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Blockchain
& Beyond

Summary

Preface

This report, part of the work CELLABZ is doing on exploring and working with emerging technologies, multi-disciplinary teams and labs, is focusing on the Blockchain technology.

Bitcoin, the crypto-currency, known for allowing direct transfer of money between individuals, without relying on a bank, has been gaining popularity and publicity over the years. Still many people haven't heard of it or taken the time to carefully understand the underlying technology making the Blockchain possible and its potential transformations onto the world. As we will see, the real innovation on this technology relies on its distributed, consensus based and transparent protocol, allowing trusted parties to exchange information between each others, without an intermediary or central authority like a bank, company, lawyer or government that controls it or regulate it .

The first application of this technology happened at the financial level, but recently new ones are appearing; among them, juridical or physical implementation via more advanced versions, like smart contracts or decentralized applications. The potential of these new tools could be so important, that it is often compared to the beginnings of the Internet and the impact it had on society, industries, governance systems and individual implication in larger scale projects and decisions making.

The creation of the internet and the web in the early 90s opened the door to the first exchange of information through a network of computers on a global scale. Now, the Blockchain itself could open the way to the exchange of a more advanced information property being transactions, sharing it via a distributed and low-cost mechanism, by getting rid of the "middle man" in the process.

Our current societal, economical and juridical systems rely heavily on those traditional, centralized and controlled mechanisms, and that's why the potential impact of Blockchain could be so important; for instance, disrupting industries like Uber,Airbnb and Paypal are doing today. Furthermore, those same and present disruptors could also be in danger, as these distributed architectures are opening the race to the need of always deeper, faster and innovative transformations.

As the race starts, the ecosystem and potential applications are already accelerating and blooming. The purpose of this report is to provide a short but global understanding and awareness of the past, current and future prototypes, services and startups, being built with the blockchain technology.

For that purpose, CELLABZ spent the last two years analysing, meeting and working with many actors of the industry, by travelling around the world, from Paris to London, Tel Aviv to New York, Boston or San Francisco, to be in direct contact with the teams, evaluating on the ground the level, reality and potential of the technology, and exploring new ways of applying it, via our 'non-disciplinary' (cf. Joi Ito), collaborative and distributed approach of innovation.

This report is meant to inform, spur debate and help catalyse new fields of research, opportunities and collaborations across multiple individuals, universities, business, makerspaces, startups and communities.

«Bitcoin is exciting because it shows how cheap it (Financial transactions) can be. Bitcoin is better than currency in that you don't have to be physically in the same place and of course for large transactions currency can get pretty inconvenient. » --- Bill Gates

«The most interesting intellectual development on the Internet in the last five years.» --- Julian Assange

«Making sure that conversations around this are happening at the highest level will hopefully result in common-sense reforms to areas such as taxation and law enforcement, which will be of real benefit to all concerned. It's crucial that everyone has an understanding and access to enable it [digital currencies] to work for them.» --- Sir Richard Branson

«The Blockchain is the most disruptive technology I have ever seen.» ---Salim Ismail

«I'm a big fan of bitcoin... regulation of money supply needs to be depoliticized... I think the fact that within the bitcoin universe an algorithm replaces the functions of [the government] ... is actually pretty cool.» --- Al Gore

«It is worth thinking about money as the bubble that never ends. There is this sort of potential that bitcoin could become this new phenomenon.» --- Peter Thiel

« Digital currencies have immense potential to improve human welfare by strengthening the capacity of governments to deliver more responsive services and secure the rights of their citizens to property, identity and increase financial inclusion... And because it is an open-source protocol for innovation, a wide range of services and products can be built by entrepreneurs and non-profits on top of it.»--- Brian Forde

«It will be everywhere and the world will have to readjust. World governments will have to readjust.» --- John Mcafee

Information Sea

Like any points throughout history, 2008 was full of events, being witnessed locally by individual, recorded digitally via technology, shared globally thanks to media and social networks. And stored online, inside private and giant server farms, to be redistributed in space and time across the planet, kept for future usage and generations to come.

Among some of these events, Barack Obama was elected as U.S president, Chinese spacecraft Shenzhou-7 carried China's first space walk, Mexico drug war brought military to take over police, Russian new president Dmitri Medvedev was sworn in, the Large Hadron Collider particle accelerator went live, a global food crisis started with rice price rising, Space X launched Falcon 1 (the first privately funded rocket) into orbit, and the Global Financial Crisis saw the approval of a 700 Billions financial rescue plan by the U.S.

Within that information sea that year, Satoshi Nakamoto, an anonymous person, group of individuals or stand alone complex, published online a whitepaper describing the concept of a new technology, the blockchain and its implementation in finance. It was the start of Bitcoin, a digital currency, using cryptography and decentralized protocol to control the creation and management of money in an horizontal way, checked by everyone and without a central authority, like banks and governmental agencies, controlling it.

A small drop into the ocean, mainly unnoticed at that time, but growing slowly over the years, all the way to 2015, ready to give birth to its first off-springs. With the potential of having major impacts into the social, financial, juridical and, we believe scientific, technological and innovation landscape.

Building Blocks

To understand the blockchain and what's hidden behind its core technology, a quick jump, back into the old days is necessary. The Blockchain by itself is nothing new and this is important to remember. Like any other innovation throughout human history, it was built on top of older bricks of ideas, over the shoulders of curious minds, explorers and innovators.

In fact those bricks are quite old. So old, they are part of the fundamental «code» that gave birth to human civilization itself, and the ongoing update of its operating system.

Throughout time, information, matter and life, evolved and spread out across the universe, rose from the oceans and walked over continents. Replicating their genetic code, cells, organisms and colonies went on exploring, adapting, networking, combining and improving themselves over billion of years. More recently, some species and our ancestors, started recording and sharing additional information, by building new means of communication. The emergence of complex languages helped to build a deeper representation and understanding of their surrounding, giving birth to culture. In return culture pushed humankind to build better tools for recording, replicating and sharing their legacy across long distance and generations to come.

From painting ecosystems of wonder in caves, to engraving stories and important historical facts on temples' walls, they improved information technology over the ages, with more efficient mediums like wood, pottery, paper, printing and libraries. Today we store them digitally on computers, traveling at light-speed across our submarine, sliding and orbital networks. Tomorrow we may free them onto artificial living memories and intelligent space probes.

But one thing is constant, we, as a species and as individual, experience, share and pass on the knowledge and discoveries of those that came before us, to the next generations, no matter what the vessel is. From genes, to memes, information keeps growing throughout the technium (cf. *What Technology Wants*) as an accelerator for innovation. Constantly building new means of sharing data, between more and diverse agents, individual or in group, between humans and machines. Today, the next generations are coming. Those tools are being thought, encoded, shared, combined and improved. Among them, the Blockchain.

What is the Blockchain?

If the blockchain is anything, it could be described simply as being a way of storing the information of a transaction, between multiple parties in a trustable way. Recording, sharing, storing and redistributing its content in a secure and decentralized way. Being owned, run and monitored by everybody and without anyone controlling it. Avoiding modifications or abuses from a central authority.

In short, it is a book-keeping or publicly available ledger, used to keep track of a transaction for trusting reasons, between two entities, being humans back then, and also with and between machines today. The modern financial version, it is that little room where we go and get our paycheck, called accounting, and play a big role in the nature of the blockchain and it's first implementation with the crypto-currency Bitcoin.

Accounting for Information

If we dig a little bit closer, the history of accounting is thousands of years old, and can be traced to ancient civilizations, from Babylon to ancient Egypt and Mesopotamia. It was born in what is considered to be the cradle of civilization, and this innovation was closely related to the developments of writing, counting, money, agriculture, medicine, philosophy, science and technology.

Over the ages, this «information technology» improved and one of its update became the Double-entry book-keeping system. Its name comes for the fact that every entry on the ledger 's account requires a corresponding and symmetrical entry to a different account. What you substract from somewhere you need to add somewhere else.

