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Platform ecosystems and blockchain technologies - Can they stimulate growth in developing countries?

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by
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Affidavit

I, **OSKAR MAXIMILIAN HUSCHKE VON HANSTEIN**, hereby declare

1. that I am the sole author of the present Master's Thesis, "Platform ecosystems and blockchain technologies - Can they stimulate growth in developing countries?", 108 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

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Abstract

The thesis is aimed to highlight the opportunity of how platform economies and blockchain technologies can positively stimulate growth in developing countries. This chapter collects the key findings and argues why the thesis becomes a relevant contribution to the field.

The first part presents an overview of general challenges developing countries facing and looks behind underlying patterns, what hinders growth and development.

Often, citizens have to live with underfinanced and corrupt governmental systems, what are pushing them to start creating their own, so called informal sub-systems, where they work, paying rents and taxes. There, however, they are often exposed to the arbitrariness of the ruling local elites.

A corrupt land titling system prevent citizens from owning and trading land and use it for getting a loan. This is one the reasons why people often don't get access to a bank account and are being unbanked because of the missing legal status and high costs.

The challenges are often grounded missing standards and corrupt and weak institutions. Private companies, NGOs and aid organisations are filling these gaps and needs with their own approach, what is often criticized.

On the other site, the access to internet and communication services is often easier available than the access to clean water. More and more services moved over to the telecommunication services and internet, what leapfrogged many existing institutions.

The second part focuses on platform ecosystems and blockchain technologies. Here, the reader can have an overview of the technology, its services and its underlying functionality and potential. The advantages of platform economies and also its disadvantages will be analyzed. Centrality and their business models based on selling private data and user behavior insights often attracted criticism what leads to blockchain technologies. They can provide a direct answer to the challenges of platforms. Through its analysis of the technical features the reader will see that, for instance, smart contracts can replace many third-party intermediaries like notary services. Blockchain's inherent design of cryptography and its decentralization and its scalability can enrich or even replace many of the public sector services.

The third part will show on best-practise examples and cases, how private companies, startups and aid organisations using these technologies for triggering growth in different forms of capital

beyond financial capital. The cases are categorized in four sectors, who are: Public sector, Financial sector, business sector and the Sustainability / Charity / Aid Sector.

The technology's inclusiveness is able stimulating peace processes and breaking down prejudices between hostile groups. It can address the needs of people, parties, and businesses down to micro-granular levels, that they will be able to help themselves. This will result in a robust society with increased levels of trust, where innovation and competitiveness can act freely.

Several use cases showed evidence and the potential for society. Its inherent logic and features will move them towards more responsibility. Digital tools, who are broadly available can be used by all stakeholders for creating value. Everybody can participate in strengthening society and being a part of self-aid systems and self-made growth, paving the way towards growth and new markets.

Technology can provide a meaningful contribution for growth and leading to more sustainable systems.

There, we were able to see how blockchain and platform economies can capture value and also provide the basis for completely new value creation models.

Table of contents

Abbreviations

A.I.	Artifical Intelligence
B2B	Business to Business
DAO	Decentralised autonomous organisation
DApp	Decentralised Application
DLT	Distributed Ledger Technology
FUD	Fear, Uncertainty, Doubt
GST	Goods and services tax
ICT	Internet and Communication Technologies
ICT4D	Internet and Communication Technologies for Development
ICT4OC	ICT For Open Contracting
IoT	Internet of Things
KYC	Know your customer
OECD	Organisation for Economic Co-operation and Development
P2P	Peer-to-Peer
POS	Point of sale
POS	Proof of Stake
POW	Proof of Work
RFID	Radio-frequency identification
SME	Small Medium Enterprises
SMS	Short Message Service
SRM	Sales Recording Module
SWIFT	Society for Worldwide Interbank Financial Telecommunication
UN	United Nations
VAT	Value added Taxes

1. Introduction

1.1 Problem formulation

Many stakeholders in developing countries are presented with the challenge of their actions not being protected enough by existing standards and executive powers. Additionally, they do not have access to valuable market information for building successful businesses.

Institutional standards and their supervision would increase overall business activities and trigger additional investments. Accessible information about local markets and their needs would scale up sustainable development and boost value creation.

Related to this, the opportunities of establishing solutions for these two problems have drastically changed in recent years. Digitization of human interactions and business development create new opportunities for replacing solution frameworks, which are built on old analogue models. The opportunity for new mental models, especially in regions characterized by great scarcity in many dimensions, can be found in digital success models and its technologies.

Business standards and strict governmental executive powers are the basis for high levels of trust, which are necessary for transnational business action. Under these circumstances, stakeholders are more open to riskier business actions, which in turn pave the way for experiments and innovation. The executive powers in developing countries are often supervised by local structures, which tend to favor local elites. As a result, corruption and mistrust impact investments and entrepreneurial activities negatively.

Successful sustainable development requires standardized market conditions. Governments, aid organizations, and entrepreneurs are dependent on objective market data for substantiating the right decisions.

The challenge investigated in this paper is how governments, aid programs, entrepreneurs, and investors, can have access to more standardized and supervised business practices. Those will increase levels of trust, a necessary basis for business practices.

Success models of platform economies and blockchain technologies will be analyzed to find alternative ways to positively stimulate growth in many forms of capital and enable more trustworthy business environments.

1.2 Objective of the master thesis

The objective if this thesis paper is to identify the relevant advantages of the technologies and their market proven business models for providing an alternative opportunity for development.

I will look into the underlying reasons of scarcity and why countries can't evolve, even with external support.

Digital platform ecosystems and blockchain technology have shown already how impactful they can be in many market areas. Both topics can be used to fulfill the needs of the developing countries. The objective of this paper is to show how digital technologies and their business models can address stakeholders' needs and provide a habitat where sustainable growth can happen in many capital dimensions.

It is the aim of the paper to explore digital technologies with the focus on blockchain and the digital platform ecosystems, highlighting their great potential. Especially in an environment of scarcity and low trust levels between people, these technologies can create a positive impact for development.

1.3 Course investigation

The research used within this paper is based on literature review.

Several theoretical and practical inputs to the topic will be observed, analyzed, and interpreted. Mainly secondary and tertiary sources are used. Furthermore, different perspectives and practical inputs to the topic will be referenced, in order to support the arguments of this paper and answer the research questions.

The main research question to be investigated is the inquiry of how scarcity and the problems' stakeholder in developing countries facing, can be addressed with the mentioned technologies and its services. The challenges will be analyzed and matched with the advantages of provided technologies. The literature analysis is structured as a combination of three areas. First, the main challenges of developing countries will be researched. The following chapter will be focused on the different technologies and their business models and highlight the advantages and features of them. Furthermore, some model cases, implemented in praxis with regards to real life challenges, which are listed in the following chapter, will be discussed.

2. Developing Countries and their challenges

This chapter will introduce relevant factors of what hinders development in developing countries. The content of the two books of the economists Hernando de Soto and Dambisa Moyo will show the most relevant obstacles of growth. The selected challenges represent patterns which are emerging in many countries and will later be analysed with regards to the opportunities of blockchain and platform economies.

2.1 Internal Factors

2.1.1 They can't unlock their assets

People in developing countries have assets - but they can not unlock them, for instance, for a loan or renting and selling (de Soto, 2001, p.6).

De Soto shows based on real-life examples and facts that many poor people are already in charge of assets that would enable them to participate in capitalism. Altogether, the savings of the poor are immense. An estimate puts them at 40 times the total sum of all international aid distributed all over the globe since 1945. De Soto points out that, "in Haiti, the poorest nation in Latin America, the total assets of the poor are more than 150 times greater than all the foreign investment received since Haiti's independence from France in 1804. If the United States were to hike its foreign aid budget to the level recommended by the United Nations – 0.7% of national income – it would take the richest country on Earth more than 150 years to transfer to the world's poor resources equal to those they already possess." (de Soto, 2001, p.6).

The challenge here is that these resources are locked. Real estate and land property in developing countries is quite often not registered and not listed in land registers. Businesses are not officially reported, or their debts are not visible or directly connected to a person in charge. This causes potential investors to back away from investment opportunities, and, for example, bar owners from converting their assets into capital. Trading these assets outside its local trusted context for instance, for a loan, is not possible because of missing standards and a proper ownership tracking system.

In comparison, western countries are tracking every kind of asset, building or machinery and its ownership. All these resources are connected through documentation connected to the remaining economy. This documenting process along the analogue world creates a visual representation that has several advantages. Standardized representation of material presence creates a landscape of capital and its connections. This is very useful for crediting an asset. Credit history can be linked to individuals or companies.

“These assets can also provide a link to the owner's credit history, an accountable address for the collection of debts and taxes, the basis for the creation of reliable and universal public utilities, and a foundation for the creation of securities (like mortgage-backed bonds) that can then be rediscounted and sold in secondary markets. By this process the West injects life into assets and make them generate capital.” (de Soto, 2001, p.6).

De Soto characterizes the unlocked assets of the poor as “dead capital”, because they can’t be mobilized as an asset for mortgage, nor can they be exchanged on the open market. According to De Soto, “[the poor] lack the process to represent their property and create capital. They have houses but not titles; crops but not deeds; businesses but not statutes of incorporation. It is the unavailability of these essential representations that explains why people who have adapted every other Western invention, from the paperclip to the nuclear reactor, have not been able to produce sufficient capital to make their domestic capitalism work." (de Soto, 2001, p.7).

De Soto describes the typical situation people are facing.

If identification of ownership and its correct localization is missing or hard to track, people are not able to ask for a loan, or vice versa can’t be held accountable to pay debts. Missing standards in collection and description of information about assets and property make it challenging to create a fair and objective process. Transferring these goods and land into money or creating shares out of it is different from the local context and is dependent on the social network (de Soto, 2001, p.14).

De Soto makes a point that 80% of the people are not poor per se (de Soto, 2001, p.14). Even if they live under poor conditions, often they own small parts of land, but they are not able to

make it economically useful and add value. Because of the missing legal framework of property rights, which would make mortgages and accountability possible, additional business opportunities are scarce. Institutions are not present to supervise everybody's assets and third-party interests.

2.1.2 Weak or no formal system, High bureaucracy, exclusion from services

Some real-life experiments in Lima, Peru illustrate these obstacles of legality and difficulties in more detail. The research team wanted to start a legal business and went to official institutions registering the business. After 289 days, the small garment workshop with only one worker operating it, was finally officially registered at a cost of $1.231. This amount of money is 31 times the minimum wage per month. In order to get a construction permit to build a building, nearly seven years and 207 administrative steps in over 50 public agencies were necessary. In other countries like Egypt and Haiti, the same process also took years. Where formal institutions are weak or inefficient, they will be replaced by informal ones (de Soto, 2001, p.18).

The mystery of legal failure

DeSoto's research results show that many of the investigated countries have a legal land registration system. Even when some kind of legal system exists, many people, especially the poor, don't have access it or can't use it properly (de Soto, 2001, p.160). Thus, for the majority of people, the only way to participate in the economy is to move business activities to the extralegal sector - where they can act, but never can come back again, barring them from converting their assets into capital.

Why are governments still failing to enable poor people to access legal systems?

They are acting under five misconceptions, according to De Soto, which deny participation to the poor. "All people who take cover in the extralegal or underground sectors do so to avoid paying taxes; real estate assets are not held legally because they have not been properly surveyed, mapped and recorded; enacting mandatory law on property is sufficient, and governments can ignore the costs of compliance with the law; existing extralegal arrangements

or 'social contracts' can be ignored; you can change something as fundamental as people's conventions on how they can hold their assets, both legal and extralegal, without high-level political leadership." (de Soto, 2001, p.161).

De Soto's research mentions that 50 to 80 percent of people in the researched countries are operating mainly in the so called “underground economies” (de Soto, 2001, p.161). It is a misconception that these business owners are only doing this for avoiding taxes. The author and his team found out that the existing law and its procedures do not fit the entrepreneurial activities (de Soto, 2001, p.161). For instance, based on research in Peru, his team addressed these needs through a re-design of the property law and the reduction of the costs of red-tape to register and enroll a business (de Soto, 2001, p.162). The margins of many of these small businesses are often very low, and they can’t finance the legalization of a business. After the team and local government adapted of the costs for acting legally to acceptable levels, hundreds of thousands of small business owners registered their businesses and went legal (de Soto, 2001, p.162).

Often local business owners underestimate the costs paying for securities and services covered by local authorities like the mafia, which is not comparable to official property laws. The extralegal sector is a big disadvantage for all stakeholders and creates much more costs than lack of taxes (de Soto, 2001, p.162).

For instance, people in the economic underground face the following challenges:

Without having a legal address, they don’t have access to low interest formal credits. They can’t ask for insurance or a limited liability company status. Only neighbors and local informal authorities can cover the business, but under insecure conditions and at a high cost (de Soto, 2001, p.162).

The illegal status of these businesses forces the owners to hide from governmental institutions. These businesses can’t scale properly and are fragmented into smaller units in order to lower the risk of getting caught, at the expense of the economy of scale. Furthermore, traditional marketing under these conditions is very challenging and it prevents businesses from gaining new customers (de Soto, 2001, p.162).

Another important factor is the missing legal administrative system, which works absolutely objective. So called local social contracts are replacing legal law and represent a shared

understanding of justice. Illegal property is protected by informal law structures (de Soto, 2001, p.164).

2.1.3 Centralised power structures – not aware of the challenges

Governments are often fully aware of the missing documentation of land titles, black-market business activities and other kinds of informal ownership. But they are not providing any solutions or are not able to create systems that are able to scale and adopt (de Soto, 2001, p.71).

Within the rapid urbanization of mega-cities like Sao Paolo, Nairobi, or Bombay, local citizens have created their own extralegal procedures where formal institutions are weak or corrupt. Citizens take over the administration of the self-occupied real estate and the local economies. Corruption, poverty and violence is the result if governmental law is in conflict with extralegal systems (de Soto, 2001, p.71).

De Soto mentions two so-called blind spots. The first is the growing number of entrepreneurs and citizens under informal and extralegal conditions of self-made legal frameworks. Local governments are not able to see behind the problems, because they analyse the problem from single perspectives, and can't see the impact of it. The source of all the problems is not connected to the "outmoded system of legal property" (de Soto, 2001, p.75).

The second blind spot is that governments are addressing problems one by one rather than seeing the big picture and the potential of cross-pollinating concepts which are strengthening the whole system. By increasing the productivity of the law and property system, the general productivity will also benefit (de Soto, 2001, p.76).

2.1.4 Legal Failure - Failed property law and system, Corruption

De Soto mentions that every country has a kind of legal property land system, but in most cases, not all citizens have access to it (de Soto, 2001, p.160).

The reasons for this phenomenon are diverse. There is not necessarily a deliberate governmental act of shutting out poor people from the system or obscuring it from them. De Soto describes five reasons for the lack of accessibility of those systems:

1. All people who are working in informal areas and maintain extralegal activities or unregistered companies are trying to avoid paying taxes
2. Not officially mapped and recorded real estate assets are not legally owned - not to mention that these tracking activities are mostly impossible to finance by the governments.
3. Existing property laws seem satisfying and sufficient to them, and often they "ignore the costs of compliance with that law" (de Soto, 2001, p.161).
4. Informal social laws and their contracts, grown over the years in the local context, are ignored.
5. Commonly accepted conventions about land ownership from the formal and informal context can not be changed without intense discussions within society and top-ranking political leadership.

(de Soto, 2001, p.161).

De Soto explains the reasons for the citizens' behaviors as follows:

1. 50 to 80 percent of the people are working in the shadow economies because the established laws are not matching their needs. High bureaucracy and long and expensive red tape to register a business made it really hard for entrepreneurs to act legally. Costs of acting in the extralegal area are quite expensive and can become life threating. Taxes and protection money have to be paid to local bosses and mafia like structures. Businesses can't be officially marketed out of fear of getting caught by formal executives. Because of their lack of legal status, companies can't be credited with a loan and shares can't be sold to others. (de Soto, 2001, p.161).
2. A bad legal and administrative bureaucratic system in these countries which favors the elites who are familiar with the complex and expensive-to-use system. All the rest of the people, who are living outside the bell jar, have own extralegal system, which regulates everyday life and security for them. "These local social contracts represent collective

understandings of how things are owned and how owners relate to each other." (de Soto, 2001, p.164).

In many cases, poor people don't have access to a property system because it is organized and designed in a way that bars them from participating. Fernande Braudel described a phenomenon which became famous as Braudel's Bell jar. He analyzed the reasons for capitalism serving only an established elite. De Soto states that the formal system is build with high borders around it, only the well connected and wealthy or market insiders have access to it. For instance, expert lawyers or insider information is reserved for local elites. It locks out others from the formal system (de Soto, 2001, p.67).

The poor who are doing business within the legal system have to deal with a lot of potential risks. The chances of businesses being shut down by governmental institutions or getting caught by police are relatively high. Illegal business owners have to bribe often corrupt and also underpaid police to look the other way on their business (de Soto, 2001, p.162).

2.1.5 Missing identification of people – addressability as critical factor

Official addresses of people are often unavailable, resulting in people being unable to get a mortgage or even to be accountable for any kind of legal action (de Soto, 2001, p.15). Addressability of people is a missing link in unlocking potential growth. Without a fixed address people don't have access to a bank account or to public utility services like access to water, gas, or electricity. Moreover, governments aren't able to collect taxes, debts, or rates. (de Soto, 2001, p.49).

