



The future of Digital Money

From Bitcoin to Smart Contracts

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Spoiler Alert: Conclusions

- **Lesson 1: The money of the future will be DIGITAL**
 - Not digital counterparts; **natively digital (algorithmic)**
 - Kids born today will probably grow in a world where cash and plastic money will seem odd
 - Maybe even government money will seem odd.
- **Lesson 2: Digital Money will not be passive – it'll be ACTIVE**
 - Money will have code embedded on it (**programmable money**)
 - Code will allow money to determine appropriate action/behavior
 - Money will determine FOR ITSELF when/where to go (move, be invested, etc.)
- **Lesson 3: Programmable money will not be used by humans – it'll be used by MACHINES**
 - Intelligent machines will enter the economic landscape as quasi-independent economic agents
 - **M2M commerce** will prevail
 - Naturally, **social consequences will be vast**

Money Digitized

From fiat currencies to **Bitcoin**

Technology of native Internet money

From Bitcoin to **blockchains**

Machine-to-machine (M2M) money?

From homo economicus to **machina economica**

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Money as technology: Versions

Money 1.0: Hardware-based money

Gold (until early 20th century)

Currencies, backed by **gold** (until c. 1973)

Fiat currencies, backed by **governments** (now)

Money 2.0: Software-based money

Enter **Bitcoin** (2009)

Enter **Ethereum** (2014)

and many others (alt-coins, colored coins, meta-coins, sidechains, ...)

The nature of money

- Think for a while: what is **real** money?
 - “The money that **is** appears to be real money”
- Money is a human invention



Money is based on



A first attempt at Money 2.0: Bitcoin

Bitcoin is a private, decentralized, digital cryptocurrency

- **Private:** Not issued by a sovereign
- **Decentralized:** No issuing party; units are issued algorithmically
- **Digital:** Fully electronic; with no underlying peg to assets
- **Cryptocurrency:** Anti-counterfeiting through cryptography



Bitcoin as currency



Bitcoin as a payment network

Still much smaller than competition, but growing fast

Year	VISA		MasterCard		Discover		Western Union		Bitcoin	
	(Vol.)	(Tx.)	(Vol.)	(Tx.)	(Vol.)	(Tx.)	(Vol.)	(Tx.)	(Vol.)	(Tx.)
1Q11	15,153.8	198.3	8,011.0	65.6	746.5	14.7	208.8	0.6	0.04	0.002
2Q11	16,604.4	213.2	8,934.1	72.5	787.0	15.7	226.4	0.62	1.6	0.006
3Q11	17,033.0	217.7	9,285.7	77.1	787.0	15.4	231.9	0.63	0.92	0.008
4Q11	17,450.5	223.6	9,505.5	84.4	761.3	15.1	226.4	0.65	2.1	0.006
1Q12	16,934.1	215.7	9,329.7	84.8	804.3	15.8	214.3	0.62	0.7	0.007
2Q12	17,252.7	218.7	9,780.2	93.8	861.1	17.5	220.9	0.64	1.04	0.021
3Q12	17,582.4	225.3	10,087.9	95.4	860.9	17.6	216.5	0.63	2.47	0.032
4Q12	18,648.4	236.8	10,835.2	101.3	840.1	16.8	219.8	0.64	2.45	0.033
1Q13	18,120.9	227.9	10,406.6	95.1	819.2	16.1	207.7	0.61	8.12	0.052
2Q13	19,109.9	245.6	11,087.9	104.1	856.1	17.0	225.3	0.66	26.2	0.053
3Q13	19,175.8	252.1	11,494.5	109.9	850.5	17.1	231.9	0.69	19.3	0.050
4Q13	20,197.8	259.9	12,142.9	114.0	883.8	17.2	236.3	0.71	108.65	0.061
1Q14	19,011.0	249.9	11,483.5	108.2	850.4	16.5	223.1	0.66	91.01	0.063
2Q14	20,274.7	269.6	12,351.6	116.6	892.2	17.6	239.6	0.70	52.35	0.063
3Q14	20,703.3	275.9	12,714.3	120.5	881.0	17.5	242.9	0.72	51.07	0.068
4Q14	20,879.1	285.4	12,879.1	127.1	912.0	17.7	233.0	0.72	60.1	0.084
1Q15	19,263.74	275.6	11,681.32	121.3	852.32	16.3	214.29	0.68	48.80	0.094

Table: Volume in million USD (Vol.) and millions of transactions (Tx).

