

Payments and FinTech

Payment Primers vol.2: From bitcoin to blockchain... from hype to reality?

The crypto-currency bitcoin has been through the traditional technology hype cycle over the past few years. First the Peak of Inflated Expectations was reached in late 2013 with bitcoin prices reaching record highs, then the failure of the biggest bitcoin exchange began to push bitcoin toward the Trough of Disillusionment... we think there will be the gradual shift away from bitcoin, the currency, towards its underlying infrastructure, the blockchain, that will put the concept of crypto-currencies on the path to broader acceptance. By separating the two, the blockchain can be used as a low-cost, transparent, reliable and direct infrastructure for many forms of interaction, including payments and also securities exchanges, voting, and inventory management to name but a few. The bitcoin phenomenon has generated significant interest in the tech and financial services communities... and as we look deeper into the world of digital payments, we increasingly have and are asked about bitcoin by institutional investors. With this report, we aim to answer the key questions of what/how/why of bitcoin, the prospect for its underlying technology and the eventual impact on our technology coverage as well as other industries.

Bitcoin's success as a currency is questionable...: Bitcoin made a breakthrough in 2009 by proving faster and cheaper payments were possible with crypto-currencies. Bitcoin provides a more elegant solution than our current payment system in many ways, but it also falls short in a number of areas. The irrevocability of transactions makes it less consumer friendly and the anonymity and lack of "know your customer" has drawn criticism from regulators. The failure of the bitcoin exchange Mt. Gox and subsequent loss of funds for many consumers provided high profile examples of these shortcomings.

... But blockchain is leading to better alt-coins and other services: The technology concept underlying bitcoin, the blockchain, is being employed to build better crypto-currencies without the pitfalls of first-gen bitcoin. Multiple so called "alt-coins" are under development, taking bitcoin's initial concept and adding natively key features like KYC, reversibility/refunds, real-time transfers and improved security. Building on the idea behind blockchain, crypto-ledgers are also being deployed in areas away from basic payments, such as asset exchanges, smart contracts, inventory tracking and voting.

Still early, but stay tuned for disruption: The timing and the extent of the effect of crypto-currencies and -ledgers on the payment system and broader economy remains unclear. We do expect the concept of blockchain, however, to eventually be disruptive and for long-term investors, we think it worthwhile to monitor developments in these areas related to financial services, particularly for payments, banks, exchanges and insurance.

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Save the date

Barclays Select Series: European Payments & FinTech Forum

Tuesday 15 September 2015

The May Fair Hotel
Stratton Street
London W1J 8LT

We are pleased to invite you to the Barclays Select Series: European Payments & FinTech Forum to be held on Tuesday 15 September 2015 in London at The May Fair Hotel.

The 4th instalment of this forum will provide a prime opportunity to address topical issues within the Payment sector and, given the rate at which the space continues to evolve, we are this year extending the remit of the conference to incorporate FinTech.

The interactive programme will include keynote presentations and panel discussions with a schedule of one-on-one and group meetings running in parallel. Further details on participating companies will be announced in due course.

Multiples crypto-currency companies mentioned in this report will be attending.

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The payment industry is undergoing a metamorphosis, with changes in form factor (wallets, pay-with-wearables, pay-by-biometrics, crypto-currency), architecture (shift to real-time settlement, blockchain), transaction communication (NFC, QR, HCE, tokens), security (biometrics, GPS, beacons) and value added services around data.

To keep the investment community up-to-date with these rapid changes and announcements, we intend to publish shorter payment periodicals, in addition to our longer term thought pieces. In this second instalment, we look at the controversial, complex and disruptive nature of bitcoin and, more importantly, its underlying technology, the blockchain.

Bitcoin has generated significant interest initially in the tech and latterly in the financial communities... as we look deeper into the world of digital payments, we increasingly have and are asked questions about bitcoin.

With this report, we aim to answer the key questions of what/how/why of bitcoin, where its underlying technology is headed and the potential eventual impact on our coverage and other industries. While we normally shy away from writing “think pieces” with limited direct and near-term stock implications, we have received recently so many questions from investors about bitcoin that we thought it worthwhile to survey the landscape.

We think our most interesting conclusion from this research is that it is not so much bitcoin the currency which is disruptive, but more likely its underlying infrastructure the blockchain. Many of the problems — the hype and speculative activity — can be associated with bitcoin the currency... while many of the positives — the elegant system, the low cost, the transparency — can be associated more with blockchain the infrastructure.

Multiple companies offering a wide range of applications for the concept of crypto-currency and of the blockchain are emerging. We offer an overview of some of the most innovative ones and their target markets.

Governments and regulators, who were initially cautious and reluctant to support the emergence of crypto-currencies, are gradually getting comfortable too, so it is the right time in our view to learn about this exciting new vibrant industry.

"I would not encourage your grandmother to put her life savings in [Bitcoin. But] every single smart computer science person I've had look into it has reached the same conclusion - it's a fundamental breakthrough in technology." - Marc Andreessen, Senior Technology Venture Capitalist

FROM BITCOIN TO BLOCKCHAIN ... FROM HYPE TO REALITY?

What is bitcoin?

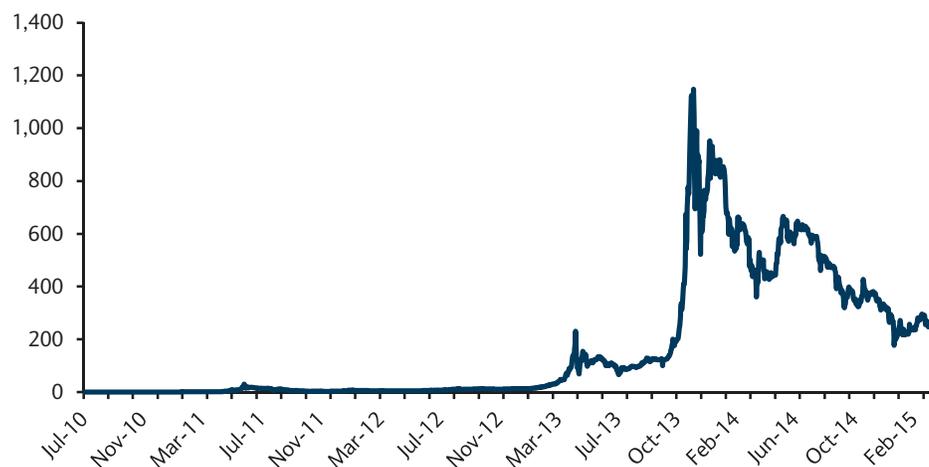
Bitcoin is a crypto-currency which enables near real-time peer-to-peer payments, across the globe, and without the need to involve a third party intermediary. Transfers are mostly anonymous and in theory highly secure, and at the moment cheaper than the traditional banking rails.

Bitcoin may be attractive on many counts, but whether it will see substantial adoption and take over payments is debatable...

We believe the spectacular rise of bitcoin prices in 2013 then collapse in 2014 is reflective of not only the high profile collapse of the Mt. Gox Bitcoin exchange, but also the gradual realisation of some early issues of the crypto-currency's design (bitcoin was born only in 2009), which may prevent it from becoming the disruptor it was once heralded to be.

Still today, the answers to many key questions remain subject to significant debate: is bitcoin safe as a storage of value? Is it safe as a vehicle currency to ease payment transfers? Is the lack of central authority good or bad? Is it consumer friendly enough? Was the initial muted reaction from authorities justified, and to what extent can it improve? Even as new emerging services are addressing some of these shortfalls, will they be enough to convince the regulators to allow a deeper integration with the existing financial system and for merchant and consumer alike to adopt it?

FIGURE 1
Bitcoin price in US Dollar since inception



Source: www.coindesk.com/price

Separating the hype of bitcoin from the elegance of blockchain

At the heart of bitcoin lies a concept called the blockchain. The blockchain is a database which is distributed and replicated among all bitcoin network participants (including users), and which keeps track of all the transactions in the bitcoin network. As we see in further detail later, the key features of bitcoin (i.e. method and speed of settlement, number of coins in circulation, cost of transactions, etc.) are in fact determined by the blockchain's initial design.

When we look below into the key advantages and criticisms of bitcoin, we realise that most of the positive aspects of bitcoin can be attributed to the concept of the blockchain and not so much the “currency” per se.

