



Massachusetts  
Institute of  
Technology



MIT  
Connection  
Science

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

# Blockchain & Financial Services: The Fifth Horizon of Networked Innovation

WHITE PAPER EXCERPT  
APRIL 2016

David Shrier, Deven Sharma, Alex Pentland  
Connection Science & Engineering  
[connection.mit.edu](http://connection.mit.edu)

---

The authors would like to thank the team that helped develop this document, including Jackie Iarossi, German Canavale and Weige Wu at MIT Sloan, and Michael Casey at the MIT Media Lab Digital Currency Initiative.

**This is an excerpt from a longer series paper on Blockchain, being released in May:**

- Blockchain: 5th Horizon of Networked Innovation: **May 3**
- Blockchain & Transactions, Markets & Marketplaces: **May 10**
- Blockchain & Infrastructure (Identity, Data Security): **May 17**
- Blockchain & Policy (with U.S. Treasury Office of Financial Research): **May 24**

*Disclaimer*

*The Massachusetts Institute of Technology may have financial or other relationships with one or more entities described in this document. No endorsement, implied or explicit, is intended by discussing any of the organizations or individuals mentioned herein, and is expressly disclaimed*

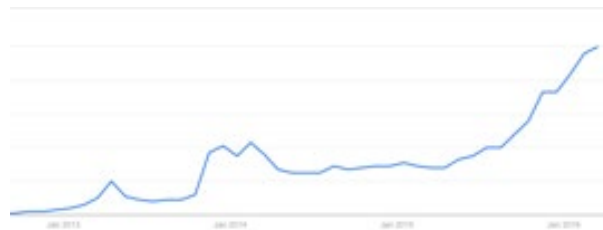


## The Fifth Horizon of Networked Innovation

How can you capitalize on the disruption that blockchain is introducing into the global financial system? What are the risks and opportunities that this new technology represents? What roles can each of government, academia and private industry play in shaping the new future that blockchain can enable?

### Blockchain: Popular Topic of 2016

Blockchain technology has entered the top strategic priorities of the CEOs of the Fortune 1000<sup>1</sup>. Venture investment in the field has grown to \$1 billion in 2015, representing 7% of all Fintech VC funding, with some forecasting investment in blockchain to grow to \$10 billion in 2016<sup>2</sup>.



**Rising interest in "blockchain" as a search term trend (2012-2016)<sup>3</sup>**

### Potential for Transformation

Blockchain represents a technology innovation that enables transparent interactions of parties on a more trusted and secure network which distributes access to data. Although the technical components have been in existence for decades, blockchain qua blockchain is a novel, resilient, and ubiquitous approach to data, transaction analytics and networks. It holds the potential to address inefficiencies, reduce cost, unlock capital, improve trust in societal fabric, and open new business models. It also could accelerate the growth of the informal economy or even criminal elements of societies, complicating efforts of governments to provide security and safety to their citizens. Like any new technology, it holds the potential for good and for harm, and benefits from an enlightened, informed, and ethical application by its users.

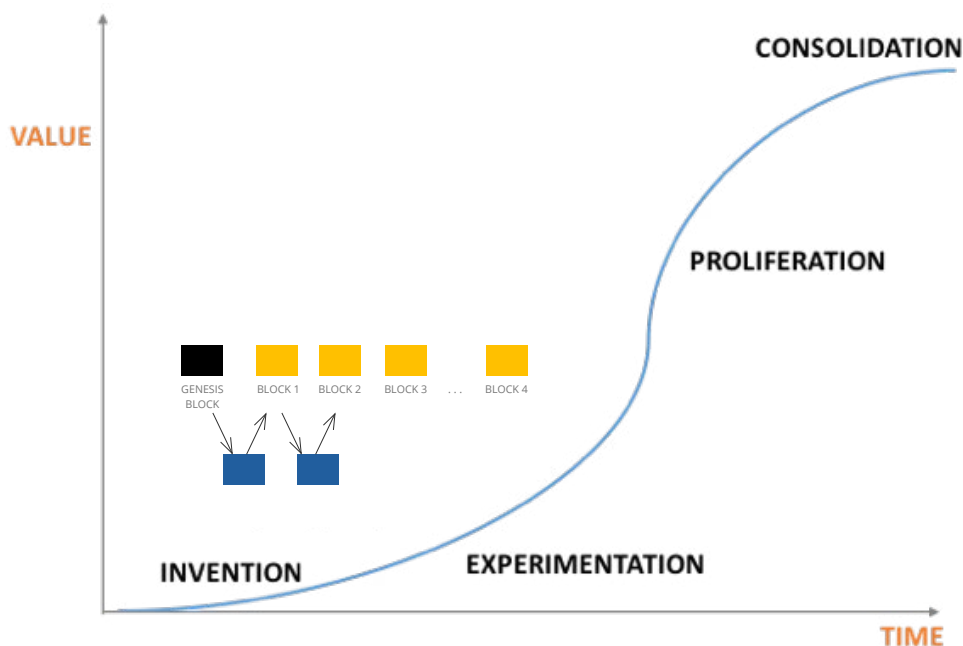
Blockchain has generated extensive interest and enthusiasm in financial markets. Why? Trust and confidence in the promise to meet the obligations is the cornerstone of any financial transaction. Substantial parts of financial markets are designed to solve for trust and asymmetry in the financial transactions through the risk management infrastructure.