Shared legal property systems within a legal system create a shift from an informal local context to an impersonal one that is available and sharable across whole countries. It releases them from dependencies of the local social systems and their cultural laws, whose downsides are limited economic action and fixed localization (de Soto, 2001, p.53). Formal registration of addresses creates accountability on both sites. Citizens becoming more aware of their actions

and getting access to a legal system and additional services. These parallel representations are increasingly relevant and create additional value to assets and economy and society in Western countries in general. Formal property representations allow to show new qualities of an object and transfer it into a value system. With these new forms of representation, an object can be described in all its qualities, allowing comparisons within the same category (de Soto, 2001, p.49).

2.2 External Factors

2.2.1 Different dimensions of aid challenges

As Nial Forgeson mentioned in the introduction of the book "Dead Aid", by Moyo: “Aid has been, and continues to be, an unmitigated political, economic, and humanitarian disaster for most parts of the developing world. (...) In the past 50 years, over US$1 trillion in development related aid has been transferred from richest countries to Africa.” (Moyo, 2009, p.01). To understand why aid is not working, we start with the definition and classification of the term aid and how it is classified.

Humanitarian aid or emergency aid, which comes into play after natural disasters, like a hurricane or tsunami, hitting a country.

Charity based aid, where money is collected by private organisations, which in turn independently distribute this money.

Systematic aid, where financial aid is directly transferred from one government to another (bilateral aid) or institutions like the world bank, transfer money to the receiving countries (multilateral aid).

Charity-based aid is often criticized for its high administrative costs, or poor implementation. Missing understanding of local context makes this kind of aid often inefficient. For example, the charity World Vision, which raised US$100 Million after the 2004 Tsunami, spent only less than a quarter of the money on actual aid, for no apparent reason. In addition to the fact that many of the charity-aid initiatives are not professionally managed and their efficiency lacks performance, the amount of money and its impact is neglectable when compared to bi- and multilateral aid directly send to governments, which is in the billions.

Systemic aid is creating more challenges

There are mostly two types of money transfers to African countries:

A concessional loan, is lent money under below average market conditions and longer lending periods. **Grants,** are money given with no strings attached, not bound to any restrictions or burden. Concessional loans will be spent more responsibly and let countries act more sustainably. They are developing multiple income sources like taxation systems, always in mind that they have to pay their loans back in the near future. Grants create no kind of responsibility and can be considered part of a government's domestic resource.

This fact pushes donors to decide for grants. It is often argued that the impact of investments will on the GDP will only become effective after longer periods of time, and revenues generated in the meantime will be negated by loan payment rates. Some countries are said to be too heavily indebted to pay their loans back. This kind of aid had not been effective in terms of reaching development goals and even pushed them into more dependency. As a solution, these countries were set free from these foreign loans, to become capable of action again. Over time more heavily indebted governments came to see no distinction in-between loans and grants." (Moyo, 2009, p.07-09).

Looking back, Post-war aid can be described in several major steps:

Its birth of Bretton Woods in the 1940s. In order to overcome the great depression in the 1930s and to reorganize and design new international finance and multilateral trading system after World War 2nd, it was decided by the commitee to stabilize Europe socially, politically, and economically through financial aid. Europe's advantage here was they just needed to rebuild their already existing standardized social and legal systems. This laid the foundation for the economic powerhouse that Europe is today. During this conference in 1944 the prerequisites for the World Bank, the IMF, and the World Trade Organization were created." (Moyo, 2009, p.11-12).

The period of the Marshall plan in the 1950s. Europe, reeling from the impact of the 2nd World War, was provided with an economic stimulus package of around US$ 20 Billion (equivalent to more than US$ 100 Billion today). Over a period of five years, the countries benefitting from the Marshall plan had to work out a program for reviving their economy. The Marshall plan was

highly successful in retrospective and brought Europe back to economic progress. The USA was also able to influence policies, establishing their close alliance with Western Europe and laying the foundation for US-led multilateralism. In addition to that, the Marshall plan provided stability for the participating countries and kept the US economy on top. (Moyo, 2009, p.12-13). Through the success of the Marshall plan, many took for granted "that investment capital was critical for economic growth." (Moyo, 2009, p.13). In the lack of any form of capital, and to attract private investment, "foreign aid was seen as the only way to trigger higher investment, which thus lead to higher economic growth." (Moyo, 2009, p.13).

Other reasons triggered initiatives in Africa by the USA, Great Britain and France. Many countries, like Ghana in 1957 and Kenya in 1963, declared independence from their previous colonists and that meant the western countries losing their power to influence.

The cold war triggered wars fought on foreign soil. Capitalism versus communism was also fought with the weapon of choice – aid. In the beginning 1960s aid initiatives were characterized by big industrial projects, like the hydroelectric dam between Zambia and Zimbabwe. The theory behind it was that funding infrastructure had better economic payoffs over time (Moyo, 2009, p.14-15).

The international community turned to foreign aid as an answer to the problem of considerable poverty in the 1970s. These aid programs often failed for various reasons.

Moyo cites another author, Collier, who analyzed Africa's unsuccessful aid programs for the geographical, cultural, institutional or historical reasons of their failure. In his work "Africa: Geography and Growth", he classifies Africa's countries in three main groups: resource-poor, but with coastline, resource-rich countries (with or without coastline) and resource-poor without coastline. All these three types have dramatically different growth patterns. From the economic standpoint, resource-poor countries with coastline performed best against resource-rich countries with or without coastline. The countries which are landlocked and have no resources performed worst (Moyo, 2009, p.28-30) (Collier, 2006).

Other reasons for war and disputes on the African continent are new demarcation lines, as laid out at the Berlin conference by European colonialists in 1885. They continue to be an obstacle for many small countries to survive economically, politically and culturally until today. (Bayeh, 2015).

The high number of different tribes and ethnolinguistic varieties are often cited as an argument for Africa's economic failure. There are around 1.000 existing tribes across the sub-saharan African continent. Many of them have their own culture and language, for instance, Nigeria has over 400 tribes among its 150 million citizens. Countries with a high number of tribes and its minorities are facing ethnic rivalry and it can be difficult to enforce reforms within such a high diversity of opinions. "Ethnically diverse societies are likely to be characterized by distrust between different groups, making collective action for public service provision difficult." (Moyo, 2009, p.32). As Paul Collier states, especially under the impact of stressful environments, weak and post-war environments, this diversity can produce ethnic rivalries and even genocide, like in Biafra (1967-1970) or genocide in Rwanda in 1990. The more culturally divided a country is, the higher is the risk for civil war. This is one of the reasons why Africa had more civil wars then in South Asia in the last thirty years (Moyo, 2009, p.32).

Another crucial point to mention is that political change or new reforms are harder to establish in these environments. Collier argues that many countries in Africa are still working under poor policies. Low levels of trust between different ethnoreligious groups are hindering shared decisions for democratic actions, for instance, new public services across all groups. The 2008 elections in Kenya showed the tensions between different tribes and ended in a compromise and a coalition of two group representatives M. Kibaki (a Kikuyu) and R.Odinga (a Luo) (Moyo, 2009, p.32-33).

Another problem which hinders economic growth in Africa is the absence of strong institutions. Moyo mentions the missing formal institutions, which would have to be stong, transparent, and credible in order to make a change, is hindering development. Several authors, like D. Landes in his book "The Wealth and Poverty of Nations" argue that such political institutions are a necessity for ideal growth and development models. "Secure personal liberty, private property and contractual rights, enforced rule of law, an ombudsman-type of government, … are mandatory." (Moyo, 2009, p.33-34) (Landes, 1999).

N. Ferguson argues a similar point in his book "How Britain made the modern world", that the country's underlying legal and political systems are what triggers private investment and innovation (Moyo, 2009, p.34) (Ferguson, 2004).

D. Rodrik presents the same case, stating „that institutions that provide dependable property rights, manage conflict, maintain la wand order, and align economic incentives with social costs and benefits are the foundation for long-term growth" (Moyo, 2009, p.34).

He shows examples in his book of “In search for prosperity”, arguing that China’s, Mauritius’ and Botswana’s success is based on the foundation of institutions, who placed market-oriented incentives in the economic context and secured property rights of investors (Rodrik, 2003).

Moyo brings forth a couple of arguments, why aid failed its goals and interrupts economic growth. She describes it as the vicious cycle of aid, where corrupt regimes were supported by foreign aid money, which in turn would be used inappropriately against any rule of law. The result is that foreign and domestic investment becomes more and more unattractive and will be shut down, leading to dwindling economic growth and rising poverty. Foreign donors would react to the new highs in poverty with more aid support, which can be described as the vicious cycle of aid. It creates a culture of dependency to aid and nurtures a culture of corruption (Moyo, 2009, p.49).

Corruption and growth

Corruption is able to cripple economic growth and destroy the basis within society in many ways. Under these circumstances, entrepreneurs and investors won’t risk resources, when government officials or private forces with the support of the executive can push them out of property or business. Investments and business activities decline. Corruption lowers the quality of public infrastructure projects. When it influences public contracting, not the company which provides the best work under given conditions, but whoever gains the most favor with the authorities, will receive the contract. Public projects are chosen under the criterium of getting the highest bribe payment, not the overall quality. To highlight the impact of corruption on the GDP, Moyo shows a correlation of Corruption Perception Index (CPI) from the Transparency International organization and the GDP. A one-point improvement in the CPI results in 4 percent on the GDP (Moyo, 2009, p.50-51).

Aid and corruption

When it comes to aid in combination with corruption, the World Bank estimated that 25% of the money donated (US$130 Billion, 1946-2004) was misused. For example, in Uganda, only 20 cents of every aid Dollar spent on education reached local schools in the 1990s (Moyo, 2009, p.52-53).

Moyo asks, why the World Bank, IMF and other private initiatives should even support corrupt countries? Her argumentation, next to political, economic, and moral reasons are two other obvious reasons: More than 500.000 people working in the business of aid sticking to their business model. Organizational success is measured by the value of the lending portfolio and not by the impact of the donations. “Donors are subject to 'fiscal year' concerns: They feared the consequences within their agencies of not releasing the funds in the fiscal year for which they are slated.” (Kanbur, quot. fr. Moyo, 2009, p.54). “Almost to the absurd point, where the donor has a greater need for giving the aid than the recipient has for taking it.” (Moyo, 2009, p.55). The second point is that donors are often not able analyzing which country is to what degree corrupt or not.

Aid and social society

Countries who are perceiving aid are less motivated of taking care of creating an environment where the middle class can rise, who is the backbone for long-term sustainable economic growth. A middle class is often not “wanted” because it can make the state accountable for its actions. The economist Bauer states, “that aid diverts people’s attention from productive economic activity to political life, fatally weakening the social construction of a country.” (Moyo, 2009, p.57-58).

Aid-dependency

The author states that aid creates a dependency who is weakening the countries in many ways. When countries consider aid as a constant source of income, policy makers have no motivation for change. They are not looking for ways to stabilize the economy, creating economic incentives, and tax revenues for financing public infrastructure or social services. It is still the donors who control policy making and influence the countries' future development. They are hindering the countries themselves finding their own way of economic, social and political life and the freedom of autonomy (Moyo, 2009, p.65-67).

Doubts regarding aid: Easterly, Collier and Bauer

The economist Peter Bauer was one of the first who critics the impact of aid. He criticizes, that "…the money always ended up in the hands of a small chosen few, making aid a form of taxing the poor in the west to enrich the new elites in former colonies"(Moyo, 2009, p.67).

The economist Bill Easterly analyzes the failures of aid policies. His books discuss third world countries and the challenges the people there facing. His works highlight why western countrie's donations are creating more harm, than doing good (Easterly, 2006).

In his book "The Bottom Billion", Paul Collier criticizes the generalized aid concepts approach without analyzing details and needs of the receiving countries. He describes the challenges in the form of different traps, people are suffering, like the "conflict trap", the "natural resource trap" or "bad governance" in a small country. He stands up for a tailored approach of aid, where a set of policy tools enable people help themselves. Aid has to come from within the country, not externally (Collier, 2007).

2.3 De Soto solution framework – how the West can unlock growth by six property effects

2300 years ago, Aristotle said: "what you can do with things increases infinitely when you focus your thinking on their potential." (Aristotle, quot.fr.: de Soto, 2001, p.50).

Aid initiatives were very successful in many developing countries over the past forty years, especially in South America, but as well in Asia, e.g. India, China and others. Their GDP growth rates are often higher than those of Western countries. The author believes that capitalism can be successful if certain conditions are set up and stakeholders can participate in the process. The success of capitalism in western countries is based on strong property rights.

He mentions six points which are relevant for the success and he argues that if governments are tackling the following facts, the success will come:

1. An intense documentation about the living conditions of the poor is an important base for further investigation and planning.
2. All people are capable of saving money and resources, for later events.

3. Poor people are not able to participate in the official formal institutional systems, which means they cannot transform their work and other assets to financial capital.

4. Local authorities, like mafia structures, are ruling many aspects of life.

5. Within this situation, the poor are not the problem, but a vital part of the solution.

It needs a lot of effort for politicians and other stakeholders to discuss the creation of a local property system. Identifying the local social woven networks and contracts needs time for creating a legal system which meets everyone's interests.

the SOLUTION - within the Mystery of capital

DeSoto mentions that western countries are producing six property effects with their formal property systems, that unlock the potential for their citizens to produce capital in various ways (de Soto, 2001, p.47):

"Property effect No. 1 - Fixing the economic potential of assets" (de Soto, 2001, p.47)

With description and documentation of an asset, the focus shifts from the physical representation to the title itself. It shifts to thinking about a house as a social and commercial conception. It transforms the view from “a dead asset - and to see it as live capital.” (de Soto, 2001, p.48).

“Formal representations are a concept of your own personal representation of a concept about the house. It specifically represents the non-visible qualities the have potential for producing value.” The advantage is to secure multiple interests of the involved parties. This provided framework creates responsibility and offers the opportunity to transform an asset into a loan (de Soto, 2001, p.49).

"Property effect No. 2 - Integrating Dispersed Information" (de Soto, 2001, p.50)

As we heard in the previous chapter, the hurdles are very high for most people in developing countries to gain access to legal property systems. The result is that they are holding their assets in an extralegal system (de Soto, 2001, p.50). With the integration of assets in one formal system, which is generally agreed upon and shared, capitalism triumphed in the West. Politicians, legislators and judges worked over several decades in the 19th century to put all the facts, and side information, ownership of all assets in one shared system. Former Soviet

countries didn't go through this painful and difficult process. De Soto found not one shared system, "but dozens or even hundreds, managed by all sorts of organisations, some legal, others extralegal, ranging from small legal, ranging from small entrepreneurial groups to housing organisations." (de Soto, 2001, p.51).

This advantage is that market participants don't have to be physically present anymore. It is traceable which assets are available for the market and everybody can see what kind of economic potential is inherent to it. "An asset's potential has become easier to evaluate and exchange, enhancing the production of capital." (de Soto, 2001, p.53).

"Property effect No. 3 - Making people accountable"(de Soto, 2001, p.53)

One shared a single property system within one jurisdiction will remove social and political attachments and contexts from the property. This de-contextualisation makes trading of property outside the local context much easier, DeSoto mentions that it also increases the amount of liability for all participants. Attaching land owners to their property and a track record has an effect on personal freedom and stability for individuals, because they are becoming independent from the local power structures (de Soto, 2001, p.53).

One shared jurisdiction system has its downsides. Land owning individuals lose their anonymity (de Soto, 2001, p.54). Citizens in western countries are fined if they purchase unidentifiable goods and services. It becomes nearly impossible to purchase anonymous goods and services. Its jurisdiction system supervises contracts and in the case of a fraud it can intervene.

This protection of contracts of ownership is deeply respected because in the case of a violation, the reputation of the individual will be damaged by many surrounding parties which are a part of the system, like banks, insurance companies, credit scores and the rest of the network. (de Soto, 2001, p.54).

Accountability for all participants within the system is a huge positive impact for all, because it sensibilizes the participant for the economic and social upsides and downsides of the asset itself. This potential of losing and winning creates engagement (de Soto, 2001, p.54). The protection of both parties and legal contracts backed by guarantees of property rights creates a sense of security.

"Property effect No. 4 - Making assets fungible" (de Soto, 2001, p.55)

Mobilising assets for trading is much easier when characteristics and economic features are separated from its physical existence (de Soto, 2001, p.55). An additional standardisation process of property characterisation allows for a better market overview. With a better overview of the market, it is possible to cut transaction costs. Dividing a property into virtual shares, who can be possessed by many different shareholders with different user rights, allows investors with small budgets to participate in the market. The virtualization of property enables businesses and entrepreneurs to work on strategies and business models (de Soto, 2001, p.57).

"Property effect No. 5 - Networking People"(de Soto, 2001, p.58)

Another effect of the legal property framework and its liability of the owners is the increase in trust, which created new business models on top of it. For instance, infrastructure providers like gas and electricity producers are motivated to invest in the network because of addressable owners and payers. Localisation and identification of people made a lot of structural models like subscription services and tax paying possible. Another advantage of the knowledge of all assets and businesses is the increased opportunity of managing risk for upcoming business ventures and also for insurances to cover that risk. (de Soto, 2001, p.59). The result opens the door for international trade on a massive scale and makes a wide variety of business models for financial instruments possible.