The simple equation is Equity = Assets − Liabilities, and serves as an error detection tool, an important mechanism of logical and mathematical trust, and pillar of the latter blockchain protocol.
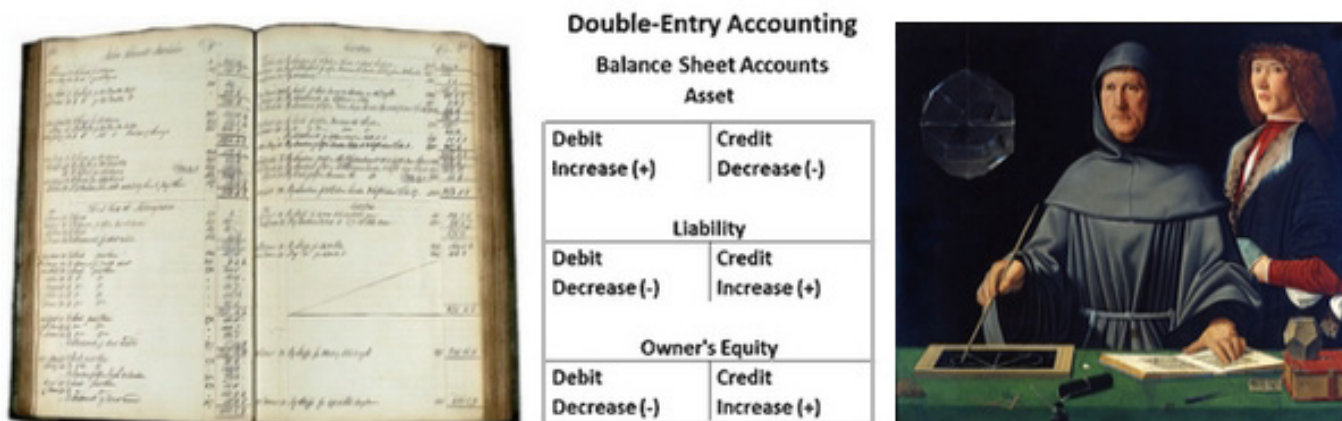
Double-entry book-keeping system manuscript / Portrait of Luca Pacioli, attributed to Jacopo de' Barbari, 1495.

Its earliest form came around the 13th century, used by bankers and merchants of Florence and Genoa. Franciscan Luca Pacioli, an Italian mathematician and collaborator of Leonardo da Vinci, considered to be the «father of accounting», was the first to publish a detailed description of this double-entry system. Enabling others to study and use it, expending as a consequence commerce all over the world. Something no so far when considered, from Satoshi 's choices with the open publication of his blockchain paper.

Finally and important to notice, is the emergence around that time, in 1450 Venice, of another major breakthrough, the modern patent system. It was systematically granted with the issue of a decree, by which new and inventive devices were communicated to the Republic, to be able to obtain legal protection for 10 years, against potential infringers. As Venetians emigrated, they brought similar patent protection with them, leading its diffusion to other countries. Both innovations combined as we will see, had a major impact in the world, its organization structure, and became core elements in the diffusion and improvement of ideas, commerce, knowledge, industries, economy, legal & intellectual property and innovation mechanisms.

First child: Bitcoin

Origin

Bitcoin, the financial application of the Blockchain, as a new digital currency, was built on multiple research, work and layers of previous innovations in the financial, cryptographic, computing, network and security sectors. Original digital cash technologies also have been around for some time.

Among them eCash protocols from David Chaum, the inventor of secure digital cash, conceived in 1983, as an anonymous electronic micro-payment system. Published in a paper that year, the idea was for eCash to store money in a digital format, cryptographically signed by a bank on a user's local computer. He raised $10 million from VC David Marquardt, started the company DigiCash and by 1997 had Nicholas Negroponte, co founder of MIT Media Lab, as its chairman. Yet only one bank in the US implemented eCash. After three years of trial and around 5000 customers, it was dissolved and went bankrupt in 1998. Hashcash, a proof of work scheme for spam control was proposed in 1997 by Adam Back, a British cryptographer and crypto-hacker. More recently it has become known for its use in Bitcoin, as part of the mining algorithm. A mechanism used to confirm transactions through a common consensus system.

In regular currency systems, we use physical money like bills and coins, governments controlling when to print and distribute it. Because of its decentralized nature, Bitcoin use miners, people making available powerful computers and today, computer farms, to run a special software to solve maths problems, to receive bitcoins in exchange to compensate them. Another way to see it is by asking who pays for running the internet today ? Companies are creating services, customers use them. And the data, information, is often being sold to a third party. Here a few people are running the network, getting paid for providing the infrastructure, via micropayments. This system create a distributed way to issue currency and a financial incentive for people to share their resource by mining for the network.

At the same time in november 1998, on a cypherpunks mailing-list, Wai Dai a cryptographer, proposed B-Money. Bit Gold also, proposed by Nick Szabo, a computer scientist, legal scholar and cryptographer; was describing a system for the creation of decentralized unforgeable chains of proofs of work. With transfer prevention of double-spending via a Byzantine-resilient peer-to-peer method. Both were precursors to most of the mechanisms being used inside Bitcoin's blockchain protocol.

History

After Satoshi published his paper in 2008 called: Bitcoin: A Peer-to-Peer Electronic Cash System. He shared the code of his blockchain the following year on the internet, releasing the first open source bitcoin client and issuing the original bitcoins. The first transactions started to take place in the weeks to follow, and later that summer, the first exchange was based on the average electricity cost of running one CPU miner for a year. At that time the change between USD and Bitcoin BTC was 1 to 1,400.

The story that followed for Bitcoin, could have come out from a technological thriller, as it became filled with stories and news of secret identities, factory explosions, hacking, financial manipulation, fake com-

panies, international drug rings, dark web organizations, FBI busting, you name it. It also became an entrepreneurial landscape for millionaire wannabes. A formidable community for many young minds, developers, mathematicians, economists etc working together to bring a new form of currency. It was also the frustration from many people of the current financial system and crisis. Some saw opportunities, but many were put in front of reality. Young students coming out from their financial education with a shaking industry and carrier. Individuals, families and large communities confronted to the everyday difficulty of a rising financial inequity and insecurity.

It was all that and more. So here is a quick walk through some of its main events. Thanks in part to the great job being done at BTC Registry that helps keep track of Bitcoin's history.

January, 2010	After one year, 1,64 million of bitcoins had been minted.
May, 2010	In May 2010, two pizzas were exchanged for 10,000 BTC. With today's exchange rate at 256 USD for 1 BTC, those two pizzas would have cost you 2,560,000 USD... or half that price for one pizza. The 17th of May is now celebrated as «Bitcoin Pizza Day» as a reminder of the first real-world transaction with bitcoin and paved the way for early merchant adoption.
August, 2010	In August 2010, a bug with a major vulnerability was discovered in bitcoin blockchain 's protocol. It was later exploited with the release of over 184 billion counterfeit bitcoins. Thanks to the open source format of the protocol and a strong community of developer, combined with the financial risk, the bug was quickly fixed, the counterfeit bitcoins removed and the problem fixed in few hours.
November, 2010	Bitcoin reached over 1 Million USD market capitalization. Few months later in February 2011 Bitcoin touched parity with the US dollar. 1 BTC = 1 USD. At this point the little drop in the ocean started to create waves and the first articles on Bitcoin appeared in major US publications.
June, 2011	The first bubble happened in June 2011, when Bitcoin, at almost 32 USD, crashed back to a single digit. One month latter a Mt.Gox, a Bitcoin exchange company was hacked, triggering massive selling orders forcing the price down and exchange to halt. Latter it was discovered that user-names, email addresses and password hashes of over 60,000 users were leaked.
July, 2011	The first mobile Bitcoin wallet was released in July 2011 for android smartphones. Opening the road to bigger adoption.
September, 2011	In September 2012, the Bitcoin Foundation is created, with the mission to standardize, protect and promote Bitcoin usage worldwide.
March, 2013	In March 2013, following the financial crisis in Cyprus, Bitcoin market capitalization surpasses 1 Billion USD. With Bitcoin price rising towards 100 USD shortly after.

