

Chapter 2

The Evolution of Blockchain



In his 2016 book, Mougayar analogized the evolution of blockchain to the World Wide Web. He argued that before the Web, we had the Internet—the network connecting computers. The Web came along a few years later and was the first layer on top of the Internet and allowed us to put content on the Internet that was easy to visualize, publish on, and share. More features were added to the Web including ecommerce, communication, and social media. Blockchain technology is a new layer that sits on top of the Internet, yet doesn't need the World Wide Web—it is on par with the Web. On the long-term, blockchain has the potential to be of the same magnitude of the Web as a space — similar to what the Web gave us back in 1993–1994. (Mougayar 2016).

The following section provides a timeline for blockchain from inception to maturity. The rise of cryptocurrencies is also discussed. Fig. 2.1 summarizes the development history of blockchain. The rise of blockchain can be divided into two periods—creation and growth, as discussed below:

Creation (2008–2010)

Blockchain was introduced in 2008 by a person or group of people known by the pseudonym Satoshi Nakamoto in a paper titled, “Bitcoin: A Peer-to-Peer Electronic Cash System” (Nakamoto 2008). The author(s) laid out the framework for blockchain and detailed methods of using a peer-to-peer network to generate a financial database, “a system for electronic transactions without relying on trust.” This database would contain digital records—or blocks of transactions—using a secured method of cryptography. On January 2009, Satoshi Nakamoto mined the first bitcoin transaction: the Genesis Block (block number 0), which had a reward of 50 bitcoins (Wallace 2011). The first bitcoin transaction took place between Satoshi Nakamoto

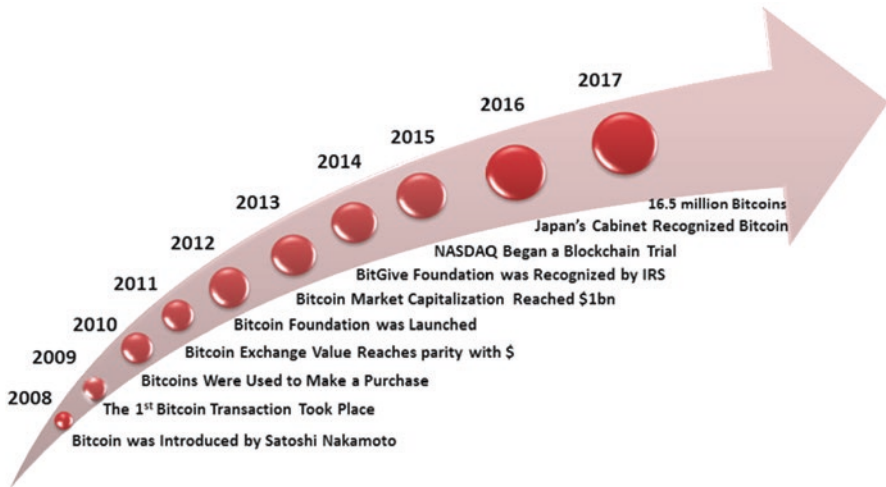


Fig. 2.1 Bitcoin and blockchain from inception to maturity

and a programmer named Hal Finney, the first supporter, adapter, and contributor to bitcoin, on 12 January 2009 (Peterson 2014). The first bitcoin exchange market was established in October of that year. In 2010, bitcoins were used to make the first purchase of a product. 10,000 bitcoins were used to buy two pizzas from Papa John's (Wallace 2011).

Growth (2011–2018)

In 2011, other cryptocurrencies started to emerge. A non-profit group, the Electronic Frontier Foundation, started accepting bitcoins. Additionally, Bitcoin's exchange value reached parity with the U.S. dollar (Rainey 2011). In 2012, a global bitcoin payment service provider, BitPay, reported having over 1000 merchants accepting bitcoin under its payment processing service (Browdie 2012). In November, an open source web company, WordPress, started accepting bitcoins (Skelton 2012). In the same year, the Bitcoin Foundation was launched to provide standardization, protection, and promotion of bitcoin as the open source protocol (Matonis 2012). In 2013, the market capitalization of bitcoin reached \$1 billion, and it was announced that the first bitcoin charity, BitGive Foundation, would be established. Additionally, companies like WooCommerce began to process online orders made with bitcoin. In 2014, the BitGive Foundation was recognized by the IRS as the first bitcoin charitable organization and was granted 501(c)(3) status (Macheel 2014). The number of merchants and

organizations accepting bitcoin increased at a rapid rate. For example, BitPay announced that 12,000 merchants had signed up for their service (Burniske 2015). The Sacramento Kings announced that they would accept bitcoin as a form of payment for tickets and merchandise (Rovell 2014). By 2015, it was estimated that 160,000 merchants accepted bitcoin payments. In the same year, NASDAQ began a blockchain trial (Burniske 2015). In 2016, the Cabinet of Japan recognized bitcoin as having a function similar to real money (Kyodo 2016), and Russia legalized the use of bitcoin (Kharpal 2017). The number of bitcoin ATMs reached 771 worldwide (Buntinx 2016). In 2017, the number of businesses accepting bitcoin continued to increase. The number of bitcoins in circulation reached 16.5 million (Linuma 2017). Bitcoin has gained more legitimacy among financial companies.