- **Positive I - Near real time settlement:** Settlement in bitcoin takes 1 to 60 minutes, depending on the availability of miners (i.e. processors) and is determined ultimately by the time it takes to run a complex mathematic formula on the blockchain, which requires secret information known only to the bitcoin payer. For many bitcoin derivatives, or alt-coins, settlement is actually quicker, as faster algorithms have been developed. This is better than most money transfer networks and schemes around the globe, including SEPA-FAST in Europe and Vocalink’s Faster Payment in the UK. Most of these traditional networks settle transactions only a few times a day, and in most cases only once, even if the transfer seems instantaneous from the consumer’s point of view (see further down the note for more detail on banks’ money transfer systems).
- **Positive II - Low transaction fees:** transaction fees are well below 1% at the moment compared to between 2% to as much as 12% for mainstream electronic payment schemes, the extreme being represented by international remittance systems. In the traditional banking system, such an operation involves multiple banks, with bilateral agreements in place, sometimes the central bank too, and many costly risk management functions, collateral capital and infrastructure. None of that is necessary for secure and certain payment transfers in bitcoin, as it comes down to writing only once the transaction into the blockchain.
- **Positive III - No central authority:** Bitcoin is decentralised, which means that there is no central bank with the power to impact at will the money supply. Many see this as an advantage since the value of bitcoin is not subject to monetary policies, in this way drawing a parallel between bitcoin and refuge assets like gold.
- **Positive IV - Certainty of payment transfers:** Merchants have often complained too many consumers ask for charge-backs on credit cards on false claims that a product or service was not delivered (banks have to intermediate). Bitcoin has certainty of transaction; there is no way to cancel or reverse a transaction.
- **Positive V - Financial inclusion:** Opening a new bitcoin wallet is immediate and free today, and does not require any form of identification document. It helps financial inclusion in places with poor financial infrastructure and via lower transaction costs.

We view the downsides of bitcoin as it exists today due more to implementation of standards, namely around features and security, than an inherent problem with the blockchain technology:

- **Shortfall I – Security in bitcoin is questionable:** Bitcoin remains more risky than fiat currencies and traditional financial rails, with the security in particular for both the value and the safety of the deposits still a big area of debate today:
 - **As a currency for money transfer and storage of value:** The value of a currency needs to be relatively stable for merchants and consumers to feel safe using it for trading and to store value. The recent price volatility of bitcoin shows it is not fulfilling these criteria completely. Bitcoin has no watchdog to prevent collusion or price manipulation and no central bank to smooth its daily price volatility. This is not an issue in our view due to the blockchain but more due to the way people have decided to use bitcoin (for speculation and investment as much as for simple money transfer vehicles). We note too that the decision to not have a central authority capable of stabilising bitcoin prices - which does not help in this case - was a design choice and could have been implemented in the blockchain.

- **At the level of the safety of the deposit itself:** There is no regulation at the moment or standard for best practice for IT security so the risk of a wallet provider acting fraudulently or going insolvent due to negligence or fraud still exists. There is also no deposit protection scheme to help compensate users in case of fraud or bankruptcy (no minimum capital requirements, no last resort insurer or guarantor). Again, this is not an issue with the blockchain itself but the IT security standards across the ecosystem. In theory, the algorithm behind bitcoin is sufficiently sophisticated as to negate any risk of fraud. For instance, the failure of the bitcoin exchange agent Mt.Gox, which was the largest bitcoin exchange at the time, was due to a poor implementation of IT standards, not a failure of the concept of bitcoin.
- **Shortfall II - Non-reversibility is bad for consumers:** Non-reversibility helps merchants as it reduces the fraud risk from charge-backs. It can however be a problem for consumers who issue a transaction by mistake to the wrong bitcoin wallet and have no ability to recall funds. This is again a design choice with bitcoin, and could have been implemented differently on the blockchain.
- **Shortfall III - A step backwards for crime prevention (where anonymity becomes an issue):** Money transfers in the traditional financial system are made between account holders which have been identified and background checked (“Know Your Customer”), which makes it easier to detect suspicious transfers, irregularities and money laundering as well as to confiscate a criminal’s funds. With bitcoin, this becomes more difficult because anyone can create a wallet, buy bitcoin and make transfers anonymously.

True disruption to come from the blockchain not bitcoin

Some of the aforementioned features of bitcoin have proven unpopular with both users and regulators, offsetting the positives of an otherwise compelling solution for C2C and B2C payment exchanges.

In order to alleviate these issues, new 3rd party features can be built around bitcoin. This however adds intermediaries and costs, to accommodate for the shortfalls of the bitcoin network while it is still not used widely, so it is not the optimal solution in our view.

A further possibility is to modify bitcoin’s infrastructure, giving birth to new crypto-currencies - called alt-coins - incorporating better features from the onset. Today, bitcoin remains the largest digital currency in existence, but we are watching to see the traction gained by these new and improved alt-coins.

Adding new features around bitcoin

A number of companies are launching services which complement bitcoin. Elliptic for instance is a start-up in London which offers a complementary set of services for anti-money laundering, and asset custody. In this way, Elliptic are addressing the two most important complaints from regulators against bitcoin. Others have launched services to address the irrevocability of transactions, the other oft-criticised feature of bitcoin; in this example, in the case of ecommerce, funds will first be held in an escrow account until the goods are delivered. All these additional services however come at a cost, reducing one of the key selling points of bitcoin, namely low transaction fees.

New alt-coins

A better way to improve bitcoin is just to restart one from scratch, but with better design features. The technology concept underlying bitcoin, the blockchain, is being employed to build better crypto-currencies without the pitfalls of first-gen bitcoin. Multiple alt-coins have and continue to emerge, taking bitcoin's initial concept and adding natively key features like

KYC, reversibility/refunds, real-time transfers and improved security. Examples of such alt-coins are Litecoins and Dogecoins.

Disruptive potential in B2B: Payment transfers and many other uses over the long term

Bitcoin with its 3rd party services and the alt-coins may provide compelling alternatives for peer to peer money transfers or even interbank infrastructure. We do not see this however as immediately disruptive to our European Payment service providers, such as Ingenico, Wirecard or Optimal Payments, as bitcoin and alt-coins remain a small fraction of the addressable market of transactions. We also think that until the system coalesces around a set of standards that consumer adoption will remain relatively low.

We think that crypto-currencies and the blockchain are more likely to have a nearer term impact in other areas in B2B scenarios, where the blockchain technology is being tested. These include core banking infrastructure for payment transfer and asset exchanges (e.g. a securities exchange with no intermediary can be fashioned using the blockchain), as well as in enterprises for customer billing, supply chain management, or for other applications such as voting systems (i.e. improving the transparency of public elections), notary and traceability.

First area of disintermediation is the infrastructure for money transfer at banks and remittance networks.

One of the most intuitive applications for bitcoin and other virtual currencies is in the area of remittance and money transfers. Today's banking system has evolved by incorporating multiple layers of services and intermediaries, so sending money anywhere in the globe is possible, but it can take time and be costly. With the fast and secure blockchain, large parts of these infrastructures could be replaced, thereby reducing considerably the speed and cost of running payment transfers. In fact, it could even reduce the capital requirements of banks, as it would reduce considerably the counterparty risks.

Many incumbent players are experimenting with blockchain-esque ledgers for payment transfer at the moment. For example, Western Union has confirmed it has had preliminary discussions with Ripple Labs (an alt-coin) regarding a pilot for real-time settlements. We view Western Union's collaboration with Ripple as evidence of incumbent players reacting to the threat of start-ups.

How does bitcoin compare to bank transfers and remittance networks today?

We show in the figure below an example of a money transfer via three different "schemes": 1) through the traditional banking system, 2) via a remittance provider like Western Union, and 3) using bitcoin. We have also highlighted the typical transaction costs of each method.