April, 2013	2013 was a turbulent year, but with positive publicity in the media, U.S Senate hearings and Bitcoin popularity in China. The price went to over 1000 USD, briefly reaching the parity of an ounce of gold.
October, 2013	In October 2013 the FBI shuts down Silk Road. A dark web marketplace using Bitcoin for illegal transactions. At the same time, the first ATM is installed in Vancouver Canada. Many other Bitcoin ATM units deployed around the world latter.
January, 2014	January 2014. Bitcoin celebrates it's 5th year anniversary. With 12 million bitcoins in circulation. In February Mt.Gox, the biggest bitcoin exchange filed for bankruptcy protection in Japan. They announced the lost of nearly half a billion dollars worth of virtual coins due to hacking. Over 750,000 bitcoins are unaccounted for at the end.
April, 2014	In April Bloomberg terminals now track Bitcoin prices. A month later, Yahoo and Google offer real-time Bitcoin quotes on their financial portals. In June, the U.S Marshals service auctions first block of almost 30,000 bitcoins, seized during the Silk Road operation. More auctions are still to come.
September, 2014	In September 2014, PayPal and later NCR start gradual Bitcoin integration into their payment processing systems. Microsoft latter on adds Bitcoin payments for Xbox games and mobile content.
October, 2014	The next month a fire destroys Thai Bitcoin mine, with 3,6 million worth of hardware equipment.
December, 2014	In December, miners are starting to go off-line, pressured by a declining Bitcoin price and diminishing profitability. Triggering a slowdown of the network hash rate. Two days later, the U.S Marshals Service completes the second auction of 50,000 bitcoins. Bitcoin Investment Trust syndicate and wins 48,000 Bitcoins. The other 2,000 are going to VC and Managing director of DFJ, Tim Draper.
January, 2015	January 2015, BitStamp, European largest bitcoin exchange is hacked, resulting in the disappearing of 19,000 bitcoins. The company goes off-line while bitcoin value drops below 300 USD. BitStamp rebuilds the exchange operation and opens for business refunding all customer funds. Ten days later massive sell off across major exchanges pushes Bitcoin value below 170 USD. The Bitcoin Bubble of 2013 finally burst.
February, 2015	In February, Hong Kong exchange MyCoin shuts its doors, disappearing with around 400 Million in investor and customer funds. An inside job, scam, is suspected. Few days later, Stripe, a payment processor launches its bitcoin integration product for web and mobile payments.
March, 2015	In March, the U.S Marshals Service auctions 50,000 more Bitcoins from the Silk Road Operation. Rakuten, Japan's largest online retail firm announces accepting Bitcoin across its global marketplaces.

June, 2015

In June, the New York State Department of Financial Service releases its final version of a long awaited and controversial regulatory framework for digital currency companies. The BitLicense in the New York State register divide and many companies decide to leave the state. Those who decide to stay, see it is a «necessary evil». Being a logical and necessary move into the evolution of the bitcoin ecosystem. With regulation comes larger oversight but also better clarity. The previous and numerous scandals in the industry were often the result of a lack of general regulation, checks and balances, as most financial institutions have. With the bitLicense, Bitcoin companies in NYC State are brought to the same standard as others in the traditional industry.

August, 2015

August 2st. Mark Karpeles, Ceo of now defunct Mt.Gox bitcoin ex-exchange, is arrested by Japanese police, on fraud charges.18th of August, Bitcoin started to go through a major debate inside its community, with the ongoing forking of the software and possibly its blockchain. The two versions are known as Bitcoin Core and Bitcoin XT.

This never happened before and is important to understand, as Mike Hearn explained on his post: *Why is Bitcoin forking? A tale of differing visions*

The founding vision for Bitcoin was carefully laid out by Satoshi, and has always been crystal clear. This dispute is about growth... Satoshi's plan brought us all together. It changed the lives of hundreds of thousands of us across the globe. Some of us quit our jobs, others devoted their spare time to the project, still others founded companies and even moved across the world. It's the idea of ordinary people paying each other via a block chain that created and united this global community. (...)

That vision is now in jeopardy. In recent months it's become clear that a small group of people have a radically different plan for Bitcoin... They see a golden, one-time opportunity to forcibly divert Bitcoin from its intended path and onto a wildly different technical trajectory. They don't know exactly what the alternative design will be, and certainly haven't built it—but that doesn't matter. They think that by blocking the blockchain's growth they can "incentivize" (i.e. force) the Bitcoin community to switch to something different, something more in line with their personal technical tastes. (...)

As Bitcoin has grown, so have the blocks. Reasonable traffic projections indicate that as Bitcoin spreads via word of mouth, we will reach the limit of the current system some time next year, or by 2017 at the absolute latest. And another bubble or press cycle could push us over the limit before even that. The result might not be pretty... So it is now time to raise the limit, or remove it entirely. That was always the plan. This is where the problem starts: those who don't want to see Bitcoin scale up as Satoshi intended have decided to stall the process of doing so. (...)

«The current system where every user is a network node is not the intended configuration for large scale. That would be like every Usenet user runs their own NNTP server. The design supports letting users just be users.» Satoshi Nakamoto, July 2010

Tomorrow

So what? And more importantly, what about tomorrow? Bitcoin is a fascinating project, with a fundamental and deeply needed reflection and experiment on the nature, value and possible alternative of our current financial system. It has a passionate community of talented, curious and active individuals, and all along has been an unexpected adventure full of success, fails, falls and rises. But tomorrow, we will look back and see it as being just the beginning of that story. Awaiting on the other side, are new promises, opportunities, illusions and unexpected applications. A blooming ecosystem on the rise.

As the recent debate over the fork of the Bitcoin Blockchain protocol is starting. What we are seeing is a mutating technology. Witnessing the rise of new species of Blockchains.

Also, Bitcoin is the biggest, but one among a plethora, of other cryptocurrencies that are called altcoins. In early 2015 there were 530 of them available for trading in online markets and more that 740 in total. With 10 of them having a market capitalization over $10 million.

Blockchain 2.0

Since 2014 and less visible to the outside community, are starting to appear 2nd generations of blockchains projects. Like other cryptocurrencies, they are based on the same kind of public ledger, decentralized and trusted mechanism. But they add new functionalities like smart contracts, decentralized consensus and applications. Side chains or assets, proof of work and of stake. Ownership crypto- representation etc.. adding new possible applications.

Among some of them are projects like Ethereum, Eris, Blockstream, Counterparty, Ripple Labs, Swarm, MaidSafe, Nxt or Crypti. Many more are on the rise and this is just the beginning, but all share a common character. They are trying to expand the horizon and functionality of the blockchain with new tools and approaches. To get an idea of what such on-building projects and services look like, here is a preview at some of them.

ADEPT

ADEPT is a system developed in partnership between IBM Samsung and Ethereum, using elements of bitcoin's underlying design to build a distributed network of devices – a decentralized Internet of Things. The concept, an Autonomous Decentralized Peer-to-Peer Telemetry, taps blockchains to provide the backbone of the system, utilizing a mix of proof-of-work and proof-of-stake to secure transactions to serve as a bridge between many devices at low cost

Augur

Augur is a Blockchain Prediction Market that allows its users to buy and sell shares in the outcome of an event. The current market price of a share is then an estimate of the probability that event will occur. Already, many academic researchers attest that such platforms, while incorporating aspects of gambling, do have practical value. Maybe the most advanced project in the Ethereum ecosystem, being supported by the community. One of the first applications in the making.

Ascribe

With Ascribe your digital work will always be attributed to you. Digital is easily copied. This makes it difficult to prove your work is your original creation. Just as signing a painting helps attribution, ascribing your digital creation helps prove authenticity and provenance of your work. This is a high potential application, and one we watch closely for the development of next generation collaborations.

Colu

Colu is an Israel-based startup aimed at digitizing the ownership of all your things through the blockchain. The service provides an easy way to use the blockchain technology, originally meant for Bitcoin transactions, for anything, from cars, to art, to concert tickets. They announced $2.5 million in new funding recently.

Backfeed

Backfeed develops resilient technology and new economic models to support free, large-scale, systematic collaboration. Based on a distributed governance model, Backfeed protocols make it possible for people to easily deploy and maintain decentralized applications and organizations that rely on the spontaneous and voluntary contribution of hundreds, thousands or millions of people. (http://backfeed.cc)

Airlock

Decentralized electronic security. Airlock is a next generation key-less access protocol for smart property powered by Ethereum and the Internet of Things. The next step after bringing blockchain was to use it into real world everyday usage. That' s what they are working on, and we see some powerful mix being applied with next level organizations.

Bitnation

Bitnation' s goal is to create an open source governance. They provide the same services traditional governments provides, from dispute resolution and insurance to security and much more – but in a geographically unbound, decentralized, and voluntary way.

OpenBazaar

OpenBazaar is a new way to buy and sell goods or services online. By running a program on your computer, you can connect directly to other users in the OpenBazaar network and trade with them. The network isn't controlled by a company or organization. OpenBazaar is a BitTorrent-style peer-to-peer network. This means there are no mandatory fees to pay and the network is censorship-resistant.

Dunveganspace

Dunvegan Space Systems is an early stage company focused on bringing decentralized, networked, open source design principles to spaceflight with the goal of opening new frontiers throughout the solar system for the betterment of all humanity. This is the kind of new ventures we are actively searching, following and supporting with our own R&D effort, because of their high goals, large impact opportunities and outside the earth approaches.