- Substantial costs in the financial infrastructure are designed for identity checking, transaction authenticating, reliably and accurately transacting, supporting records, and securely storing records. These activities solve for trust, fraud and error.
- Substantial capital and collateral gets locked in the financial system to buffer against the trust and confidence in certainty and predictability of outcomes.
- The cost burden of the risk infrastructure makes the economics of small size transaction expensive and unaffordable and inaccessible to low income members of the society.

Blockchain solves for trust, asymmetry of information and economics of small transaction without burdensome risk infrastructure and central intermediary.

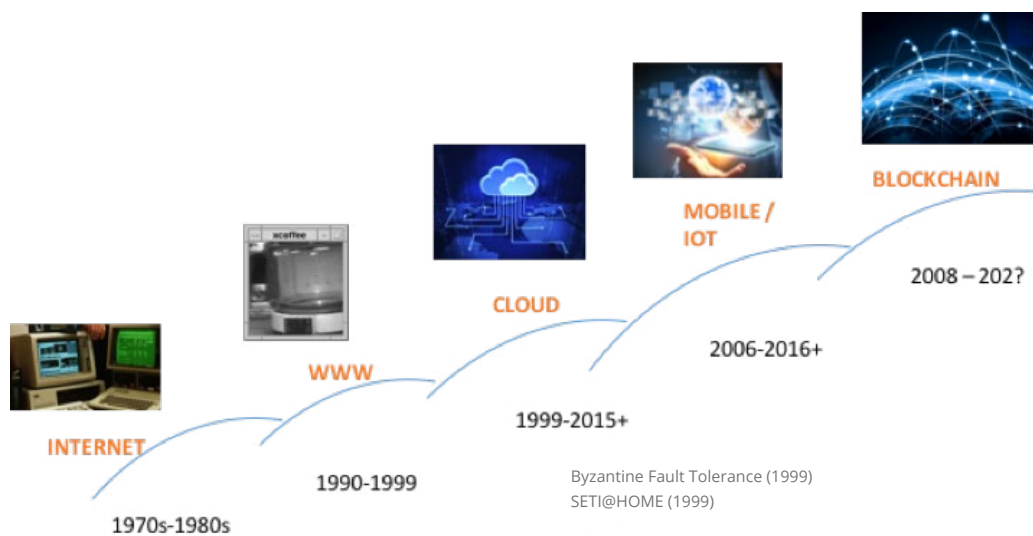
### The Evolution of a New Technology

We are in the early stages (“invention/experimentation”) of the adoption of blockchain. As with other new technologies, blockchain is undergoing a phase of invention and experimentation. Blockchain is a revolutionary innovation in its approach to building trust, transparency and traceability in financial transactions. The innovation is in the concept and approach of piecing together technology components, not necessarily a technology magic silver bullet.



If we examine the evolution of networked innovation, the 1970s and 1980s saw the development of the Internet, the “first horizon” in our paradigm. Beginning in 1990, Sir Tim Berners-Lee and others promoted the creation of intuitive navigation and cross-connection of information, making possible the “second horizon” of the World Wide Web. While “cloud computing” had its origins in other technologies, we argue that the formation of Salesforce.com in 1999 marked a key milestone in its evolution into the “third horizon” of networked innovation. A notable publication around Byzantine Fault Tolerance (critical to the theoretical underpinnings of blockchain), and the launch of SETI@Home (which anticipates the distributed nodes of blockchain), also were produced in 1999. With decreasing bandwidth costs and increasing ubiquity of smart phones and smart devices, we trace the “fourth horizon” to the launch of mobile broadband services in 2006.

This brings us to the blockchain, with Satoshi’s October 2008 paper launching the “fifth horizon”.



In 1993, no one could have realistically envisioned an Uber, or an Airbnb, or a viable ZipCar. In 2001, no one could have predicted Facebook’s success (an earlier version of a “university-member-driven-social-network”, The Square, was a casualty of the dotcom bust) or YouTube’s market dominance (bandwidth constraints and other issues led companies like Broadcast.com and TheFeedroom to relatively modest outcomes). And today, in 2016, we can only dimly imagine what the “killer app” for blockchain will be. The near-term future is somewhat more clear, and we will concentrate the majority of our white paper series on the 5-year horizon of blockchain innovation and financial services.