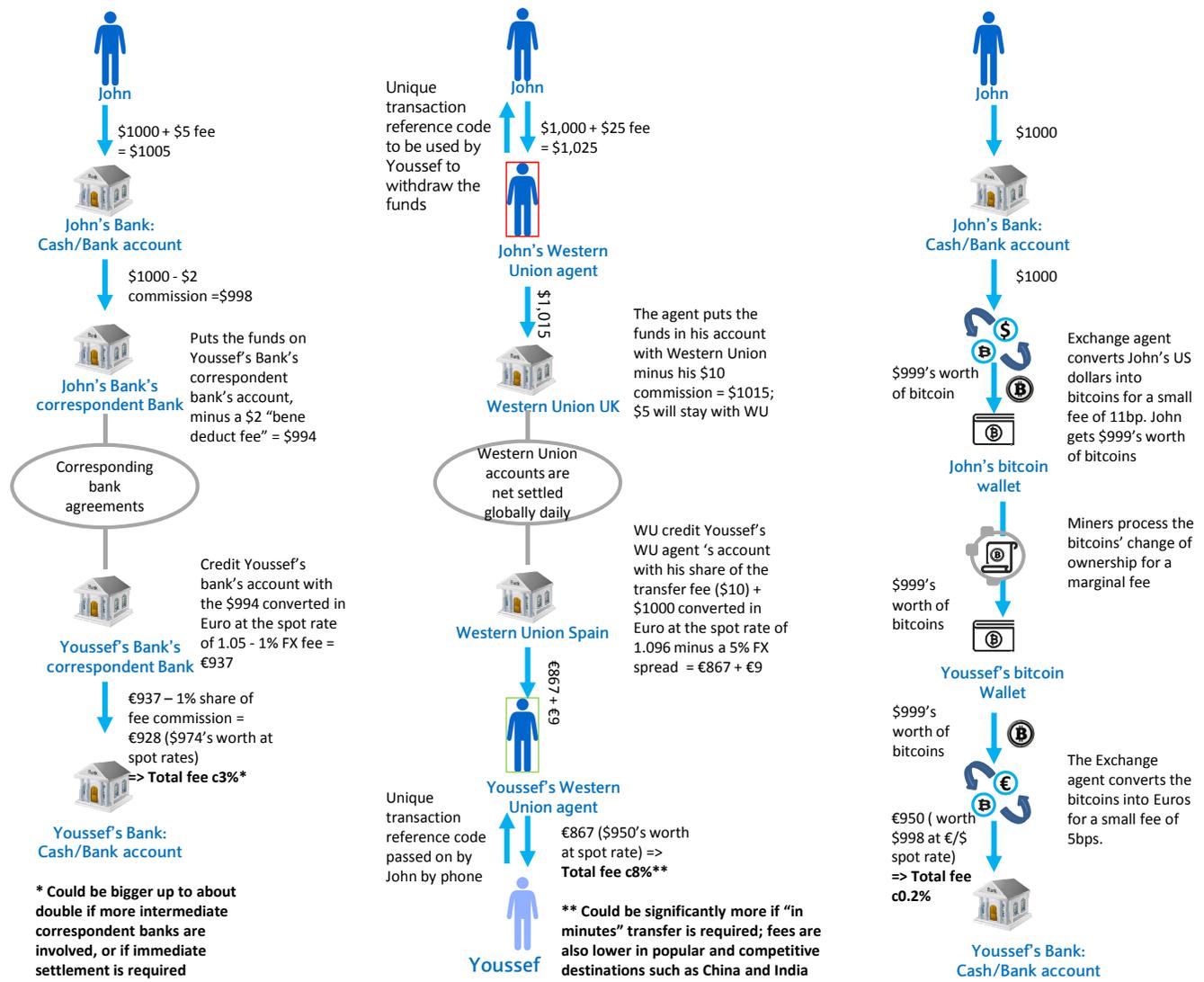
Unless the money transfer occurs between two accounts at the same institution, transferring money between banks is usually slow and potentially expensive due to the number of intermediaries involved in correspondent banking. Costs escalate further if the transaction is cross border.

Most money remittance networks work similarly to a network of banks with correspondent bank agreements. Remittance networks offer some of the advantages of bitcoin (instant, KYC "light", no need for bank account), but delivering such features with the traditional banking system means incurring new layers of costs on top of that of a traditional banking transfer, so transaction fees are even more expensive.

Unsurprisingly for a disruptive technology, we find that crypto-currency transfers are substantially cheaper than bank transfers which are cheaper than remittance networks.

FIGURE 2

How to send money – Traditional bank transfer, Western Union and bitcoin compared



Source: Barclays Research

Second potential blockchain application: Securities exchanges

Why would the blockchain be limited to only vanilla currency transfers? The blockchain concept has been abstracted to carry any sort of asset which can be represented digitally.

Swiss bank spoke about simplifying trading and settlements thanks to blockchain-based solutions. Similarly Nasdaq announced that it will trial soon a blockchain-based solution for using and trading securities. There has also been a migration of high profile industry figures towards FinTech start-ups looking at bitcoin/blockchain-driven solutions, so we expect to hear more in this area over the coming year or two.

Third potential blockchain application: Registries for asset traceability

Blockchain could also be used as a registry of assets to help insurers and buyers keep track of objects. This would bring transparency on the origin and status of assets, which would have the dual benefit of helping buyers make educated purchase decisions and insurance companies fight fraudulent claims. For example, if a car breaks down, and the insurer pays for the repairs, both events would be recorded on the blockchain, so it would become more

difficult to make a second claim or to hide the event in the aim of gaining a lower premium from another insurer. Edgelogic is working with Aviva on trials at the moment.

More to come over the next few years

As shown briefly by this list of examples and also by the large number of bitcoin start-ups present in London alone, the possibilities for the bitcoin/blockchain concept are great, far greater in our opinion than that of the bitcoin currency alone. Further examples are presented at the back of the document, but we also believe that more use cases will emerge over time.

Deep dive into bitcoin

What is bitcoin?

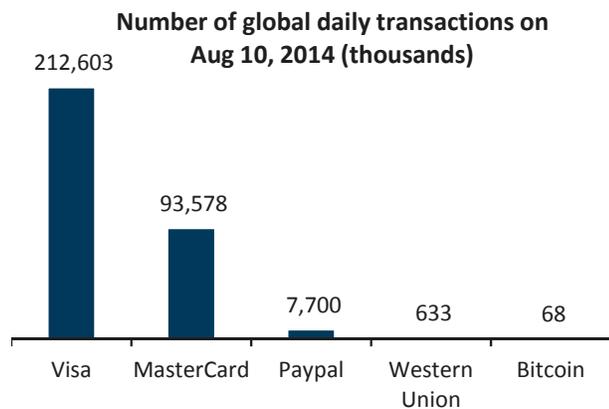
Bitcoin is an open source online payment system born in 2009 after being initially outlined in a whitepaper by Satoshi Nakamoto. Satoshi Nakamoto is a pseudonym and, to date, it is not clear yet who is behind the initial bitcoin paper.

The lack of clarity around its source has not prevented bitcoin from flourishing and gaining public attention, even if in the grand scheme of things, actual adoption remains embryonic after over 5 years of existence.

Bitcoin and, more importantly, its underlying technology the blockchain have proven that it is possible to make payments across the Internet which are quasi-anonymous, highly secure, cheap, near-instantaneous and without involving a middleman.

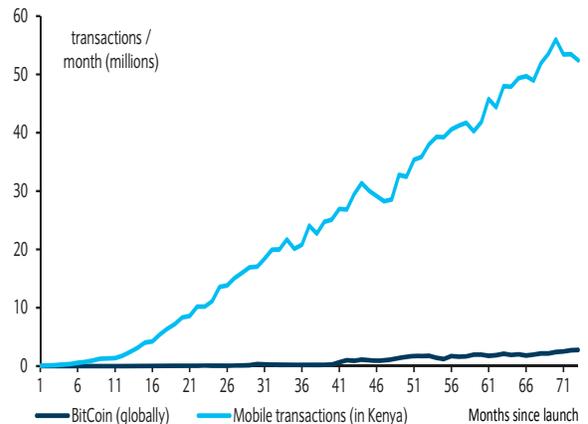
Today, while the number of transactions continues to grow rapidly, it is still dwarfed by traditional payment rails such as Visa and MasterCard. While it may be significantly cheaper to transfer money or to make payments in bitcoin than with traditional means of electronic payments, the benefit of incumbency in payments remains clear. Bitcoin is also growing significantly slower than other emerging payment methods such as m-PESA, which was launched in 2007 and has revolutionised peer to peer payments in Kenya, highlighting as well the benefit of providing a compelling payment solution in a market where little before existed.

FIGURE 3
Bitcoin transaction volumes are small compared to established systems...



Source: www.coinmetrics.com

FIGURE 4
...even compared to other recent m-payment success stories



Source: Blockchain.info, central bank of Kenya

Who are the various players involved in a bitcoin transaction?

