchain system determines who can add new blocks to the chain, and how the procedure is done. (Lee Kuo Chuen 2015)

Blockchain offers special qualities that make it better than traditional database as shown in Fig. 1.1.

An important feature of a blockchain is that it is resistant to modification or changes to the data. It is a decentralized, distributed ledger system that can record transactions between two parties efficiently and in a verifiable way. Blockchain is typically managed by a peer-to-peer network and is verifiable using a consensus-based approach for keeping the ledger accurate (Fig. 1.2). The nature of the transaction is immediately transparent on the entire blockchain. Transactions use cryptographic protocols to ensure that the recorded data in any given block cannot be altered retroactively without the alteration of all subsequent blocks, which requires collusion of the network majority (Chang 2017). As a result, the most important feature of blockchain is that it cannot be corrupted. Altering any unit of information on the blockchain would be difficult to impossible (Zheng et al 2017). Blockchain is the biggest development in information technology. For the first time in human history, we are able to create a permanent record of every transaction, governed by the unyielding laws of mathematics.

According to Google Trends, Bitcoin Internet searches were double the Blockchain searches in early 2018. Google Trends suggests that 'Bitcoin' is nearly
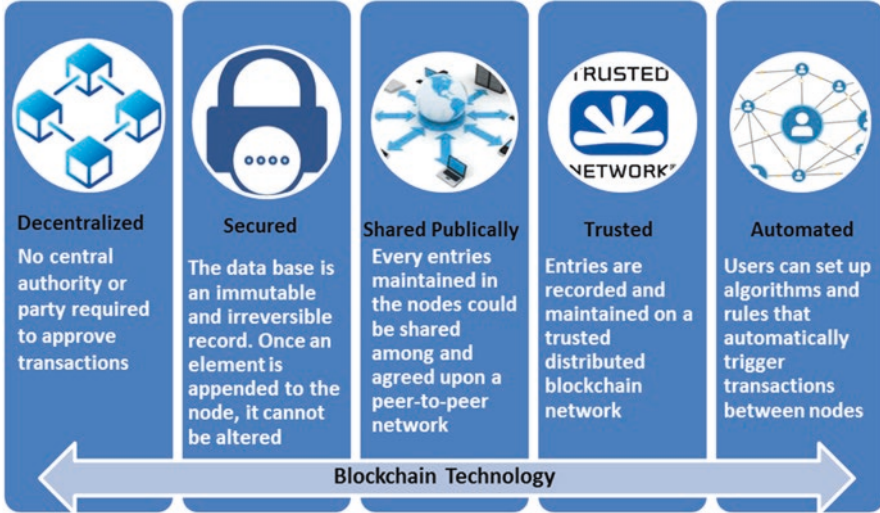
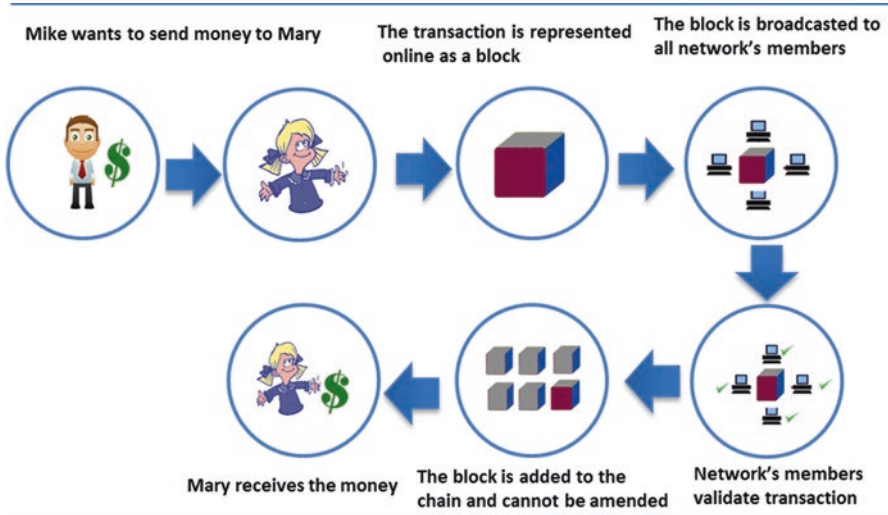**Fig. 1.1** Special qualities of blockchain

Fig. 1.2 The distributed ledger

10-times more popular than terms like 'cryptocurrency' and 'blockchain.' Bitcoin was ranking high (Top 10) on Google Trends, hitting over 100K+ searches in the beginning of 2018. In light of these data, it can be said that the interest in blockchain on Google seems to be related to the interest in bitcoin and cryptocurrencies (Cavicchioli 2019). China was one of the countries with the most searches for the word blockchain. However, since early 2018, popularity of bitcoin on Google search has decreased and the gap between blockchain and bitcoin has decreased.