Network Society

The network Society is creating a vision and analytical tools to allow individuals, enterprises and society at large to deal with the ongoing transformation from exponential technology, with the common feature of being decentralized, and organized in a network.

La Zooz

La Zooz, is often described as the decentralized Uber, is being built as a Community, creating Social Real-Time Ridesharing Service. They are developing a Collaborative Transportation Network to change the way we move and transfer things from place to place.

Cellz

Cellz is a Research & Development program among CELLABZ, exploring practical applications of the Blockchain with other technologies, into helping scientific and technological teams, to build a network of distributed labs for collaborative innovation.

Ethereum: World Computer

«It is very possible that ...
one machine would suffice to solve all the problems ...
of the whole [world]» --- Sir Charles Darwin, 1946.

One of the best know of these new species is Ethereum.

«Arguably the most ambitious 'crypto 2.0' project to date, and the third-largest crowdfunded project of all time, Ethereum is aiming to create a new universe of programmable contracts, powered and secured by its own proof-of-work blockchain. Grand in scale and flexible by design, it aims to decentralize pretty much anything on the Internet. «What bitcoin does for payments, Ethereum does for anything that can be programmed..» wrote Grace Caffyn, for CoinDesk.

Co Founded by Vitalik Buterin and Gavin Wood, Ethereum as described by its creators is the first truly world computer in the making. Initially described by Vitalik Buterin in late 2013, and formally described by Gavin Wood in early 2014. Ethereum is an open source project, and was launched on 30 July 2015.

In order to finance development, Ethereum distributed the initial allocation of Ethers Ξ , its cryptocurrency, via a 42-day public sale, netting 31,591 bitcoins, worth $18,439,086 at that time. Making it the third biggest crowdfunding campaign in history.

The stated purpose of the Ethereum project is to «decentralize the web» by introducing four components as part of its roadmap: static content publication, dynamic messages, trustless transactions and an integrated user-interface. Each of these services are designed to replace some aspect of the systems currently used in the modern web, but to do so in a fully decentralized and pseudonymous manner.
As the team wrote :
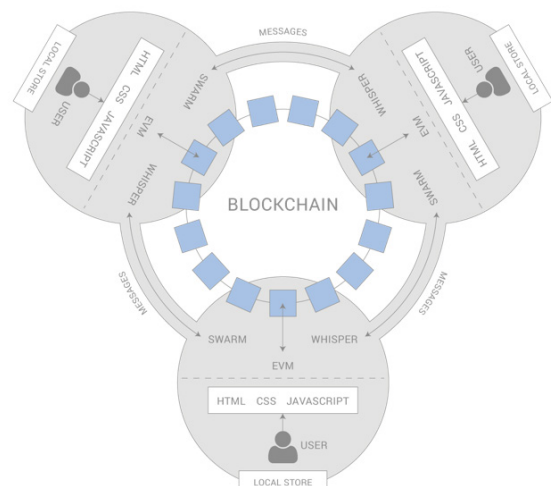
«In a technical sense, Ethereum is a «world computer». Harking back to the days of the mainframe, and probably about as fast, Ethereum can be viewed as a single computer that the whole world can use. It notionally has only a single processor (no multi-threading or parallel execution), but as much memory as required. Anybody can upload programs to the Ethereum World Computer and anybody can request that a program that has been uploaded be executed. This does not mean that anyone can ask any program to do anything; on the contrary: the author of the program can specify that requests from anyone but themselves be ignored, for example. Also, in a very strong sense, every program has its own permanent storage that persists between executions. Furthermore, as long as it is in demand, the Ethereum World Computer will always be there: it can't be shut down or turned off.»

In their exploration of new frontiers for the Blockchain, Vitalik rephrased it by :

«A blockchain is a magic computer that anyone can upload programs to and leave the programs to self-execute, where the current and all previous states of every program are always publicly visible, and which carries a very strong cryptoeconomically secured guarantee that programs running on the chain will continue to execute in exactly the way that the blockchain protocol specifies.»

On the 30th of July, Ethereum officially released Frontier. The first in a series of releases that punctuate the roadmap for the development of Ethereum. Frontier will be followed by 'Homestead', 'Metropolis' and 'Serenity' throughout the coming year, each adding new features and improving the user friendliness and security of the platform.

The focus of Frontier is the Go implementation of an ethereum full node, with a command line interface codenamed «Geth». By installing and running Geth, you can take part in the ethereum live network, mine Ether on the blockchain, transfer funds between addresses, create contracts and send transactions.

Space & Time Ethereumed

A beautiful metaphor written by Justin Drake takes the concept to a higher level of philosophy:

«*Ethereum puts time into computing. Time appears to have direction. The past lies behind, fixed and immutable. The future lies ahead, awaiting to be shaped. Sounds familiar? This sense of time characterises Ethereum (and Bitcoin!). Behaviourally, Ethereum is a computing engine with three key properties :*

*Immutable history: the past is fixed*

Ubiquitous state: the present is a shared common

Guaranteed execution: the future is inexorable

In this light, Ethereum is simply a computational universe with true time dimensionality. Let's flesh out the metaphor :

The Genesis block = the Big Bang / blocks = space / mining = time progression /the blockchain = spacetime / the highest block state = the present / contracts = physical bodies / transactions = physical interactions / ether = energy / the state transition function = the laws of physics / block confirmation time = Planck time / block propagation speed = the speed of light.

I believe this insight captures and crystallizes the essence of the new era of computing pioneered by Satoshi Nakamoto.»
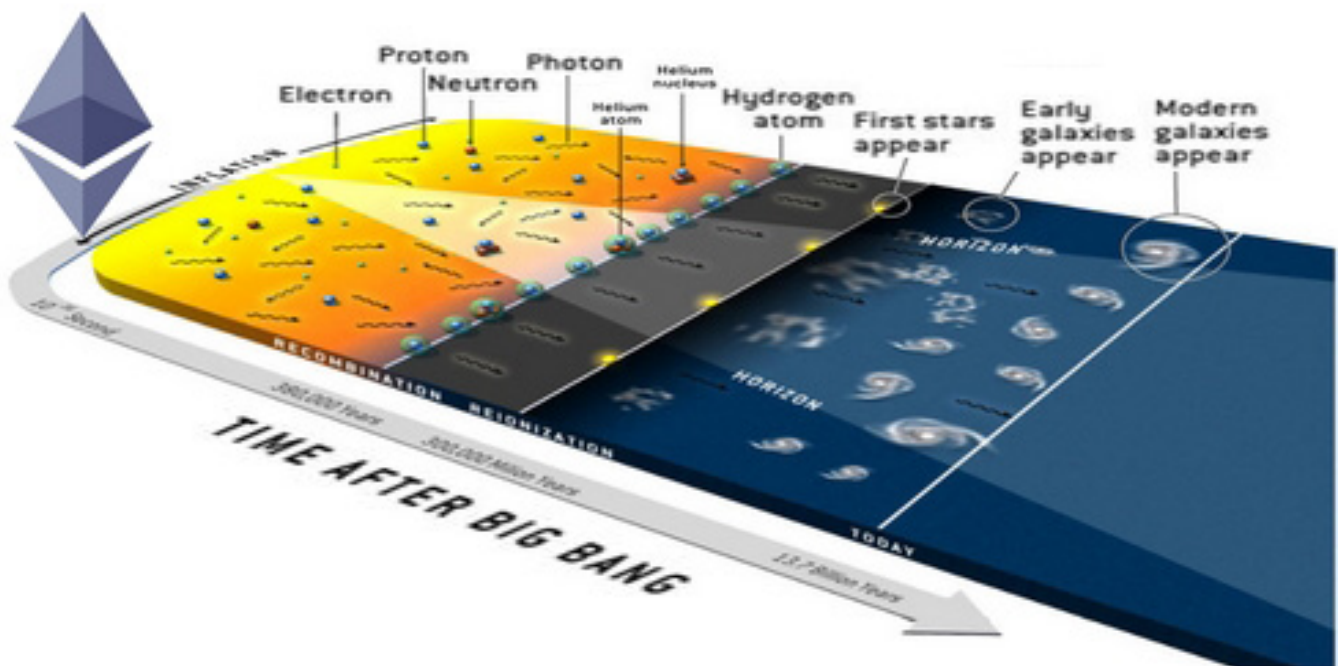
Smart Contract

A game changing idea around new blockchain generations is the idea of «Smart Contracts». The reason for that is they are aiming at upgrading another old and fundamental technology of human society: Laws.

