

Insights into Blockchain

Opportunities and Challenges across Multiple Industries



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Foreword

The report that follows was compiled by Storyful on behalf of Capgemini. By tapping into online discussions, shared reading material and media consumed by those participating in technological innovation in the area, it offers a unique viewpoint of the pulse and passions of the region. As such, however, it should not be considered the official viewpoint of Capgemini, its employees, clients or affiliates.

Editor's Note

Almost all of the media coverage around Blockchain these days is rightfully geared toward Bitcoin, Ethereum, and other cryptocurrencies. And while this is all well and good, FinTech is actually only one application for the ledger technology.

In a real sense, Blockchain is simply a safe, verifiable, de-centralized reckoning and record of not only economic transactions – but virtually everything else.

Diamond certification? We got it here.

Healthcare, data privacy and security? Keep reading.

Test results authentication? Sure, why not.

The opportunities are nearly limitless, but we've tried to collect some of the most important applications (outside of Fintech!) here for the first time. We hope you enjoy.



Lanny Cohen

Group Chief Technology Officer
Capgemini

What is Blockchain?



BLOCKCHAIN is very well defined as “an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value”

Though first created for the digital currency Bitcoin, a flurry of new applications for Blockchain technology have since emerged that hold the potential to radically transform the way multiple industries do business.

Defined as “an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value” by Blockchain Revolution¹ authors Don and Alex Tapscott, the technology holds massive promise for multiple industries, particularly in regards to securing data.

Information held on a Blockchain exists as a shared and continually reconciled database. Because the data isn't stored in any single location, no centralized version of this information exists for hackers to corrupt.

Hosted by millions of computers simultaneously, the data is accessible to anyone on the internet, making it public and verifiable. Blockchain can only be updated with the consent of the majority of its participants. Once entered, information can never be erased, allowing for the creation of a definite and verifiable record of “digital events.”

How Blockchain is used today

Industries like financial services, cybersecurity, education, healthcare, auto leasing, IoT, supply chain management, government, and human resources have begun to explore the application of Blockchain for a variety of uses; however, most uses remain experimental.

Many industries have already embraced the benefits of Blockchain, including the diamond industry, which historically has been prone to fraud. With Everledger², a permanent Blockchain ledger for diamond certification and related transaction history, verification for insurance companies, claimants, and law enforcement can be provided.

Banks are also experimenting with the use of Blockchain as a means of expediting onerous back office functions and settlement operations with the hypothesis that nearly \$20 billion in middleman costs could be cut as a result.³ Unsurprisingly, banks have been among the leaders in financial services to fund and partner with Blockchain startups.

Healthcare firms are drawn to Blockchain as they work to meet new requirements around the security and privacy of sensitive patient data. For education, companies are testing its use around certification and credentials. For governments, Blockchain has been used as a critical piece of infrastructure for implementing “responsive open data.”⁴

Unlike traditional open data, responsive open data allows citizens to access information such as business licenses, property titles, or birth certificates when they want it and where they want it, enabling citizens to access critical information without the undue time and costs associated with lawyers, notaries, or waiting at government offices.

¹ Blockchain Revolution (2016)

² Wired.co.uk 'Blockchain: How The Blockchain is Helping Stop The Spread of Conflict Diamonds' February 2017

³ Financial Times 'Technology: Banks Seek The Key to Blockchain' November 2015

⁴ MIT Media Lab: 'Blockchain Could Be A Critical Piece of Infrastructure for Governments' January 2016

Challenges facing companies who adopt Blockchain Technology



While there has been a steady increase in the number of industries moving to adopt Blockchain technology, there are a series of challenges facing companies using this shared database.

One challenge when using Blockchain involves security issues around the authentication and encryption of the database. While the database is considered highly secure, the accuracy of each entry ultimately rests on the entity in control of each private account.

As with all areas of online security, there is also an increased need to protect against hacking. As well as a data security risk, current insurance policies may not support adequate definitions or exclusions in their policy detail, leaving coverage of companies, banks, and individual insurance policies open to interpretation if hacked by a third party. For example, money is defined as any “government-backed currency” under certain crime policies. By this definition, Bitcoin is not actually considered money (a question many governments have debated in recent years) and therefore could fall outside of the coverage zone if a hacker were to gain access to private keys in order to transfer bitcoins to his or her account.