---

## Financial Services Opportunities

In financial services, examples of blockchain applications include the ability to:

- Improve speed and reduce cost of syndicated loans, by enabling the possibility of direct syndication;
- Enhance regulatory compliance by automated, instantaneous record validation;
- Reduce costs of money remittance and currency exchange;
- Create self-executing contracts that reduce or eliminate the possibility of fraud or corruption;
- Improve rule of law regarding transfer of property title;
- Eliminate most of the costs and friction in issuance and trading of securities such as equities and debt;
- Reduce cost and improve access in insurance markets by creating the potential for easier implementation of self-insured risk pools;
- Allow the creation of new forms of identity separate from a central issuing authority; and
- Provide a means of exchange of value in systems where trust in central authority has been lost.

We are seeing blockchain currencies being used to transfer value out of markets where currency regulations are strict and trust in central banks is weak. As this level of activity increases, regulatory authorities will undoubtedly take a more strict view on these activities. Yet, as governments that have attempted to restrict Twitter usage have found, once the genie is out of the bottle, it is difficult to recapture.

New models being pursued range from a primary “distributed trust” structure which makes it impossible to separate the use of a cryptocurrency, like bitcoin, and are defined as open and public, to permissioned, private, trusted systems, such as those being implemented by some investment firms as a faster, lower-cost means of settling and clearing trades.

---

## A Note of Caution

We are currently in the invention/experimentation state of market evolution of blockchain. Today, we can't predict which application will be the "killer app", but the speculation is that as much as \$15 billion to \$20 billion can be saved in the financial services sector alone using blockchain<sup>4</sup>, translating to more than \$150 billion of potential equity value creation based on current market multiples. These savings will primarily come through greater efficiency, i.e. job loss.

Many hurdles remain towards adopting the new concept, and as with any new technology, human and organization attitude poses a high barrier, including a lack of standards and clear policy guidance, high processing costs, and legacy infrastructure. In addition, resistance to the employment dislocation will create inertia favoring the status quo. The rise of digital media in the 1980s led to a disruption of the newspaper industry, ultimately reshaping the face of media globally resulting in hundreds of thousands of jobs lost. Given the potential as well as the pitfalls of blockchain development, we ask:

- How can policy interventions shape the new future of blockchain in productive directions?
- Is there any way to more effectively manage the productivity improvements, that in turn may lead to significant employment disruption in financial services?
- What steps can we take to mitigate the negative impacts of innovation-driven employment dislocation?

## An Origin Story

The antecedents of the current environment have been developing for some time, since the publication of the bitcoin protocol in October 2008. We note that the first blockchain applications emerged out of eroded trust in traditional institutions, yet eight years later, more than 60% of the global financial system has entered into a consortium to apply blockchain to remove cost and create efficiency in their businesses. Have we gone from "revolution now!" to "reengineering processes"?

A series of conversations at MIT and elsewhere, ranging from our "Ecology of Digital Assets" conference July 2014 to a CEO workshop at Davos in January 2016, have shown rising interest in the potential of blockchain and methods to address regulatory hurdles that might inhibit adoption.