> *«If a man fails to fulfill an agreed contract - unless he had contracted to do something forbidden by law or decree, or gave his consent under some iniquitous pressure, or was involuntarily prevented from fulfilling his contract because of some unlooked-for accident - an action for such an unfulfilled agreement should be brought in the tribal courts, if the parties have not previously been able to reconcile their differences before arbitrators (their neighbors, that is).»* Plato, The Laws, Book 11, §23, Contracts.

By nature, contracts are legally-enforceable promises, made by one party to another. Adding this concept into the blockchain, Smart Contracts are computer programs that automatically execute the condition and terms of a contract. By making them virtual, autonomous, without central control and therefore trustable by everyone, they become more efficient and create an equitable and affordable legal system to anyone , being humans... and machines.

As we saw earlier with the origin of Bitcoin. It's important to understand why smart contracts are starting to appear. Journalist Jay Cassano summarized:

> *«The idea of smart contracts goes way back to 1994, nearly the dawn of the World Wide Web itself. That's when cryptographer Nick Szabo ... first coined the term «smart contract.» At core, these automated contracts work like any other computer program's if-then statements. They just happen to be doing it in a way that interacts with real-world assets. When a pre-programmed condition is triggered, the smart contract executes the corresponding contractual clause.*
> *Szabo's original theories about how these contracts could work remained unrealized because there was no digitally native financial system that could support programmable transactions. (It defeats the purpose of smart contracts if a bank still has to manually authorize the release and transfer of money.) «One big hurdle to smart contracts is that computer programs can't really trigger payments right now,» says Phil Rapoport, Ripple Labs' director of markets and trading.*
> *The advent and increasingly widespread adoption of bitcoin is changing that, and as a result Szabo's idea has seen a revival. Smart contract technology is now being built on top of bitcoin and other virtual currencies... Because bitcoin is itself a computer program, smart contracts can speak to it, just like they would with any other piece of code. The puzzle pieces are falling into place. A computer program can now trigger payments.»*

The idea is someday for those programs to 'update' or replace lawyers, banks, governments or corporations all together for handling regular financial, social, political or legal transactions.

As a healthy meditation on our topic, Lawrence Lessig, American academic, political activist, founding board member of Creative Commons, and a candidate for the 2015 presidency of the United States, wrote back in his book, Code: And Other Laws of Cyberspace:

> *«[The code] will present the greatest threat to both liberal and libertarian ideals, as well as their greatest promise. We can build, or architect, or code cyberspace to protect values that we believe are fundamental. Or we can build, or architect, or code cyberspace to allow those values to disappear. There is no middle ground. There is no choice that does not include some kind of building. Code is never found; it is only ever made, and only ever made by us.»*

Two projects working on smart contracts:

Etherparty

Etherparty is a platform that removes the complexity of creating and executing smart contracts. Deploying Smart Contracts relies on a back end of packages, modules, and libraries. It automates this process by preconfiguring these dependencies to just a few clicks of a button. (http://etherparty.io/)
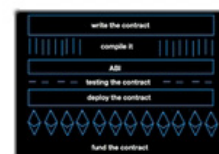
Trustatom

Trustatom is a next generation multi factor authorization. Its ID mobile workflow relies on strong cryptography for critical action authorization. Knowing who is on the other side of the connection has always been a challenge. What's even more complicated is knowing enough about that person to conduct business with her. With Trustatom ID users can easily share isolated pieces of their information (residency, age, banking information, contacts etc.) signed by trusted third parties upon request.

Smart Property

The next logical extension of Smart Contracts are Smart Property. Using again the blockchain but to record and prove the ownership of assets by people. Making it possible then to have ownership of your house, car, art creation or collection, shares in a company or equity crowdfunding, in a distributed secure way. One of the application, being explored by numerous projects, is to represent physical property, allowing the smart property to scan the blockchain for information and events relevant to itself, and react, self execute if needed.

Some prototypes are currently being tested on cars and with door locks. Allowing these objects to share or update their keys, upon accord of rent, lending or selling, transferring the ownership to the next person and blocking the previous one to access it for example.

Ellis gives the example of renting out his house.

> *«Let's say all the locks are Internet-enabled and they've all got network connections. When you make a bitcoin transaction for the rent, the smart contract you and I agreed to automatically unlocks the house for you. You just go in using keys stored on your smartphone.»*

> *«A smart contract would also make it trivial to set up dates when those digital keys would automatically expire. It sounds a bit like Airbnb without the need for Airbnb. And if you think about it, that's the fundamental transformation smart contracts are after. A service like Airbnb is desirable because it obviates the need for the host and the guest to trust each other—they both only need to trust Airbnb. If the guest doesn't pay up, or the host doesn't leave the keys, either of them can take it up with Airbnb. But smart contracts don't have to just disrupt existing business models. They can also complete them. Way back in his '94 essay, Nick Szabo envisioned the idea of smart property writing that «smart property might be created by embedding smart contracts in physical objects.» His example of choice was a car loan, writing that if you miss a car payment, the smart contract could automatically revoke your digital keys to operate the car. No doubt car dealerships would find this appealing.»*

Two on-going projects in the field:

Monegraph

Monegraph lets you, in a permanent and public way, claim your work as your own and set its rules for use. Anywhere that work goes, when it is used, you get paid. Built on the oldest and most secure public ledger, Monegraph uses blockchain architecture to establish and link the author of a work to its title of ownership, its constellation of usage rights, and payment terms for handling those rights. (https://monegraph.com/)

Bitproof

We live in a broken world. From finance to private property, major parts of our lives rely on easy-to-forge pieces of paper called contracts. Bitproof created SealX, a tool that lets you create frosted contracts. They're sealed forever and valid worldwide. (https://bitproof.io/)

The Internet of Decenthings

Maybe one of the most interesting short term application, to be built for blockchain technology, is its fusion with hardware and IoT, The Internet of Things.

One of the biggest misconception we see in IoT at the moment, from providers to customers, is the focus on the infrastructure and the objects themselves, instead of the network and fluidity needed between them and the information. A diverse range of connected objects are available, from a simple crowdfunding-deve-loped humidity sensor to a sophisticated sensor that monitors a person's health. From a billion today, the number of connected objects is expected to rise to hundreds of billions in the near future.

And some of the main issues , security and privacy over the data and the devices themself, are most of the time avoided or not well planned for «things» to come. Some business models need to be questioned, for example in relation to subcription fees, invasive advertising and intrusive surveillance. The other point is scalability and infrastructure efficiency often missing with current centralized architectures.

As the world if getting more and more transparent and full of sensors we see increasing debates and concerns about security and privacy, both in the political and civil society spheres. From Edward Snow-den opening up information on current intelligence gathering, to daily hacking and nation/corporation cy-ber-warfare, the virtual world has started to reshape itself over the last few years, and this will have pro-found effects on future protocols and impact on our social, individual and global evolution.
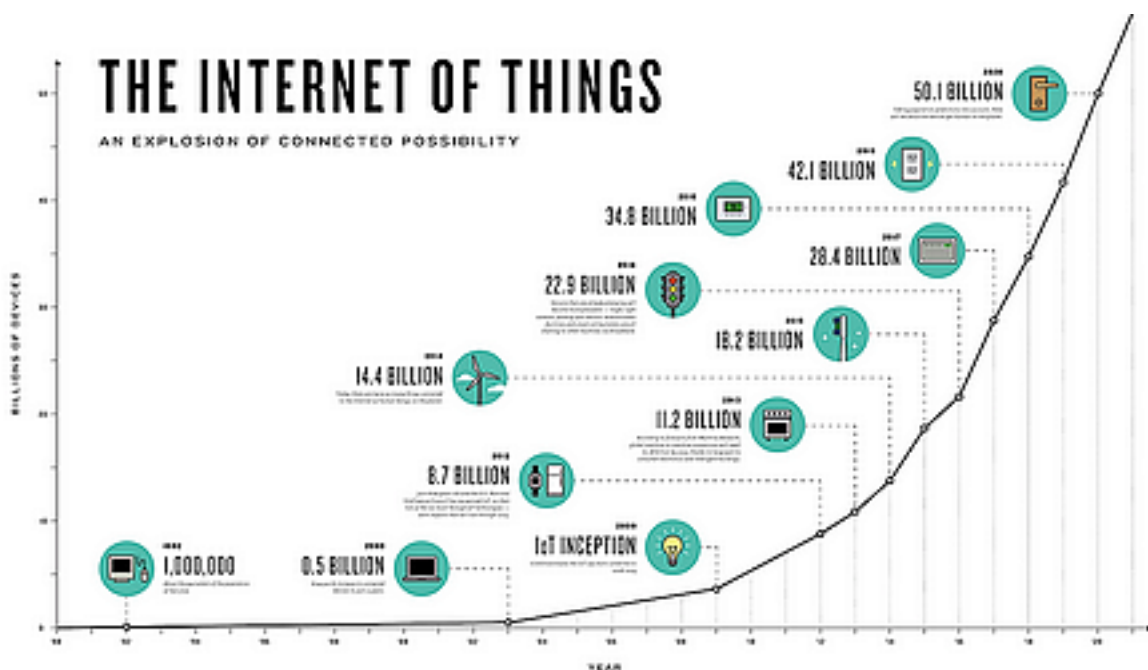
To get a preview of the possibilities of combining blockchain and the IoT. One interesting player in the field is :

Filament

«Filament is a decentralized IoT software stack, that uses the bitcoin blockchain to enable devices to hold unique identities on a public ledger. By creating a smart device directory, Filament's IoT devices will be able to securely communicate, execute smart contracts and send microtransactions.

