INTRODUCTION

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While aware of bitcoin for some time being professionally involved in payments, my interest in bitcoin was triggered when I had the opportunity to discuss bitcoin backgrounds and developments with Amir Taaki en Donald Norman from bitcoin Consultancy right after their rather informal but very inspiring keynote at the 2012 Congress on Online Payments in Amsterdam. I was truly inspired by them and the story behind bitcoin they spoke so passionate about. At the time I was starting to prepare for a presentation at the congress on the Future of Payments (Amsterdam, June 2012) myself and this was the type of coincidental but energising encounters that created the right focus at the right time for my keynote “Payments 3.0”.

In April 2013 bitcoin has been the subject of media hype. The media interest and the bitcoin exchange rate seemed closely correlated and going through the roof simultaneously. A slew of articles and blog posts started popping up on the Internet, but also in the traditional news channels bitcoin received lots of coverage. Some suggested that the only reason for the exchange rate to explode was the media hype itself. Though much of the discussions and contributions could be discarded as hype and scratching the surface at most also interesting topics where raised.

Even when bitcoin proves to be a bubble, as many believe, the legacy of the technical and business concepts involved will leave its mark on the future of currency and
payments. Bitcoin, as a representative of a new bread of crypto-currencies, is a new phenomenon that needs to be understood better. Not only by payment professionals but also by society as a whole.

I feel the need to address several aspects of currencies and payments that were hardly mentioned at all or referenced only implicitly at most. How does the development of crypto-currency relate to the mega trends we are part of? How will society (and the respective governments with heir own interests) deal with an “anarchistic” currency beyond institutional control? What will be the impact on traditional currencies, payments and financial institutions?

To answer these type of questions we have to take a step back and answer: What actually is money/currency? What is the contribution of money to our society? How did it evolve and where do these new currencies fit in? What is trust, on which our currencies are based, about in a digital age?

I personally have two interests in answering above questions:
1) as a professional I have been involved in strategy and business development assignments for clients in the payments industry.
2) with the Red Planet Dust blog I have been investigating aspects of human collaboration and payments are one of the mechanisms of collaboration covered.

Without having the ambition to create the conclusive article on crypto currency I do hope to be able to shed some light on aspects that are part of the foundation of currency and payments and are worth considering when thinking about the possible impact of Bitcoin and its crypto-currency cousins.

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Red Planet Dust is a blog created by Leika Consult BV, The Netherlands. www.leika.nl
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What we today perceive as money is the result of thousands of years of evolution. And looking at history, why would we be the “lucky guys” to live in the end-state of this evolution? Crypto-currency like bitcoin represents yet a new step in the evolution of money. To understand this evolution we need to take a step back and look at how money has evolved. A short conceptual history of the development of money in 5 logical steps:
1) From barter trade to a reference commodity

Lets place ourselves back some 3,000 years and imagine we are trading the proceeds of our little farm on a market nearby or with our neighbour who runs a small bakery: 3 apples equals 1 reasonably sized loaf of bread which again represents 6 chicken eggs of the third neighbour...

But then we found it easier to have a central commodity in between (i.e. historic example sheep: pegasus hence pecunia) to reference the exchange ratios between the neighbours. So 100 apples is 1 sheep, 100 bread = 3 sheep, 1 slave = 2,5 sheep etc. etc. This made it far easier for all to see the relative rate of all the commodities.

2) From perishables to gold as a reference commodity

The set-up with sheep had a lot of disadvantages: what happened if your sheep died? Or when a disease would kill a lot of sheep? And how to pay if you do not have sheep, but you have other stuff the other party does not want to have in return? Or you do not want to chop it up to only buy a few apples?

Now enter the great invention: lets have a good (= a commodity) in between that is scarce as to be valuable, cannot die, can be stored for later use, etc. etc.: lets use precious metals like bronze and gold as the in between commodity! Let us now create standardised lumps so we all know how much these lumps (i.e. weigh) are worth. We let the state have the monopolistic right to coin these lumps and as a sign of authenticity (and weight!) we stamp the head of our emperor on it!

Money has been engraved in our minds as the physical coins ever since. The gold coin IS the money. In effect these golden coins represent the money and indicate its value 1:1. Gold has been the
standard commodity for money for over two millennia ever since the Romans.

(NB slides were used for a guest lecture at two grammar schools in Alphen aan den Rijn, The Netherlands during their project week on money in 2011 and 2012.)

