

Executive Summary

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The Internet of Value

Five decades ago, the birth of the Internet revolutionised the way information is produced and shared. Prior to that, people resorted to disconnected channels, such as direct person-to-person communication or postal, telegraph and telephone (PTT) services, to transmit information. Through its communication protocol, the Internet makes information easily and immediately accessible across the globe, irrespective of physical location or users' native language. Today, the Internet has become the pathway for people to create, store, retrieve, curate and exchange any sort of data.

Despite the advancement in the exchange and transmission of information, the exchange and transmission of "money" – or, in a broader sense, "value" – continue to be siloed. Our long-standing, traditional banking system fundamentally controls monetary activities. Although payment gateways such as Paypal and Stripe allow people to conduct certain types of monetary transactions inexpensively on the Internet, it remains a challenge to conduct all types of transactions people and firms need. This is particularly so for those transactions involving substantial amounts and underprivileged users from unbanked regions.

Eleven years ago, blockchain technology emerged, changing the fragmented nature of our monetary system. The technology gives control over value flows to value holders by eliminating conventionally trusted intermediaries such as banks and escrows, and by allowing all participants of the value network to contribute to the operations of the network. Peer-to-peer transactions surpassing regional and economic infrastructure restrictions become possible.

More recently, the advent of smart contracts has led to further efficiency enhancement of the value network on blockchain. A smart contract ensures that value transactions automatically occur following pre-programmed rules without human intervention. In tandem with the Internet of Things (IoT) technology, smart contracts enable machine-to-machine value transactions on blockchains. As such, value can be created, stored, retrieved, curated and exchanged swiftly and cheaply within the blockchain ecosystem just like information, forming the Internet of Value (IoV).

The motivation for this report

Late 2017 witnessed a tulipmania-like craze for blockchain due to the skyrocketing price of cryptocurrencies and the high expected return of Initial Coin Offerings (ICO). However, the enthusiasm quickly waned when investors realised the pervading scams and frauds associated with ICOs. The overall price level of cryptocurrencies plummeted subsequently, and the reputation of the companies in the blockchain sector suffered. The mantra "we have a new technology, now we need to find the problem" was not fulfilled.

Unfortunately, conventional wisdom still equates blockchain with cryptocurrency and fails to see a wide range of uses for the technology beyond this. To date, cryptocurrency trading is mostly speculative, resulting in high price volatility and scepticism about the underlying technology.

Against this background, the University College London Centre for Blockchain Technologies (UCL CBT) put together a team of industry and academic experts to work together for six months to provide a variety of perspectives on:

- The massive potential of the technology that can drive the establishment of the IoV;

- Blockchain's component pieces that enable the IoV, including smart contracts, cryptography and various consensus mechanisms;
- Specific protocols that propel the development of the IoV such as XRP and IOTA.

Key takeaways

The most important key takeaways from this report are summarised below (see the corresponding sections for the original research articles).

- **The IoV can be defined as the instant transfer of assets expressible in monetary terms over the Internet between peers without the need for intermediaries.** The IoV can grow in the new distributed ledgers paradigm, where digital assets, namely digital representations of claims on material or immaterial assets from the physical world, remain unique. At the same time, their ownership and usage licenses are being exchanged, sent, copied and updated without a trusted central authority. [Chapter 2]
- **The mission of the IoV is to exchange any amount of value as quickly and fluidly as information is exchanged today.** Value creation, measurement and exchange will remain at the core of human society, and harnessing the IoV will be its most critical success factor. [Chapter 4]
- **The IoV forms a Value Web of relationships that remove the silos of existing data structures and networks.** The IoV reduces barriers to entry, introducing a borderless economy. [Chapter 4]
- **The IoV is fundamentally enabled by blockchain.** Ensuring trust and transparency, blockchain allows new e-commerce business models to achieve quick transfers of value, whether monetary, social or perceived customer value. Across retail and consumer goods industries, collectively known as consumer markets, the areas subject to potential disruption include Loyalty, Direct to Consumer, Servitisation, Sustainability, and the areas of Data and Self-sovereign Identity. [Chapter 5]
- **Merging the IoT with blockchain technology enables more efficient machine-to-machine transactions, further enhancing the IoV.** As such, data can be logged in a verifiable, encrypted and tamper-proof fashion, and can be processed by self-executing machines. The network of interconnected devices will be able to interact with their environment and make decisions without any human intervention via the deployment of smart contracts. [Chapter 1]
- **Advancements in artificial intelligence and 5G drive the evolution of the IoT.** The emergence of 5G will ensure low network latency, one of the critical requirements of most of the use cases with IoT. The development of artificial intelligence will play a key role in automating complex decision-making processes. [Chapter 6]
- **The removal of intermediaries in combination with increased information transparency leads to a mitigation of the so-called principal-agent problem** whereby agents possess all relevant information and act in their own best interests rather than in those of the principals. The IoV helps to reduce this specific problem by applying smart contracts as well as by giving principals advanced options to monitor transactions. [Chapter 2]
- **New IoV businesses can take the form of decentralised autonomous organisations (DAOs) through an optimised governance structure that incorporates decisions made by both**

computers and humans. The technological innovation inevitably unlocks new ways of doing business in finance that result in the realisation of one big aim: cost saving. By leveraging these new technologies, most of the legacy cost, including labour overhead and cost incurred due to human errors that financial institutions bear in their balance sheets, can be cut to the bone. [Chapter 3]

- **Everything that can be tokenised will eventually be tokenised – this is the foundation of the IoV.** Tokenisation increases an asset's moneyness, i.e. the degree to which an asset approximates cash and can thus be used as a medium of exchange. An asset in its tokenised form can be exchanged with little impact on its value and at low cost. [Chapter 4]
- **Through reliance on purely virtual tokens, DLT sidesteps the complications of bridging the real/virtual divide:** a purely virtual system can address “truth” through self-containing consistency. Once the distributed ledger achieves consensus about who is entitled to control a tokenised asset, this is sufficient to effectively establish ownership in the practical sense. [Chapter 3]
- **Global central banks could cooperate to reap the benefits of recent technological advances.** Early examples of synthetic central bank digital currency (sCBDC) will drive more central banks to reactively follow suit and launch their versions in partnership, either with each other or with private actors, despite the current low appetite for global economic cooperation. To cater to the new trend and remain competitive, centralised digital currency issuers will likely provide new on-ramping options and exchange pairs with decentralised cryptocurrencies, leading to their true mass adoption. The proliferation of new forms of money may act as a bridge and educational tool for the mainstream public to transition from legacy systems to a new tokenised economy. [Chapter 3]
- **In a distributed network, a trade-off between efficiency and robustness to attacks must be made.** The increased efficiency through the establishment of special nodes serving as hubs comes at the expenses of a high fragility to targeted attacks: If a few hubs are identified by attackers or shut down, the system breaks and will fail to perform its function. [Chapter 7]
- **Although the transparent and open transmission of data on blockchain imposes privacy concerns, new protocols are being developed to protect personal and confidential information effectively.** Through zero-knowledge cryptography, transaction data can be obfuscated, and varying degrees of access to information can be implemented. [Chapter 8]