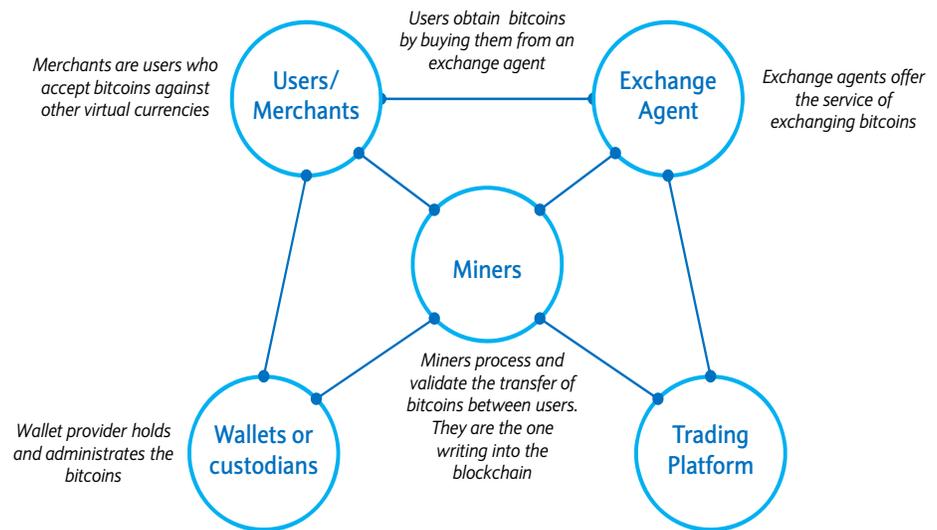
Several entities are involved in a bitcoin transaction. We list the main ones below, and then we will review how they interact in an example:

- **The Users:** consumers can pay for a good or a service with bitcoin or own bitcoin as an investment. They obtain the bitcoins by buying them from an exchange agent, by earning them, or by receiving them as a gift from other bitcoin users.
- **Merchants:** Merchants are users who accept bitcoin for goods or services.
- **Exchange agents:** They offer the service of exchanging bitcoin against other cryptocurrencies or fiat currencies.

- **Trading platforms:** They can handle large volumes and more complex transactions than simple exchange agents; they are meant for exchange agent professionals.
- **Miners (i.e. the bitcoin platform’s payment service providers):** Miners process and validate the transfer of bitcoins between users. All transactions are recorded on a public ledger called the blockchain. Multiple independent miners are involved in the process to make sure no single or group of miners make mistakes (or commit fraud). Miners get paid for this service. In the way the initial creators of bitcoin designed the blockchain, 15 new bitcoins on average are distributed to active miners every day by the blockchain.
- **Wallets (or custodians):** Wallet providers hold and administrate the bitcoins on behalf of users. Safety is arguably better than if a user self administrates his bitcoins (which is also possible) and wallet providers often have a polished user interface pre-connecting the wallet to other services such exchange agents in order to buy or sell bitcoins. Wallet providers also offer value-added services such as a history of transactions (similar to bank statements).
- **The central authority (or the lack thereof in bitcoin):** Just like a central bank, the central authority defines the rules of the currency, maintains a central ledger of all transactions, and is responsible for the integrity of the system. Bitcoin is a decentralized crypto-currency so it does not have a central authority. The key rules of bitcoin were pre-defined on the day the crypto-currency was launched and there is no superseding agent capable of changing them on the fly at any point in time.
- **The inventors:** They created the initial algorithm and technical parts of bitcoin. While the original inventor is unknown, some early contributors are still involved in the project and bring sporadic updates and fine-tunings to the platform over time.

FIGURE 5

The relationship between the various players of the bitcoin platform



Source: Barclays Research

As described above, the various entities involved in a bitcoin transaction are in many ways similar to what is found in the traditional payment value chain.

FIGURE 6
Comparing the constituents of the bitcoin network and the regular banking system

Bitcoin	Usual fiat currencies
Users	Users
Merchants	Merchants
Exchange agents	Exchange agents
Trading platforms	FX markets
Miners	Payment processors
The blockchain	All the banks' ledgers as well as that of the central bank combined into one unique ledger
Wallets	Bank accounts and management services
Central authority	Central bank (<i>in the case of a central authority, which bitcoin does not have</i>)

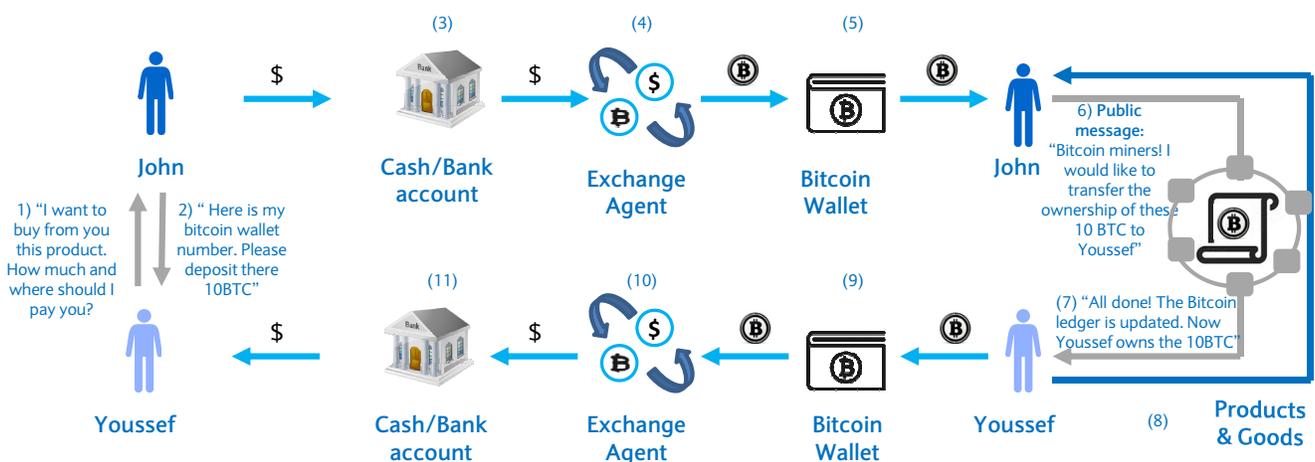
Source: Barclays Research

Example of a bitcoin transaction

The flow of a bitcoin transaction is therefore also very similar conceptually to that of a normal payment transaction, with very few differences.

In our example, John wants to buy a good from Youssef by using bitcoin. First, he goes to an exchange agent and trades his US dollars for bitcoins. He puts his newly acquired bitcoins in a wallet he opened with a wallet provider. John then asks Youssef how much he should pay him and the coordinates of his wallet. He opens his bitcoin wallet app and enters John's bitcoin wallet address and the amount to transfer. On behalf of John, the wallet provider broadcasts to the bitcoin miners the money transfer order. The miners pick up the message, and write the transaction into the shared public bitcoin ledger (the blockchain). The transaction is completed once the blockchain has been updated.

FIGURE 7
Transaction flow of bitcoin



Source: Barclays Research

Pros and cons of bitcoin compared to leading fiat currencies

Compared to usual fiat currencies, bitcoin features a few key advantages but also multiple risks and drawbacks which have led to the rather cautious initial response from regulators.

The advantages are tangible: near real time settlement, lower costs, security

- **Near real time settlement:** The settlement of a bitcoin transaction takes 1 to 60 minutes, on average 10 minutes, depending on how many miners are available. This is better than most bank transfer schemes around the globe, including SEPA-FAST in Europe and VocaLink's Faster Payments in the UK. Most of these networks rarely settle transactions more than a few times per day, although to users the transfers seem far quicker.
- **Low transaction fees:** As the blockchain does away with a lot of duplication and intermediaries, the transaction costs of using bitcoin and its distributed ledger are low. At the moment, a bitcoin transaction costs less than 1%, compared to 2-12% for mainstream electronic payment schemes. This could increase overtime in line with the cost of processing transactions (computing capacity, energy, compliance burden), but this issue is a minor consideration in the near to medium term.
- **Anonymity / Traceability:** The blockchain is public so all transactions are in theory traceable. However, the blockchain does not track the identity of participants, and there is no framework in place collecting and keeping records of every user receiving bitcoins for the first time; users' identity can therefore be obfuscated easily.
- **Financial inclusion:** Opening a new bitcoin wallet is immediate and free today, and does not require any form of identification or documentation. It helps financial inclusion in places with poor financial infrastructure. This benefit is compounded by the lower prices of bitcoin money transfers over the likes of MoneyGram and Western Union.
- **No central authority:** Bitcoin is decentralised, which means that there is no single entity such as a central bank with the power to unilaterally change the "rules of the game", by for instance impacting the money supply. Many see it as an advantage as the value of bitcoin is not subject to monetary policies (just like refuge assets of gold and silver), even if this comes at the price of higher intra-day volatility as no one is there to stabilise the currency value to facilitate the day to day operations of businesses and individuals.
- **Certainty of payment transfers:** Merchants often complain that too many consumers ask for charge-backs on credit cards on false claims that a product or service was not delivered (banks have to intermediate). Bitcoin has certainty of transaction: there is no way to cancel or reverse a transaction. The downside is for consumers, because merchants are in control even in the case of a transaction which was actually a fraud.