3) From reference commodity to certificates

To make the reference commodity even more efficient we started using paper certificates that could be traded in for gold. Also coins from other materials then the gold it represents as backing were created. This step in the 13th century represents a crucial development where the cost of the paper/coin representing the money was not linked to the represented value it self. (NB Today many small denominated coins are more expensive to produce than the value they represent.)

The certificate slowly but surely transformed in the banknotes we use today: when you had to take gold with you to an other town you could get a certificate from a bank (by handing over your gold) in your own town that said to the bank in an other town to give gold to you when you handed over the certificate. Then instead of going to the bank to collect the gold and then go to your business partner with it your business partner would accept the certificate itself. He then would have the option to get the gold at the bank or pass the certificate on himself.

The gold could remain in the safe en the certificates where then circulated as money. In time we learned that banks could circulate much more certificates then having gold in the safe. The certificates “fiat money or ” where based on “trust”. The de-materialisation of the money had started to take effect.

These certificates (like today’s travellers cheques) where then institutionalised into banknotes, as we knew them until only a few decades ago. These certificates could literally be changed for gold at the reserve. It would even say so on the banknote (“Betaal aan toonder”).

![](image.png)
4) Drop the gold backing to get an immaterial reference commodity

Later we decided to drop the gold backing of the banknotes altogether (e.g. USA dropped the link with gold for the US dollar in 1971). The ratio between gold and certificates/banknotes had grown to such a ludicrous small fraction that it was the fairy-tale about the cloth of the emperor anyway. Money from then on was based on trust alone (“fiat money”) and had become an immaterial commodity.

Fiat money is money that derives its value from the confidence that it may be bought with it. The nominal value is not based on a specific weight and fineness of a precious metal but is based on the confidence that economic operators set the value of the currency.

5) From banknotes to digital money

If you look at a paper banknote today every banknote of a certain denomination (let's say €50) is exactly the same as all the others. Except for one thing: they are baring a unique number. All the other aspects of the bill are created to make it recognisable as a valid (not counterfeited) copy of the denomination. So in a logical sense we are only handing over a unique number. The number itself can not be verified based on the physical aspects of the banknote or by how it is formed as such if it indeed is a unique number. So we need to make the paper note and its security features to transport the unique number.

But what if we could create a unique number that cannot be replicated? Then we would not need the paper and the security features on them. Then the money would not only be an immaterial commodity but would not even need paper to transport and authenticate it: we could send it over the Internet.
Voilà; and that is exactly what bitcoin is: an immaterial and virtual reference commodity.

The de-materialisation of money and our dependency on trust started a long time ago. Money has evolved in a series of steps into an immaterial commodity. With crypto-currencies like bitcoin we now make a (final?) conceptual leap towards money being an immaterial virtual commodity. Bitcoin as a crypto-currency is the ultimate reference commodity! With hindsight it is the inevitable outcome of a continued process of abstraction.

NB Cash and banknotes reside in the physical world, but currencies reside in both the physical and the digital world, digital currencies reside only in digital world. While a bitcoin is not more then a unique number it can only reside and be passed on via the Internet. Bitcoin is tightened to the network and therefore still having an unbreakable link to the physical world. Where a number on a banknote is bound 1:1 to the paper it is printed on the Bitcoin in that same respect is bound 1:1 to the Internet, it is only not bound to one small bit of identifiable matter.

Digital Currency

Many call Bitcoin “digital money” but not all types of digital money are also behaving as a currency, or at closer inspection are not even money: Facebook coins are no currency like bitcoins but are digital tokens all the same. But Euro, US Dollar and

If you insist on using a physical world analogy...

The use of the word “coins” does reference the peer-to-peer and anonym aspect of physical coins. But I think this invokes the wrong analogy: coins are not numbered, paper banknotes are uniquely numbered, bitcoins ARE numbers and represent the ultimate "tokanisation" of money.

If you persist in having a analogy from the physical world (always dangerous to use analogies!) then bitcoins are more like paper banknotes then coins, but then without the limitations of paper. An oxymoron seemingly, but it is still the easiest way to describe digital currency a la Bitcoin which is not physically attached to a “carrier” like paper or mag-stripes or chips on plastic cards or secure elements on a digital device but bound to the electronic realm.

