



The shifting perception of blockchain and the potential impact on businesses, governments and the investment landscape.

Introduction

The following commentary is intended to provide a brief introduction to blockchain technology, its potential to disrupt businesses, governments and individuals and to provide a synopsis of the current investment landscape.

Blockchain has been touted as a new technology that has the capacity to change the world in the same way that the internet did back in the 1990`s. Yet many simply associate the technology with the speculative fervor that is currently occurring in crypto-currency and crypto-asset trading. Blockchain is indeed the foundational technology behind crypto-currencies and assets, but this is only one of the many applications that can be driven by the technology. There have been many skeptics of crypto-currency trading, with prominent business leaders even labelling it as an outright fraud or a pyramid scheme at one point. However, there is a growing consensus amongst many business leaders that while the outcome and uses of crypto-currencies are uncertain, the underlying blockchain technology is real and has the capacity to disrupt many industries. Even one prominent U.S. CEO followed his earlier skepticism on crypto-currencies with a statement, "The blockchain is a technology which is a good technology. We actually use it. It will be useful in a lot of different things. God bless the blockchain."

Blockchain is not Bitcoin

Blockchain is the underlying technology that enables Bitcoin to function as a secure, transportable and transactional asset that is

not controlled by any single entity. Usage of the underlying blockchain technology has the potential to disrupt the way we record, store and communicate data and fundamentally change the way transactions are conducted and recorded across global systems. In its infancy, blockchain has the potential to cause significant disruptions in many industries. Both large and small companies around the world will strive to be at the forefront of the development and implementation of practical, efficiency-enhancing and profitable, blockchain applications.

What is "Blockchain"?

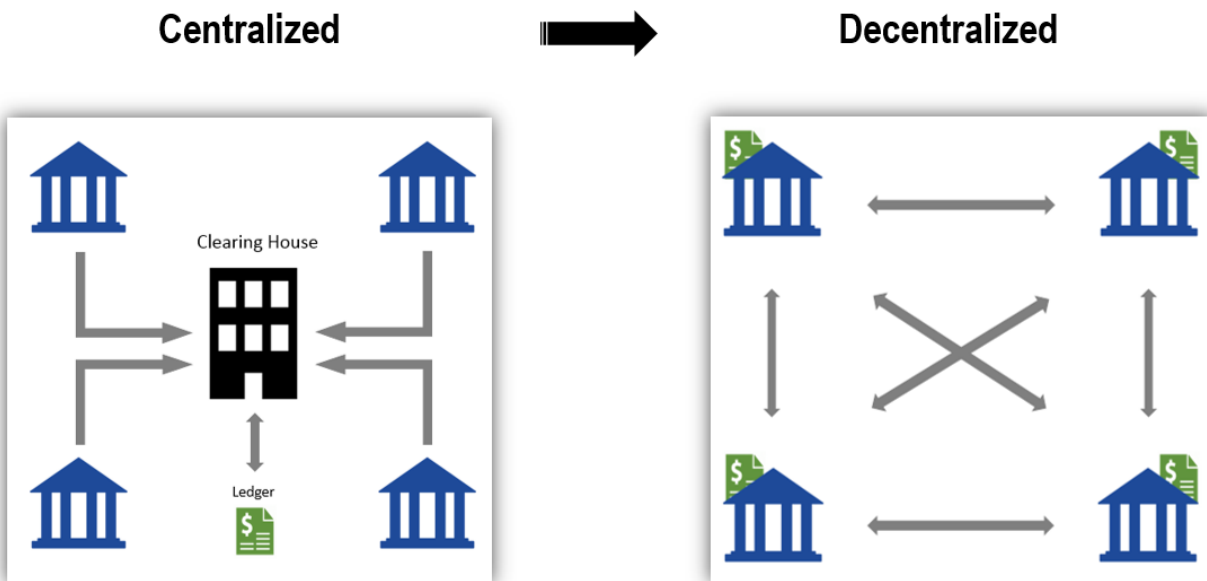
Blockchain is a decentralized and distributed digital ledger that facilitates the process of recording data and transactions in an unalterable database. Said another way – it is a permanent record of debits, credits, transactions and a record of assets that is shared by and uniquely verified via a consensus mechanism within a network. This could entail the ownership record of an asset, the transfer of an asset (e.g., cash, cars, commodities, stocks, private company shares), a database of identification records (e.g., healthcare records, driver`s licences) and smart contracts (i.e., self-executing contracts) that are all stored, verified and executed automatically once the network validates the transactions, and without a centralized entity responsible for control of the data ledger. The data records are validated quicker than current standards through a protocol managed by the user community via a consensus mechanism, while maintaining an even higher level of security through the use of cryptography where each block of data has a secure cryptographic signature of the previous block

which creates immutable records of data. The blockchain network improves efficiency, eliminates duplication of verification and reduces the need for intermediaries.