It is also worth noting that while Blockchain may lead the way in innovative solutions, it is difficult for the database to reach its full potential while banks try to find a way to integrate the technology with existing legacy infrastructure.

While out-of-date technology infrastructure is part of the problem, the biggest reason for the delay is ensuring the balance of functionality against security. When flexibility or innovation is prioritized ahead of security, Blockchain networks may be vulnerable to hack attacks or external threats.

Spotlights

Healthcare



How is Blockchain being used?

Healthcare organizations have outpaced a lot of other industries when it comes to Blockchain adoption: they are even ahead of the financial industry.

According to a study from IBM⁵ surveying 200 healthcare executives across 16 countries, 16 percent of surveyed healthcare organizations expect to have a commercial Blockchain solution at scale in 2017—scaling at higher rates than the banking or financial market enterprises IBM also surveyed.

With Blockchain, healthcare organizations can capture an individual's lifetime medical history. Privacy concerns can be managed via permissionless Blockchains, where all parties can view all records, or permissioned Blockchains, where privacy can be maintained following an agreement on which parties can view what transactions and when it's necessary to mask the identity of the party.

The trailblazers in this sector can expect the greatest Blockchain benefits across time, cost, and risk in the areas of:

- **Clinical trial records**
- **Regulatory compliance**
- **Medical/health records**

There is an expectation that Blockchain will not lead to widespread disruption in healthcare due to anticipated regulatory constraints keeping new models and competitors in check.⁶ Executives planning early adoption of Blockchain believe that it will help them to access new markets, as well as to manage new and trusted information that they can keep secure.

IBM expects Blockchain in healthcare to reduce the following nine areas of friction, in three categories:

- **Information:** Imperfect information, inaccessible information, information risks
- **Interaction:** Transaction costs, degrees of separation, inaccessible marketplaces
- **Innovation:** Restrictive regulations, institutional inertia, invisible threats

IBM notes that a vast amount of healthcare data is “digitized but not yet shared, and there are extensive regulations and risks associated with sharing it.”

Their conclusion? “Blockchain benefits are compelling and can be gained in every aspect of healthcare.”

Who is innovating?

Estonia, considered to be the most advanced “Blockchain nation”⁷ in terms of government and citizen services, all medical health records are already stored online, but are not yet Blockchain-enabled. In 2016, Estonia announced its intention to secure health records on a Blockchain that would provide real-time visibility to individuals and institutions, though experts warned that enabling medical records on Blockchain could take considerable time because privacy, security, and regulatory hurdles are so high.

The torrent of data gathered by wearable devices to track an individual’s health may hit the cloud, but rarely lands in a physician’s hands. Much of this patient-generated health data (PGHD) is going nowhere—sometimes not even to the patient.

Even the data generated by at-home devices and transmitted to physicians is frequently kept in the dark. Swiss-based Healthbank is just one of several organizations working on integrating PGHD data⁸ with more traditional medical information—sleep patterns and glucose and heart rates pulled from wearables and other devices—along with information from doctor visits, health records, and medical equipment, all to be stored via Blockchain.

Interpol estimates that more than one million people are killed each year by counterfeit drugs, stating that the “manufacture and sale of counterfeit drugs is becoming one the most lucrative businesses for organized crime gangs around the world.”⁹

Blockverify in the U.K. is just one organization working on combating this problem by using Blockchain to track pharmaceuticals throughout the supply chain and to ensure consumers receive authentic products.

British artificial intelligence company DeepMind¹⁰ (owned by Google) is working with the NHS on a series of trial projects adopting Blockchain technology. Working to create a digital ledger that will record how and who accesses patient’s health data, the Blockchain technology will keep accurate logs of all activity on the account without accessing the records themselves. The project’s overarching aim is to reduce public fear on the protection of access to patient’s records.

What challenges or potential challenges exist in implementing Blockchain in health?

Legacy infrastructure: With multiple legacy systems already in place, bringing in new technology would require rebuilding much of the existing platforms. In the current systems, patient information is stored in local databases with little ability to share that information between multiple organizations. Blockchain technology would represent a major shift from centralized and small-scale technologies to distributed and worldwide systems.