...But there are also some downsides, mainly crime prevention becomes harder

- **Security is questionable:** Bitcoin remains more risky than fiat currencies, but not because of its underlying technology the blockchain. The platform itself is new and not always user friendly, so the security in particular for both the value and the safety of the deposits remains a big debate today:
 - **As a vehicle currency for money transfer and storage of value:** The value of a currency needs to be relatively stable for merchants and consumers to feel safe using it for trading and to store value. The price volatility of bitcoin shows it is not fulfilling these criteria completely. Bitcoin has no watchdog to prevent collusion or price manipulation and no central bank to smooth its daily price volatility.
 - **At the level of the safety of the deposit itself:** There is no regulation at the moment or standard for best practice for IT security. The risk of a wallet provider acting fraudulently or going insolvent due to negligence or fraud is therefore higher than in the traditional financial system. There is also no deposit protection scheme to help compensate users if a fraud or bankruptcy occurs (no minimum capital collateral requirements, no last resort insurer or guarantor).

- **Non-reversibility is bad for consumers:** Non-reversibility helps merchants because it reduces the risk of fraud from charge-backs. It can however be a problem to honest consumers if they issue a transaction by mistake to the wrong bitcoin wallet and have no control over calling back the funds.
- **A step backwards for crime prevention (where anonymity becomes an issue):** Money transfers in the banking system are made between account holders which have been identified and background checked (“Know Your Customer”), making it easier to detect suspicious transfers and identify irregularities and Money Laundering. It is also easy to confiscate a depositor’s funds to apply justice, international sanctions, or prevent financial crime. With bitcoin, this becomes more difficult because anyone can create a wallet, buy bitcoin and make transfers anonymously.

What is blockchain?

In our opinion, the blockchain is the most innovative part of the bitcoin story.

The concept of keeping a ledger of all transactions in itself is nothing new, and has been central to payments and banking since the early days of banking during the Renaissance. However, what makes the blockchain so special is that it is unique. The blockchain is the only ledger and point of reference for everyone in the bitcoin network to determine who owns which bitcoin in circulation as well as who was the previous owner of each bitcoin.

In the traditional banking world, each bank keeps its own ledger, which generates duplication of work and inefficiencies in the system. Indeed, every bank ends up having to separately keep track of all the transactions it does with everyone else (duplication of work) and then spend time regularly reconciling its internal ledger with that of others (more inefficiencies, room for error and dispute). The blockchain does without this duplication and reconciliation, as it poses as the irrefutable unique ledger for the whole ecosystem.

Everyone can trust the blockchain because it is public for anyone to see and it is highly secure, protected by complex mathematics, making it near impossible to enter fake entries.

The hacks and thefts and bankruptcy scandals in the bitcoin world which made the headlines since 2013 were not due to a weakness of the blockchain technology but mostly to weak IT and compliance policies of the various custodians, exchanges, and trading platforms in the ecosystems.

Leveraging on the bitcoin foray and on the concept of blockchain to go one step further

When considering the pros and cons of bitcoin, it is important to recall that many of these items are specific to bitcoin and how it was decided that the transfers of value between its users will be handled by the blockchain.

For instance, one of the most criticized features of bitcoin from a technical point of view is the choice of the mechanism by which each transaction is validated; bitcoin uses a very complex mathematic concept called the “Proof of Work” which requires a lot of computing power. This means that not only it takes time to validate each transaction, but also that the costs of running the system are high. By switching from Proof of Work to another simpler mechanism but which is still “good enough”, the amount of computing power required to process transactions would reduce and settlement can happen in seconds rather than dozens of minutes with Proof of Work.

It is in theory possible to change “on the fly” features of bitcoin’s blockchain to improve it over its current design. However, this requires that most people currently involved with bitcoin agree on such changes, which is difficult. Many parties have vested interest or have built business models on bitcoin’s current form so they would not necessarily agree.

Relaunching an improved “new” bitcoin from scratch

This does not mean however that we are stuck in a dead-end. The concept and the source code of bitcoin are open-source and free for anyone to reuse. Re-writing from scratch or tweaking the parameters of the blockchain then re-launching a new “improved” bitcoin under a different name is perfectly doable...

The key questions crypto-currency designers have tried to address are as follow:

- Should the crypto-currency be centralised or decentralised? One would give control over the rules of the crypto-currency to one entity only, and the other would make any

decision the result of a consensual agreement between the participants to the crypto-currency.

- Should the supply of coins in the system be fixed or inflationary? And if so, how does the money supply inflate or deflate over time?
- Can anyone become a miner or is it limited to a set of defined entities? and if so who decides on the list?
- Is the blockchain ledger public or restricted to a sub-group of the platform?
- Is there a minimum or maximum wallet and transaction size?
- Are transactions anonymous or should each be earmarked with a user number?
- Should the ledger be enabled to record only one type of assets (e.g. a bitcoin), or can it be more generic (i.e. many type of coins can go into one ledger, or even more complex concept than a coin such as a financial instrument),

Fine-tuning differently the parameters of the blockchain (or creating a new blockchain from scratch with features slightly altered away from bitcoin’s blockchain) gives birth to new crypto-currencies with different value propositions. These bitcoin derivatives are commonly referred to as “alternative coins”.

Many “alt-coins” exist today, most of which are based on altered version of the blockchain. Most developers focused on improving the speed at which transactions can be processed (it takes 1-60min on bitcoin, some alt-coins are down to milliseconds). Some have tried to push the anonymity even further, or to remove anonymity altogether. Some alt-coins introduced the reversibility of transactions, and others introduced a central authority (just like central banks for our common fiat currencies), which can manage the supply of coin in the system. Other groups of developers thought that pushing the boundaries of security even further was what needed fixing.

FIGURE 8
Examples of alternative coins aiming at improving the concept of bitcoin

Name	Key improvement over bitcoin
Ripple	Ultra fast transaction settlement (10sec vs 10min on average for bitcoin), can be used to trade more than just Ripple’s own crypto-currency (XRP)
Litecoin	Faster transaction settlement (3min vs 10min for bitcoin)
BitShares	Faster (10 secs vs 10min for bitcoin), more user friendly (usernames vs complex codes, and can be used for more than just money transfer (e.g. financial derivatives)
Darkcoin	Heightened degree of anonymity
Zerocoin	The source, destination, and amount of transactions is unknown (total anonymity)

Source: Barclays Research

An example of successful new ventures after bitcoin is the Ripple Labs network. Ripple implements a different way to process transactions which is much more energy efficient than bitcoin and which makes settlements near instant. Ripple Labs, the company behind the Ripple protocol, launched its own crypto-currency (the “XRP”) which could be used as a vehicle currency to facilitate payment transfers with uncommon currency pairs, but Ripple also lets users create and trade their own virtual currencies if they want to. Ripple has kept the principle of the decentralised ledger, which enables the system to work without a central counterparty so it remains fast and cheap to run. These key improvements make Ripple a much better protocol than bitcoin to replace a domestic or cross border money transfer infrastructure.

In Summary: while bitcoin was a first of breed, many of its evolutions are addressing better the existing regulatory frameworks, offer richer features, and inherent better security. As they mature, we expect these evolutions to become solid alternatives to current money transfer solutions, or become useful to other applications even far away from payments (smart contracts, as we will see in the following section).

Regulator's response – post Mt. Gox

The enthusiasm, followed by the disillusionment of the early days adopters after the thefts, hacks, price volatility and bankruptcies in early 2014 added to the lack of knowledge around bitcoin to result in highly divergent reactions from regulators.

There was a wide range of responses, going from embracing the crypto-currency in some countries, to finding over 70 reasons why it should be kept away from the regular financial system (“EBA Opinion on ‘virtual currencies’, European Banking Authority, July 4, 2014). Divergences even arise among bodies of the same economic area. Central banks do not even necessarily agree on calling crypto-currencies currencies, means of payment, or assets.

What were the biggest criticisms?

Aside from liquidity rules and a general call for higher standard of IT security, the other key criticisms by regulators are on compliance and crime prevention. Bitcoin transactions are all recorded on the blockchain, and the blockchain is public. So it is easy to track the movement of money between bitcoin wallets. However, there is no framework for identity checks and registry of wallet ownerships, and anonymity is a problem for money laundering and terrorism.

Regulation is good, a balanced approach even better

While most central banks issued warnings, most did not venture to call for a complete ban of crypto-currencies. Many of the most conservative ones think that crypto-currencies like bitcoin should evolve and fit better within the current regulatory framework for financial institutions, not the other way around. On the other hand, many crypto-currency promoters are arguing that it would hurt innovation and that they should be left alone for now, and propose a greater effort towards standardisation instead of regulation.