In a related manner, the process by which transactions are validated, verified and added to the blockchain (i.e., the shared ledger) is known as crypto mining, and is requisite for new crypto units to be released. Anyone with access to the internet and suitable hardware can participate in mining. The process involves compiling recent transactions into blocks, the individual blocks added by miners should contain a proof of work (PoW). This is done in a competition-like environment amongst miners to be the first to solve a computationally complex mathematical problem or puzzle. The miner

who first solves the problem gets to place the next block on the blockchain and claim the rewards. The rewards, which incentivize mining, are both the transaction fees associated with the transactions compiled in the block and potentially newly released crypto units. For crypto miners, the key to success is faster computing power and cheaper energy costs.

On the whole, the decentralized blockchain technology is expected to have a disruptive impact across global systems, transforming how governments, institutions, businesses and individuals interact. The diagram below highlights the differences in the current centralized database system versus a decentralized database system.



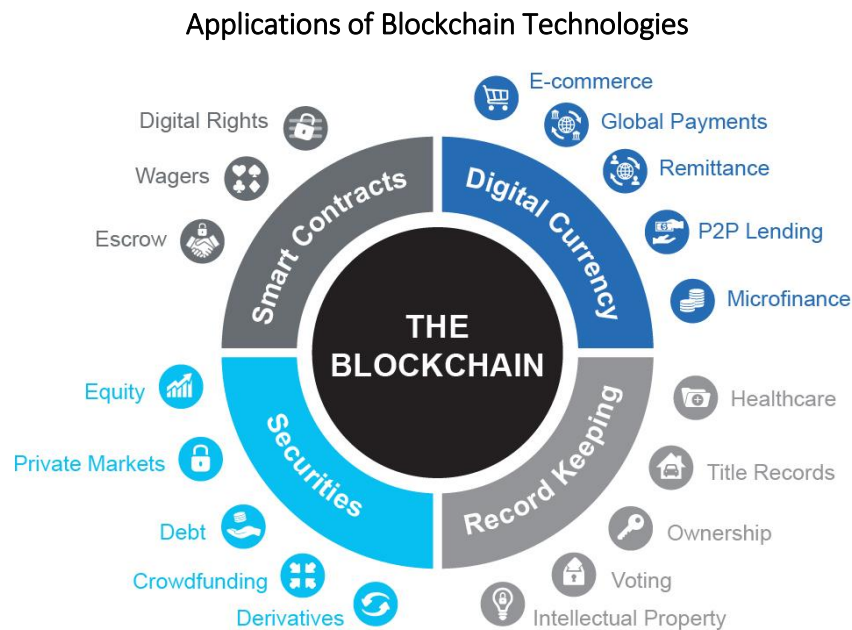
Source: Harvest Portfolios Group Inc.

What Blockchain enables and its potential uses

In late 2015, the World Economic Forum surveyed over 800 executives with over 58% of them believing that by 2025, 10% of GDP will be stored on blockchain technology. By the 2018 World Economic Forum, blockchain became the most popular item of discussion. On a basic level, the technology can automate existing transaction systems to remove manual and redundant reconciliation

processes. This offers material cost savings related to improved efficiency, transparency, reliability and security.

The following diagram highlights the potential areas in the current system to which blockchain technology may be applied, followed by a brief summary of selected specific applications in various industries.



Source: ACI Worldwide

Financial services impact

Financial markets and institutions stand to be among the most disrupted industries by the technology.