«The lesson is that decentralized systems are more valuable to the company and the people that use them,» Jennings explained. «That's the ethos we've learned, that decentralized systems with more equal footing between the users tend to be more valuable.»

Filament's thesis is based on seeking to unlock how a similar platform can be used to enable decentralized communications between connected devices, a vision Jennings, CEO at Filament, argues is based in business logic rather than any ideological support.

«Decentralized isn't a tinfoil hat position,» Jennings argued.

«Decentralized systems are more valuable to people that interact with them... It's a good reminder. 'Why does it matter using the blockchain? Because it can make systems more powerful and more valuable.»

Filament's technology stack will use five layers – blockname, telehash, smart contracts, pennybank and BitTorrent. Filament's sensors rely on the first three in order to operate, while the final two protocols are optional for clients. Filament will seek to market two hardware units: the Filament Tap, a sensor device that allows devices to communicate with phones, tablets and computers at distances of 10 miles, and the Filament Patch which extends the capabilities of the technology to custom hardware projects.» They just raised $5m in Series A funding . (http://filament.com/)

Decentralized Autonomous Organizations

Combining the different building blocks we have been discussing we can create Decentralized Autonomous Organizations (DAOs).

«They would be a decentralized network of narrow- autonomous smart programs, which perform an output-maximizing production function and which divides its labor into computationally intractable tasks (which it incentivizes humans to do) and tasks which it performs itself.

It can be thought of as a corporation run without any human involvement under the control of an incorruptible set of business rules. These rules are typically implemented as publicly auditable open-source software distributed across the computers of their stakeholders. A human becomes a stakeholder by buying stock in the company or being paid in that stock to provide services for the company. This stock may entitle its owner to a share of the profits of the DAO, participation in its growth, and/or a say in how it is run.»

William Mougayar, author, advisor on Blockchain, went past this idealistic vision and looked at the possible value creation process of DAOs

«Let there be no mistake that the key objective of a DAO is value creation or production, and to make that happen, there needs to be a specific linkage between user actions and the resulting effects of those actions on the overall value to the organization, as symbolized by the value of the cryptocurrency that is underlying it.

That's where entrepreneurial creativity needs to take place, and where business models will be concocted. Usage without value linkage is a waste and will result in a failure backlash.

But there's a warning here. Many of these DAOs will be theoretical in their inception stages. A pre-sale only enables the DAO to start on a path. At the end of the day, a new DAO is like a startup. It requires a product/ market fit, business model realization and a lot of users/ customers. Early on, a lot of assumptions are made, and the DAO may resemble science-fiction until the product/ service hits the market forces realities. The «proof of success» will be sustainable in the market, not the pre-sales success.»

Many questions on how such DAO entities may look like remain unanswered, but here are some views on a subclass of DAOs called Decentralized autonomous corporations/companies (DACs):

A DAC is a DAO that pays dividends on purchasable and tradeable shares which potentially entitle their holders to continual receipts based on the DAC's success, to the point where the profit mechanism and

the consensus mechanism are not the same thing. According to Stan Larimer, President of Invictus Innovations, Inc. (a developer of DACs), an open source DAC with its state information kept public has these characteristics:

They are corporations
— they are free and independent persons (but don't have legal personality).

They are autonomous
— once up to speed, they no longer need (or heed) their creators.

They are distributed
— there are no central points of control or failure that can be attacked.

They are transparent
— their books and business rules are auditable by all.

They are confidential
— customer information is securely (and incorruptibly) protected.

They are trustworthy
— because no interaction with them depends on trust.

They are fiduciaries
— acting solely in their customers' and shareholders' interests.

They are self-regulating
— they robotically obey their own rules.

They are incorruptible
— no one can exercise seductive or coercive influence over them.

They are sovereign
— over their digital resources (but don't have legal capacity).

This is still in the early stage. But this gives a clear idea of how disruptive such organisms could be in our future 'Social Operating System'.

Chaining Business Blocks

As the Blockchain gain visibility, entrepreneurs and investors are starting to wonder about what the killer app could be ? What are the business models of this technology ? These are important questions as the blockchain technology could radically change the way the world is conducting transactions, potentially bypassing intermediaries for the first time ever.

As we got to follow and meet many early projects and founders at their beginning, following them and others, as the number grew, we got the chance to witness part of the infancy, adolescence and today, the on-going transition, for many of them, into adulthood. One thing is on everyone's mind, the business model. Can the Blockchain become a profitable service or product. If so how ?

As Joichi Ito, entrepreneur, venture capitalist and Director of the MIT Media Lab explained recently :

> *«Very much like the early days of the Internet, when we saw the power of Internet email but hadn't yet invented the Web, we are just imagining the potential uses of concepts such as crypto-equity and smart contracts ... to name just a few.*
>
> *I believe that Bitcoin is the first «killer app» of The Blockchain as email was the killer app for the beginning of the Internet. We are in the process of inventing eBay, Amazon and Google. My hunch is that The Blockchain will be to banking, law and accountancy as The Internet was to media, commerce and advertising. It will lower costs, dis-intermediate many layers of business and reduce friction. As we know, one person's friction is another person's revenue.*
>
> *I also believe that layer unbundling and innovation at each layer, assuming that the other layers will sort themselves out, is a good idea. In other words, exchanges and wallets that are coin-agnostic or experiments with colored coins, side chains and other innovations that are «unbundled» as much as possible allow the learnings and the systems created to survive regardless of exactly how the architecture turns out.*
>
> *It feels a lot to me like when we were arguing over ethernet and token ring -- for the average user, it doesn't really matter which we end up with as long as in the end it's all interoperable. What's different is that there is more at stake and it's moving really fast, so the shape of failure and the cost of failure might be much more severe than when we were trying to figure out the Internet and a lot more people are watching.»*

As we spent some time listening and talking with them we realized that like for many of the other technological and innovation teams we work with in other fields; from Drones, to Oceans explorations, Space, Agriculture or Biology, Robotics or Citizen science; a fast capacity for adaptation and organizational reconstruction, is becoming an important part of the answer. Some of our ongoing research and work, across many organizations, and industries, brought us to the idea of mixed approaches. And as we will be testing some of them in the near future, here are some concepts, among many, that we believe will have some impact in such solutions :

Social Market Networks

James Currier, an entrepreneur and investor in the Silicon Valley, wrote:

"First we had communication networks, like telephones and email. Then we had social networks, like Facebook and LinkedIn. Now we have market networks, like HoneyBook, AngelList, Houzz, DotLoop and Joist. (...)

What's unique about market networks is that (1) they combine the main elements of both networks and marketplaces (2) they use SaaS workflow software to focus action around longer-term projects, not just a quick transaction (3) they promote the service provider as a differentiated individual, helping to build long-term relationships. (...)

You can imagine a market network for every industry where professionals are not interchangeable: law, travel, real estate, media production, architecture, investment banking, personal finance, construction, management consulting and more. Each market network will have different attributes that make it work in each vertical, but the principles will remain the same. Over time, nearly all independent professionals and their clients will conduct business through the market network of their industry. We're just seeing the beginning of it now.»

The Clothesline Paradox

Another observation we encountered over and over again, in our current innovation and technological ecosystem is what Steve Baer called the «Clothesline Paradox.» Tim O Reilly, founder of O'Reilly Media, updated his work and shared some interesting insight about how what could be called the dark matter of innovation needs to be turned into a tool to create new value.