This status-quo in our view does not help to promote crypto-currencies. Completely ignoring digital currencies is wrong, as it prevents them from gaining corporate and consumer confidence to then become mainstream. Over regulating on the other hand is bad too since it leaves less room for innovation, a necessity especially since it is still the early days of these technologies. So it is important for crypto-currencies to be “legitimised”, although the approach needs to be balanced to let the burgeoning sector continue to innovate.

Moving in the right direction – regulating vs. framing

More recently, several positive steps were taken: the crypto-currency ecosystem is working on solutions to comply with the regulatory concerns, and governments have started working on new packages for regulation, including defining anti-money laundering rules for crypto-currencies, which is an important step to raise their profile and make them mainstream. This includes the US, with the proposal of a “BitLicense” being finalised in New York, and the inclusion of digital currencies on the agenda of UK's new parliament.

- **BitLicense:** The NY Department of Financial Services (NYDFS) has been working on a regulatory framework dubbed “BitLicense” for over a year now, and the finance

document is expected to be made public by the end of May 2015¹. Multiple drafts have been presented over the past several months. While it addressed the key issues we discussed up front in this note (money laundering, consumer vulnerability, a standard for IT security, etc.), it also initially called for restrictions which would have hurt innovation and forced multiple small players (start-ups) into bankruptcy. Many of these were however later removed thanks to a constructive dialog with the bitcoin community. The final text will therefore hopefully have the right balance to help build a strong ecosystem but not too restrictive so that innovation can continue.

- **In the UK:** the government announced it would regulate digital currencies by applying anti-money laundering rules to exchanges. £10m in funding was allocated to digital currency research to study the opportunities and challenges, and help construct an adequate standards and regulation. Many market commentators, including members of the UK Digital Currency Association applauded the announcement as a stamp of approval for digital currencies, while providing enough oversight without hurting innovation².

Implications for the industry

We view positively the progress in general made on the legitimisation of crypto-currencies. **The industry is therefore gaining the support to emerge from the status of interesting oddity to actual integration in the mainstream.** Following the lead from the US and the UK, we expect more governments will make moves to gradually “legitimise” crypto-currencies, helping them emerge over time in a more meaningful way.

¹ <http://www.newsbtc.com/2015/04/24/the-bitlicense-countdown-begins/>

² <http://timesofindia.indiatimes.com/tech/tech-news/Britain-to-regulate-bitcoin-exchanges/articleshow/46623991.cms>

... and non-currency transfers to apply blockchain concept beyond currency into other areas (transactions, contracts, voting, stock exchange, asset exchange, insurance)

Looking beyond payment transfers, the technology community is also exploring ways to leverage the concept of the blockchain to exchange all sorts of value bearing assets, not just straight vanilla money. Indeed, instead of only recording a number (the amount paid) on the blockchain, why not record references to tangible assets? Or a mathematical description of a contract (e.g. a bond, a financial derivative, an insurance contract, etc.)?

An example of such alternative use cases of the bitcoin infrastructure is lawyer-free “smart contracts”, which would implement the terms of an agreement between two counterparties directly in the network (e.g. a financial derivative contract). Instead of each party spending time and resources double-checking that the other is respectful of the terms, the blockchain miners would all be independent executioners of the terms of the contract and public witnesses at the same time that the terms are fairly applied.

Example 1 of applications beyond payments – asset exchange

An example we believe worth highlighting is that of asset exchanges. NXT, Mastercoin, Counterparty, and Ethereum are example of blockchains which enable that. For example, UBS spoke about the use of blockchain for trading and settlement.³ Nasdaq announced in early May’15 that it will trial a blockchain based solution on the Nasdaq Private Market for the issuance and exchange of shares.

Using blockchain for securities exchange would result in significantly faster settlement times, reduced counterparty risk, and much cheaper operational costs than current infrastructures which require central counterparties, clearing house and significantly more collateral capital to mitigate counterparty risk.

Example 2 of applications beyond payments – rig-proof and cheap voting

Another example of applications of the bitcoin platform outside of plain vanilla payments is tamper-proof online voting. Each voter would be sent a unique token, which can be randomly attributed if necessary to make it anonymous. Each voter then sends his token to the wallet of the option he votes for. The computers of all the voters are also miners, to reduce the risk of electoral fraud, and the blockchain and the wallet of the candidates are always public to promote transparency.

Example 3 of applications beyond payments – supply chain management

An easy to grasp example of applications is supply chain agreements: The buyer gets a discount after a certain threshold of volume is reached. Currently, the supplier’s accountants would calculate the amount to invoice the buyer, and the buyer’s own accountants will double check that this amount is in line with the terms of the agreement. If such contract is implemented on an alt-coin platform, then the miners will know how much to process out of the buyer’s wallet automatically after each order. Alt-coin therefore brings trust and transparency between the two parties and reduces their operational costs.

Example 4 of applications beyond payments – traceability

A start-up in London called Edgelogic is working with the insurer Aviva to see how the concept of blockchain can be applied to trace the history of precious stones, and what claims and crimes were reported for each stone. If every precious stone which gets insured is entered into the blockchain, and insurers refuse to insure a stone which is not linked to the presumed owner’s identity onto the blockchain, then it also becomes difficult to resell it

³ <http://blogs.wsj.com/digits/2014/10/27/ubs-cio-blockchain-technology-can-massively-simplify-banking/>

if it is stolen. This could therefore help not only buyers ensure the stone they are buying is clean, but also insurers to reduce fraud.

Many other applications are possible and will emerge over time as the industry continues to explore the various possibilities of the bitcoin platform concept

Below are a few other examples of alt-coins trying to address wider issues than just the simple payment question:

FIGURE 9

Most “Alt-coins” are based on the bitcoin principles but alter a few features, making them +/- fit for new purposes

	NXT	Bitshares	Bitcoin	Ripple	Counterparty	Mastercoin	NEM
Transaction settlement time	1 Minute	5 Minutes	10 Minutes	10 Seconds	10 Minutes	10 Minutes	1 Minute
"ultra" anonymous Transactions?	*	✓	x	x	x	x	*
Transaction Fee Costs	1 NXT	Variable	0.0001 BTC	0.00001 XRP	0.0001 BTC	0.0001 BTC	Progressive
Coin supply today / at maturity	1bn/1bn	2.5bn/2.5bn	14m/21m	100b/100bn	2.6m/2.6m	0.563m/0.563m	9bn/9bn
User can issue new Assets	yes	Yes	x	x	✓	✓	*
User Registered Accounts	✓	✓	x	x	x	x	*
User can send messages	✓	x	x	x	x	x	✓
Can it be used as a monetary system?	✓	x	x	x	x	x	X
Asset Exchange	✓	✓	x	x	x	x	*
Decentralised currency	✓	✓	✓	x	✓	✓	✓
Strong user identification	*	x	x	x	x	x	✓
Can it be used as a Voting System	*	x	x	x	x	x	*
Smart Contracts	*	x	x	x	x	x	x
✓= supported;+ *= currently being implemented; X = not supported and no plans to add support							

Source: Barclays Research, <http://www.supernet.org/en/>

- **NXT:** NXT is one of the most ambitious projects. It started rebuilding the blockchain from scratch and implemented a faster transaction validation scheme than bitcoin, reducing the time of settlements to a few seconds compared to an average of 10 minutes for bitcoin. NXT chose to keep the money supply fixed and implement a fixed transaction fee from day one. NXT's blockchain is meant for smart contracts, and it carries a lot more information than that of bitcoin; it therefore enables NXT to offer many new applications than simple money transfer like bitcoin. Examples of applications include asset exchanges (e.g. bonds, shares) and voting system (quick, transparent, and materially cheaper to run than any previous system in existence).
- **Ripple Labs:** Ripple has rebuilt from scratch a new blockchain with an improved mechanism to record transactions which significantly reduces settlement time (a few seconds' vs 10 minutes on average for bitcoin). The blockchain is also more generic so users can trade Ripple's own crypto-currency or create their own. Ripple has a central counterparty although the ledger remains distributed so it eases the regulatory issues without taking away the key benefit of distributed blockchain for lower costs. Ripple aims to replace the traditional bank transfer infrastructure which is slower and more expensive, especially for international transactions.
- **Mastercoin:** is another very ambitious project, which aims to bring the best of both worlds together: the possibilities of alt-coins and the established popularity of bitcoin. Instead of launching a new blockchain, Mastercoin therefore wants to enable trading of currencies and assets such as securities on top of bitcoin.⁴ The complexity of the project

⁴ <https://bitcoinmagazine.com/7961/mastercoin-a-second-generation-protocol-on-the-bitcoin-Blockchain/>

makes it still a work in progress a couple of years after the initial project specifications was published, and critics highlight that it will be much more centralised than other alt-coins so it is losing a key feature enabled by most crypto-currencies.