Clearing and settlement, identity and know your client documentation, securities trading, collateral, derivatives, bond, non-public share trading, deposit taking,

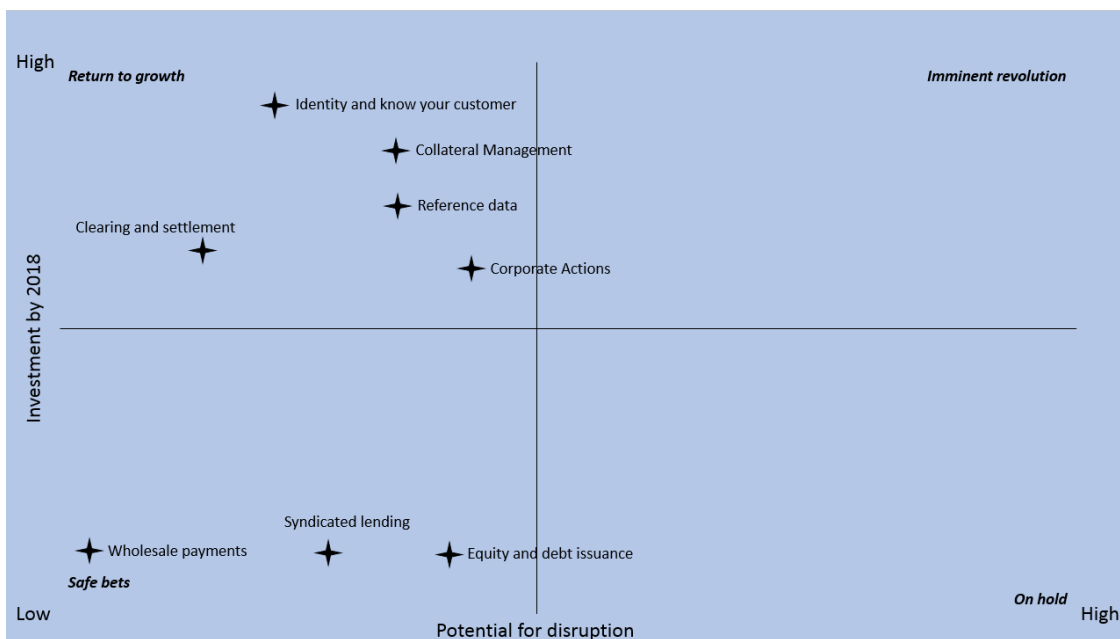
mortgages, retail payments, corporate lending and consumer lending and

global payments are just some of the areas that are primed for disruption. Specifically, Accenture conducted a study in 2017 and estimated that by 2025, eight of the largest ten investment banks could stand to benefit from over 30% in cost savings, which translates to \$8 to \$10 billion in annual cost reduction on a total cost base of \$30 billion.

Also highlighting the potential impact to financial institutions, in a global survey of over 1,300 executives conducted by PWC in 2017, over 75% of respondents indicated that they expect to adopt blockchain as part of their ongoing operations by 2020. Specifically, payment companies are also heavily invested in blockchain technology, with 90% planning to adopt it as part of an in-production system by 2020. In late

September 2016, IBM used a survey conducted by The Economist Intelligence unit to highlight some of the areas in financial services that are set to be disrupted. They found that financial institutions are primarily investing in five key areas: identity and KYC, clearing and settlements, collateral management, reference data and corporate actions.

Areas of investment and disruption identified by all financial markets institutions