The benefits of the digital equivalent of the banknote are that you can tear them to pieces to precisely fit the amount payable and no need for other proofs of authenticity and security to prevent counterfeiting.
probably all other legal tender currencies are held in a digital manner too; just look at
your bank account. But to be clear that should not even be considered digital money.
Actually there is no real money on your bank account: it is an administration of the
credits/debits you owe in relation to your bank. You trust your bank to hand you the
money when asked, and that it has sufficient real money to do so even if many people
will show up at the banks (virtual) counter at the same time. With an average
capitalisation rate in the single digit realm it is clear that

The term “digital money” is not defined well enough if we want to discuss the
developments on initiatives like Bitcoin: we need to get our definitions right!

The US Department of the Treasury Financial Crimes Enforcement Network
(FINCEN) released a paper FIN-2013-G001 recently on the application of its
Regulations to Persons Administering, Exchanging, or Using Virtual Currencies
clarifying their position on virtual currencies. This paper gives a clear definition and
hence demarcation of the various types of currency. It is also the first guideline on
how virtual currencies are legally seen (in the US) and therefore a milestone in their
development.

Currency is the coin and paper money of any given country that [1] is designated as
legal tender and that [2] circulates and [3] is customarily used and accepted as a
medium of exchange in the country of issuance. In contrast to real currency according
to FINCEN:

“virtual currency is a medium of exchange that operates like a currency in some
environments, but does not have all the attributes of real currency. In particular,
virtual currency does not have legal tender status in any jurisdiction.”

The FINCEN breaks digital currencies down into three forms:
1) e-currencies (and e-precious metals) are essentially certificates for what FINCEN
calls “real” currencies – that is, currencies that are, somewhere in the world,
legal tender.
2) digital currencies that have a “centralized repository”
3) decentralized digital currencies like Bitcoin, is one “(1) that has no central
repository and no single administrator, and (2) that persons may obtain by their
own computing or manufacturing effort”.


What Is Crypto-Currency?

Every bitcoin consist of 64 digits that have been established via a complicated cryptographic process to create a unique number. The number is the money but only transferable when part of a complicated replicated string distributed to other bitcoin users. You can print it on a paper, create QR codes to facilitate the usability of it but you can only transfer it via the electronic realm.

It is thus possible, just by passing on this number; annex bitcoin, to exchange "value" directly and anonymously between parties e.g. mobile to mobile, without the intervention of third parties. The possible implications of digital currencies are enormous.
We need to understand our “ability to collaborate” before we can understand how developments in money/currency - reflecting “value” - and payments - as the logistics of handing over the value - will improve (or potentially disrupt!) our ability to collaborate.
We as social creatures have been dividing tasks amongst the members of the group from the beginning. Our ability to collaborate, as it is embedded in our genes through evolution, is a prerequisite for the development of our complex societies, as we know them today. To me, this ability to collaborate is the essential characteristic of our human species (“Homo Sapiens”) and core to our success in evolutionary terms (and hence the complexity of our society). I will be referring to “Homo Collaborans” (“the collaborating man”) in this regard.

Specialising in tasks makes the members of a group more dependent on each other while being able to create better chances to survive and enhance living conditions as a group and as an individual or for our offspring. Specialisation does not only mean that the task at hand can be done more efficiently and effectively but also prompts – continuous - improvements.

Crucial in this development was the introduction of mechanisms that would allow collaboration between groups and their members (and inter-group collaboration) without the need to constantly tune what we do with (all) the others. For the lack of a better word I have called this “implicit collaboration”.

Examples of these mechanisms are: Culture, Trust, Law and Standards. Money is an applied mechanism for collaboration and is being founded on the four before mentioned mechanisms.

We tend to internalise these types of mechanisms very successfully, both socially as a group and psychologically as individuals. To an extend that we in general do not even see them as mechanisms and that most of us take the outcome of these mechanisms as absolute truths.

Implicit collaboration is commonly used unilaterally, even unconsciously most of the time. Parties adhere even without realising they are, and by obeying to it, are creating an environment that all others can easily “link” to, even parties that they will never do business with directly or even will ever know of their existence. This network effect that has a direct effect on the ability for all to collaborate will be referred to as “collaborability”.

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Collaborability is the social counterpart of the economic term “externalities”. (NB In economics, an externality is a cost or benefit which results from an activity or transaction and which affects an otherwise uninvolved party who did not choose to incur that cost or benefit.) Collaborability creates the circumstances for parties to collaborate which can result in activity or transaction and which affects the involved party/parties who do not have to incur the cost it would otherwise have had to spend.