Source: P. Tasca, Digital Currencies, ECUREX Research

Bitcoin's monetary features

Bitcoin has a number of interesting monetary features:

- **Fixed Supply:**
 - Money supply is regulated in the protocol
 - **Only 21 million bitcoins will ever exist.**
- **Transparent monetary policy:**
 - Available to everyone to examine and verify
 - The protocol is fully **open source**.
- **Consensus-based:**
 - Key features can't change unless a **majority of participants** in the system agree to change them.

So, is s/w money better than h/w money?

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Scarcity	✓ (trust in CB/gov)	✓ (fixed supply)

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Verifiability	✓ (third parties)	✓ ✓ (blockchain)

So, s/w money IS better than h/w money

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Acceptability	✓✓	✗ (it'll take time)

Outline

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Machine-to-machine (M2M) money?

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Bitcoin is NOT just currency

Bitcoin is **a collection of technologies:**

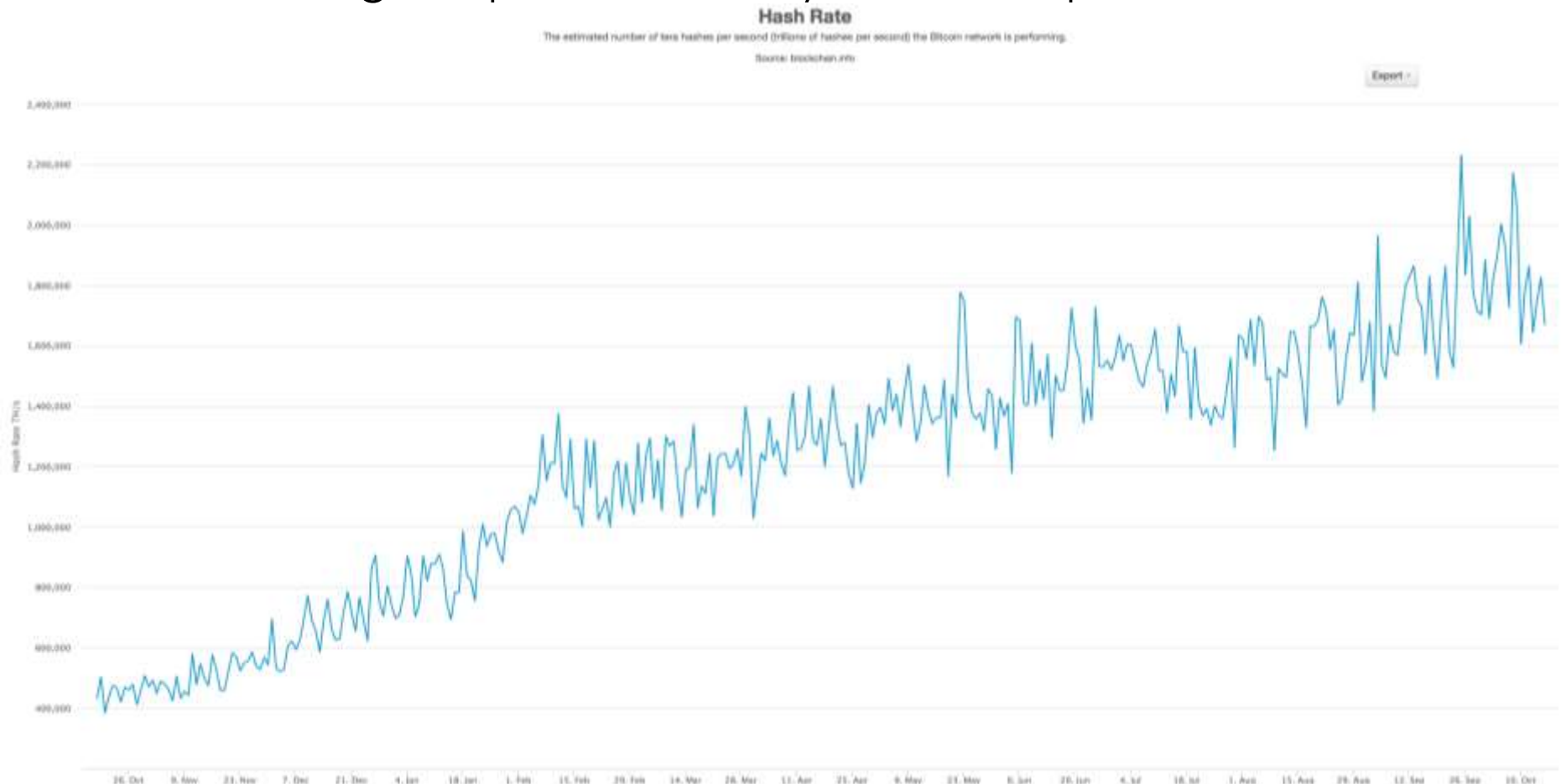
A de-centralized peer-to-peer network (the bitcoin **protocol**)