«(Steve Baere) was talking about alternative energy. The thesis is simple: You put your clothes in the dryer, and the energy you use gets measured and counted. You hang your clothes on the clothesline, and it «disappears» from the economy. It struck me that there are a lot of things that we're dealing with on the Internet that are subject to the Clothesline Paradox. Value is created, but it's not measured and counted. It's captured somewhere else in the economy.

I started thinking about this first in the area of open-source software, or for that matter, the Web. You think about how much value Tim Berners-Lee created and how he didn't actually capture very much of it. It was captured by companies like Google, Apple, Twitter, and Facebook. You also think about the other extreme, where companies like Goldman Sachs managed to extract a great deal of value from the economy, but as the 2008 financial crisis demonstrated, they did so while actually destroying value for the overall economy. So that got me thinking about how value creation and value capture are not the same thing. Our economics tends to measure value capture. If we're going to get 21st century economic policy right, or even just correctly model what's working and why, we have to start moving to a model that measures value creation rather than value capture.

But then I started asking myself, what might be some other examples of Clothesline Paradox economies, hidden economies of value creation without value capture? A pretty clear one is YouTube: user-generated content, people making videos for each other.

There are ones that have millions of views. It's a whole sub-genre that's been created by users for users, a niche that would never be made accessible without something like YouTube. And of course, it's an interesting kind of derivative work, since it builds on copyrighted characters. So there's a lot of complexity to be studied.

But what's really interesting, when I dug into YouTube, is that it turns out that the monetary economy there is about to explode… (with) major pop star who actually makes more money on YouTube than on iTunes, and more of the money comes from ads run against videos that are uploaded by users than from the ones that are put up there by the music companies themselves.

The trick is that YouTube auto-detects the musical signature of a song, and so when a user, for example, puts up their wedding video and it has a pop song as the soundtrack, the music company gets paid, not the person who uploaded the video. There is an emerging set of business models by which a peer economy, a sharing economy, actually gets monetized. Often the value creation is only partly perceived by the people who created the content, and sometimes it's received by other people downstream. If value creation and value capture are not the same thing, how would we start to model those systems? How do we do the basic research that lets us understand how «free» is being monetized?

What appears to be uneconomic and free actually is the foundation for the next generation of businesses. There's something that Clayton Christenson once called «The

Law of Conservation of Attractive Profits.» When something that used to be valuable becomes commoditized, something that's adjacent suddenly becomes valuable.

This is the thread that ties together my thinking about open source software and what I called «Web 2.0.» I was fascinated with the parallels between commodity PC hardware and open source software. When IBM made PC hardware a commodity, Microsoft figured out how to make PC software proprietary and valuable. As the Internet and open-source software made software more of a commodity, companies like Google figured out how to make data and algorithms into something that was proprietary and very valuable. I think we're going to see the same thing in the world of open access."
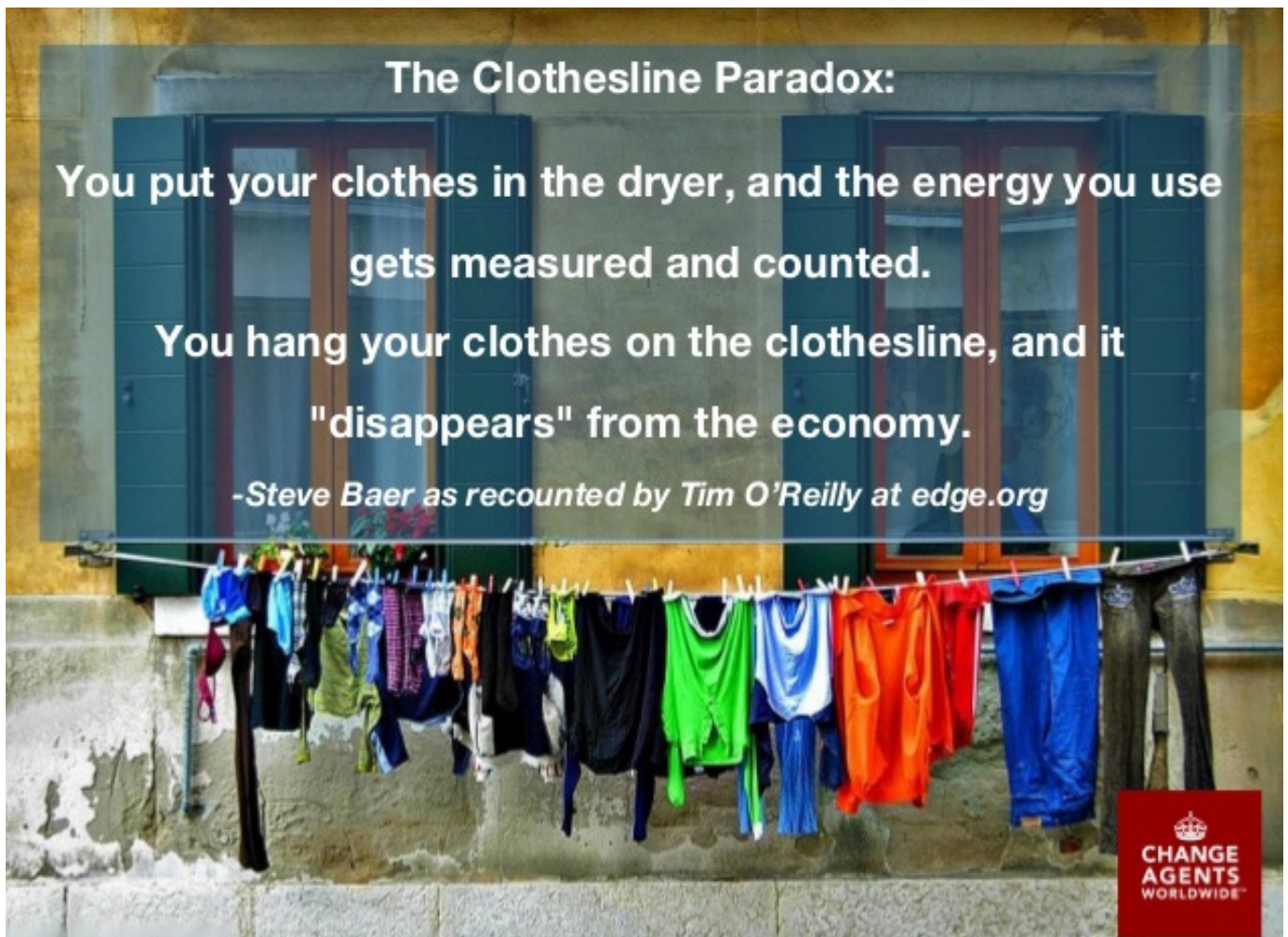
Exponential Technology and Organizations

Maybe the most important metric of the computer industry, and some argue of the whole history of technology, is Moore's law, the observation that, over the history of computing hardware, the number of transistors in a dense integrated circuit has doubled approximately every two years. This has been behind most of the astonishing and recent discoveries, innovations in the modern age from genetics to robotics, artificial intelligence, to energy efficiency, medical progress or space exploration among others.

The ever increasing and accelerating loop of technological progress is here to stay. An important aspect to mention is the level of disruption some of these technologies are bringing. These new technologies are not

just providing new business opportunities. They transform our society by creating new ways of thinking, acting and interacting with each other. They redefine and empower the life of many eople from all over the world and all socio-economic backgrounds.. These technologies are transforming the speed and depth of our civilization. In doing so, they are reshaping our structural organizations. Combined together, they attack the core nature of civilization itself.

As Peter Diamandis, chairman of the X Prize Foundation and co-founder of SU, summarized :

> *«A thousand years ago the only people who could impact a nation or region were the kings and the queens. ... A hundred years ago, it was the industrialists, the robber barons who could build the railroads, the steel mills and affect the economy of a region or solve problems. Today it's all of us.»*
> *We are living in a very different day and age, when we can stop complaining about problems and start solving them. Anyone driven by a dream to solve a major problem could potentially do enough to impact a billion people.*
> *All it takes is the right amount of knowledge and the right amount of tools. Today we are lucky to have access to extraordinary exponential technologies that only governments and corporations had 20 years ago: artificial intelligence, virtual reality, 3D printing, cryptocurrencies, crowdsource platforms, peer-to-peer systems, etc. The marketplace is being flooded with technologies that present innovative solutions to age-old problems. The persons who effectively take advantage of these new technologies will hold the keys to launching bold, hugely profitable projects that will define and create the future of business.» «If you want to become a billionaire, impact a billion people».*

The evolution of exponential technologies and organizations will keep moving and disrupt faster. Forecasting their impact will be even more difficult than today, making it hard for regular individuals, organizations and companies to be successful when basing their decisions on today's experience and methodologies. The impact on social and economics will be larger and faster too, creating disruption, restructuring, and destruction at a higher scale. Because of these, we believe that the complementary of transparency and accountability technologies like the Blockchain and its children, will play a key role in these next waves of instabilities and opportunities.