Security: Healthcare data is inherently valuable and sensitive, with the number of healthcare databases that have been hacked growing exponentially.¹¹

⁵ IBM Blockchain Healthcare: Healthcare rallies for Blockchains (2016)

⁶ IBM Blockchain Healthcare: Healthcare rallies for Blockchains (2016)

⁷ The Cointelegraph ‘How Estonia Brought Blockchain Closer to Citizens: GovTech Case Studies’ March 2017

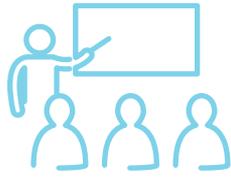
⁸ CIO ‘Blockchain applications for healthcare’ March 2016

⁹ TechCrunch ‘Using the Blockchain to Fight Crime and Save Lives’ September 2015

¹⁰ City AM ‘How Google’s DeepMind is using blockchain-like technology to make patient health data transparent and secure’ March 2017

¹¹ Forbes ‘Hacking Hospitals and Holding Hostages: Cybersecurity in 2016’ March 29, 2016

Education



How is Blockchain being used?

Educational institutions are turning to Blockchain as a way to avoid fraudulent certifications as well as to ease record-keeping needs for students and alumna.

While existing paper-based certification systems may be subject to loss or fraud, the need for a centralized database of credentials and achievements has become critical in the face of an increasingly mobile and digital population. It also offers benefits not available with Open Badges—another method used to gather evidence for credentials.

In regards to keeping track of continuing professional development and corporate learning, Blockchain could potentially take data from conference attendance, courses, and other forms of learning and store them securely in a reputable system.

Who is innovating?

In Cyprus, the University of Nicosia issues academic certificates verified through the bitcoin Blockchain to students who have completed the Introduction to Digital Currency—the first university course offered on the topic of cryptocurrency.

The process allows someone to authenticate a University of Nicosia certificate without having to contact the actual institution. For the process to work, they had to ensure that certificates were verifiable and that there was no way for someone to copy the process to create inauthentic records. A number of other educational institutions have also started experimenting with this process such as MIT and Holberton School.

Two think tanks—The Institute for the Future (ITFF) and the Act Foundation—presented the idea of “the Ledger” as a new technology that could tie into “Learning is Earning.”¹² The ledger would potentially track everything students have learned in units called Edublocks, creating a profile to display all the Edublocks they have earned. Employers can use this information to offer jobs that match student skills.

Last year, Sony’s Global Education division announced¹³ that it would create a centralized platform for educational assessment and testing scores using Blockchain to house educational data that can be securely shared with other services and third parties.

The potential outcome? A central system for candidates and their results.

¹² Learning Is Earning: 2026 Media Kit, ITFF

¹³ ‘Sony Plans to Develop an Education and Testing Platform Powered by the Blockchain’, TechCrunch. Feb 22 2016

What challenges or potential challenges exist in implementing Blockchain in health?

Weighing the future: Many of these projects are firmly in the experimental stage, with a number of challenges to be overcome before a universal application becomes possible. Questions remain over what constitutes a transaction in education. What will be the implications—positive or negative—as institutions move to more comprehensively record these transactions and activities?

Trust: Discussions about trust and Blockchain in education often frame students as being untrustworthy. Blockchain would remove this opinion by verifying credentials. But, how would the trustworthiness of Blockchain credential-issuing institutions be measured or verified?

Government



How is Blockchain being used?

Governments are turning to Blockchain as a potential means to better serve their citizens and improve processes for public administrative functions. The ability to record transactions on distributed ledgers offers new approaches for governments to improve transparency, prevent fraud, and establish trust.

According to a recent survey conducted by IBM and the Economist Intelligence Unit,¹⁴ governments are highly interested in Blockchain, with nine in ten government organizations planning to invest in Blockchain for use in financial transaction management, asset management, contract management, and regulatory compliance by 2018.

Seven in ten government officials predict Blockchain will significantly disrupt the area of contract management, while another 14 percent expect to have Blockchains in production and at scale in 2017.¹⁵ Half of these trailblazers have already invested in three primary areas: asset management, identity management, and regulatory compliance.

¹⁶ Coin Telegraph 'How Estonia Brought Blockchain Closer to Citizens: GovTech Case Studies' March 2017

¹⁷ Coindesk 'Sweden Moves to Next Stage With Blockchain Land Registry' March 2017

¹⁸ Cryptocoinsnews 'Singapore's Central Bank Completes Blockchain Payments Pilot, Nods at Digital Currency' March 2017

¹⁹ Blockchain News 'Dubai organisation announces launch of Global Blockchain Council' February 2016

Who is innovating?