A de-centralized deterministic
currency issuance and transaction verification
mechanism (**proof-of-work** and **mining**)

A public transaction ledger (the blockchain)

The Blockchain

- A publically reviewable ledger, where **every transaction is written in and verified**
 - **Shared by thousands of computers** worldwide
 - Making it impossible for anyone to tamper with its contents



Let me say that again:

The blockchain is a
public record of ALL Bitcoin transactions in history!

The screenshot displays a Bitcoin blockchain explorer interface. At the top, it says "Home Welcome to Blockchain" with a "More..." link. Below this is a table of recent blocks. The table has columns for Height, Age, Transactions, Total Sent, Relayed By, and Size (KB). The rows show blocks at heights 434660, 434670, 434678, 434677, 434676, and 434675, with ages ranging from 8 to 48 minutes. Below the table is a "Latest Transactions" section with a list of transactions, each showing a truncated address, a time of "< 1 minute", and a green button indicating the amount in BTC. To the right is a "Search" section with a text input field and a "Search" button. Below the search is a "NEWS" section with several article titles and their respective authors and dates.

Height	Age	Transactions	Total Sent	Relayed By	Size (KB)
434660	8 minutes	2565	15,345.57 BTC	BT Fury	999.04
434670	35 minutes	1099	4,206.99 BTC	F2Pool	465
434678	37 minutes	1295	8,106.61 BTC	BT Fury	952.88
434677	36 minutes	759	2,074.47 BTC	BitClub Network	988.21
434676	42 minutes	1103	24,925.89 BTC	F2Pool	810.91
434675	48 minutes	1194	7,425.65 BTC	F2Pool	900.85

Latest Transactions

8888800046e717d126938473...	< 1 minute	0.7587531 BTC
d71c33e158e5378a0671019d1...	< 1 minute	674.09750265 BTC
a180e054e052803d0d4113c...	< 1 minute	3.027407 BTC
4ed0a032785d90d9399906ba...	< 1 minute	46,265.18192 BTC
08973e6135d1c3c0d705e103...	< 1 minute	0.00894 BTC
3ac8758487818d7c02fa3004...	< 1 minute	0.0081306 BTC
3d79e693a6d0c0ba0c57fd...	< 1 minute	0.00894 BTC
8b23e108081c0c0713e1d...	< 1 minute	0.00894 BTC
77020e073ee003e0115847ab...	< 1 minute	10.3873602 BTC
78e036c304059e992d6e...	< 1 minute	0.01 BTC

Search
You may enter a block height, address, block hash, transaction hash, hash/ID, or ipid address...

Address / ip / ID hash

NEWS

- Magnr - Bitcoin Trading Platform | Trade with Leverage
Posted on 1 month ago
- Coinbase Error and No Service Response.
Published 2 months ago
- What do you think about this show? Is accurate to the reality of blockchain technology and digital currency?
Published 2 months ago
- SegWit is not great | Deadnix's den
Published 2 months ago
- Ethereum Classic Price Technical Analysis - ETC Bulls Are Back
Published 7 hours 35 minutes ago
- Moved 2 BTC without transaction fee. Still unconfirmed after 5 days. What now?
Published 7 hours 35 minutes ago
- Miner guide - How to safely hard fork.
Published 1 year 10 months ago

Why is this important?

- Think of Bitcoin as **an Internet-wide trust system**:
 - Anyone can buy in or sell out of its ledger
 - Anywhere in the world
 - Without anyone's permission or intervention
 - At virtually no cost
 - **Without needing to know or trust one's counterparty!**
- Practically, this gives us, for the first time, **a way for one Internet user to transfer a unique piece of digital property to another Internet user, such that**:
 - the transfer is **guaranteed** to be safe and secure
 - **everyone knows** that the transfer has taken place
 - **nobody can challenge** the legitimacy of the transfer

The consequences and application implications of this breakthrough are hard to overstate

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Bitcoin/Blockchain implications