"Property effect No. 6 - Protecting transactions" (de Soto, 2001, p.60)

“One important reason why western formal property systems are working like a network, is that all the property records (titles, deeds, securities and contracts that describe the economically significant aspects of assets) are continually tracked and protected as they travel through time and space.” (de Soto, 2001, p.60). These networks collect, keep and send all relevant information across the network, to keep every institution updated. Public agencies are responsible for record-keeping and updating standardised forms regularly with information about the property like bankruptcies or mortgages. Next to governmental institutions, private ones are also assisting stakeholders with additional services. Starting from notarial activities and other trust services, or mortgage brokers appraise and many more. These private services are governed by the states and can only work under strict regulations. (de Soto, 2001, p.61).

Governmental and private institutions are mainly responsible for protecting transactions and ownership. “Security is principally focused on producing trust in transaction so that people can more easily make their assets lead a parallel life as capital.” (de Soto, 2001, p.61). The number of asset transfers may be massively increased and can be bundled with a less number of work steps.

2.4 Chapter summary

This chapter has described, from several perspectives, which challenges aid efforts and developing countries are facing.

On the other hand, social contracts and other human-made frameworks are already creating safety-nets for society. As DeSoto mentioned already in his solutions' framework:

“These local social contracts represent collective understandings of how things are owned and how owners relate to each other. Creating one national social contract on property involves understanding the psychological and social processes - beliefs, desires, intentions, customs and rules – that are contained in these local social contracts and then using the tools that professional law provides to weave them into one formal national social contract. This is what Western nations achieved not so long ago.” (de Soto, 2001, p.164).

How can these claims of DeSoto can be fulfilled from today's view?

The current perspective described in the previous chapter shows, that governments and politics are limited in their power, providing proper solutions under these challenging circumstances. We can find enabler in the field of nowaday's technologies who already showed success in many different fields of innovation and are available in mentioned countries. Digital communication, platform services and blockchain technology can leverage their inherent features on already existing networks. They are socially accepted ready for leveraging their exponential potential.

From the different perspectives of innovation, we are looking for technologies who are already established across the mentioned geographic areas and social layers and have most upfront potential. We want to unlock future potential providing political, economic, financial, social inclusion and generating market conditions, who are internationally accredited.

The following chapter introduce into platform economies and blockchain technologies who are providing the wanted potential and the features addressing the needs.

3. Sources of value creation: Platform Economies & Blockchain technologies

The digitization of our world is shaping nearly all parts of our life today. This transition is driven by fundamental forces of the success of digital economies and they are shaping the evolution of entire markets. It can be ascribed to three main factors, which have been shaping technologies, products, services, and markets and their upcoming future for decades (Sundararajan, 2016, p.52) (Dhar & Sundararajan, 2007, p.121-141).

1. The transformation of nearly all information into digital form. Digitized representatives can then be analyzed, manipulated, and reused much easier. Physical objects start as digital represented designs, before they get materialized, allowing much more analysis, simulation up front, and results in better quality and efficiency.
2. Exponential growth in an increase of hardware power in combination with its miniaturization. Exponential increase in digital storage and transaction bandwidth.

During the 1960s, Gordon Moore predicted that the ratio of price and performance of computers would double biannually, for the 21st century, this prediction has come true. Despite the fact that this trend has slowed down over the last couple of years, through software optimization and parallelization, it is to be estimated that the trend of exponential growth is not expiring.

3. Increased simplification and modularity in programmability, which allow more complexity, easier standardization and also speeds up the market saturation. “Machines” in the classical sense having a fixed built-in task routine that can’t be changed without applying physical changes. Nowadays, for instance, mobile phones and robotics can be totally redefined, just by sending new software code. The programmability and modular changeability of hardware of nowadays machines created new businesses and task wise opportunities. This adoptability makes the ongoing factors one and two even stronger.

(Sundararajan, 2016, p.52-54)

Sundararajan outlines four consequences of these three forces, which he claims are responsible for the evolution and a massive rise of crowd-based capitalism:

1. **The consumerization of the digital**

The digitization started in the 1980s to the early 1990s, focusing on the corporate world, where client-server tech, computer workplaces and Ethernet transformed the classical workplace and workflows. Nowadays the focus is more on the private consumer and many technologies are generally democratized. The IT industry's main inventions in the last couple of years are mainly driven by the private consumer needs. Smartphones, tablets, or social media, like Facebook, Youtube or open street maps are mainly developed for private users, and later adopted by the industry and governments. Sundararajan and his colleagues call it the "consumerization" of digital technologies (Sundararajan, 2016, p.55).

2. **The digitization of the physical**

Two major technological inventions are showing another major trend called the digitization of the physical.

The Internet of things (IoT) and 3D printing & Additive Manufacturing are fueling digitization. IoT technology allows it under no costs the connection of objects to the internet and that they can interact with each other in a network. As a result, monitoring and tracking of objects will be easier. Based on this information new business models will appear and "rentability" and usage of objects will increase.

3. **3D printing and Additive Manufacturing**

If you need a replacement part or a new phone case, buying the physical object will be extended, and in many ways replaced by buying a particular design in digital form and let print out at the next nearby 3D print shop. Data in digital form will be exchanged instead of the physical object, which will also reduce the number of retailers and wholesale distributors (Sundararajan, 2016, p.58).

4. **The emergence of decentralized peer-to-peer**

Before the Internet peer-to-peer filesharing network Napster was shut down by the authorities in 2001, at its peak nearly 80 Million users were sharing music on the platform. Napster can be, next to eDonkey, considered the first-generation peer-to-peer sharing network. Their music

index was centralized, and after the shutdown, it made impossible to share music between peers. The successor, Gnutella, succeeded by changing this and creating its true decentralized system architecture, which made it impossible to shut down. In the year 2009 Bitcoin was established, starting a new generation of decentralized peer-to-peer networks. An anonymous decentralized distributed ledger was combined with peer-to-peer file sharing technologies and cryptography and was called the blockchain. An additional economic incentive system and a decentralized system of verifiers to a clear transaction within the network laid the foundation for "trusted peer-to-peer transactions without a third-party intermediary" (Sundararajan, 2016, p.59).

Sundararajan mentions that "…the blockchain promises to take the role of the crowd from the periphery to the center. The peer becomes the market makers." (Sundararajan, 2016, p.60).

5. The digitization of trust

Digital platforms let us trust each other much easier with their inherent tools and under the impact of widely accepted standardization.

Digital trust infrastructure

Trust is defined from a business perspective within a commercial transaction by the sociologist James Coleman as follows: "Trust is a willingness to commit to a collaborative effort before you know how the other person will behave." (Sundararajan, 2016, p.60; Coleman, 1990).

Creating trust takes normally time and needs multiple dimensions to be established. Within a sharing context of booking a service over digital platform three dimensions becoming important: "That the person is authentic, has good intentions and that the person actually knows, what she is doing." (Sundararajan, 2016, p.61).

Sundararajan thinks of "trust in semi-anonymous Internet-based peer-to-peer settings as stemming from at least five cues:

1. From one's own prior interaction
2. By learning from the experiences of others
3. Through brand certification
4. By relying on digitized social capital

5. Through validation from external institutions or entities, digital and otherwise, government and nongovernment" (Sundararajan, 2016, p.61).

The levels of trust increase over time with every positive experience. "For instance, S.Tadelis, University of Berkeley and C.Nosko from the University of Chicago have quantified these reputation externalities on eBay, externalities that are bound to exist on more recent sharing economy platforms as well." (Nosko & Tadelis, 2015)

Other general advantages

Crowd-based capitalism can limit the environmental impact. Renting instead of owning reduces the usage of resources and products are being more used over their life-time.

Geographic co-location of products within a city, for instance, camping equipment can be shared within a city and safes ways and time for people, who want to rent such equipment (Sundararajan, 2016, p.66) (McLaren & Agyeman, 2015).

Economics

From the economic point of view, we've seen tremendous growth and adoption of digital technologies since its invention. All parts of life and businesses are affected by it and revolutionizing flow and handling of information. Platform businesses, like Amazon, Twitter, Facebook, and many more dominating markets and surpass each other in annual growth. We are already entering the second generation of digital platforms, called the sharing economy, where all kind of assets of customers are mobilized for others via platform businesses (Travlos, 2013).

Social

Democratization of information and easy participation on discussions via social media empowers people much faster than centuries ago. Social media and platform ecosystems in general are enabling new insights, forming social norms and beliefs and also building new business opportunities. It paved the way for more collaboration but also exclusion and division.

All these new services and economies have recently come under massive criticism.

The natural desire for social interaction and discussion were abused by companies and institutions to influence elections or public opinions. It is widely assumed that the opinion of

voters during US elections and the voting about the United Kingdom leaving the EU, both in the year 2016, were heavily influenced by massive misinformation and fake news through several social media channels.

The massive appetite for user data became public and questioned the general business models of platforms like Facebook, who were affected by massive data breaches in year 2016. In the recent discussions these data-harvesting business models were collectively named as surveillance capitalism (Zuboff, 2019).

Next to misuse of data, their centralised storage and sloppy protection against hacking produced a honeypot for hackers, which led to massive data leaks. We already reached the point of no return, where public and private users can not live without all the services (Zuboff, 2019). Questions remaining how to handle these problems they are creating?

BLOCKCHAIN TECHNOLOGY

Blockchain technology seems to be a good approach addressing mentioned challenges. Beyond the hype in 2017, where the price of one Bitcoin climbed up to 20.000.- USD, the technology raised popularity, but not only as currency or investment.

The underlying technology is an answer to many challenges. We can cite it as an opportunity for banking the unbanked in developing countries, where account management fees exceeding any budget of people of low-rise income groups. Others looking for alternatives to local currencies because of hyperinflation storing their savings, they are interested in a trustless, secure auto executing contract services, to eliminate middlemen.

Since then, aside speculation, blockchain technology itself created a lot of opportunities, for improving or even replacing many current services and business models.

The following chapters introducing principles of platforms, blockchain technologies and services for getting a better understanding of its use cases. First, however, it shall be illustrated what the advantages of such platforms are. With that in mind, blockchain technologies and companies will be explained, which could be the next logical next step in the evolution of digital business models.

3.1 Platform economies

3.1.1 Fundamentals of platforms

New digital business models arose since the 2000s and very successful companies emerged from them: Uber, Amazon, Airbnb, Facebook and Twitter, and many more, all evolved from small startups to big Fortune 500 companies. All of them followed the same pattern of growth, and they used the same business model (Choudary, 2015, p.22). Opportunities of reaching customers and transporting value emerged in big steps with the internet. New opportunities emerged within the digital space and classical business models shifted to new designs. The author describes this phenomenon as a shift from “pipes to platforms" (Choudary, 2015, p.23).

Companies created value by developing products and services and sell them to customers. Pipes as a business design dominated the classical economic landscape for a long time. Direct flows of value were established.

Today, Facebook, Google, Uber and many more use the platform business model to accelerate growth. It enables end-users and producers to interact and connect with each other through the platform. Platform owners orchestrate users and resources within the network, creating value through their interactions and not via processes that manage resources and labor (Choudary, 2015, p.23).

3.1.2 Core concepts & principles and Value Proposition of platforms

Multi-sided (Tiwana, 2014, p.31ff).

The platforms' key element of success is the opportunity of bringing many different stakeholders to one place and addressing their needs constantly, which keeps them staying on the platform. Mostly, stakeholder having complementary needs, each side looking for the opposite stakeholder. For instance, book authors, sellers, and readers use Amazon to find potential customers or products. The standardisation, sorting, and easy processing systems and recommendation systems for sellers and products are provided by the platform.

All participants are saving acquisition and transaction costs (Tiwana, 2014, p.32).

The status of multi-sidedness can change and evolve over time from an isolated, single-sided one to a multi-sided one with multiple interaction channels. The difference between single-

sided, two-sided and three-sided/multi-sided platforms can be explained by the following examples:

For example, the cloud storage company DropBox can be considered a single sided platform, because it serves cloud storage to end-consumers. Two-sided platforms, like a credit card company, serve two different groups, in this instance the seller and the card holder.

A three-sided platform is for instance, the company Apple, which connects via the AppStore and iOS developers, end-users and advertisers, all participating from a single Point of Sale.

All forms can evolve into multi-sided platforms in the later stage over time if they want to serve more customers.

Network Effects (Tiwana, 2014, p.33)

Every additional user of the network makes the platform more valuable to every existing user. This is also referred to as network externalities and dubbed Metcalf's law by economists. The value of platforms also grows exponentially rather than linearly. Once they reach a critical mass, once they are established, they create high entry barriers against competitors.

Metcalf's law states that:

"The square of the number if users or number of users times their logarithm, depending on which version of Metcalfe's law one considers." (Tiwana, 2014, p.33).

To get a better understanding of it four more definitions need to be remembered:

- Direction and sidedness
- Direction of the network effect can be positive or negative:

Positive. As mentioned before, when every new user has a positive effect and contribution to the network.

Negative. Every new user has a negative influence on the existing network. An example might be the bandwidth problem. Every additional user in the neighbourhood slows the limited bandwidth (Tiwana, 2014, p.34).

- Another difference of sided-ness of a platform, which is divided into same-sided one's and cross-sided ones.

Same-sided network effects

When a new user of one side (end-consumer) changes the value of all participants of the same side of the network. For instance, an additional member of Skype is beneficiary for the whole

network and increases value to the network. A negative same-sided network effect can happen as well.

Cross-sided network effects are happening when one new member of the network increases or decreases (positive vs. negative) the value of the opposite side of a network. For instance, more iPhone buyers motivating more programmer to write apps for the platform, the effect is called a positive cross- network effect.

From these four mentioned effects are possible and can be actively designed into the platform. The winners are not only the participants but also the platform itself. Means, when one user participating multiple, often rival platforms.

Multi-Homing

means, when one user participates in multiple, often rival platforms. “Multihoming in platforms refers to when a platform participant on either side participates in more than one platform ecosystem.”(Armstrong, 2006; Armstrong & Wright, 2007). When for instance, a programmer writes his app idea for multiple operating systems, reaching more users. This rational strategy is often used when participants want to increase their economic chances or the platforms feature sets are giving small advantages in some situations. Multi-homing is generally limited to the expenditures of time, money and maintenance, especially for end-users. The higher these costs, the lesser are participants willing to multi-home bandwidth (Tiwana, 2014, p.36).

Tipping is the moment when the amount of users reaches the critical mass, as the platform reaches the level at which network effects become decisive, thus self-growing, self-perpetuating and positive feedback loop kicks in. (Tiwana, 2014, p.36-37).

Lucrative platforms face different kinds of competition. They are threatened by direct clones which provide the same kind of feature sets and platforms with advances or complementary feature sets. Competing platform ecosystems might be good for the customer, but from the economic point of view, it ends in price fights in a zero-profit industry. That is why developers use lock-in effects within their platforms, to keep the users within their sphere of influence.

They are sometimes established by hardware as a middleman, which creates high switching costs, for example, the necessity of new hardware for switching platforms. Another opportunity

is the increase in features and making the platform more valuable for the participants and developing a so called a “golden cage” where all participants feel treated well (Tiwana, 2014, p.37).

Envelopment

What supports lock-in effects is the continuous adding of new feature sets which are already used in concurring platforms or other markets / products that are widely useful and enhance the competitive advantage of the platform. For instance, integrating cameras into smart phones is occupying value from the classical camera market and pushing it the mobile phone market bandwidth (Tiwana, 2014, p.37). One platform can use evolvement for winning over another platform with overlapping user groups. Just adding additional features can increase the overall value of its platform.

Architecture

Platforms are made out of different functionalities and features. These feature sets can be highly modular with plug and play components and monolithic as well. Architecture defines the parts of a complex structure. And it defines the function and what they do and how they interact (van Schewick, 2012). Its platform architecture can be viewed from the programming point of view and also from the user perspective. It gives orientation and takes out complexity and let the user more focus on provided features bandwidth (Tiwana, 2014, p.38).

Governance

Within platform ecosystems there are a lot of regulations governed by different parties. Generally, there are three facets of decision-making processes:

“ - how decision rights are distributed across all stakeholders, especially platform owner and developer.

- formal and informal control mechanisms which steer behaviour of (for instance) programmers who are following specific processes under certain economic behaviours.

- specific economic incentives installed within the platform will lead to a certain behaviour. We can call this direct and indirect behaviour forming through governance.”

Governance influences many behaviours directly and indirectly and it controls the external and internal dynamics of the economics bandwidth (Tiwana, 2014, p.39).

3.2 Sharing Economies

Definition of sharing economies

The former Wallstreet analyst Neal Gorenflo described in an interview in 2009 the sharing economy and its Shareable project as “democratizing how we produce, consume, govern, and solve social problems.” (Sundararajan, 2016, p.24).

Jemeriah Owyang, founder of the brand-council Crow Companies describes the sharing economy phenomenon of “the collaborative economy”. He sees the sharing economy as an evolutionary step out of the social media industry and its development from a couple of years earlier. Sundararaja mentions: “Without social media, the sharing economy probably wouldn’t exist in its current form." (Sundararajan, 2016, p.25). Consequently, it delivers not only an advantage, economically, it has also social and cultural functionality. Some describe the “‘sharing economy’ as an early instance of a future in which peer-to-peer exchange becomes increasingly prevalent, and the ‘crowd’ replaces the corporation at the center of capitalism.” (Sundararajan, 2016, p.2)

The author A. Sundararajan mentions that the term “sharing economy” needs five characteristics:

"

1. Largely market based: the sharing economy creates markets that enable the exchange of goods and the emergence of new services, resulting in potentially higher levels of economic activity.
2. High-impact capital: the sharing economy opens new opportunities for everything, from assets and skills to time and money, to be used at levels closer to their full capacity.
3. Crowd-based ‘networks’ rather than centralized institutions or ‘hierarchies’: the supply of capital and labor comes from the decentralized crowds of individuals rather than corporate or stage aggregates; future exchange may be mediated by distributed crowd-based marketplaces rather than by centralized third parties.