Beyond Blockchain

Today the chain keeps adding blocks... over the last few days, Ethereum released Frontier. Augur prediction market has already passed $1.3 million USD in Crowdsale launch. Eris Industries published its platform version 0.10 in beta. The European Banking Federation recommended the regulation of Bitcoin. IBM announced to be developing a new Blockchain smart contract system. Coinalytics rose $1.1 Million for a Blockchain Data Platform. Nine of the world's largest banks formed a Blockchain partnership. Bitcoin-to-Cash App Abra rose $12 Million. And the list keeps going, on a daily basis, as we track and integrate it, in our analysis.

The ecosystem as we saw, is growing with a large number of new projects. Even so, many of them are still in the financial and legal sector. Things are starting to shift slowly into new verticals, with some amazing people, teams, ideas and work, being done all over the world.

We also get more and more feedback on the ground that the Blockchain could find some useful and rapid application to the problems faced by emerging countries and their populations rising to the billions. One of the reason being the flexibility and often lack of previous infrastructure, helping technological jumps, by allowing people to adapts more suitable and needed solutions to their daily life and problems.

The level of maturity in the earlier projects and teams evolved too. Part of it being brought back to reality, after running out of cash. The community and open source angle, is also shifting from what we can see, moving for many of them into start-ups and incubator models. One speculation is, from moving of open to close, one of the main problem the ecosystem and actors had to deal with; being in silo, with no or little collaboration in the processes and protocols; will keep increasing and adding more distance. Something to consider with attention, when the technology itself is aiming at solving such problems. The next steps will be probably a combination of both directions, reconnecting further down the road, as new theories, trials and errors are tested.

Another challenge at the moment is the early stage of the Blockchain technology itself. Many questions are still unanswered like scalability, private and public chain compatibility etc. Many groups and people are working on that part, and it will be interesting to see what comes out of it, and with what degree of collaboration.

A lot of projects started with an ideology and good intention. But the technological gap came back quickly. Putting aside the communication abuses for personal and financial gain sometime, we see more and more groups adopting better strategy. Some in the financial sector and others for example, are starting to welcome highly experienced professionals in their boards, from the industries they were trying to engage. Before that, the attitude often consisted in trying to find theoretical and potential applications of the technology without clear needs, instead of using and improving technologies to solve existing problems. Many of them had never worked or at least had first hand experience, on what were the real problems or practical optimization and solutions to be looking for.

An important point, being recurrent in all technological specialty, is the small number of people and level

of diversity in those communities. Stephan Tual, Coo of Ethereum, estimates the number of people working on Blockchain in the world to be no more than a few hundreds. Combined with the level of specialty needed to start with this emerging technology, and it is normal to have a closed environment, where cross pollination of ideas and experiment is harder than necessary.

After witnessing many of those points, we started motivating labs in universities, startups, companies and communities we work with or are visiting, to learn and experiment with this new technology, to develop original and unexpected applications. Over the last few months, our visits and work with groups from Stanford Universities, to MIT Media Lab, EPFL Lausanne, UPMC Paris and other groups, reminded us that with many other fields and industries, innovation today, is less about entirely novel breakthroughs, but more about the clever combination and extension of existing ideas.

The next generation of Blockchain applications will emerge from the combination of unconnected ideas, people, talents, disciplines and mindsets. From drone telecommunication, to satellite imagery, autonomous cars, IoT distributed-networks, political empowerment, citizen science monitoring, energy smart grid or ecological genetic mapping and pharmaceutical research. These are some of the interesting field to be looking for.

As always, and often forgotten by young generations of entrepreneurs aiming for rapid crowdfunding campaigns, hackathon pizza mania and incubators bubbles, innovation takes time, a lot of time. Hypes, interest, investments will fall down, and rise back, bringing new people, ideas and projects into the cycle. The first will open the road, for others to follow and improve. But what is interesting today, when witnessing the up and down in the Blockchain community, is that they share the same problems as with any other fields.

Today innovation, even if bringing some amazing discoveries and practical applications and products for the improvement of society, health, energy, food, security etc, is also often slow and inefficient. Some of the reasons being its closed nature, centralized architecture, lack of multidisciplinary approach and the limitations of current organizational structures». People, time, money and resources, are often being wasted in large repetitions of already existing or failed, ideas, projects and products. Among them: the lack of visibility, knowledge and easier collaborative mechanisms, between different parties.

What's also missing is the absence of simple trusting and legal mechanisms to keep track of individual contributions to the development of ideas and projects. Patent and copyright protocols changed from opening up innovation, the spread of ideas and global commerce from early on in history, to segregating, limiting and closing it, more and more today.

In that regard, we believe that the Blockchain technology has the potential to provide new solutions in combination with elements such as smart contracts, artificial intelligence, machine learning, semantic and metadata, hardware integration, sensor networks and new business models. As exponential technologies and re-organizations keep growing, it will be fascinating to help and work with more people, to explore how to open up new directions to address some of these problems and, in doing so, possibly work towards an entire new model for innovation.

We envision a system in which ideas can connect to each other by themselves, helping humans and machines to seed their ideas into projects and to connect them to existing ones, exploring non-disciplinary approaches to link unconnected people, organisations, expertises, technologies, sciences and projects. The signs are that innovation today is less about entirely novel breakthroughs, and more about the clever

combination and extension of existing ideas.

At a larger scale, transparent, trusted, autonomous and distributed organisations could constitute the next upgrade of our Civilization Operating System. Since lacking can often be connected to systemic failures in current social organizations and mechanisms, from finance to violence, poverty and inequality, pandemics to corruption, it will be worth following closely, what people will be building, with those new information tools. And as humankind is attacking the nature of Information itself, by making it digital, synthetic, autonomous and cellular, it could grow one day, over time, to replicate, mutate, combine and bring a life of its own. We would be looking through the edges of the autonomous information age...

«We are at the very beginning of time for the human race. It is not unreasonable that we grapple with problems. But there are tens of thousands of years in the future. Our responsibility is to do what we can, learn what we can, improve the solutions, and pass them on.»

--- Richard P. Feynman

Cellabz

CELLABZ provides intensive training courses and workshops around emerging technologies with a multidisciplinary approach. We help small teams to design, prototype, document and deploy, in a short time, technological projects at high impact potential.

Constantly working on the ground with a large spectrum of labs, we produce real and useful innovations, respecting and valorizing individual contributions, through transparency and mutual evolution, avoiding the communication innovation bullshit bubble.

Founders

Nicolas Loubet (nicolas@cellabz.com) - Co-Founder CELLABZ, Bluenod, Knowtex, Umaps. +5 years expertise in project, community bootstraping & management. Helping teams to deploy learn and prototype formats around Documentation, Hyper-networking and implementation, across multiple industries.

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Resources

General Introduction

History of Bitcoin
Bitcoin Registery
The General Theory of Decentralized Applications, Dapps
Blockchain, Blueprint for a New Economy
A Complete Beginners Guide to Blockchain Technology
Why Bitcoin Could Be Much More Than a Currency

Ethereum Papers

White Paper by Vitalik Buterin : Smart Contract and Decentralized Application Platform
Yellow Paper by Gavin Wood Ethereum: A secure decentralised generalised transation ledge

Network Society

Network Society Manifesto

Social / Moral issues

The coming digital anarchy
The Decentral Authority
The emergence of dynamic ownership
A new operating model for government

Business / Tech Issues

Demain les entreprises autonomes (1/2) : au coeur de Bitcoin
Demain les entreprises autonomes (2/2) : vers des transactions intègres ?
Where is Bitcoin 2.0 Heading?
How Blockchain Technology Could Revolutionize the $1.1 Trillion Insurance Industry
The Internet Of Someone Else's Things
Blockchains and the Internet of Things: The future of Cryptocurrency

Education Resources

Khanacademy
Blockchain University
Hackcoin

Blockchain
& Beyond

Version 1.0
November 2015

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