---

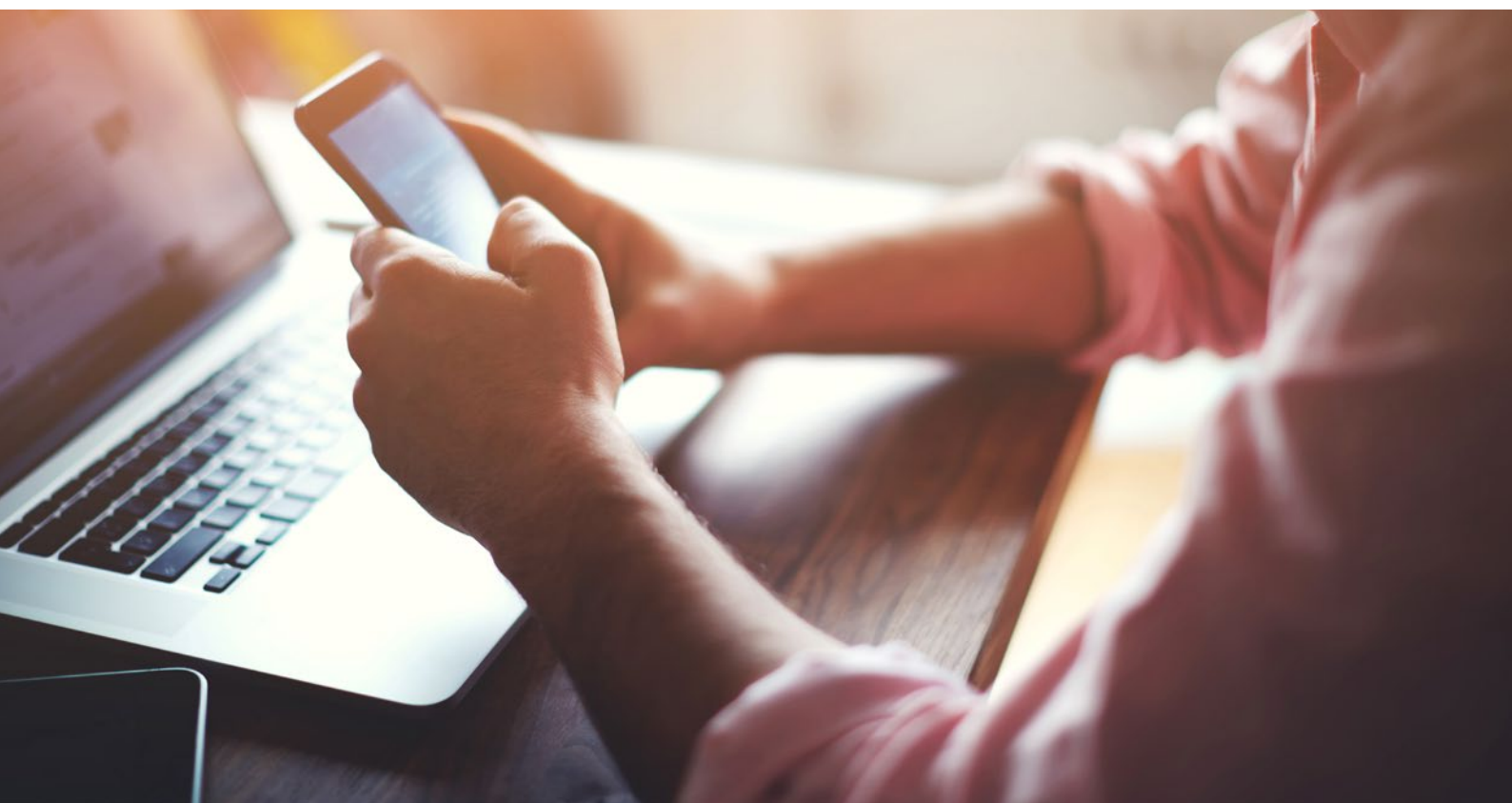
## A Call to Action

In our discussions with an array of individuals among industry, academia, and policymakers, the authors have found that understanding of blockchain is poor, and appreciation is modest of both the dangers that the technology can generate as well as the benefits it can deliver. We observe a generalized awareness, but heterogeneous comprehension of the nuances.

Recognizing the need for strategic clarity, and framework solutions, the Massachusetts Institute of Technology's Connection Science & Engineering team seeks to offer context on the blockchain revolution, pose policy questions to regulators and lawmakers, and provide inspiration to blockchain innovators.

MIT is frequently called a place where “the future is invented,” informed by our mission of solving humanity's biggest problems. Our belief institutionally is that innovation can be a positive force for change, if guided by a responsible, ethical framework. Despite the notes of caution that we inject into this report, we believe that blockchain technology can deliver material benefits to society, and will provide guidance around potential areas for application that we feel hold promise.

**We invite you to enter the fifth horizon of innovation, and help us create the future of blockchain.**





# THE FINANCIAL WORLD IS FOCUSED ON FINTECH. ARE YOU?

If you don't want to get left behind, consider updating your expertise and upskilling yourself with this **12-week online certificate course** from MIT, starting 6 June, 2016.



**EX**perimental  
**L**earning

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

## **Fintech certificate course: Future Commerce**

*Presented in collaboration with leader in online education, GetSmarter.*

**DOWNLOAD COURSE INFO PACK**



*"You need to understand what's going on in this highly chaotic environment. And we can help."*

**DAVE SHRIER - MANAGING DIRECTOR, MIT CONNECTION SCIENCE,  
COURSE INSTRUCTOR**



**SA+P**

Massachusetts Institute of Technology | School of Architecture + Planning

IN COLLABORATION WITH **getsmarter**

---

## REFERENCES

<sup>1</sup> MIT personal conversations with CEOs of over 60 leading financial services and technology companies, Davos Switzerland, January 2016.

<sup>2</sup> Prediction: \$10 Billion Will Be Invested in Blockchain Projects in 2016 <http://coinjournal.net/prediction-10-billion-will-be-invested-in-blockchain-startups-in-2016/>

<sup>3</sup> Google Webtrends, accessed 19 March 2016.

<sup>4</sup> Santander InnoVentures, Oliver Wyman, Anthemis Group, "The FinTech 2.0 Paper" (2015).