4. Blurring lines between the personal and the professional: the supply of labor and services often commercializes and scales peer-to-peer activities like giving someone a ride or lending someone money, activities which used to be considered ‘personal’.
5. Blurring lines between fully employed and casual labor, between independent and dependent employment., between work and leisure: many traditionally full-time jobs are supplanted by contract work that features a continuum of levels of time commitment, granularity, economic dependence, and entrepreneurship." (Sundararajan, 2016, p.27)

Advantages of sharing economies

Mary Keeper describes the sharing economy as a movement towards an “asset-light” generation (Keeper, 2012, p.59, ff.) Social inclusion, increased levels of trust and collaboration are the advantages, where assets can be fully utilized.

3.2.1 In general - advantages of platforms

Massively distributed innovation

The competitive advantage of platforms and its owners is to attract innovators and specialists at a massive scale that would normally be impossible for conventional firms. Quality and quantity of these apps are the true value for end-users. Platform developers will generate deep insights about the end-users' needs and can develop upcoming trends out of it, which will guarantee the quality of the network.

Risk transfer

In classical product development product owners dealing with the whole risk within the developing process and during commercialisation. Platform developers spread the risk and its financial claims for development and maintenance to app developers and users.

Capturing the long-tail

Digital platforms ecosystems can serve two main markets: mass market and niche markets. So called "Long-tail customers" are normally harder to serve because of their highly fragmented individual needs. This is normally economically impractical and hard to maintain, but within

platforms it can be served much easier. Amazon is a great example, where the company can offer many niche market products, without spending store capacity on them. The platform owner as an institution, for instance, the App Store of Apple, moves risk and development of Apps and services to the developer, who, when he sees it valuable enough to serve the group. The institution can set up economic or other incentives for attracting app developers bring value to the platform. With attracting these niche-markets, they can expand their market shares and strengthen their overall market value for participating the network.

App developers

The motivation to join a platform and add content has two arguments: They have access to end-consumers and they can scale without ownership and economic responsibility for the platform technology in the background.

Technological foundations

A typical software application can be divided into two main parts: (1) one element describes the unique selling proposition, what defines the individual need for the particular market niche. The other part (2) defines the technological foundation of the platform, which is necessary to run the software. For instance, an app runs on Apple's iOS platform and uses the particular programming language SWIFT, for development. Platform owners lowering the entry barriers with, for instance, easy-to-use tools and pre-made software elements, which facilitates the programming work for developers.

End-Users

The advantages of joining a platform as end-user has four reasons: (Tiwana, 2014, p.67)

(1) Tailored mass-customization (Tiwana, 2014, p.67)

Software based platforms with an apps system allows the end-consumer to match their personal needs with special apps. That keeps the experience lean and every user can focus on its own needs, ranging from mass market needs to individual niche ones.

(2) quick innovation cycles and network effect advantages (Tiwana, 2014, p.67)

Every digital platform is adapting constantly to external and internal needs for separating from the concurrence. Also, app developers are innovating for keeping their existing customers, but also attracting new customers. Both are interested in increasing the value of the platform itself. The big beneficiary is the end-consumer who has access to the latest technology, features and trends.

(3) Competition among app developers and platforms (Tiwana, 2014, p.68)

There is a competition between app developers for the getting higher end-user attention within a particular user scenario. The quality of provided products are increasing and end-users are benefitting. Same with a platform who is evolving and stepping upwards to the post-dominant design phase, where competition focuses more on competition more over the price. Finally, the end-consumer will benefit from it.

(4) Lower search and transaction costs (Tiwana, 2014, p.68)

Quality and quantity of features, services and products on the platform are increasing and will attract more participants to join platforms, which increases the overall attractivity. With this greater choice in mind, user transaction costs are reduced, and they keep faith with the platform. The platform can increase the overall quality of app developers and their products and build up more trust and brand loyalty.

Summary of the nine guiding principles in the platform markets

Principle	Key Idea
Red Queen Effect	The increased pressure to adapt faster just to survive is driven by an increase in the evolutionary pace of rival technology solution
Chicken-or-egg problem	The dilemma that neither side will find a two-sided technology solution with potential network effect attractive enough to join without a large presence for the other side
The penguin problem	When potential adopters of a platform with a potentially strong network effects stall in adopting it because they are unsure whether others will adopt it as well
Emergence	Properties of a platform that rise spontaneously as its participants pursue their own interests based on their own expertise but adapt to what other ecosystems' participants are doing

Seesaw problem	The challenge of managing the delicate balance between app developers' autonomy to freely innovate and ensuring that apps seamlessly interact with the platform
Humpty Dumpty problem	When separating an app from the platform makes it difficult to subsequently reintegrate them
Mirroring problem	The organisational structure of a platform's ecosystem must mirror its architecture
Coevolution	Simultaneously adjusting architecure and governance of a platform or an app to maintain alignment between them
Goldilocks rule	Humans gravitate toward the middle over the two extreme choices given any three ordered choices

Diagram: Summary of the nine principles in platform markets (Tiwana, 2014, p.39-47)

Summary

Platform businesses enabled many benefits for individuals and society. New economies appearing in the context of internet-connected digital mobile devices. Success can be derived by average mobile usage, who increased to up to six hours a day. Platforms in general are the main target. The big advantage of platforms next to the obvious features for users, are the data created during their usage. The data collected is an opportunity for increasing the overall quality of the platform, its services and are beneficially for all stakeholders.

These, so-called closed feedback loops creating:

- better product & services
- better understanding about stakeholders
- testing opportunities for new features and services
- better forecasting
- development of new business models and their features

Data sets allow businesses to manage supply and demand, customer behavior and trends much better, lowering their risks. This rising significance of data unleashed new opportunities for customer insights but has negative effects for stakeholders, especially for the end-consumers. Badly protected data storage leaded to massive hacks where data sets of millions of people

landed on the black market. Credit card companies use an identity centric model. Over the years, hundreds of millions of personal data got breached. For instance, T-Mobile lost 15 Mill. records, JPMorgan lost data of 76 million households and eBay: 145 Mill. to hackers (Son & Riley, 2014), (Peterson, 2014), (Greenberg, 2015).

Data produced by the customer interactions will often be sold on the after market. Data brokers are collecting data and processing it. It means that the data is anonymous and can not be allocated to somebody directly. But when pairing them with multiple other sources, from other data providers, behavior patterns appear. Over time, data sets can be allocated directly to one person.

Next to undermining data protection laws, who are paving the way for data abuse and manipulation, information in general, becomes a very profitable business, where platform participants are not compensated. Users becoming more and more aware of and even Californian governor Newsom is campaigning for getting users paid for their online data (Thompson, 2019).

Within the scope of the facebook data scandal, questions will remain unanswered in which direction platforms will develop? How to overcome the mentioned disadvantages and make a more sustainable interaction possible?

Let's see how Blockchain economies and its technology are able to let the crowd be the market maker within a decentralized Peer-to-Peer environment secured by cryptography.

3.2 Blockchain Technologies

3.2.1 The Fundamentals of Blockchain technology

Distributed Ledger

Blockchain technology is able to keep different forms of information distributed across many nodes or computers, which form part of a network. This also called “distributed ledger technology” is a non-centralized system where the majority, or normally up to 80% of the participants, are controlling all parts of the system. The whole system and all of its generated information and history are verified by a self-auditing system for guaranteeing their correctness. The collected information is packed into single blocks which describe one state of information. It is called blockchain because many blocks are cryptographically connected,

recording the history of every transaction and change in state of information. With this distributed ledger system, delivering false information is impossible because it needs the acceptance of the network on every change within a block. Changing information history is very hard, because the demand for computation power to do so would be tremendous.

Usage, mining and maintenance takes a big amount of energy for computing power and is one of the downsides of this kind of distributed data network. It needs currently 200kWh for every Bitcoin transaction (October 2017) instead of a Visa transaction of 0,01kWh.

What we currently understand and describe as blockchain and its usage of blockchain dates back to the work of Mr. Satoshi Nakamoto. His scientific paper about the technology and its blockchain protocol, where he explained the functionality of blockchain and Bitcoin dates back to the year 2008.

With the rising popularity and price of Bitcoin, the idea of blockchain got momentum and turned into a movement. In 2014, the decentralised platform Ethereum introduced a new concept that allowed much easier development of own blockchain technologies based on smart contracts. The founder Vitalik Buterin and his team introduced a blockchain with a complete build-in programming language, where individuals can design smart contracts individually for any kind of purpose with the general advantages, without any censorship, fraud or third-party interference. These smart contracts come with their own custom-built blockchain. This open platform principle and open-source code allowed individuals create innovative projects based on blockchain technology. The currency coin market held a total of 2278 of so called “Altcoins” (alternative coins to Bitcoin) and Tokens for the most diverse requirements (www.coinmarketcap.com, June, 2019).

Blockchains and DLTs can be described also as algorithms secured by cryptographic measures to verify the transaction and creation of information, within a peer-to-peer network. (Maupin, 2017).

The paper of the Asian Development Bank describes in the report: "Distributed Ledger Technologies for Developing Asia" how and what DLTs can be used for. The innovation is an addition of cryptography and distributed consensus protocols. Economic incentives with support of game theory motivates participants to uphold and perpetuate the generated

networks. Next to their well-known usage as currency, DLTs can hold, and track a wide variety of information or assets, as mentioned in the report of Ferrarini, et al., (2017, p.1-2):

"

- Fiat (government- issued) money (Wild, 2016)
- Stocks, bonds, derivates, and other financial products (DTCC, 2016)
- Real and intellectual property rights (Shin, 2016)
- Contract rights (Morrison, 2016)
- The movement of goods and services across a global supply chain (Higgins, 2016; Parker; 2016a, 2016b)
- The expenditure of public or private funds (Samburaj; 2016; Parker, 2016c)
- Personal and sensor-based data and messages (Sønstebø, 2017)
- the delivery of digital entitlements and digital identity to end-beneficiaries (AIDTech, 2019)"

  (Ferrarini, et al., 2017, p.1-2)

DLTs can be tailored to the use case and specific goals dependent on the business model. Starting with various degrees of privacy for users within the DLT addressing needs of global economy Ferrarini, et al., (2017, p.2). It is summarized as:

- "distributed consensus—no central point of control or failure (no choke points or intermediaries),
- transaction transparency/auditability—every ledger entry can be made verifiable and retraceable across its full history (accountability), and
- party identity abstraction—individual parties can transact with one another across the network without revealing their full identities (enhanced privacy)." (Ferrarini, et al., 2017, p.1-2)

The features and many more applications of DLT formed the term the "Internet of value", where participants of the network can directly and indirectly interchange different forms of value. The interchange of value is much faster, cheaper, decentralized and more secure than classical financial systems (Ferrarini, et al., 2017, p.2).

3.2.2 7 Principles of Blockchain

This chapter gives an overview of the most important reasons why blockchain can be a useful catalyst implementing in current economies in the context of scarcity. For getting a better understanding of it, the book “Blockchain revolution” (Tapscott & Tapscott, 2016) breaks down the advantages into seven principles.

Network Integrity

Trust is directly implemented within the blockchain by logging the history of every transaction ever made and everybody in the network have access to it. This is immanent in the technology itself and not centralised to one institution or individual. Every piece information represents an encoded and encrypted transaction. The liability of every action, their responsibility and incentives and penalties are hard-coded in the blockchain (Tapscott & Tapscott, 2016, p.30-33).

Distributed Power

The system shares power between all members of the peer-to-peer network. No single participant or separate institution can make changes to the blockchain or shut down the whole system. Even if participants and groups are cut off the system it can be regenerated, because every individual has a complete copy of the system on their computer. All changes are tracked and can be seen by network members (Tapscott & Tapscott, 2016, p.33-35).

Value Incentives

One of the main drivers for the success of the distribution of Bitcoin is the idea of wiring economic incentives into preservation of the network. Bitcoin is designed in a way that people who work with it or mine it or just hold it and use its tokens will get a reward. This economic incentive guarantees the success, maintenance and support of all network participants. This guarantees that the participants maintain it and that the network will grow. From an economic standpoint, it will lower social costs of spreading and the idea is bootstrapping (Tapscott & Tapscott, 2016, p.35-39).

Security

There are several opportunities of establishing security across the network or within the blockchain code. All actions are encrypted and provide confidentiality, but also allows

authentication. Disrespectful and harmful behavior can be punished immediately, by prohibiting any further actions, confiscating their coins or excluding the participant from the network. All depends to the law written in the code. A wide variety of rules can be set and backed in the, so called “Smart contracts”. These hard-coded black boxes can’t be changed, and if so, only by the agreement of the majority of the peer-to-peer network.

The Bitcoin blockchain uses SHA-256 Hash functions developed by the United States National Security Agency, which is one of the highest safety standards. Because of the rigidity of the code, and its seclusion, levels of trust can be drastically increased (Tapscott & Tapscott, 2016, p.39-41).

Privacy

Respect for the right to privacy and also respecting privacy itself are very important factors within the rise of social networks and more and more advanced technologies for harvesting personal information. Mr. Satoshi's invention established two important factors: He made trust an unnecessary factor within transactions and made true personal identification unnecessary. Blockchain doesn’t need any personal identification for the network layer itself to function. Also, downloading and using it as currency doesn’t require any personal identification. To be more precise, the transaction layer is operating separately next to identification and verification layers, that there is no reference to each person who, for instance, is sending somebody money.

On the blockchain you can protect your privacy and handle as you want, meaning you can sell it or safe it for your own, regarding your interests (Tapscott & Tapscott, 2016, p.41-45).

Rights reserved

The right of personal property of one's inventions are protected by governmental institutions and well respected within our society. With the rise of digital streaming services and P2P torrent sharing platforms in combination with its anonymity, however, many movies, music and other forms of art were shared for free and disrupted the artists' income model. Bypassed copyright protections made sharing content over the internet possible. Ownership can be handled within the blockchain much easier and is absolutely impossible to manipulate. Public Key Infrastructure records and saves ownership within a block, including transaction history. Blockchain can be the ledger of everything and can replace in one way or the other institutions which were responsible for that in the past (Tapscott & Tapscott, 2016, p.45-49).

Inclusion

Healthy markets are working best if everybody has access to them and can participate. Especially many people and local corporations in developing countries are excluded from foreign export markets which bars them from economic growth.

On the microeconomic level, many people don't have access to the financial system in form of a bank account, which excludes them from many economic activities.

There are still two billion people without a bank account. People of the bottom of the pyramid in these countries have better access to a mobile phone then to clean water. They can use the mobile phone's camera, scanning QR codes for sending money, which is a big step forward bypassing the high transaction and bank fees. Blockchain is designed for that. It works next to TCP/IP also offline. Satoshi Nakamoto called it the "Simplified payment verification" (SPV) which also works on a $10.- mobile phone. That lowers the obstacles for entering the market and can be accessed without having a bank account or any kind of verification. These advantages are useful for citizens in developing countries. In countries like Argentina or Uruguay where citizens are suffering under high inflation or unstable and corrupt regimes, crypto currencies can be great alternative for the local currency (Tapscott & Tapscott, 2016, p.49-51).

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3.3 Side Excerpt - side factors for using both technologies and their services

If any socio-economic context is under the influence of general scarcity, it becomes relevant, understanding the different dimensions of valuable resources for stimulating the economy.

When we look for different sources and factors of growth and describe an economy as an ecosystem, different perspectives may appear. Beyond the financial dimension, an economy can be described in many more forms. Scientifically, Bourdieu and Putnam identified different forms of capital who impacts economic growth or at least building a basis for it (Bourdieu, 1986), (Putnam, 1995 & 2000). However, there are many more forms of capital, who are influencing each other, building opportunities, or just accelerating processes within a society. Especially under perspective of developing countries, where different forms of capital are unevenly distributed, other, not so common forms of capital are becoming relevant or can be

used for building and supporting the fundamentals that an economy can grow. In the following, different forms of capital will be introduced, who are having the inherent potential for growth.

The article by Mr. Roland Soloview in the magazine Permaculture in UK extended the view on forms of capital to a total of eight forms.

He substantiates his opinion how capital is defined by the Oxford Learner's Dictionary as "wealth in the form of money or other assets" and as a "valuable resource of a particular kind." (Oxford Learner's Dictionary, 2019). In the following, his extended definitions of capital will be broken down in more detail.

Intellectual Capital

In the case of the potential of value transformation, knowledge is the easiest asset to be transformed. It is the most useful form of capital in the community context. Equipped with knowledge, individuals are able to start a career, get a job and make a living. Educational institutions, like schools or universities are the exchange of financial capital to intellectual capital.

Social Capital

The term "social capital" is characterized by the works of Putnam within his writings: "Making democracy work: Civic Traditions in Modern Italy" (Putnam, 1994) and Bourdieu (Bourdieu, 1986). Social capital will be generated by building and sustaining connections in the form of material or immaterial interchange of goods. Over time they let you create valuable networks. This form of capital can be accumulated in terms of influence and connections to other people. Social capital works also as a multiplier for other forms of capital. With social capital you can ask for support and help in other concerns. Social capital is generally important in doing business, politics and forming communities. (Bourdieu, 1986).