HSBC, one of the world's largest banking and financial services firms, commissioned a study of more than 12,000 people in 11 countries and territories looking at their perceptions and use of technology. Among the people surveyed, 60% had never heard of blockchain technology, and 80% of those who had could not explain how it works. However, blockchain is making significant headways into the finance and trade industries (HSBC 2017).

In 2016, World Economic Forum (WEF) released a report regarding the future of financial infrastructure that was based on over 12 months of research, engaging industry leaders and subject matter experts. Creating this report involved extensive outreach and dialogue with the financial services community, innovation community, technology community, academia, and the public sector. The project explored the landscape of disruptive innovations in financial services, and its findings included (World Economic Forum 2016):

- Many banks experimented with blockchain. 80% of banks planned to initiate DLT projects by 2017
- 90+ central banks engaged in DLT discussions worldwide
- Global interest in blockchain was increasing. 24+ countries were investing in DLT
- Blockchain research was also on the rise. 2500+ patents filed over the 2013–2016 period
- Venture capital investment in blockchain was on the rise, with over $1.4 billion in investments over the 2013–2016 period
- Consortium efforts increased substantially. 90+ corporations joined blockchain consortia
- 10% of global gross domestic product (GGDP) will be held in blockchain technology

The analysis has yielded six key findings regarding the implications of blockchain-based technology on the future of financial services:

- Blockchain has great potential to reduce costs and increase efficiencies through the establishment of new financial services processes
- The technology should be viewed as one of many technologies that will form the foundation of next generation financial services infrastructure
- Blockchain-based financial services infrastructure will redraw processes and call into question orthodoxies that are foundational to today's business models
- Blockchain has potential applications in different industry, each leveraging the technology in different ways for a diverse range of benefits
- Digital Identity, a critical enabler offered by blockchain, has broader applications. Blockchain-based technology has the ability to amplify benefits.
- Successful blockchain applications require deep collaboration between incumbents, innovators, and regulators, adding complexity and delaying implementation.

Harvard Business Review considers blockchain a foundational technology, akin to the computer networking technology of the 1970's that laid the groundwork for

the development of the Internet (Iansiti and Lakhani 2017). Gartner, the world's leading information technology research and advisory company, estimates the impact of blockchain on the world economy will grow to slightly over $360 billion by 2026 and will be on the order of $3.1 trillion by 2030. Gartner encourages Chief Information Officers (CIOs) to embrace blockchain to explore strategic business initiatives, capture future value, and mitigate competitive threats. Google, Intel, and Microsoft have already put $4.5 billion towards blockchain adaption (Panetta 2018b). According to one recent survey by WEF, 10% of global gross domestic product will be held in blockchain technology by 2027 (World Economic Forum 2016). In a 2017 IBM survey of 200 global banks and 200 other global financial markets, nearly 65% of banks surveyed were expecting to have blockchain solutions in production by the end of 2020 (Parker 2017). Similarly, Goldman Sachs Investment Research projects that the implementation of blockchain technology could streamline the clearing and settlement of cash securities, saving capital markets $2 billliom in the US and $6 billion globally on an annual basis. Finally, according to an Aite Group prediction, investment in new blockchain-enabled financial technologies will reach $400 million by 2019 (Accenture 2019).

It is necessary for CIOs to understand what blockchain is, how the technology works, and how it can be utilized to further mission-critical business priorities. However, according to a Gartner 2018 CIO Survey, only 1% of CIOs surveyed indicated any kind of adoption, and only 8% were in short-term planning and pilot execution. The majority of responding CIOs (77%) said their enterprise had no action planned to investigate or develop the technology (Panetta 2018a).

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