Source: IBM Institute for Business Value and The Economist Intelligence Unit

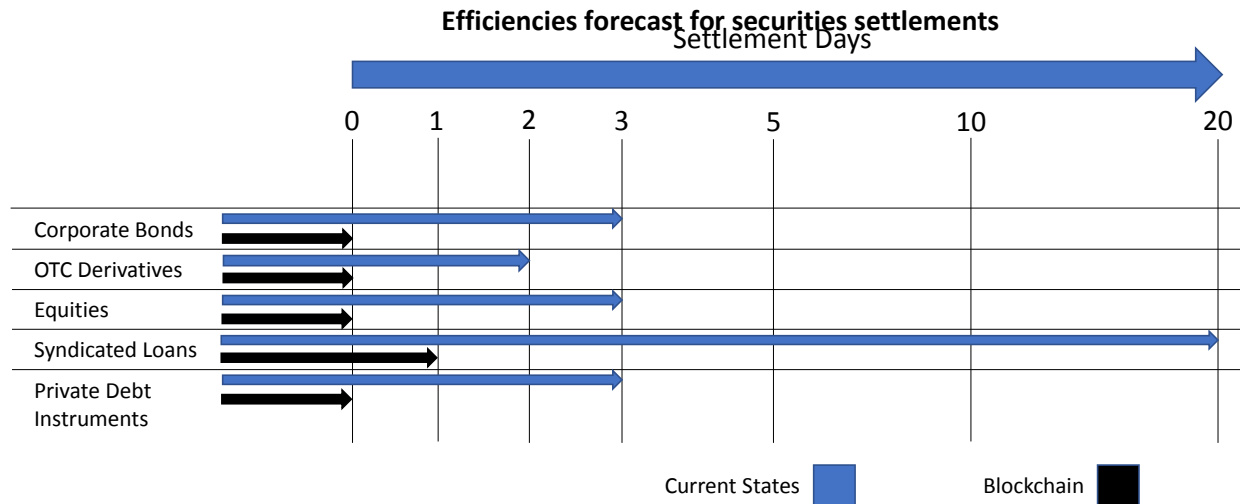
Approaching imminent revolution

The Australian Stock Exchange announced in December of 2017 that after 2 ½ years of analysis, it intends to eliminate the Clearing House Electronic Sub-register System (CHES) for transactions clearing and settlements. The CHES system was implemented in the 1990’s and at the time was considered revolutionary – resulting in settlement for securities reducing from 5 to 3

days. The exchange is the first in the world to announce that they will be adopting blockchain technology for its settlements. Guidelines and timelines are expected in March of 2018.

As highlighted below, the potential for efficiencies are meaningful in settlements. With early adoption now underway, broader

based adoption will likely follow as improved efficiencies materialize.



Source: Accenture, 2016

Smart contract in insurance

Similarly, smart contracts offer significant capacity for improved efficiency, lower costs and prevention of fraud. A smart contract is a self-executing contract that facilitates the exchange of money, property, shares, or anything of value in a transparent, conflict-free way without the need for an intermediary.

In Jan 2017, a report by McKinsey & Company, entitled “Blockchain Technology in the Insurance Sector”, highlights the valuable opportunity the technology can offer for insurance companies. For example, blockchain can offer peer-to-peer automated insurance policies with built in smart

contracts that will determine and self-execute the claim pay-out once an insurance event happens and its policy conditions are met, all without the need for central validation or manual administration.

The technology has the potential to significantly reduce administration fees and operating costs associated with sales and commissions. This will increase customers’ trust in the system due to the enhanced transparency and availability of claims history, ownership of information and documents which make them easily verifiable and auditable.

Implications for Governments

Government institutions have also been investigating uses for the technology. It offers a new approach to enhancing

transparency and collaboration between governments, businesses, institutions and citizens.

Governments manage vast amounts of personal data from birth and death records to marriage certificates, passports, census data and have their own financial ecosystems in managing tax revenues and respective capital budgets. In the 2015 World Economic Forum survey of over 800 executives, 73% of respondents expect taxes to be collected “on chain” before 2025.

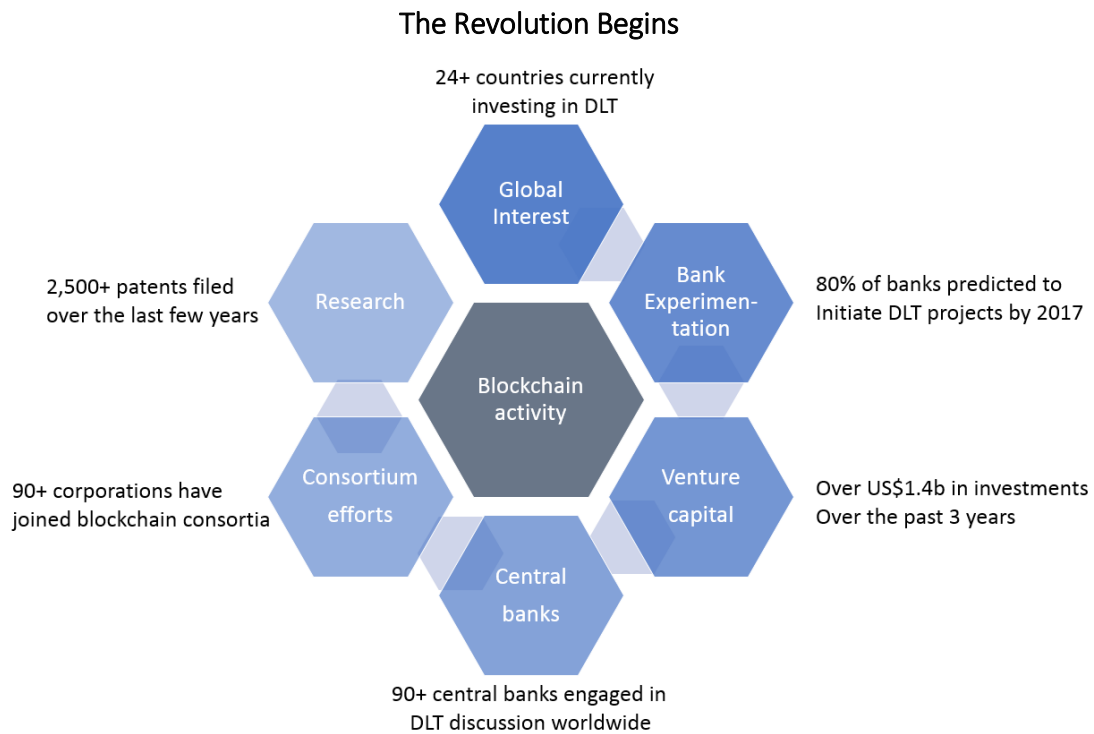
In another municipal government example, Dubai which is often called the “city of the future”, is planning to become the first