Trust – as part of the social capital

Trust as part of social capital becomes relevant within communities. High levels of trust having many advantages. Trust is the most important one when other forms of capital are not available, are not existing or not well established. It is the most archaic form of a resource of humans, that are used building up communities. High levels of it, for example, increase levels of taking risks of business owners within their activities. They tend to take more debt for a business venture or trust business partners more. We can also argue it is the oldest currency in

the world. A community with strong social capital can unlock resources, ask for favors and obtain the opportunity to risk more. Together they can work on more complex, time- and resource intense projects (Karlan, et al, 2009)

Material Capital

Bourdieu included 'material capital' to financial capital, but sometimes it is mentioned separately. Generally, all inanimate physical objects are a part of material capital. They can be separated by the different state of development if they are combined with each other. Starting from raw materials like raw metals to more complexed ones, like computers or stones to concrete to houses.

Financial Capital

When a layman hears the term 'capital', financial capital is probably the first thing that comes to mind. The current global society focuses primarily on financial capital. It is our dominant element for sapping services and goods. It can be a powerful tool for suppression, or, liberation. The global financial system created many different forms of financial instruments. At least since the dollar disconnected from the gold price many financial instruments were invented, next to classical currencies, securities, options. This sort of capital gets most of its awareness and is used as a main tool of economic interchange of goods and services.

Living Capital

Ecological diversity, flora & fauna and water resources are qualities that are summarized by living capital. Especially in rural areas it is the only form that can be developed pretty fast. Sustainably developed, it is a valuable resource.

Experiential Capital or human capital

This form of capital gives individuals or a community the capability of transforming intellectual, social and experiential capital into other forms. Transforming theory into experience is an important step. Collaborating with others sets free up new opportunities and makes the community stronger and more efficient and effective.

Cultural Capital

When we compare it to other forms of capital, there is one major distinction to make: this form of capital is shared with the majority of society instead of all the other, who can be hold by individuals. Cultural capital can be summarized by all internal and external processes who will describe the character of communities. Also, all kind of cultural activities like art or music and

also religious related cultural actions like a marriage are all events who are shared within a community. They are a part of inter-capital exchange processes often slightly different from one village, bioregions, or valley to the next.

Spiritual Capital

One of the less common forms is Spiritual Capital, which involves spirituality and religion. The practice and investment in it accumulated over time and includes intellectual and also spiritual capital. Accumulation is reflected in some religions even as currency, like in Buddism it's called Karma. We can compare it to the definition of equity where you can "own" positive spiritual experience and fulfilment or, on the contrary, you "ow" it, at the expense of bad Karma. These rules are stabilizing a community and are often a kind of regulatory system, or the early stage of law and order. These rules and laws are working as a part of membership but also spending purpose. A few examples are the Protestant work ethics of Max Weber, the ten commandments of the Bible, as guidelines for living together within a community (Soloviev, 2011, p.59).

We might be skeptical about some of these forms of capital and its relevance for economic growth of a country. But often, value is not visible in the first row and for instance, tourists with religious backgrounds, looking for spiritual experiences in some countries, despite the fact that living standards are below their level of agreements. These classifications of different forms of capital open the perspective for economies and companies reflecting on their existing sources of value, who are underdeveloped.

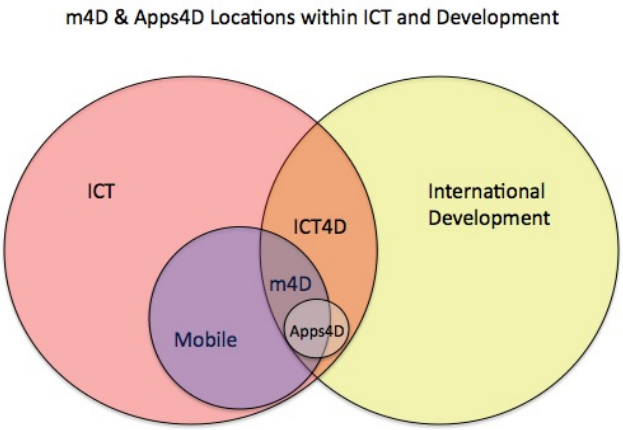
Having established the development and possible uses for digital technologies, namely blockchain, as well as having described various forms of capital, we will now turn to the more practical aspects. The theoretical literature supports uses of blockchain technology in developing countries, but how will such experiments fare in practice?

4. The Impact of digital platforms and blockchain technology on economies in developing countries for triggering economic growth

This chapter shows the advantages of the two provided topics of platforms and blockchain in the context of developing countries. One case is of the mentioned author Hernando deSoto in chapter 01 where blockchain technology is used to implement a land reform in Georgia, Europe. Other best-practice models showing the advantages blockchain and how it can provide the fundamentals for development.

4.1 Examples & Use cases

4.1.1 ICT in the context of development



Definition of Information and Communication Technologies for Development (ICT4D) & Mobile for development (M4D) is a classification originating from the socio-economic studies which describes the use of Information, Communication Technologies (ICT) for increasing levels of development and human rights on international levels. It describes the theory that overall development of a society, with all its dimensions like learning, income, security, health and any other kind of human evolution is positively correlated with high levels of high-quality information and an increase of overall communication within society. The higher the inflow and exchange of information and communication, the better.

Figure 1: (Vota, Wayan, 2010) m4D & Apps4D within ICT and Development

Increasing the infrastructure of ICTs is the most effective solution to increase levels of communication and information. McNamara describes that an increasing number of ICT

projects within developing countries is positively correlated to poverty reduction (McNamara, 2003).

Transparency, social stability and accountability within society were improved if ICTs were integrated, as Avila et al. (2010) have proven, especially when online and mobile technologies were used to offer citizens better access to the ICT and providing them the opportunity of participation.

The following chapter shows several successfully integrated ICT use cases with positive sociological effects on piece-building, inclusion, and also development effects on poverty reduction and business development.

4.1.2 Examples of multi-sided mobile service platforms:

In the field of Information, Communication, Transaction, Business Development & Entertainment

Platforms provide a wide range of services, accessible at low-cost levels. Local communities can access the necessary information via smart phones or distributed feature phones, thus closing the service gap. In the following several use cases will show that platform services can help supporting local structures and development in general.

4.1.3 USE CASE 1: ICT for open contracting in fragile environments - Agriculture

Local farmers in rural areas, who want to sell their crop are often dependent of the market prices middlemen are providing and are often below market levels. With the service FrontlineSMS they are able to check market prices for their produced goods in real-time. A pilot project in Banda, Indonesia, initiated by the food and agriculture department of the UN and the government realized a national system, named Fish Marketing Information System (FMIS). The goal of this system was to implement fair-trade processes for fish on the local, up till the international level. Prices for products were sent directly to all stakeholders, like the fishermen, traders, processors, and also government agencies. Regarding ICT, they chose a mixed media

approach via SMS, local newspapers, and the project platform webpage. (Schouten, 2009, p.11) (Syahputra, 2009).

Another example was initiated by the non-profit organization RONGEAD, which gives producers of cashew nuts in Cote d'Ivoire access to important information about the market situation. They sent out 3.000 SMS per week to 8.000 producers via the service FrontlineSMS. The goal is to provide them with all information necessary, to increase their revenue sources and create better results. The SMS recipients can make better decisions based on real-time data, according to FrontlineSMS. They can store crops and decide when it the best moment to harvest and sell on the market for the highest obtainable price (Gonnet, 2011).

Diagram showing the path (and potential vulnerabilities) of an SMS interaction between a FrontlineSMS user and a mobile phone, or end user, who both subscribe to the same mobile network operator.
Source: FrontlineSMS

Figure 2: Schouten, 2012, p.11, The path of SMS interaction between the FrontlineSMS user & end user

FrontlineSMS offers this SMS service to every community and can be set up under their supervision. Next to their SMS service, the company provides training for the people on location for increasing the effectiveness and enable them to analyze upcoming challenges and advantages. A user guide and additional consulting services will guarantee a successful implementation.

4.1.4 USE CASE 2: peace building in conflict areas

The World Bank Institute (WBI) published a research report in the year 2011 about the positive impacts of using ICT in unstable and conflict-affected regions. The goal was to use the Mobile network to - "... to open data portals – for fairer and more inclusive, transparent and accountable public resource management."(Schouten, 2009, p.11).

33% of the world's poorest people live in countries under the impact of conflicts and in a fragile state, according to the World Bank. Around 14% of the world's total population live in these countries. "...these countries are generally noted for their limited ability to govern a population and territory and build mutually constructive and reinforcing relations with society (OECD 2010). Kaplan (2013) explains how fragile states are defined by sociopolitical fractures and structural weakness or volatility, and their peoples do not accept common identities, borders, and institutions." (Schouten, 2009, p.3).

Their research and interviews of users in the countries resulted, that Information and Communication Technology (ICT) and Information and Communication Technology for development (ICT4D) can have a positive impact on piece building, procurement and open contracting in conflict afflicted regions (Schouten, 2009).

4.1.5 USE CASE 3: tracking development promises in Liberia

Liberia was in a state of civil war for nearly 14 years. After building up new institutions and infrastructure for the duration of over ten years of, the government published a 150-day action plan about their development initiatives in January 2012. The goal was it, to accompany this initiative over this period with media coverage, that citizens are more involved and can be a part of this action plan.

The Liberia Media Centre (LMC) initiated an online platform, where the results of the initiative are being published. Citizens are able to participate in the process and were invited to track the government's results, and to control whether they are keeping their promises. Further progress results were published in other national newspapers, and the story was shared in radio stations as well.

In order to keep up momentum, they moved the project and its media coverage over to Facebook, resulting in even more media coverage and more participation. The LMC changed the public debate and also the attitude of governmental activities and policies, how to handle public projects. The campaign was so successful, that the government decided to publish new initiatives on a regular basis. Now they are publishing relevant information about upcoming and current projects and let the citizens participate on projects with for instance, two-way automated SMS Budget Tracking systems, or an open access online documentation resource portal.

This initiative allowed citizens to participate in governmental processes. It is creating trust and peace in the relationship between the state and the public (Schouten, 2009, p.24).

The Resumee

ICT let the public participate in governmental activities which triggers trust and participation in reforms. Especially in areas affected by scarcity, conflict and mistrust to governmental institutions, ICT and their services can be used to build trust for real a governmental engagement and can show responsibility for showing sustainable acting with public resources. The right mix of tools and content is directly related to local context. The big goal is strengthening the relationship between the parties like state and citizens and establish objective-based discussions.

4.1.6 USE CASE 4: Governmental services

The paper "Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies" (Bertot, John C., et al, 2010) shows that ICTs can increase transparency and communication between governments and citizens. With an appropriate design of platforms and communication channels, it reduces corruption and promotes openness, which will have sustainable effects on culture and society (Bertot, John C.,

et al, 2010). For creating an environment of trust, the authors highlighting a couple of necessary requirements.

Transparency and free flow of information guaranteed by law is an essential element of a working democracy. When it is provided to companies and citizens it triggers participation in democratic decisions and builds overall trust on governmental activities. Citizens can call attention to corrupt activities, which triggers the individual responsibility of citizens.

ICTs and transparency initiatives

The decreasing costs of hardware and the widely available internet and open-source software, makes accessing, collecting, and sharing of information cheaper than ever before. New channels for transferring relevant information are created. E-government initiatives across the globe showed promising results in reducing corruption and increasing levels of trust by focusing on the crucial interactions between citizens and government workers (Bhatnagar, 2003; Shim & Eom, 2008).

The paper provided a couple of best-practice examples:

- Pakistan digitized the whole tax system and redesigned their general contact between tax collectors and residents, by downsizing direct contact between both parties. This act reduces the chances for bribes and all kinds of influencing (Anderson, 2009).
- In the Philippines, the department of Budget and Management cracked down on fixed pricing and makes public accountability possible, by implementing an e-procurement system (Anderson, 2009).
- As Chile introduced an e-procurement system, the country saved roughly $ 150 million per year. Citizens have a direct insight on governmental spending and SMEs can participate in the bidding process of public projects (Shim & Eom, 2008; Heeks, 2005).
- The U.S. government implemented a wide range of e-government service platforms, where, for instance, the progress of applications can be tracked. For instance, passport seekers can check their process on the U.S: Customs and Immigration Services (USCIS). All these services are showing the grade of efficiency and the level of the process constantly.

Social media offers a wide variety of opportunities of addressing transparency, anti-corruption and inclusive participation of citizens. Social media platforms are making collaboration, participation and empowerment easier and socially accepted thoughts can be refined in its particular context through discussions and fact checking. Cultural patterns and paradigms can evolve over time faster, where society and citizens are willing to dispute. Next to governmental participatory service platforms, there are also non-governmental, like Wikileaks (www.wikileaks.org) where people can upload sensitive information subject to abuse of power or corruption anonymously.

Possible barriers and challenges

Public services via ICT can lead to new ways of corruption when, for instance, the owners or administrators of these channels are able to control and to manipulate it (Wescott, 2001). For example, in Cameroon, the e-governmental service data were tampered with once by their own government employees (Heeks, 2005).

Another challenge is the proper handling of complexity of a wide variety of services. The effects of the services are limited by bad user experience, government and technological hurdles or the availability of digital hardware and internet. This could affect many parts of the population, which limits the effect and impact of these services (Bertot, 2003; Jaeger & Thompson, 2003; Singh & Sahu, 2008).

Sometimes the base of building transparency and trust within a society is flawed by governments to hinder public engagement. Filtering and limiting access to information, especially to government-critical information hinders the development of trust. Access to the worldwide web and international content is often limited in many countries of the MENA area (North Africa, Middle East) (Zittrain & Palfrey, 2008). China arresting government-critical citizens regularly (Klotz, 2004). These countries and many more, filtering the internet for security, political and social reasons. Making content about free speech and expression, human rights, economic development or just information about other countries is blocked (Zittrain & Palfrey, 2008).

Three topics of anti-corruption implementation paths are used in general (Shim & Eom, 2009):

1. **Administrative reforms,** installing watchdog agencies or other initiatives for tracking and supervising governmental agency actions and its behavior (Johnson, 1998).

2**. Law enforcement** as a necessary side part of administrative reforms is responsible for the integration and correct executions of them (Hamilton-Hart, 2001).

3. Social change within a society has its most impact for fighting corruption. Direct participation initiatives (e.g. direct democracy) on the change of institutional reformation is the most efficient, because it changes the culture of trained practices who are tolerating corruption (Fukiyama, 2001).

Summary

Development with the support of ICT and their services needs several prerequisites that it has its promised impact:

- **Access to ICT in a society.** Network effects occur if more people are joining the community which increases the overall system and its output (Hampton & Wellman, 2001).
- **Transparency and trust are directly interconnected.** As more governmental information is accessible, transparency is increased within society (Fukiyama, 2001; Johnson, 1998).
- **Increased access to ICT boost social capital within society.** Digital collaboration within online social networks which provide access to relevant governmental information triggers the increase of social capital (Lin, 2001)
- **Participation of governmental organizations** within ICT-triggered transparency projects increasing the impact and its success. If the usage and its acceptance are openly shown to the public, the success and its social implementation is more likely (Jaeger & Matteson, 2009).

4.1.7 How sharing economies building trust and safe resources - the car sharing company BlaBlaCar

The vision of Frederic Mazzella, founder of BlaBlaCar, can be explained at its best by his quote: “The initial motivation was the waste, the unbearable waste that empty cars on the road represent.” (Sundararajan, 2016, p.12)

Background of BlaBlaCar

BlaBlaCar is in its essence a platform business which is matching empty seats of cars with travelers. Their mission is to develop an international peer-to-peer sharing platform, powered by people with the focus on travelling. The platform is connecting drivers who want to share their empty driving seats with potential travelers, who are driving the same route.

The platform's Achilles heel at the beginning was the doubts of travelling with a stranger, who they never met before personally and just connected digitally. It took the company five years to reach their first million customers. Over the time they developed a number of tools for easing up their process and increasing trust between their users. Over time their trust layers evolved within development.

They started first with **declarative information.** Participants have to show their identity with personal information and a photo provided is the first layer of identification provided for the network. **Verification.** Next, they needed further verification and have to provide their phone number. **Rating.** The drivers asked for a rating history record, where the participants' behavior can be tracked and is recorded over time. **The Booking system.** Within the order system bookers and car drivers had full access to rating and feedback to decide with whom they want to drive. **Two-way ratings.** In the later step they introduced a two-way identification system, which increased the quality of the overall ratings. Both parties can leave a review, which will be hided until the other party is leaving also a rating.

The results of the experiences they made over time resulted in the D.R.E.A.M.S. framework for building and sustaining trust online, is explained as follows:

D. - Declared

Personal identified information about the users like the name, age, preferences, and a personal, specifically created description about themselves put strangers out of anonymity.

R. - Rated

Rating about human behavior is widely developed on digital platforms. Like at Tripadvisor or eBay, which increased the overall experience online and brought more authenticity in it. It regulated also human behavior and increased personal responsibility.

E. - Engaged

For guaranteeing that users will to stick its booking, an established pre-payment service granted the engagement of users. “It links past information to future commitment.” (Mazzella & Sundararajan, 2016, p.18).