The social - and economic - value of collaborability is huge but is totally unaccounted for in our economic models. How should we value the social and economic value of the meter as a standard for example? NB Collaborability and its social and economic implications will be investigated further at Red Planet Dust.

Our society, as the collection of humans on this planet, has grown to a degree of complexity - and size - that, if you just take a moment to reflect on it, is just mind-boggling. Our society has not always been so complicated and intertwined as it is today. We can all see it getting more complex during our lifetimes.

With his book “The Future” Al Gore in my opinion did a pretty fine job to describe and analyse the changes and challenges we as the human tribe are faced with. Gore identifies 6 different “mega-trends”, which he labels as:

1) **Earth Inc**: the deeply interconnected global economy;
2) **The Global Mind**: a planet wide communications grid connecting humans, sensors, data and (intelligent) devices;
3) **Power in the Balance**: new balance of political, economic and military power;
4) **Outgrowth**: rapid unsustainable growth;
5) **The Reinvention of Life and Death**: technologies enabling the design of matter and life;
6) **The Edge**: the relationship between human civilisation and the earth's ecological systems.

Based on Gore’s work it is not difficult to argue that the complexity will increase even further in the future.

As described earlier by Thomas Friedman in “The World is Flat” we see the world changing and we can see that our ways of collaboration are changing. He describes a world in which the borders are dismantled by new technologies. The effect that location independency for instance has on the cooperation and competition between people and businesses leads to large shifts worldwide. These shifts are part of what we have been addressing by the generic term 'globalization'.

Money is one of mankind’s most important and far reaching conceptions to facilitate (implicit) collaboration. The development of our conception of money has been developing over time. Today we see technology and new concepts like Bitcoin that have an impact on currencies and payments rapidly proliferate. This will have a major impact on our ability to collaborate.

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**Mars’ Law**

Without suggesting to be scientifically sound or bolstering my claim with historic proof I hold the assumption that the complexity of our society is increasing at a higher than linear rate. (NB I have presumptuously put forward Mars’ Law a year ago that predicts the doubling of the effective reach of our relative – interconnected - network every two years by inclusion and lowering the friction to reach others and take part in the interconnected world.

*With a respectful nod to "Moore's Law", I want to launch "Mars’s Law":*

"The effective range of the network that we're living doubles every two years."

(\(Ne = R / P\). The effective range of the network equals the resistance between the participants divided by the nodes in the network)
Human collaboration is based on trust. We do not have a choice other then to rely on an incredible amount of others if we are to accomplish almost anything at all. We have to rely on people we have contact with very regularly and intimately, but also we are reliant on countless others who are to do their little part in having the gears of society move for you to have what you need or want. We are just blatantly dependent on others. (i.e. This may come as a bit of shock for readers truly believing that we are living an individualised live, only pursuing our individual interests.)
I have been using the traffic metaphor before: even when you estimated the duration of a road trip for your appointment this morning you trusted that your fellow road warriors will all drive on the “right” side of the road, and that they will try to keep their lanes. By and large we not only expect the right behavior of others we also provide it ourselves without a second thought out of sheer self-interest and hence the interest of the group. Trust and behavior are intertwined.

We cannot control all aspects we encounter in life, nor can we predict the future. As individuals we try to predict the behaviors and actions of others – individuals, groups and institutions - based on former behavior, or by reputation, or by impression. We mostly unconsciously calculate how much we are willing to be dependent on them. Trust is about predictability and others acting in your, or your groups’ interest. Trust are unwritten agreements that otherwise would cost so much time and friction to establish that the effort to collaborate would be bigger then the “revenues” coming from that collaboration. Like using standards for instance, trust is helping us to effectively collaborate without the need to discuss the terms and conditions and all other technicalities involved again and again, it makes the future (linearly) predictable to a comforting degree. It makes that people can collaborate almost ad-randomly.

How we sociologically behave and how we psychologically function has a direct link of how we use trust. Trust is embedded in our DNA for it is crucial to collaborate and collaboration is at the core of our human abilities. Trust has evolutionary proven to be a very effective mechanism for collaboration, and collaboration being at the core of our success as mankind. Trust is a key sociological and psychological mechanism to have us collaborate while dealing with essential uncertainty about the future.