- Bitcoin can be thought of as a **beta version** of real digital money:
Money-over-IP or **Programmable Money**
- Blockchain will create a new Internet layer: a **trusted Internet**
 - Its implications will be the same as with Internet 1.0:
dis-intermediation & cyber-mediation
 - **Whole industries will be disrupted – probably, even the society**
- For example, in the future we may see:
 1. Money that can be transacted in really small quantities (**nano-payments**), most likely conducted by machines
 2. Autonomous, AI-based, economic agents (imagine **self-driving cars bidding for your ride**)
 3. Cloud-based, human-less corporations (imagine a **blockchain-based lawyer/notary/bank**)

How far are we?

hmpeter.com

Lawyer Intelligence

HOME FEATURES CLIENTS GET STARTED

MEET PETER, YOUR AI-BASED BUSINESS LAWYER

Peter speaks English. Just "Cc" him in your emails.
Request signatures, generate contracts and notarize documents in no time.

SIGNATURES

Peter manages the whole signing process by email.

CONTRACTS

Need a NDA? a SAFE? Peter will ask you the right questions and write everything for you.

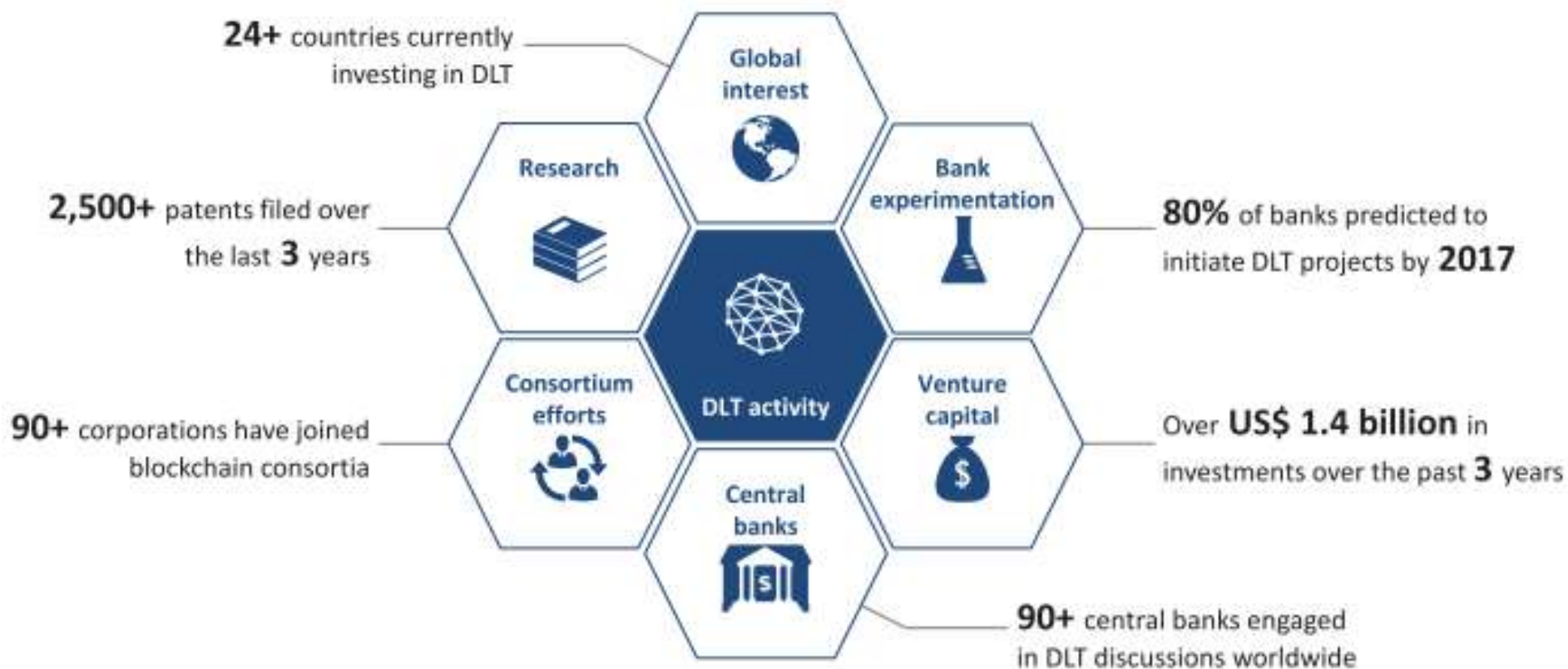
NOTARIZE

Just signed a paper contract? Scan it to Peter, he'll notarize it.

ASSISTANCE

Need an advice? Forgot an information about your company? Peter knows you better than you do.