A. - Active

The quality of a sharing platform is highly dependent on the usage and commitment of users. That’s why they provided additional information about the user's activity within the platform.

M. - Moderated

All additional information has to be confirmed by third-parties, for instance, the verification of a bank account. “Users need to know that everything they see online meets a required level of goodwill and authenticity, as ensured by the third party providing the sharing platform” (Mazzella & Sundararajan, 2016, p.18)

S. - Social

Connecting current social media life directly to BlaBlaCar allowed users to extend and leverage its online trust. The D.R.E.A.M.S. framework helped to increase their user community to up to 60 Million users in 21 countries in the year 2018 (Mazzella & Sundararajan, 2016, p.18).

RESULTS OF THE SURVEY

Within the BlaBlaCar community 18289 members from 11 countries where interviewed about the sharing platform and their experiences. The results showed, that 74% of people described BlaBlaCar as a platform, that is all about connecting people. If they are asked about the role of the platform, they stated that it is "creating trust by moderation" (63%) and "communicating about ridesharing" (57%). “Connecting people and creating trust are fundamental elements in building a reliable environment of collaboration and

ultimately an online platform's main reason for being." and "This confirms that what is true in the real world - that familiarity with a service or situation enhances trust - also applies to an online world where trust relies on digital cues." (Mazzella & Sundararajan, 2016, p.24).

Measuring trust

The interviewees were asked, to rank who would they trust more: a BlaBlaCar profile, family, friends, working colleagues, and other typical characters to total strangers. The result of the survey showed that friends and families are the most trusted persons, followed by co-workers, neighbors, social networks and last strangers. However, when including the full-profile of a BlaBlaCar member, the ranking looks different. The profile is ranked right next to friends and ahead of colleagues and neighbors. Surprising, that users within the network are trusting each other more than colleagues, who working together and meeting every day. The report divides their questionnaire for finding out if the brand of the company or the D.R.E.A.M.S. framework (Mazzella & Sundararajan, 2016, p.18) is responsible for the results.

The Brand Effect

Over 88% of them answered that they highly trust BlaBlaCar over a generic platform with the same settings and services with 67%. It shows that brand relevance is highly relevant in the case of orientation and trust leveling.

The D.R.E.A.M.S. Effect

Next to branding, the report focuses also on the efficiency of provided trust tools of the platform. Compared to average levels of trust, 17% more to average members are trusting a full profile on an average ridesharing platform. They called it the D.R.E.A.M.S. Effect, which explains, that these high levels of trust are generated by their developed framework. They found out, that each of the six layers of the framework, "were increasingly correlated with bilateral trust as the experience level of a member grew." (Mazzella & Sundararajan, 2016, p.30).

Spreading trust across other platforms - “Close to half of BlaBlaCar members declare that ridesharing has made them more open to other people.“ (Mazzella & Sundararajan, 2016, p.34). If interpersonal trust can grow between peers in a peer-to-peer marketplace, is it able to spread also to other platforms? The interviewed people answered with 48% that the usage of BlaBlaCar and ridesharing in general made them more open-minded to other forms of sharing businesses 39% of them are already using second-hand marketplaces and one quarter of them house-rental marketplaces (Mazzella & Sundararajan, 2016, p.34).

Conclusion

Many tools have been developed over the last ten years which are increasing levels of trust within digital platforms across many digital peer-to-peer services. The transfer of trust across platforms becomes easier than ever. Trust becomes the peer's capital and also allowed them for great opportunities for collaboration. The report said:

“The power of this behavioural shift is manifest in its occurrence across countries and across age groups. In less than a decade, century-old social constructs have been superseded. Organisations are being dis-intermediated by connected peers, ownership is being replaced by shared usage, and even our ancestral apprehension of strangers is changing. As we reinforce our faith in each other through successful economic and social interactions with online peers, we grow the overall level of trust in society. When human beings trust each other more, a virtuous cycle of collaboration is set in motion. The possibilities become endless. We are at the dawn of an incredibly promising era. Together, we’re entering the Trust Age.” (Mazzella & Sundararajan, 2016, p.39).

4.2 Blockchain use cases

4.2.1 Features and opportunities of blockchain

The following chapter focuses on blockchain use cases separated into several sectors. During my research, I discovered two reports, showing very clearly the advantages of blockchain technology in the context of the challenges of development. The researched use cases are focusing on the goal to tackle sustainable development goals (SDGs) initiated by the UN in

2015. This plan summarizes 17 goals in a blueprint for peace and prosperity on the planet (UN, 2015).

This chapter is referencing the two reports because they are matching with my thesis question and topic. One report is produced by the Blockchain Trust Accelerator at New America, called "The blueprint for Blockchain and social Innovation" last edited Januar 2019, described three main characteristics and their advantages of blockchain.

The second report "Blockchain Applications and the Sustainble Development Goals" by the Institute for Global Environmental Strategies of 2018 (Rocamora & Amelina, 2018) analyzed opportunities of how blockchain technology can positively address development goals. Both reports structure and the way of categorizing sectors, where blockchain shows its impact and be beneficial serves as a template. The upcoming examples are enriched with other representative business cases and examples who are supporting the hypothesis.

Three characteristics can provide an increase in social impact and controlling of their processes and who will be very beneficial for organisations.

- Accountability
- Efficiency
- Security

Each of these features are often interconnected and they are often providing many more attributes. All these attributes can address many weaknesses of current centralised institutions. Security breaches or data leakage scandals changed public opinion about how much these platforms and their services can be trusted (Tillemann, et al., 2019, p.17).

Accountability

Private and public institutions are not able to increase institutional accountability worldwide, despite the fact of digitalisation. Many countries are not able to bring corruption to an end despite the fact that they would profit from efficiency increases and tax income.

The IMF showed in a new research that bringing corruption to an end "would deliver additional US$1 trillion in tax revenues annually across the world" (Transparency International, 2019).

Less corruption means also more efficiency in many areas. Investments and expenditures are more profitable and higher revenue rates will be the result (IMF, 2019).

The technology of blockchain can address these issues by decentralized ledgers with different layers of permission and privacy. It allows easier connectivity across different parties all over the globe. Public and also private blockchains can form transparency and traceability within their networks via auditable records of all transactions ever made. Know-your-customer identification (KYC) encrypted via public key creating a trustless environment where business activities can be processed.

Efficiency

Lack of efficiency is a serious problem for governments and private institutions and costs, for instance, the U.S. over US$3 trillion per year because of poor data quality (Redman, 2016). Governments with smaller budgets are to increase efficiency and providing better services at the same time. Blockchain can add fail-proof data networks within a decentralized environment. Verification of data or status updates can be established much easier by trusted nodes within the network. Every false input will be cleaned out of the blockchain by the consensus algorithm, automatically. Another point that drives efficiency is the decentralisation of master nodes. Status updates of the blockchain can be sent to the nearest node, instead to one central entity, which speeds up the transfer of information, especially in high demand networks is an advantage.

Security

More and more parts of human interaction and parts of economic life are digitized in the last couple years. With the process of digitization, comes dependency to these services. E-commerce, social media, cloud storage of data and many other services accelerates our workflow and how we transact information with tremendous results in efficiency and economic growth (Sabbagh et al., 2013). Sharing of information and feeding the internet's service companies with personal or business-related data comes with the necessity for more security. In year 2017 the Online trust alliance registered an "18.2% increase in reported breach incidents (RBS)" (Online Trust Aliance, 2017).

With the tremendous growth in the field comes responsibility to protect customer data against any unallowed access, several major hacks and data breaches on Social media platforms decreased the levels of trust in these services. Security is one of the major benefits of blockchain and can provide the highest standards of encryption and distributed storage of information across their nodes. Data and changes of information can be verified through the network of all participants. Another security factor is, that the de-centralized data storage can not go offline, because the whole data set is stored across all nodes. Identification and in the next step accountability are the most important factors in order to establish a system where blockchain can "play out their advantages". Even if they are encrypted it requires addressability. Many areas are deeply connected, which is a major advantage for users and the providers of the regarding services.

4.2.2 Basic Necessitities for fully functional decentralized networks

Functional networks with blockchain services have basic requirements, that people can have access it, and that it creates value to it.

Pure data in digital form

For generating valuable information that can be used by participants it needs access to data in digital form. The source of data needs to be trusted and pre-checked if they are correct. Inaccurate data will be stored in the distributed ledger system forever, which can not be solved by blockchain.

Access to the internet

In order to provide functional network access to the internet is necessary. Every change or transaction within the network needs to be uploaded to the distributed ledger via an internet connection. The quality of the connection is often linked to the requirements of the particular network. For instance, "internet of things" devices need only a small bandwidth in comparison

to big blockchain networks with a high number of master nodes with higher demands (Tilleman et al, 2019).

4.2.3 Different sectors

Blockchain technology and their services have an impact on every industry. It is estimated that blockchain will add the value of $176 billion by the year 2025, and in the following it will exceed $3.1trillion by 2030 (Granetto, Bianca et al, 2017).

A report from Hileman and Rauchs about global Benchmarking study in year 2017 evaluated, that industry sectors with the highest impact on blockchain technologies will be banking and finance (30%) right after Government & Public goods (13%), insurance (12%) and finally the healthcare sector (8%) (Hileman & Rauchs, 2017). The following examples of institutions and companies using blockchain are sorted in different sectors, who will be affected by the technology. Use cases are just representatives for becoming familiar with the topic and are not complete.

A McKinsey report (Carson et al., 2018) highlighted that the sectors of healthcare, agriculture, insurance, public sector, property management, financial services and utilities will be affected by blockchain.

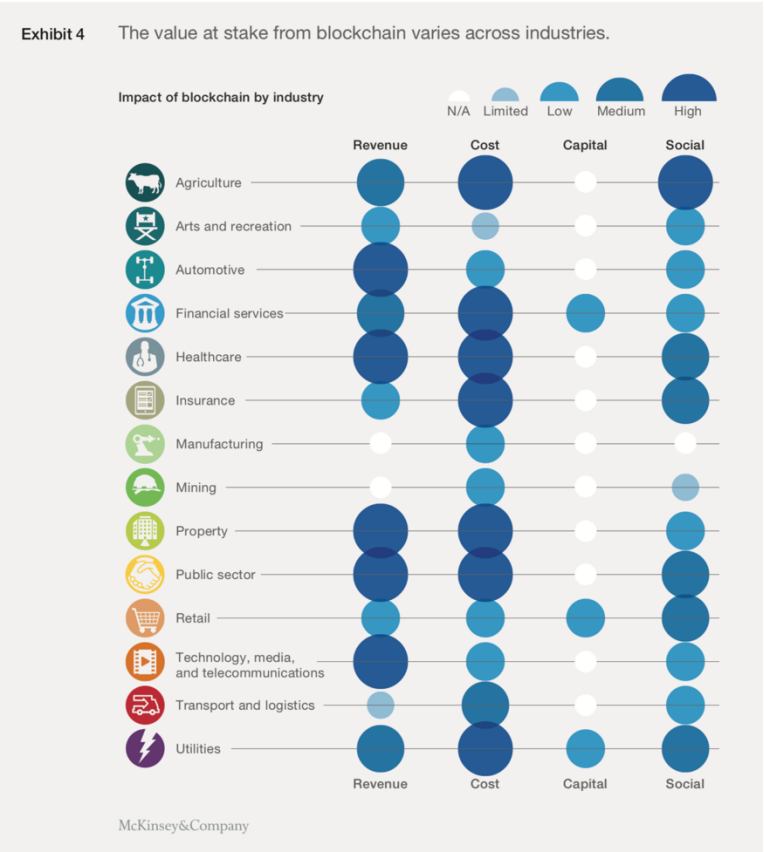


Figure 3: Carson, et al, 2018, p.6, The Value at stake from blockchain varies across industries

4.2.3.1 Public Sector

4.2.3.1.1 general Identification - Know your customer (KYC)

Being registered after birth in a governmental institution comes with many benefits for the individual. Every child takes advantages like having access to governmental services, such as health, education or social security. An identity can protect from child labour, human trafficking and child marriage. UNICEF estimated in year 2016, that round about 230 million children worldwide, under five years old have never been registered (UNICEF, 2016). In Nigeria, 19.5 million children alone under five, or in other words, 60% had no birth certificate in the year 2017 (UNICEF, 2017). It is easier for governments saving children from child labour, when they are registered. Then they can equip them with social security and education (UNICEF, 2016).

An identity accompanies an individual their whole life and helps them to have access to the public and private services, like banking. This traceability comes with accountability, but treated well, it can be the starting point for benefits they can make use of it. Digitized identities are the entry ticket to many more services, which will provide many advantages on both sites. Putting birth certificates on the blockchain is a major step towards more efficiency and data security. Local governments in the state of West Bengal in India are moving birth certificates on the blockchain in collaboration with the company Lynked.world from Holland. The certificates will be put on the blockchain after verification by local authorities. Regarding the reports their goal was it to put one million certificates on the blockchain till the end of 2018. After successful implementation, more legal documents and the other certificates will follow. Indian citizens of the state Tamil Nadu can download birth-, and also the death certificates 21 days after the event for free from the government website (Sunny, 2018).

Figure 1. Blockchain in the public sector, as of March 2017

Blockchain experiments in the public sector are accelerating globally, with a concentration in the US and Europe.

Top 10 most active public sector use cases*

1. Digital currency/payments
2. Land registration
3. Voting (elections)
4. Identity management
5. Supply chain traceability
6. Health care
7. Voting (proxy)
8. Corporate registration
9. Taxation
10. Entitlements management

* Measured by observing the number of public sector blockchain experiments planned, in progress, or stalled globally

Color coding key

- In progress
- Planned
- Announced

Source: Deloitte analysis in conjunction with the Fletcher School at Tufts University.

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Figure 4: White, et al, 2017, Blockchain in the public sector

A research from Deloitte and the university of Tufts shows a global overview about blockchain initiatives of governments, who are planned or already in progress.

4.2.3.1.2 Know your customer - Identity systems within digital services

Online banking and other online business services require a certified identity from the participants. What is also called Know your customer (KYC), individuals are able to apply for loans or business interactions online. With authentication, illegal activities like money, and

other fraudulent activities can be prevented. This authentication system with different levels of privacy, allows undreamed-of possibilities in services secured by blockchain for the participants. The graphic below provide an overview of where an individual needs authentication within in its digital activities across the year. Data brokers create data profiles about individuals from all parts of their life, which are then sold to third parties. These data profiles are becoming richer with every interaction. Data sets including for example: Court and Public Records, Social media, general interests, financial, purchase history, health related data, and many more (Mirani & Nisen, 2014).

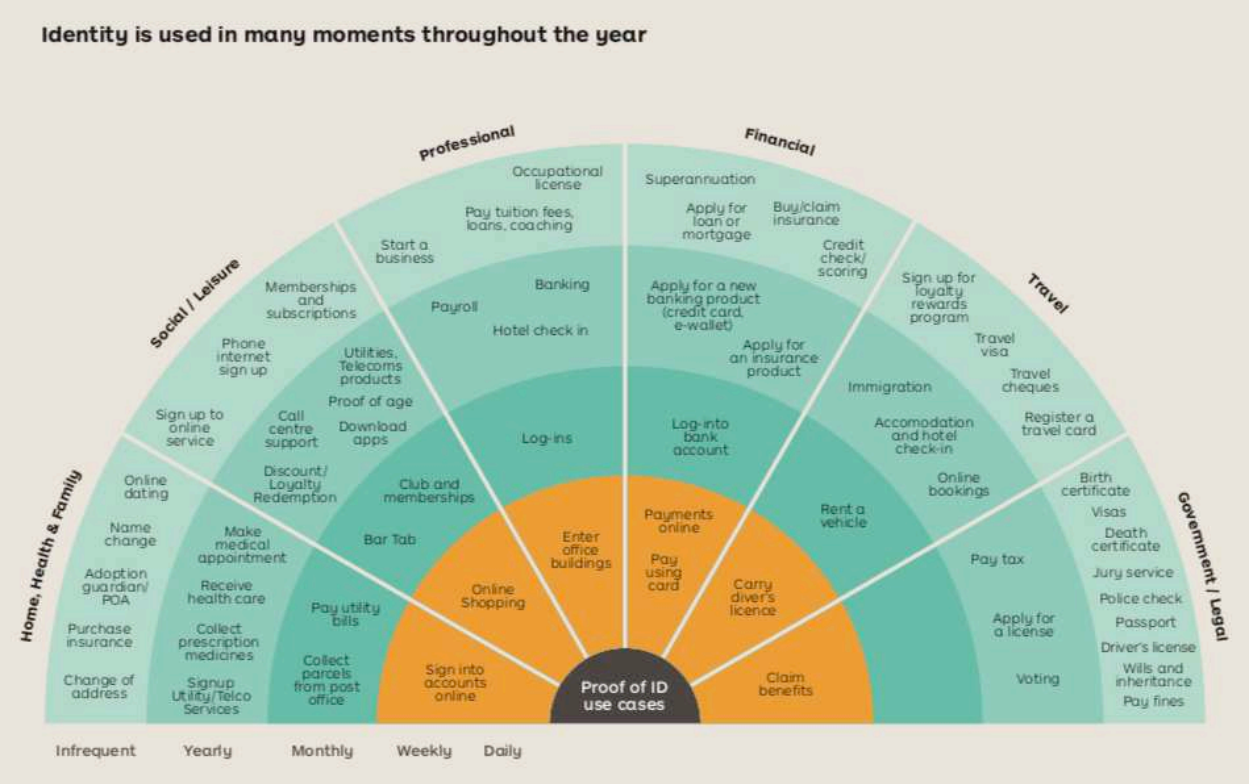


Figure 5: Australia Post, 2016, p.9, Identity in use during the year

The United Nations formulated in their Sustainable Development Goals (SDGs) a target indicator for addressing these issues. They mentioned: "By 2030, provide legal identity for all, including birth registration."(UN, 2018).