Although we highly value trust - as it is at the core of human experiences as love, friendship, religion as the superlative degree of trust, and patriotism - it is not sufficient to have our society blossom on its own. We do not all have the same interests, and many of us are pursuing only individual gains. We need laws and we need to police and enforce them. We create contracts; we put locks on our doors and bicycles, we want privacy, we create governments and political structures to handle these tensions. For we know, deep down, that in the end we have to be very cautious about the others around us. Mankind has found incredibly complicated mechanisms,
and trust in all its facets being a very important one, to deal with the frictions that could arise and hinder collaboration.

**Enter Inter-connectivity**

The more complex our society has become the more complex the fabric of trusts works out in our society and in our individual lives. With the advent of the interconnected world another layer is added that has profound impact on how we relate to each other and how we collaborate on almost anything. How are we going to transplant our conceptions of trust as we have been internalising it and using it in almost anything we do as it has formed our society for 200.000 years since the emergence of the Homo Sapiens (which I would like to re-dub in “Homo Collaborans”) into this new environment? An environment that lets many more people, and also an abundance of increasingly intelligent devices be combined and be connected at an unprecedented scale. Is trust, as we know it today the right reference in an interconnected world?

**Enter trust in technology**

Trusting technology is not the same as trusting humans or groups of humans. These are two totally different types of trust. You trust your mother quite differently then a 64 digit Bitcoin based on heavy cryptography, don’t you? Teasing question: Which one do you trust more?

Human Trust is about not knowing future behavior of others for certain, but what if we could know for certain, or at least more certain then our human trust concepts (and control mechanisms) cater for? Would we be willing to keep using this type of trust just for nostalgic reasons? To continue the traffic metaphor: there will be a moment that the self-driving car is decidedly sauer than a human driver, will we keep on trusting the human driver or will we hand over the wheel (aka trust) to technology? Are we going to keep on trusting financial institutions when alternatives are created that do not rely on human trust while catering the same functionality?

**Trust in an inter-connected world**

Many, like Felix Salmon in the article ”The Bitcoin Bubble and the Future of Currency” (Money & Banking) that ignited the series I am writing, think that not
involving aspects of human trust equals mistrust in humans or its institutions. In an indirect and relative way it is, when a certain technology can be better trusted then a human factor. But in an absolute sense trusting technology with the absence of human based trust can give a higher degree of certainty then before. The outcome of future behavior or action is more predictable then before in an increasing amount of situations. NB This is were e.g. Big data comes in. Regardless of the impact on our society, which can and will be substantial this will improve our ability to collaborate.

The other way around: how are we to create trust concepts in an interconnected world? A world that basically is “governed” by technology. I think market places are a good place to start to see how the network construction, the services and the link up of both supply and demand (based on sufficient liquidity) create a new technology driven trust amended with human aspects like reviews, likes etc. (NB which is not the same as trust per sé, but could lead to reassurance of humans as to start accepting trust of the technology provided).

**Enter Payments**

With the advent of electronic payments a few decades ago we have moved from relying on trust in individuals and institutions (both human based) into a combination of trust in humans and trust in technology as a foundation for payments.

What we now see happening with crypto-currencies as an example is that we move on to only need to trust technology.

All our payment infrastructures today are based on the combination of human and technological trust. This relates not only to the technology used, but also in how financial institutions are dealing with payments, how they are regulated, how you and I can use payments. But with the digitization of currency a lot of the provisions that were necessary in the electronic era seem unnecessary.

With crypto-currency the trust is the money itself. Trust is at the hart of the payments value chain. So if we change the type of trust at the level of the currency itself this will invoke a new payments value chain.
Bitcoin is showing us that new constructions are feasible that will make money less dependent on human trust as to become an even better facilitator of the human ability to collaborate (and to keep the social compact together in the wordings of Felix). Money does not need the inclusion of human based trust perse.

The design of a currency system based on a technical design that does not need human based trust in its core does not imply mistrust of humans or its institutions (even though it can mitigate for the uncertainty that human based trust involves). There is just less need for intangible human trust.

Bitcoin is giving us a glimpse of a payments mechanism that as a currency does not have a need for “human” trust anymore. NB Not all aspects of Bitcoin as a payment mechanism are without human trust, but the currency it self does. The potential consequences are huge.

Money is a key ingredient to human collaboration. Actually, it is one of mans most powerful inventions ever and has laid the foundation for the incredibly complex world we live in. The more efficient the form of money (and payments as the logistics part of money) to our disposal the better we are able to collaborate and create more prosperity for more people. Without money we would not have been able to create the incredible level of division of labour or ownership for instance, which forms the basis of our economies today.