Profiles of key companies

21 inc⁵

21inc is a new bitcoin venture pioneering the concept of implementing mining chips in electric machines. Making every machine mine for bitcoin, then for instance sharing the proceeds with the manufacturer or the retailer would for instance enable new pricing models for electronic goods where the upfront cost to consumers is lower. It would also bring benefits to the bitcoin network, as deploying a wider pool of miners would maintain the cost of transactions low (more mining capacity supply), and reduces the risk of hacking (the more miners, the lower is the risk a group of miners hack the blockchain and steal bitcoins).

21inc raised as of 2Q15 USD120m of funding and is backed by Qualcomm.

Coinbase⁶

Coinbase was founded in June 2012 and is one of the leading bitcoin wallets operating at the moment. It is also an exchange agent, so it acts as a one stop shop for consumers to buy and sell bitcoin against conventional fiat currencies in order to be able to store them, and to keep track of the history of their various transactions.

While Coinbase has been operating exchanges for a while already in many countries (19 currently, aiming for 30 by end of 2015), it launched in the US⁷ only in January 2015, after it obtained all the necessary licenses and approvals. The exchange service launched in the UK end of April 2015.

Coinbase raised a total of \$106m. This includes \$75m⁸ invested in January 2015 by the NYSE and several banks (including BBVA of Spain) among others.

Circle Internet Financial

Circle is a digital currency company founded in 2013, backed by Goldman Sachs and venture capital investors including General Catalyst Partners and Oak Investment Partners. Circle provides cryptocurrency wallet apps online and on mobiles, making using cryptocurrencies easier online and in-person. Circle makes it easier to send money between users by linking the bitcoin wallet to email addresses.

BitFury

BitFury group is one of the leading, fully integrated bitcoin blockchain infrastructure providers and transaction processing company. It builds chips, computers and servers which are customised for mining. It currently has specially designed data centers located in Iceland and the Republic of Georgia. After raising \$20m in its second round of funding from investors including venture capitalist Bill Tai, former Verifone CFO Bob Dykes and the Georgian Co-Investment Fund, BitFury announced they had completed the manufacturing of their first 28nm chip early this year in February. As part of the company's overall drive to keep chip efficiency in line with the rising difficulty of the bitcoin mining network, the company reported the chip had been tested to deliver 0.2 joules-per-gigahash, a figure it had advertised widely at the time the project was initially announced.

⁵ <http://ftalphaville.ft.com/2015/05/19/2129878/21-inc-and-the-plan-to-kill-the-free-internet/>

⁶ <http://www.ft.com/cms/s/0/8f54e990-ec2e-11e4-8604-00144feab7de.html>

⁷ <http://techcrunch.com/2015/01/25/coinbase-us-Bitcoin-exchange/>

⁸ <http://www.wsj.com/articles/coinbase-raises-75-million-in-funding-round-1421762403>

Xapo

Based in California (incorporated in Switzerland), Xapo provides a bitcoin wallet with extensive security features. Xapo also offers a debit card backed by the bitcoin wallet to be used in any brick and mortar location. Xapo has servers around the globe that the company says are protected by *biometric* scanner access, 24-7 video surveillance, and armed guards. The Xapo Vault is insured by Xapo Insurance Limited. In May 2015, Xapo appointed a number of notable businessmen to its recently inaugurated board of advisors, including the founder of Visa (Dee Hock) and John Reed (the former chairman and CEO of Citibank). To date, Xapo has raised \$40 million from Benchmark, Greylock Partners, Index Ventures, Fortress Investment Group, Ribbit Capital and Emergence Capital Partners.

Ripple Labs

Ripple has rebuilt from scratch a new blockchain with an improved mechanism to settle transactions significantly faster (a few seconds vs 10 minutes on average for bitcoin). Ripple has a central counterparty although the ledger remains distributed so it eases the regulatory issues without taking away the key benefit of distributed blockchain for lower costs.

Ripple's blockchain is also more generic so users can trade Ripple's native virtual currency (the "XRP") or create their own.

Ripple aims to replace the traditional bank transfer infrastructure which is slower and more expensive, especially for international transactions. The Ripple network also aims to improve the general liquidity and pricing of international bank transfers by opening up the market to anyone to become market maker, while it is currently the stronghold of a few large correspondent banks.

BitPay

Founded in May 2011, BitPay is a global bitcoin payment service provider headquartered in the U.S. It is one of the leading payment processing services for merchants. It mitigates the risk of bitcoin price volatility by allowing the merchant to accept bitcoin and immediately converting into US dollars, euros or the currency of the merchants choice. BitPay works across over 30 currencies and because it is non-reversible, it makes it valuable for merchants who are working internationally. In June 2014, BitPay announced that it would offer free and unlimited payment processing, forever. Merchants can pay for premium service plans which a dedicated account manager for support, engineering resources for integration with the merchants platform, and the integration into business applications for transaction data and value add services.

Blockchain.info

Blockchain.info was founded in 2011 and is based in London. Blockchain.info offers accessible tools to explore and analyze the blockchain (the public ledger of bitcoin).

In addition, blockchain.info offers a wallet service for holding and managing bitcoins.

Blockchain.info raised \$30 million in 3Q14 from venture capital, then the largest-ever round of funding for a bitcoin company.

KnCMiner

Founded in 2013, Swedish-based KnCMiner is a Cryptocurrency mining hardware designer of dedicated bitcoin mining chips to the market. They were the first in the world to deliver 28nm/20nm bitcoin chip technology and still remain the only producer capable of delivering 20nm in the bitcoin space. With the latest round of funding, it is aiming to move further towards cutting edge technologies with a 16nm FinFet version of their platform. The

new Solar platform is expected to offer a six-fold performance increase compared to KnC's current generation at 20nm hardware.

itBit

itBit is a global bitcoin exchange offering institutional and retail investors a platform to buy and sell bitcoin. The company is headquartered in New York City with an international office in Singapore. After 15 months of various applications, in May 2015 the company was approved as a New York Trust company allowing it to offer its services in all 50 states in the U.S. Operating under the oversight of the NYDFS will mean itBit will be subject to state audits and like a bank, will also be required to maintain a certain amount of capital. The inability for other exchanges to offer regulatory assurance to large institutional investors is one of their key competitive advantages.

Elliptic

Elliptic provide services around bitcoin to improve security and compliance to fight crime and money laundering. Elliptic offers 3 key products:

Elliptic Vault is a highly secure, insured digital asset custody service that safeguards bitcoin and other blockchain assets using proven deep cold storage techniques. It combines best-in-class security with insurance and internal controls certified by KPMG. Elliptic Vault is already the custody service of choice for regulated investment funds, public companies and trading firms.

Closely integrated with the Vault is Elliptic XI, a clearing and settlement platform for digital currencies, allowing Elliptic Vault clients to safely access liquidity across multiple international exchanges.

Elliptic Comply is an anti-money laundering tool for businesses handling bitcoin payments. Based on advanced blockchain analytics, the tool automatically flags those transactions that represent a significant money laundering risk, helping businesses to comply with their regulatory responsibilities when interacting with digital currencies. Comply should launch in 3Q15.

Hyperledger

Hyperledger pushes the concept of "generic" distributed ledger to its purest definition, by stripping out all specific features usually implemented in blockchains to facilitate exchanges. It does not for instance have a native crypto-currency like NXT, bitcoin and Ripple networks have. Instead, the rules of each asset which goes on the Hyperledger ledger are recorded alongside the asset, so this enables the trading of any sort of assets or smart contracts with a lot of flexibility.

Hyperledger targets businesses and can for instance integrate into the existing systems of financial institutions for real time settlement of payments, financial securities and complex contracts (e.g. financial derivatives) with certainty of outcome and impartiality, while reducing the need for expensive reconciliation between parties and a central counterparty.

NXT

NXT is one of the most ambitious distributed ledger projects: NXT started by rebuilding a new blockchain from scratch. It implemented a faster transaction validation scheme than bitcoin, reducing the settlement time to a few seconds from about 10 minutes for bitcoin. NXT chose to keep the money supply fixed and implement a fixed transaction fee which will remain unchanged in the foreseeable future (It is meant mainly as a hacking protection mechanism rather than a source of revenue).