UK: The U.K. government's Digital Marketplace has made Blockchain-as-a-Service available for purchase. With this service, government agencies are free to experiment, build, and deploy digital services based on distributed ledger technology.

In 2016, the Department for Work and Pensions began a trial to use Blockchain technology that allowed claimants to use a mobile app to receive and spend benefit payments. With their consent, transactions are recorded on a distributed ledger to support their financial management.

Estonia: As the leading nation in adopting Blockchain technology,¹⁶ Estonian citizens and e-residents receive a cryptographically secure digital ID card powered by Blockchain infrastructure on the backend, giving them access to various public services. Earlier this year, Nasdaq successfully completed a trial in Estonia that will enable company shareholders to use a Blockchain voting system.

Sweden: When it comes to real estate transactions in Sweden, the stakes are high. Yet the registration and transfer of properties remains difficult. The country's land registry authority, Lantmäteriet, is exploring ways to digitize the process¹⁷ by prototyping a mobile app that would provide a transaction space for sellers and buyers as well as their real estate agents and banks. A Blockchain would record detailed information on the properties being sold as well as each step in the sales transaction, making communications among all parties involved in the sale more transparent.

Outside of Europe, the Monetary Authority of Singapore (MAS) has successfully completed a proof-of-concept pilot¹⁸ to explore the use of Blockchain for interbank payments. Partnering with a consortium of financial institutions, Blockchain infrastructure has been used to produce a digital currency issued by MAS with methods to connect bank systems through distributed ledger technology that has been tested. The technology will simplify the payment process, reduce the time it takes to complete transactions, enhance transparency and system resilience, and reduce the cost of long term record-keeping. Meanwhile, Dubai has set up the Global Blockchain Council to explore current and future Blockchain applications.¹⁹ The council currently consists of 47 members from both the public and private sector, and launched seven Blockchain proof-of-concept trials covering health records, diamond trade, title transfer, business registration, digital wills, tourism engagement, and shipping.

Energy



How are individuals, companies, and states using Blockchain?

The potential for industry-wide disruption in energy is vast.

The first Blockchain-powered energy transaction took place²⁰ in March 2016 in Brooklyn, NY. The peer-to-peer exchange involved the transaction of energy produced by domestic solar panels exchanged locally. Just over a year later, Blockchain technology in energy trading is becoming an active part of the market.

According to the Harvard Business Review,²¹ the coming shift in the industry will have both utilities and consumers producing and selling electricity provided the technology proves to be both reliable and scalable. If so, it will drive the transition to what the energy industry calls a “distributed world,” in which both large and smaller power generation systems exist for homes, businesses, and communities.

While startups are positioned to move in and disrupt the industry, it could be the established companies that make strategic bets on Blockchain technology. These could turn out to be the true disruptors, ushering in a new era of decentralized power.

Who is innovating?

U.K. – Electron: U.K.-based Electron is tackling the difficulty of changing electricity providers. They have built a demo platform on the Ethereum Blockchain using simulated data from 53 million metering points and 60 energy suppliers to replicate the U.K. energy market. Using this data, they have run tests claiming to show that a Blockchain-based solution would allow consumers to switch energy suppliers up to 20 times faster than currently possible.²²

Austria – Wien Energie: Wien Energie provides electricity, natural gas, and heating to nearly two million people in Austria.

In February 2017, they announced a three-month pilot program with Canadian Blockchain firm BTL²³ in an attempt to reduce the costs associated with energy trading. According to the company, the primary short-term focus of the program will be developing Blockchain systems that efficiently manage confirmation matching, trade and portfolio reconciliation, and regulatory compliance. Longer-term goals focus on developing peer-to-peer trading and energy grids.

²² TechCrunch ‘Electron is trying to sell a Blockchain makeover to the UK’s energy sector’ December 2016

²³ Cryptocoinsnews ‘Austria’s Biggest Utility Company to Test Blockchain Energy Trading’ February 2017

²⁴ Cryptocoinsnews ‘Clean Tech Energy Initiative Introduces Blockchain To E-Mobility’ March 2017

²⁵ LinkedIn Pulse ‘Lessons from the first ‘Energy Blockchain Summit’’ February 2017

Germany – Innogy: Innogy is an energy trading company from Germany that specializes in modern, digital solutions to traditional energy problems.²⁴ They are utilizing Blockchain to create digital wallets for the drivers of electric vehicles. This would allow people to share the charging stations for the electric vehicles with other drivers.