The WorldBank supported the SDGs with their own initiative called Identification for Development (ID4D) that recommends the use of biometrics for fulfilling the Sustainable Development goals of the UN. These ID systems should pave the way for financial inclusion, for

having access to financial and health services, or the right to vote. It then can also increase the efficiency of public services and administration, next to a better tracking of development (WorldBank, 2016).

Private companies, for instance, EVERNYM, are working on a secured, blockchain supported the solution that provides people with one single identification which can be used in many different applications across the internet. The individuals decide where and how many data will be shared with the particular company. Multiple passwords and identities become obsolete. The personal data is encrypted and decentralized without the typical multiple data leakages across the different platforms. Another interesting point is that the individual will be able to start trading with their own data instead of third-parties (Chandler, 2019) (Windley, 2017) (Evernym, 2019).

4.2.3.2 Governmental services

Governmental institutions are often underfinanced in many developing countries. Public services can be positively impacted by the use of blockchain technology and a study from Hileman and Rauchs in the year 2017 showed that 77% of 42 countries interviewed are interested in the advantages of blockchain (Hileman & Rauch, 2017). Central banks focusing the areas of payments like, remittances, real-time gross settlement (RTGS) systems, interbank payments and asset transfers. Public sector institutions focusing more on the records of identity, ownership and businesses. Other topics, like voting, audits, payments and taxes are an interesting field, where blockchain can play out its advantages.

Blockchain can make governmental services much more efficient. In addition to digitization of governmental services, like registering new-borns for getting a birth certificate, automation with smart contracts will be the next layer of highly efficient services, where governments can offer their citizens high quality services. For instance, the whole process of land titling can be fully automatized. Starting from registering, to getting a certificate till the change in ownership of land titling can be fully tracked on the blockchain via smart contracts. No civil servant in the whole process is involved. Automation of these services will provide trust (Forde, 2018). This

will drop the pricing of these services and any possibility of corruption will diminish. Within this zero-trust process of zero-failure, the trust of citizens in governmental services will also rise again, which will in the same way motivate the private sector to participate more politically and publicly (Corydon et al. 2016).

Blockchain could be successful in governmental services in three areas (Killmeyer, et al, 2017, p.13): Bookkeeping, the automation via smart contracts and value transfer. It is presumed that governments and states can save money and resources that way. Governments have a responsibility for providing their citizens a working system with legal documents, and legal documents. If they can not provide citizens with appropriate services, private companies, like Aragon are already challenging this governmental responsibility with various blockchain services and organisational structures. They are providing them with organisational platform services on the blockchain, where people can build their own organisations without any intermediaries and fully decentralized. The platform works like Decentralised autonomous organisation (DAO), where human activity can be governed without any state form. They are building an entity on the Aragon network for shared billing or voting and also sharing where everybody can benefit directly. The foundation is based on the Aragon platform, where organizations in all its dimensions with all their protocols will be build. The other element is the digital jurisdiction, called the Aragon network. Aragon's vision is that people can use their platform directly without intervention of unwanted third-parties (Aragon, 2019).

As we heard, the next step is to put many governmental services online, secured by blockchain. The government of the United Arab Emirates (UAE) shows serious interest in using blockchain in governmental services. The registration of businesses or central bank operations or the usage of smart contracts for recording data and transactions are possible use cases. Since 2016 Dubai has been working on the goal of using blockchain technology for all transactions by 2020. This initiative comes with the estimated savings of AED 11 billion (roughly $3 billion) per year on document transactions, reducing the amount of documents issued by 389 million and save the state 1.6 billion kilometers of driving and estimated 77 million hours of work (Government of the United Arab Emirates, 2018).

Ledger technology and smart contracts are a chance for automatic taxation. The whole taxing process is mainly a paper-based system and often very bureaucratic, because of its wide variety of taxation within states. The advantages of a blockchain supported taxation systems will positively trigger governments' revenues. It will help to avoid tax evasion and increase trust in governmental institutions per se. Because of its fully encrypted process, it could reduce the risk of fraud and corruption among the civil servants (Rocamora & Amelina, 2018).

Digital tax collection

Corporate taxes and individual income taxes can be easily paid at its origins. With the support of smart contracts, citizens pay their income taxes automatically executed. This system creates advantages for both parties like reliability and reduced bureaucracy (Aijenka, 2017). If all sales and revenues are on the blockchain, automatic taxation will be possible.

Automatic, cryptographically secured taxation system will free up a lot of resources on both sites. It will guarantee governments stables, foreseeable income streams, and safe effort in preparing and execution of taxes.

(Gracia & Gardner, 2017).

Collection of indirect taxes

Depending to the country, there are existing a wide variety of indirect taxes, as such: Value added tax (VAT) or Goods and services tax (GST), or sales and energy taxes. All these taxes are normally caused by the event of, payment or usage. The challenge is often to calculate the exact amount, because indirect taxes are related to the amount of payment and information.

Blockchain is able to create a rigid automatically executed payment system where taxes can be collected in real-time.

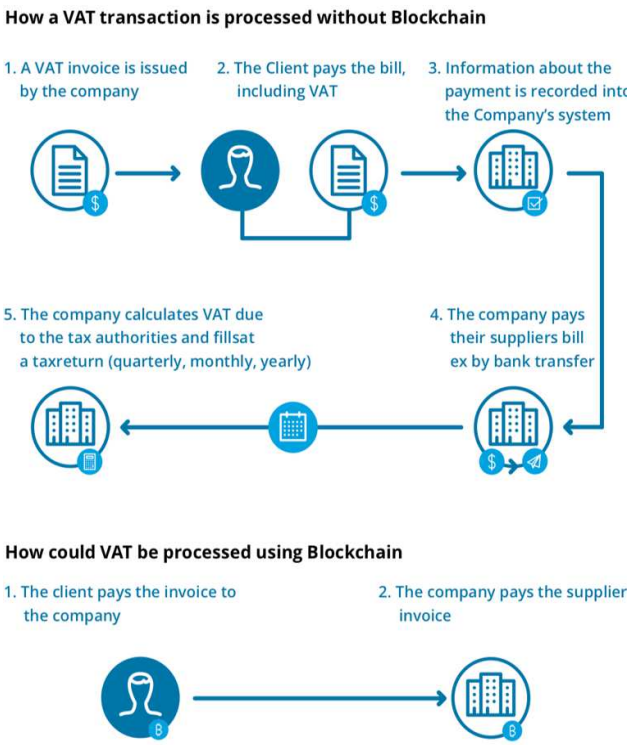


Figure 6: Deloitte, 2017, p.13, Different kinds of collection of VAT taxes

Reduction of tax evasion

Preventing tax embezzlement and payments will be much easier with a fully digitized workflow. Taxation within a blockchain based system will not only allow to track payments much better, but also provide much richer information about each taxable event. VAT with its sensitivity to local context will be much better collected. Blockchain enabled systems will not only enable micro transactions but also include location-sensitive auto taxation possible (PwC, 2017). The importance of a closed tracking system of payment data from the start is shown in an example from Quebec, Canada. Local authorities dictate the local restaurant sector, (20.000 locations) the usage of Sales Recording Modules (SRMs). The tax returns raised from USD 940 Million in 2015 to an expected return of USD 2.1 Billion in the years 2018-19 (Revenu Quebec, 2018).

Secured Voting / Elections

The next logical step after the authentication of citizens via blockchain could be to implement and enable voting for direct democratic and secure voting overall. Switching over to a blockchain driven voting system is not common and is as sceptic also in western countries, despite all the advantages like security and less bureaucratic work for government. But there are existing examples for blockchain enabled voting system in developing countries with limited resources and high chances of electoral fraud.

Electronic voting systems secured by blockchain

One small example is the midterm election in West Virginia, USA in year 2018, where 150 soldiers living abroad had the opportunity to vote via blockchain powered app, named Voatz. Since then, voting abroad via the app was extended to 24 states of the USA and even further. Female candidates in Nigeria, Africa used Voatz technology for supporting 2019 campaigns in General Elections. Voatz technology was used for building a political platform for supporting women applying for office and starting discussions. The app called Women influencing Nations

(WiN) was designed for posting social media content, attracting followers and also collect donations via mobile money (Braseth, 2019).

Personal commitment and other forms of direct democracy

As more secure and transparent democratic voting is, as higher will be the voting participation rate. Blockchain-powered voting reduces fraud by its decentralised voting system and weakens the central authorities responsible for organising the elections, just focusing on re-election (European Union 2016). Direct democracy will lead to a more politically active society. The mentioned blockchain powered voting app Voatz already leaded to more than 70.000 votes across different votings and jurisdictions (Kuebler, 2018). The company nVotes runs a lot blockchain elections across the world. nVotes was used for the Madrid City Hall election in Spain with more than 2.7 Million voters (nVotes, 2019).

Land titling

Having no access to land titling affects nearly 70% of the global population mentioned the World Bank Group in 2016. Many people in these countries are under danger becoming eventually a victim of land fraud or grabbing, because of corrupt local authorities and other reasons. For instance, in Ghana, Africa about 70% of legal disputes in court are land titling related. That's why the government partnered with the startup BenBen for addressing this issue and enabling a nation-wide property rights system. The platform verifying land titles for citizens and financial institutions, giving them access to an automated property transaction system (BigChainDB, 2017).

The final example from Georgia is probably the most famous one

Missing identification and registration of land titles, insufficient track records of persons, goods, assets and businesses created a lot of problems in the country Georgia. Cases of corruption in the public administration regarding land ownership or disproportionate effort for citizens to be officially married caused many challenges. The National Agency of Public Registry of Georgia started a project with the blockchain mining company BitFury and the economist Hernando de Soto in order to manage land titling and identification on the blockchain. The government wants to fight bureaucracy or corruption and asked them to provide a solution with the goal to

ease up the management of land titling. Before the blockchain project, registering land or to register a change in ownership cost $ 50 to $ 200 depending on the urgency. Through transferring this notary process on the blockchain the costs dropped to $0.05 - $0.10.-. George Kikvadze, vice-chairman of BitFury board mentioned in the article of the Forbes magazine in 2016, “The outcome would be citizens of a specific region have a smartphone application and they’ll be able to move their assets, and that movement will be corresponded to tokens moving on the blockchain and doing it with even less friction than what the country has now,” (Shin, 2016).

Georgia made immense progress in fighting corruption, among others with integrating blockchain technology into their governmental administration. The republic of Georgia was ranked at place 123 on the Transparency International Corruption Perception Index in the year 2003. In the year 2019 it progressed to the 41st place (Transparency International, 2018).

According to World Bank, Georgia is ranked the 4th place in year 2018 in the number of days registering property. It takes only one day registering property in comparison to, for instance, Honduras, which is ranked on place 91, taking 29 days and 6 administrative steps to fulfill the procedure. This project was so successful that other governments like Peru signed up for BitFury’s solution.

Bringing land titling on the blockchain had three main advantages. Bringing data on the blockchain will make the captured data more secure and impossible to corrupt by third parties. It saves a lot of time for governmental institutions, because of audits in real-time. The third advantage is the cost reduction through shortening the whole process and lowering friction. A successful implementation of such a project is only possible, when all stakeholders are in the boat. Especially when old power structures are affected by the new inventions, it takes some sensibility, finding ways for implementing new procedures in the proper way (Shin, 2016).

Sometimes governmental representatives having doubts integrating such systems because extra income resources from corruption within their offices will be impossible. On the other site, an increase in tax returns can be expected, which can also be used for higher salaries,

which makes corruption as an additional income source obsolete. The cases discussed here indicate that blockchain solutions in the public sector tend to be a huge success. Next, we will examine how such solutions fare in the private sector.

4.2.3.3 Banking the Unbanked

The World Economic Forum stated in a report from 2016, that"Blockchain Will Become [the] 'Beating Heart' of the Global Financial System" (Vanham, 2016).

Today's financial system is built on many intermediaries which makes it very slow and expensive to operate (Tapscott & Tapscott, 2016). This is also reflected in the high entry costs for getting a loan or even a bank account. Blockchain's advantages and its decentralisation will show the opportunity for peer to peer lending and financing initiatives.

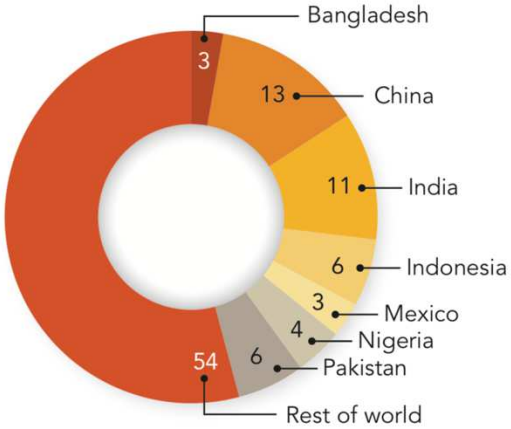
Nevertheless, nearly 1.7 billion people worldwide had no access to a bank account as of 2017, after accounting for the growth of global population. The world is on a good way to financial inclusion, because in year 2015 two billion people were unbanked (World Bank report 2018).

Most of the unbanked people are living in developing countries, like India, Indonesia, many states in Africa and South America.

FIGURE 2.1

Nearly half of all unbanked adults live in just seven economies

Adults without an account by economy (%), 2017



Source: Global Findex database.

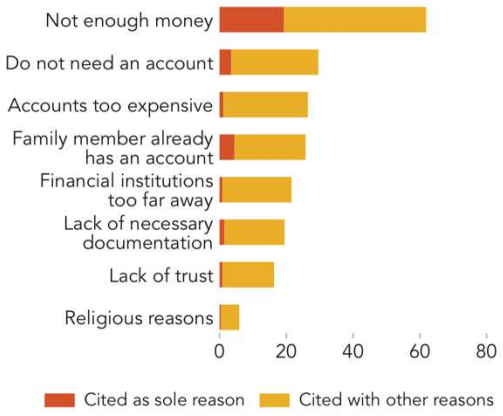
Figure 7: Global Findex, 2017, p.36

Figure 8: Global Findex, 2017, p.40, Reason and other barriers of having no bank account

FIGURE 2.11

Lack of enough money is the most commonly cited barrier to account ownership

Adults without a financial institution account reporting barrier as a reason for not having one (%), 2017



Source: Global Findex database.
Note: Respondents could choose more than one reason.

DISADVANTAGES of being unbanked

Having no access to financial instruments, creates a lot of disadvantages for the people who are affected. With no legal identity, individuals don't have access to financial services. Mostly, they can not build a financial record, barring them from access to loans, because of a missing credit history. This affects society and its entrepreneurial activities are declining. On the other hand, people in these areas have easier access to cell phones, then to clean water. That paves the way for new opportunities to give people access to financial services (Global Findex, 2017).

In the beginning of the 1990s phone companies in many African countries started offering financial services. This enabled a lot of benefits for people with no bank account or who don't even have access to it, especially in rural areas. The mobile phone company M-PESA was the first to provide banking services. Nearly half a billion people are using similar services now in over 90 countries and do banking over their feature or smart phones (GSMA, 2015).

The startup BITSOKO from Kenya is the answer to the high transaction costs of M-PESA, who are between four and ten percent per transacted amount of money. BITSOKO charging customers just half a percent and their transactions and are more secure and transparent. After support of the Gates Foundation in the year 2015, BITSOKO established more services and offers for feature phones who are more available in the region. Later in year 2017, the GATES FOUNDATION founded its own service in cooperation with the company Ripple. Their focus is on providing governments platform services combined with blockchain technology (Johnson, 2017).

Addressing the Unbanked in Sierra Leone

Julius M. Bio Sierra Leone's president of Sierrra Leone initiated a project which addresses the challenges of the unbanked in his country in 2018. The United Nations and the company KIVA.org helping unbanked citizens to build credit histories with the support of blockchain. They built a platform on the open-source *Hyperledger protocol* where citizens can store information about their financial activities in a secure and private way. Stored information includes financial activities, micro-loans and their loyalty for evaluating their credit worthiness. After digitizing the financial records of 5 million of its 7.1 million citizens since the year 2016, using the companies' KIVA blockchain protocol was the next logical step in increasing the

quality of the service. KIVA gained much experience in that field. Their platform is active in over 80 countries and processed $ 1.2 billion dollars in micro-loans to 1.7 million people. With every transaction they gained experience, especially in the field of repayment of micro-loans, next to technical expertise and working experience across many different countries. Their growing network and its network effect becomes the product, not the initial service. "With a 96% repayment rate, Kiva is hoping to take its success in micro-finance towards access to financial records." KIVA's partnered with 500 institutions across 80 countries allowed it to create a self-sovereign ID. For instance, the government of Sierra Leone can take advantage of this identification mechanism to provide other services for their citizens (Huang, 2019).

4.2.3.3.1 Remittances

Remitttances are a major source of income for families and people with relatives in foreign countries sending to their relatives. Global remittances to low-, and middle-income countries went up over 9.6% with USD 529$ billion in 2018 to its year before. The costs for sending money is still high with a global average of 7% per transfer. Sending to countries in Africa and the pacific area is even more expensive with an average of 10% (WorldBank, 2019).