The Rise of Cryptocurrencies

Around the same time blockchain was introduced to the public, a digital currency called bitcoin was proposed. Bitcoin is a cryptocurrency that allows peer-to-peer transactions without third party involvement. Bitcoin is the first application of blockchain technology that emerged in 2009, and the most widely used cryptocurrency in the world. At the moment, it has the highest market capitalization and highest value per unit. Bitcoin was rated as the top performing currency in 2015 (Desjardins 2016) and the best performing commodity in 2016 (Adinolfi 2016). At the end of 2016, the value of bitcoin transactions hit \$92 billion compared with the \$411 trillion in total global payments (Iansiti and Lakhani 2017). Bitcoin's biggest year was 2017 where the currency processed \$2 billion worth of transactions per day (Torpoy 2017). Bitcoin is growing fast and increasingly important in contexts such as instant payments and foreign currency and asset trading, where the present financial system has limitations.

The evolution of bitcoin price index from April 2017 to April 2019 was very volatile. The price index is calculated by taking an average of bitcoin prices across leading global exchanges. The bitcoin price index was \$1349.19 in April 2017. The highest bitcoin index value was \$13,860.14 in December 2017. The index lost nearly 36% of its value from January to December 2018. However, it seems the index value is increasing in 2019. The bitcoin index value for the end of April 2019 amounted to \$5151.43 (Statista 2019).

There are more than 1500 cryptocurrencies people can mine or exchange for money. According to some estimates, the total cryptocurrency market cap will be \$1 trillion by the end of 2019. The act of discovering new crypto coins (or digital coins) is called mining. The process of mining crypto coins is complex and time-consuming. To mine crypto coins, a high-powered computer solving complex mathematical equations is required. The miner gets a block reward, paid out in virtual coins, when they solve one of the equations.

Obstacles to Rapid Adoption

According to Gartner, blockchain's underlying concepts are misunderstood, its current tools are immature, and their application in mission-critical business operations is unproven (Tucci 2018). Similarly, IBM surveyed 200 financial institutions in 16 countries on the barriers to implementing blockchain technology. The top three barriers identified were regulatory constraints, immature technology, and lack of a clear ROI. Insufficient skills, lack of executive buy-in, and insufficient business cases were also mentioned as other relevant barriers (Yerramsetti 2017).

Awareness of DLT has grown rapidly, but significant hurdles remain to large-scale implementation. Those include (WEF 2016):

- An uncertain and inharmonious regulatory environment
- Lack of collective standardization efforts
- An absence of formal legal frameworks

For the blockchain revolution to be successful many barriers—technological, governance, organizational, and even societal—will have to be removed (Iansiti and Lakhani 2017). These barriers and hurdles are discussed below:

1. **Lack of Understanding and Trust in Technology:** According to an HSBC's survey, blockchain is the least understood new technology, followed by robo-advisor (automated investment advice). The study indicates that in order to establish trust and accelerate adoption, it is essential to increase people's knowledge and understanding of new technologies, build predictability, and reassure users about security (HSBC 2017). Current blockchain technology is neither scalable nor complete (Tucci 2018).
2. **Data Interoperability:** Since blockchain is a DLT, the need to agree on the structure and format of the data could pose a challenge (Tucci 2018).
3. **Solution Challenge:** Building a flexible blockchain-enabled application that is integrated with a company's business processes requires enormous resources. Many companies cannot afford to allocate those resources (Tucci 2018).
4. **Security Vulnerabilities:** Blockchain code is still in its early stages and might be liable to security vulnerabilities and hackers attack. Another risk for blockchain is the double-spending attack where an attacker goes on to make more than one transaction while utilizing only one coin and discrediting the "fair" exchange (Pinto 2019).
5. **Regulatory Environment:** An uncertain and inharmonious regulatory environment is stalling adoption. The global management consulting firm McKinsey & Company identified decentralized ownership, international justification, and encryption and user anonymity as other challenges to unlocking the potential value of blockchain (McKinsey and Company 2017).
6. **Formal Legal Frameworks:** Absence of formal legal frameworks adds complexity and could delay implementation.
7. **Collaboration:** According to World Economic Forum's analysis, successful applications of blockchain require deep collaboration between incumbents,

- innovators, and regulators (WEF 2016). Businesses will need a network of business partners to make blockchain applications viable. Getting competitors to cooperate could be challenging (Tucci 2018).
8. **Slow Bitcoin Processing:** The existing network for blockchain currencies can only process a handful of transactions per second. A bitcoin transaction could take from minutes to an hour. Storage methods and processing capability of blockchain networks need to be improved for mass adoption of blockchain currencies.
 9. **Energy Footprint:** While blockchain is a game-changing technology, mining bitcoins requires enormous amounts of energy output. According to a 2014 study, the power used for bitcoin mining was likely to take up as much electricity consumption as the entire country of Ireland in 1 year. (O'Dwyer and Malone 2014).

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