What challenges or potential challenges exist in implementation of Blockchain in energy?

The potential to apply Blockchain in small and local energy trading markets hampered by regulatory restrictions could disrupt the global energy market. The utilization of Blockchain technology could remove at least some of the barriers to entry in what has traditionally been a difficult market to crack due to high capital costs and low numbers of incumbent players., and allow small and local providers into the market. An emphasis on purchasing locally-sourced, green energy could prove popular with consumers.

Energy trading and usage is heavily regulated, with state-owned companies maintaining the industry in many European markets. As a result, it may be difficult for companies to implement the types of Blockchain-based solutions that they would like to, without initially achieving some kind of legislative change.

Thierry Mortier²⁵ lists his four key challenges to Blockchain implementation in energy as:

- **Regulation:** This necessarily follows technology innovation but, in many cases, it will inhibit the Blockchain architecture.
- **Scalability:** Transactions remain slow and consequently not fit for many of the high-volume scenarios.
- **Security:** While the distributed ledger is secure, the applications that are evolving remain immature and untested.
- **Standardization:** There are a number of technologies under the banner of Blockchain. Until one pulls ahead, investment will hold it back.

Logistics/Transportation



How are individuals, companies, and states using Blockchain?

Blockchain is poised to create major cost- and time-saving opportunities for the supply chain, logistics, and transportation sectors.

It can be seen as a new method of tracking any kind of shipment or transaction, in any kind of supply chain. With each participant in the supply chain or transaction keeping their own live record of all their information, the potential to tamper with the data decreases.

Blockchain could be applied to optimize freight flows by publicly identifying empty containers and using them for shipping purposes, thus increasing efficiency.

In a 2016 report,²⁶ the International Air Transit Association forecasted that 7.2 billion passengers would travel by air in 2035, nearly doubling the 3.8 billion air travelers in 2016. This increase will need to be matched by an equal increase in airport security, efficiency, and plane tracking.

The general principles hold for any supply chain example where physical goods are moved from one point to another. Implementing a trusted and secure method of tracking each transaction along the chain will have massive ripple effects.

According to IBM,²⁷ Blockchains have the potential to generate breakthroughs in three areas:

- **Visibility**
- **Optimization**
- **Demand**

²⁶ IATA 'IATA Forecasts Passenger Demand to Double Over 20 Years' October 2016

²⁷ IBM: Building Trust in Government Executive Report 2017

²⁸ New York Times 'Blockchain: A Better Way To Track Pork Chops, Brands, Bad Peanut Butter?' March 2017

²⁹ Coindesk 'Finnish City Awarded €2.4 Million to Test Blockchain-Powered Shopping' June 2016

Who is innovating?

Maersk: Danish company Maersk, the world's largest shipping company, was one of the first companies to invest with IBM in their Blockchain solutions.²⁸ Prior to using Blockchain, Maersk had been looking for a more efficient solution to managing the prohibitive paperwork that is associated with the movement of shipping containers around the globe.

Maersk found that a single container could require stamps and approvals from as many as 30 people. The cost of moving and keeping track of the paperwork often equaled the cost of physically moving the container around the world. The difficulty of making this work in the real world is that everyone must be involved at every step along the way, otherwise it's unlikely to induce any more confidence than the old system.

Kouvola, Finland: The city of Kouvola, Finland, is an important transportation hub home to some 200 logistics companies, with a total of 500 in the surrounding region. The city was awarded €2.4 million by the European Regional Development Fund to build tools that can streamline the supply chain using Blockchain.²⁹ One such tool can connect various enterprise resource planning (ERP) tools used by the trucking industry, warehousing industry, and freight operating industry to manage their supply chains.

Who Is Storyful?

Storyful is the world's first social media news and intelligence agency with over seven years of experience working with publishers and businesses around the world. Billions of posts, videos, and pictures are shared online 24/7. Storyful's expert global team of journalists, analysts, content strategists, and researchers separate the valuable content from social noise, and its proprietary technology finds the most engaging and most widely trending content. The team then verifies, curates, and contextualizes to add value.

Storyful marries proprietary technology, leading-edge data science, and world-class journalism to help our partners tell powerful stories. We help brands and publishers connect to the audiences that are most important to them, and offer marketing services to identify communities of influencers and the conversations they are having.



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