Naturally, global interest is high



Perhaps to a level of hyperbole

- Remember the dot-com bubble in the late 1990s?)

Which areas will be disrupted?

- Ultimately, all markets that rely on the following mechanisms:
 - **Intermediation**
 - **Clearing and settlement**
 - **Recording and information keeping**
 - Rating, recommendation, voting
 - **Databases**
 - Distributed storage, authentication, anonymization
 - Incentive schemes (rewarding / punishing)
 - **Transaction traceability**
 - **Refereeing, arbitration**
 - **Notarization**

Banking/finance is right in the epicenter!

Banking / Fintech disruption

Ex-Barclays CEO: Banks are about to have an 'Uber moment' – and it's going to be painful



Oscar Williams-Gnut
Nov. 26, 2015, 5:20 AM 64,418 20



Antony Jenkins, the former CEO of Barclays, has a nightmare vision for the future of big banks.

In a speech in London this week he said: "The incumbents risk becoming merely capital-providing utilities that operate in a highly regulated, less profitable environment, a situation unlikely to be tolerated by shareholders."



"A series of Uber-style disruptions in the industry **could shrink headcount at traditional big banks by as much as 50%, while profitability in some areas could collapse by over 60%**"

The Fintech 2.0 Paper: **rebooting financial services**

A report by Santander estimates that blockchain technology could reduce banks' infrastructure costs by up to \$20 billion a year. Santander is said to have identified "**20 to 25 use cases for the technology**"

Banking / Fintech initiatives

Hands On With Visa Europe's Bitcoin Remittance App

Joon Ian Wong (@jioonlan) | Published on December 5, 2015 at 09:49 GMT

FEATURE

729 596 62 336

Visa Europe's innovation lab was demonstrating its proof-of-concept remittance app, which sends funds over the bitcoin blockchain, at the UnBound London conference on 30th November.

The lab built the prototype with startup Epiphyte as part of a 100-day development project. Visa Europe Collab's Jon Downing and Epiphyte's Edan Yago discussed the reasons for embarking on the project, and for using the bitcoin blockchain instead of a closed network, in [this CoinDesk exclusive](#).

At the conference, held under the Victorian railway arches of London Bridge, Collab's Nigel Clarke, an innovation partner there, gave us a hands-on demo of the money-transfer prototype with an exclusive screen-by-screen walkthrough.



Remittance journey

The "remittance journey" starts on the send screen. This is a responsive web page that works on a desktop or mobile browser. The idea is for a user to link a Visa card to the remittance app. Once linked, the app will

Barclays is experimenting with bitcoin's blockchain

Oscar Williams-Grist | Jun. 23, 2015, 8:57 AM | 1,059

FACEBOOK LINKEDIN TWITTER EMAIL PRINT

Barclays is working with a startup to explore how it could use the technology underpinning bitcoin



Goldman Sachs just put a bunch of money into a Bitcoin startup

Shane Fero | Apr. 30, 2015, 2:40 PM | 288

FACEBOOK LINKEDIN TWITTER EMAIL PRINT

Goldman Sachs is jumping on the Bitcoin bandwagon.

The New York Times reports that Goldman "struck a partnership with a major Chinese investment firm, IDG Capital Partners, to lead a \$50 million investment into Circle Internet Financial, a startup that aims to use the technology underlying Bitcoin to improve



And many others:

- UBS has set up a blockchain lab in Canary Wharf
- Nasdaq is tinkering with the blockchain
- ...

Banking / Fintech initiatives



Banks involved include: Bank of America, Barclays, BBVA, BNP Paribas, BNY Mellon, Commonwealth Bank of Australia, CIBC, Citi, Commerzbank, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, ING Bank, J.P. Morgan, Macquarie Bank, Mitsubishi UFJ Financial Group, Mizuho Financial Group, Morgan Stanley, National Australia Bank, Nordea, Royal Bank of Canada, Royal Bank of Scotland, SEB, Societe Generale, State Street, Toronto-Dominion Bank, UBS, UniCredit, and Wells Fargo.

Conclusion

- **Blockchains may be the biggest revolution since the invention of the Internet**
 - Blockchains will enable a **trusted Internet**
 - Bitcoin is but one application (like e-mail is for the Internet)
- For the first time in history, we have access to **open, distributed, trusted networks**, verifying and storing financial transactions without requiring any sort of trusted intermediary.
- For the first time in history, we can conceive the notion of **human-less corporations**, which exist only in the cloud.
- Taken together, these developments will unleash a new **Networked Economy**, with profound consequences to the fabric of how societies and economies operate.