blockchain-powered government by 2020. According to their plans, all Visa applications, bill payments and license renewals, representing over 100 million documents per year, will be fully digital and processed via blockchain technology. In 2017, Dubai adopted a blockchain powered system for Dubai Land Department (DLD) to have all services digitally processed on a single platform, and launched its own cryptocurrency called “emCash” with the potential for improved efficiency and ease of business in Dubai.

Investment landscape

Broad-based investment in the technology has surfaced across multiple potential users of Blockchain. The World Economic Forum has highlighted some of the early stage

investments and interest in blockchain technologies from multiple potential users of the technology:



Source: World Economic Forum, September 2015, DLT: Distributed Ledger Technology

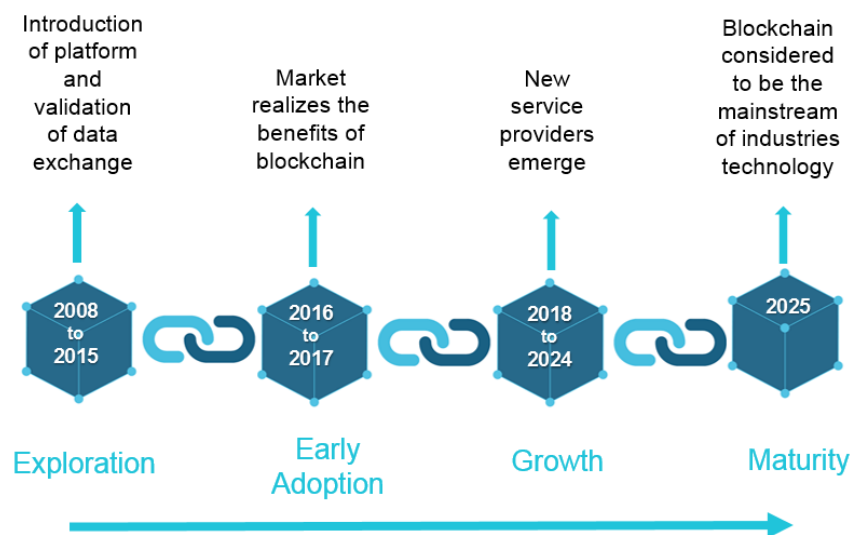
Corporate investment gaining momentum

Based on a review of publicly available information, prior to June 2015 only a handful of large financial services and consulting firms had initiated investments in Blockchain. By the end of 2016, nearly 50 large global financial services firms had initiated investments in blockchain, ranging from banks such as Wells Fargo & Co., the Canadian Imperial Bank of Commerce, BNP

Paribas, J.P. Morgan Chase & Co. to several non-bank financial and consulting firms such as the New York Stock Exchange, Visa Inc., Nasdaq Stock Exchange, and Accenture PLC.

The chart below highlights that while the technology is relatively young, it is now transitioning from early adoption into the early phases of growth.

Projected Blockchain Adoption



Source: Accenture, 2016 – Harvest Portfolios Group Inc.

The projected adoption of Blockchain technology is burgeoning and gaining significant momentum.

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