NXT's blockchain is designed with smart contracts in mind, meaning it can be used for many more complex transactions than simple payments. Examples include the exchange of assets (e.g. the issuance and trading of bonds and shares can be replicated on NXT) and voting system (quick, transparent, and materially cheaper to run than any previous system in existence). NXT is nimble enough to run multiple sort of applications at the same time.

Mt. Gox

Mt. Gox was a leading bitcoin exchange which was founded in 2010 but went bankrupt in February 2014 after over 6 months of quasi insolvency. ~850k customer bitcoins were missing (most likely stolen). According to the WSJ, it was handling as much as 70% of all bitcoin transactions in 2013, which explains why its difficulties had such an impact on the perception.⁹

Ethereum

The Ethereum Project is a Switzerland based company which was made famous by being one of the firsts and most vocal entity to articulate multiple new applications which could be made possible with a more generic and flexible blockchain than that of the original bitcoin.

The project was launched by university student Vitalik Buterin in early 2014, and raised ~USD19mn¹⁰ mostly through crowdfunding. The platform has many key innovative milestones on its roadmap but has yet to launch.

Gemini

Gemini is a US based bitcoin exchange which will launch as soon as it gets the necessary approvals from the regulators.

Gemini targets to be highly secure and fully licensed bitcoin exchange, aiming to become the leading platform once the bitcoin network becomes mature enough for a wide scale adoption.

The development of Gemini has so far been funded by the settlement money the co-founders Tyler and Cameron Winklevoss received from Mark Zuckerberg over the ownership of the original idea behind Facebook.¹¹

Everledger¹²

Everledger, the new entity following the efforts spearheaded by its sister company Edgelogic is a London based start-up with the goal of applying the concept of blockchain to improve the traceability of diamonds. Everledger's blockchain, the Blocktrace, is a representation of the history of precious stones, and what claims and crimes were reported for each stone. This could then be used by both buyers and insurers, to ensure the stone they are buying are clean, and to reduce insurance fraud. The FT reported in February that EdgeLogic was in discussion with insurer Aviva about how the Blocktrace could be implemented. The founder of Everledger, Ms Leanne Kemp is a veteran of the diamond industry.

Safello¹³

Safello is a Swedish based bitcoin exchange who aims to become the leading platform in Europe. Safello's differentiating strategy is to connect to as many banks as possible through the fast payment network SOFORT. That way, Safello can make instant payments, and does not have to wait for the slow delayed settlement, which is the case for most exchanges as

⁹ <http://blogs.wsj.com/briefly/2014/02/25/5-things-about-mt-gox-crisis/>

¹⁰ <http://blogs.wsj.com/moneybeat/2014/08/05/bitbeat-ethereum-presale-hits-12-7-million-tally/>

¹¹ http://dealbook.nytimes.com/2015/01/22/winklevoss-twins-aim-to-take-bitcoin-mainstream-with-a-regulated-exchange/?_r=0

¹² <http://www.ft.com/cms/s/0/f2b0b2ee-9012-11e4-a0e5-00144feabdc0.html?siteedition=uk>

¹³ <http://www.coindesk.com/safello-introduces-europe-wide-Bitcoin-trading/>

they operate over slower international bank transfer settlement systems. The premium Safello service is already available for customers of 86 European banks in 11 countries.

Atlas card

Atlas is a multi-service start up aiming to develop way to facilitate the use of bitcoins. The key product so far is a credit card backed by a bitcoin account so that it becomes easier to spend and accept bitcoins on the high street.¹⁴

Atlas card was founded in June 2014 and is based in the US. There are yet no public funding data and a fuller product roadmap and strategy has yet to be made public.

Zerocash (previously Zerocoin)

Zerocash is an Israeli based project led by Eli Ben-Sasson professor of computer science and cryptocurrency at the Israel Institute of Technology. Zerocash is a protocol which is built on top of the bitcoin network and the original blockchain, and aims to bring anonymity to an whole new level while improve speed of transactions. In fact, with bitcoin, all transactions are traceable since they are all recorded in the public ledger; what makes bitcoin transactions anonymous is the lack of identity check and central register of all bitcoin holders when they buy or receive bitcoins for the first time. Zerocash offers to make the source, the destination and the amount of each transaction totally anonymous.

¹⁴ <https://www.crunchbase.com/organization/atlascard>

FIGURE 10 Top 20 Bitcoin start-ups ranked by fundraising to date

	Company	Classification	Cumulative Funding (\$m)	Round	Date of latest round of funding	Investors	Country
1	21 Inc (21e6)	Universal	121	First	Mar-15	Andreessen Horowitz, Data Collective, Khosla Ventures, RRE Ventures and Yuan Capital	United States
2	Coinbase	Universal	106	Third	Jan-15	New York Stock Exchange (NYSE), USAA, BBVA, DoCoMo, Draper Fisher Jurvetson (DFJ) Growth Fund, Tim Draper, Union Square Ventures, Ribbit Capital and Andreessen Horowitz, Vikram Pandit, CEO Tom Glocer	United States
3	Circle Internet Financial	Universal	76	Third	Apr-15	Goldman Sachs, IDG Capital Partners, Breyer Capital, General Catalyst Partners, Accel Partners	United States
4	BitFury	Mining	40	Second	Oct-14	Bill Tai, Bob Dykes, Georgian Co-Investment Fund, Lars Rasmussen	The Netherlands
5	Xapo	Wallet	40	First	Jul-14	Index Ventures, Greylock Partners, Emergence Capital Partners, Yuri Milner, Max Levchin, Jerry Yang, Winklevoss Capital, David Marcus	United States
6	Ripple Labs	Financial services	37	First	May-15	US futures, CME Group, Seagate Technology, AME Cloud Ventures, ChinaRock Capital Management, China Growth Capital, Wicklow Capital, Bitcoin Opportunity Corp., Core Innovation Capital, Route 66 Ventures, RRE Ventures, Vast Ventures, Venture 51	United States
7	BitPay	Payment Processor	33	First	May-14	Index Ventures, AME Cloud Ventures, Felicis Ventures, Founders Fund, Horizons Ventures, RRE Ventures, Sir Richard Branson, TTV Capital, Jerry Yang, Richard Branson	United States
8	Blockchain	Wallet	31	First	Oct-14	Lightspeed Ventures, Wicklow Capital, Mosaic Ventures, Prudence Holdings, Future Perfect Ventures, Rafael Corrales, Amit Jhavar, Nat Brown, Individual Investors	United Kingdom
9	KnCMiner	Mining	29	Second	Feb-15	Accel Partners, GP Bullhound, Creandum, Martin Wattin	Sweden
10	itBit	Exchange	28	First	May-15	RRE Ventures, Liberty City Ventures, Jay W Jordan II, James Pallotta	United States
11	Blockstream	Infrastructure	21	First	Nov-14	Reid Hoffman, Khosla Ventures, Real Ventures, Crypto Currency Partners, Innovation Endeavors, Future\Perfect Ventures, Mosaic Ventures, Ribbit Capital, AME Cloud Ventures, Nicolas Berggruen, Max Levchin, Ray Ozzie, Danny Hillis, Embrace	United States
12	Bitreserve	Wallet	15	Second	Dec-14	Undisclosed	United States
13	Bitnet	Payment Processor	15	First	Oct-14	Highland Capital Partners, Rakuten, James Pallotta, Stuart Peterson, Bill McKiernan, Stephens Investment Management, Bitcoin Opportunity Fund, Commerce Ventures, Webb Investment Network, Buchanan	United States
14	BitGo	Infrastructure	14	N/A	Sep-14	BitFury Capital	United States
15	Chain	Infrastructure	14	First	Aug-14	Khosla Ventures, Pantera Capital, Barry Silbert, RRE Ventures, SV Angel, Thrive Capital, 500 Startups, Kevin Ryan, Scott Banister, Homebrew	United States
16	PeerNova	Mining	14	First	Mar-15	OverStock	United States
17	OKCoin	Exchange	11	First	Mar-14	Ceyuan, Mandra Capital, VenturesLab, PreAngel	China
18	Spondoolies-Tech	Mining	11	Second	Oct-14	Agile Wings, BRM Group, Genesis Partners, Olivier Janssens, Eden Shochat, Individual Investors	Israel
19	Cryex	Exchange	10	First	May-15	White Star Capital, Northzone Ventures	Sweden
20	Huobi	Exchange	10	First	May-14	Sequoia Capital China	China

Source www.coindesk.com, Barclays Research,

ANALYST(S) CERTIFICATION(S):

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