A normal bank transfer between two accounts is normally processed via the centralised protocol of the Society for Worldwide Interbank Financial Telecommunication (SWIFT), when the two banks don't have already financial relationships. SWIFT sends the money to an interrelated bank in its network, which has a relationship to both banks. Intermediaries charge a percentage as a fee, making cross-border payments expensive and slow (CBInsights, 2018).

Blockchain's features are able addressing SWIFTs challenges, regarding time and costs. It is even able to completely replace this network with its features. The advantages of distributed ledger technologies (DLT) in combination of blockchain will enable features like, reduced settlement and data management costs, flexible settlement times, automated clearing, traceability and transparency and enhanced security and resilience (Benos, et al., 2017)

Using these features will allow cost savings of about USD 16 billion in insurance and banking fees and transactions in almost real-time, instead of 3-5 business bays (Maity, Saktipada, 2016).

4.2.3.3.2 Automated clearance and settlement systems

It is currently estimated, that blockchain-based banking on distributed ledger technology will save up to USD 15 to 20 Billion per year by 2022 for the whole financial industry (Wyman & Anthemis Group, 2016).

The company Ripple offers in conjunction with the consortium R3 CEV settlement services on the basis of permissioned blockchains, with the goal of replacing the current SWIFT system (Allison, Ian, 2016). Banks of Japan and South Korea trialing Ripple's services since December 2017 and are able to cut costs by 30% and could reduce transaction time to a couple of minutes (Nikkei Asian Review, 2017). In 2019 Ripple announced, that more than 200 customers contracted with the company. RippleNet provides its services in over 40 countries right now (Ripple, 2019).

4.2.3.3.3 Peer-to-Peer banking & lending

As mentioned earlier, the world bank stated that nearly 38% of the global population does not have a bank account and nearly 91% living in developing countries struggling to get access to a classic bank loan (World Bank 2015). Often Banks can not grant loans to people in developing countries, because their risk evaluation systems are based on credit history or credited addresses, people often don't have (Tabscott & Tabscott, 2016).

Blockchain and its features allow more accurate risk evaluation measurements and can give them easier access to financial services. SMEs can participate in the advantages, where, for instance, agricultural communities can help each other with lending services. The company Cognizant forecasts a market potential of USD 380 billion of bringing nearly 2.5 billion unbanked people, worldwide to financial services (Baruri, 2016).

Peer-to-peer lending platforms are more and more providing an alternative and filling the need for loans and financial services. Companies like Kiva.org or Zidisha are connecting entrepreneurs and lenders from developing countries together with investors around the globe. Zidisha founded already 233.062 projects and conveyed around 16 Million dollars on micro loans (Zidisha, 2019). The company focuses on micro lending. Entrepreneurs, farmers, and all kinds of small businesses publish their project with all necessary side information on the platform. If lenders are interested in funding, they can ask questions, discuss the project and if they are satisfied, they can borrow the sum (Zidisha, 2019).

Peer-to-peer lending with blockchain embedded, provides even richer services who are more secure and efficient.

Other advantages are:

- they can provide the same and even higher security standards as traditional banks via cryptographic security and decentralization.
- Blockchain is able to capture, access and connect different data silos and bringing them together on one blockchain.
- in the traditional lending process there are intermediaries, like notary or underwriters involved, increasing costs and expense. This process causes high fees, and process time.
- If both parties' identities are on the blockchain, no notary or other third-party trust mechanisms will be necessary. Then blockchain can offer transparency within the whole process.
- Smart contracts can play a vital role within the lending process and make it even more flexible. If, for instance, a loan is splitted into several smaller portions and are tied to mile stones, a smart contract can play out its auto-execution features. The borrower loads up viable information about its progress of, for instance, building a fence, and after a local p2p confirmation, the next portion of the loan will be automatically transferred. All necessary legal details and actions can be set in fully automatic conditions without any additional audits (Jangwal, 2018).

For guaranteeing credit history, the company Bloom does credit- scoring on the Ethereum blockchain. On their end-to-end protocol they store identity, risk assessments and the scoring

of credit. Its platform's goal is to put lenders and its data on the blockchain globally, with the aim to create a complete credit registry databank. Then the platform provides on-demand access to credit services (Leimgruber, 2017).

4.2.4 Business sector

4.2.4.1 Supply chain management

Producers of goods and their buyers all around the world are struggling under the complexity, high costs and pitfalls of supply chain management. The shipping company Maersk found out in year 2014, that the shipping of cooled goods from Africa's East to Europe "can go through nearly 30 people and organisations, including more than 200 different interactions and communications among them." (CTMfile, 2017).

Many of the resource-intense processes are already digitized but the system and its information within shipping is mainly based on trust and dependent on verified information. Supply chains are exposed to fraud and wrongdoing because of the complexity of the environment, their widespread supplier network and the lack of internal policy control mechanisms (KPMG LLP, 2017).

The challenge is that members of the supply chain have their own data management system with different software and non-standardized processes. These data silos are centralized and not shared within the whole network, which creates additional risk and costs of adding and editing the data of predecessor. Then in the next change of the process, the problem repeats itself and data will be transformed in the next data silo.

Here blockchain and IoT come into play, which can transform and enhance the supply chain sustainably. The first step is to establish a decentralized data base, where all participants store their data in a standardized and protected way on the blockchain. All stakeholders can access the relevant data on one single platform, increasing the responsiveness of the system. Transparency of data and traceability within a supply chain platform will reduce fraud and allow the optimization with business intelligence tools**.** To guarantee quality and standards during the

whole supply chain process, starting from manufacturing of goods, to transportation, and finally, within the sales channel it is necessary that all processes are digitized and tracked from the beginning. Pre-settled payments on the blockchain can be regulated by Smart contracts. Disputes and insurance cases or even final delivery of a good will automatically trigger the execution of the payment. Within one peer-to-peer network all legal documents can be interchanged between parties.

Internet of things (IoT) will place the missing link within the system. IoT sensory systems can capture all the analog information and sending it to the network in a digital format. IoT are defined by two key components: Things and sensors or beacons:

Both in general, are attached to an object, and can permanently track and communicate data captured by a wide variety of sensors. Depending on the sensor's ability, they can track locational data, temperature, light, speed, and many more states and can send this next to its identity and behavior (Singh, 2019), (Datafloq, 2019).

Tracking of seafood

Incorrectly labeled seafood negatively affects many stakeholders in the industry. Illegal fishing hurts the ecosystem and in the later stage it hurts the reputation of sellers, restaurant owners and harms the consumer, if fish is badly stored and of bad quality. More than 20% of fish in the USA is mislabeled according to the report of a seafood fraud investigation of Oceana (Oceana, 2019).

The company "Hyperledger Sawtooth" provides with its modular platform a solution for the whole supply chain of seafood. After the catch, the fish is marked with an RFID marker and other IoT sensors, who are constantly tracking the location and time. Alle participants have access to the data saved on blockchain (Jenks, 2018), (Sawtooth, 2019).

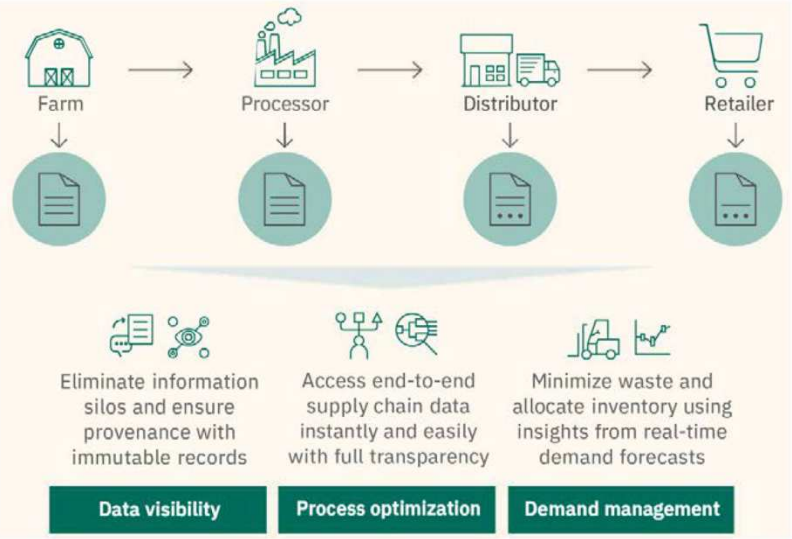
Tracking Tuna Fish

Another project bringing more transparency into tuna fishing and fighting unreported and unregulated fishing is built by the World Wide Fund (WWF) in partnership with a fishing company Sea Quest Fiji Ltd. and two tech companies from the USA, named ConsenSys and TraSeable. The goal is to track Tuna from "bait to plate" across the whole supply chain.

RFID chips and in the later stage QR codes are used for constantly tracking and scanning the fish even finally in the supermarket for end-consumer (Visser & Hanich, 2018).

Tracking food across the supply chain enables many opportunities. Consumers can act more responsibly and have more information about the products. For the fishing industry it is a chance to eliminate illegal overfishing and establish a new sustainable fishing via full transparency.

Figure 9: Supply chain benefits of using blockchain in the food industry



Source: IBM (2018)

Figure 9: IBM, 2018, how blockchain can bring transparency into the supply chain

Uncontrolled transportation standards and no tracking at all becomes challenging for the food supply chain when the source of a contaminated product needs to be identified. Recalls are very expensive and took weeks and sometimes months identifying the source of contamination, because of the lack of tracking data. Contaminated food is responsible for about 420.000 deaths worldwide according to the World Health Organisation (WHO, 2015).

That's why a group of large food supplier and producers like Nestle, Walmart and others are cooperating with IBM to establish a blockchain-based consortium for finding new ways of securing the supply chain network with blockchain. One of the goals is to develop a shared data network where the sources of contaminated food can be faster identified (del Castillo, 2017).

The company **BANQU** is providing farmers in developing countries a feature-rich platform secured and handled by blockchain for getting access to credit and a market place with fair pricing for their goods.

Producer and buyers of goods have several problems within the supply chain:

The producer is exposed to the greedy lending conditions of the informal market. They are often dependent to it because of their inability to build financial identity. Bad payments forcing farmers into bad labour conditions, like child labor.

Buyers and also the companie's brand are vulnerable to the bad public press, which can in the later stage damage the public facing image. With an undocumented market, constant supply is at risk and can hit the overall efficiency.

When farmers, companies and other stakeholders join Banqu's platfom, they have access to a wide variety of services and advantages. Banqu brings transparency and traceability to the supply chain network and its platform is flexible enough to handle all the stakeholders' needs. It all starts with an economic identity of farmers. Over time they can feed their identity with other information streams like connecting their information about the ownership of land or the quality of soil and what they are currently growing. All these actions will increase their reputation. Banqu connects the farmers to the buyers and provides them with the background information for guaranteeing full transparency around the supply chain. The platform provides full last-, and first mile visibility. This attracts more buyers and can take out underpaying and corruption. Regarding gender equality, a digital identity can be a chance for bringing women farmers to business. Often, women don't get access to financial services. With Banqu they get many things at once:

A platform for growing their own reputation for getting access to credit and a secure market place for selling their goods. Everything can be made via smart phone or any other device available.

The beer brewing company Anheuser-Busch InBev partnered with Banqu in year 2018 for capturing the market of the vegetable Cassava grown by Zambian farmers. It all started with a pilot to connect with 2.000 farmers to track their sales and have access to 2.000 tons' vegetables. Banqu connected farmers directly with the beer brewing company as a customer and eliminated the banks as middle men. Anheuser-Busch InBev was able to optimize its

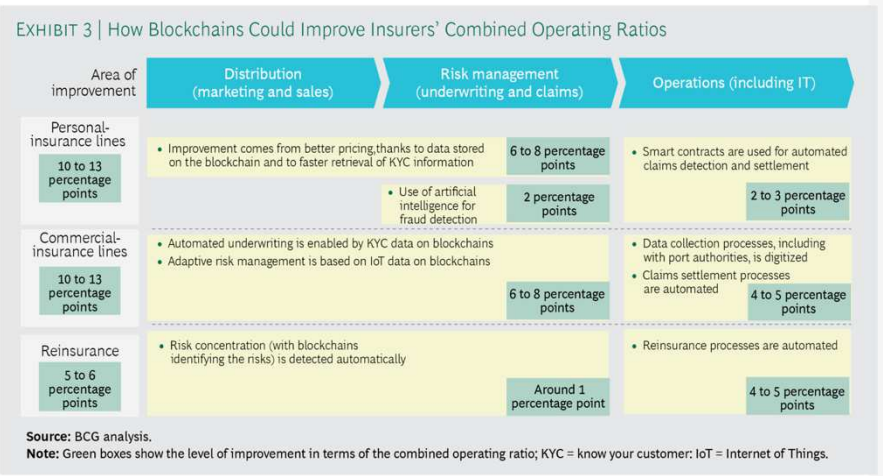
operations via the Banqu platform, providing additional crop insurances, labor laws and direct crop tracking. The company intensified their business relationships with Banqu and announced an investment into Banqu over its investment arm ZX Ventures for extending Banqu's business more internationally. Now they are operating live in 12 countries with a network of 4000 farmers (Banqu, 2019) (ABInBev, 2019) (CisionPRNewswire, 2018).

4.2.4.2 Micro Insurances

The insurance industry will be affected by blockchain applications at most. The market is dependent on data analysis and modeling of risks. As more the company knows about the customers' behavior, as better it can develop profiting services and products (Light, 2014; Reiss, 2016).

Blockchain technologies can provide access via shared distributed ledger technologies (DLTs) where all different data streams can be collected and accessed by certain partners with special permission. Blockchain and its smart contracts will allow automated insurances. Access to insurances will be easier, as they can be easily added to an existing value stream. The diagram below gives a good overview of how many percentage points the insurance market can be optimized by the integration of blockchain (BnP Paribas, 2018).

Figure 10: BnP Paribas, 2018, Improvement of the insurance market with the support of blockchain technology



Automation of insurances via smart contracts

Like in the case of the company Banqu, who provides a platform for farmers and buyers of their grown crops, micro insurance products against crop failure are fully integrated. Stakeholders who are already on the DLT will have immediate access to an insurance, which creates

additional inclusion. Insurances can be designed as fully automatic and autonomous. Dependent to external and internal data streams like weather information, farmers will get paid automatically.

Blockchain and peer-to-peer insurance products

Like in p2p platforms and sharing models like p2p lending, Zipcar or Match.com, bringing individuals with shared interests together. Blockchain on the Distributed Ledger can enable new insurance business models, where insurance products are managed fully automatic via smart contracts. They are not physically bonded anymore and can be accessed via DTL all over the world with no extra costs. All participants of the network can manage their risks by their own powered by smart contracts. Peer-to-peer insurances on the blockchain will make them more affordable, which might be interesting for social contracts and public social services. Deloitte developed together with several startups named, Stratumn, LemonWay and LenderBot a micro-insurance platform. People organizing and applying to insurances via chat. In that case, they are securing each other's valuable electronic products for a short period of time (Caetano, 2016) & (Parker, 2016) & (Clay, 2019).

4.2.4.3 Micro Financing / payments

The paper "Distributed Ledger Technologies for Developing Asia from December 2017 of the Asian Development Bank provided an overview and good examples about DLT and its advantages in the context of finance.

Data from a survey by the Asian Development Bank (ADB) shows that 57% of trade financing requests are not granted. SMEs didn't have a much higher rejection rate than global companies, whose rejection rate was just 10%, but the financing gap was nearly $ 1,5 trillion USD in year 2016 (Asian Development Bank, 2017). Missing information and credibility of companies or lack of collateral are the main reasons. A missing trade history of past commercial transactions or lack of knowledge about the financial industry are often a problem. Governments and banks in

Asia are aware of the SME's problems and designed several initiatives for addressing these challenges.

The integration of DLT will revolutionize trade financing markets within developing countries. Bureaucratic hurdles and time-consuming processes and complex paperwork with a high rate of failure will be replaced by smart contracts which execute money transfer automatically after accreditation. Smart contracts are executing automatically in particular events, like product orders executing payments without any middlemen or banks necessary. SMEs get access to international markets and money at the best possible rate (Ferrarini, et al. 2017).

Deloitte developed a proof of concept for an Indian bank based on the Ethereum blockchain and reduced the processing time "from (letter to credit) 20 to 30 days (as been the industry norm) to a few hours and provided an unprecedented visibility to all involved stakeholders" (Deloitte 2019).
Another example is the startup Sweetbridge, which lowers entry barriers for SMEs with cheaper costs of trade finance with the opportunity of strengthening payment cycles. Long payment cycles within supplier contracts increase the costs for having enough cash flow within the whole end-to-end supply chain. At this point, Sweetbridge comes into play, allowing the participating firms to use their assets and also their upcoming revenues as security for temporary financing. These assets will be written on the Sweetbridge blockchain and are saved in a secure escrow account. The digitization of liabilities and collateral assets allowing participating firms using their future earnings and bridge-financing their upcoming demands (Nelson et al. 2019).

This paper mentioned also implementation challenges. Trade finance is very paper-, and time-intense with lots of middle-men involved. Standardization or an establishment of interactions across different workflows or laws on a global level are challenging and hard to level the playing field. When the number of digital identities of companies grow, levels of trust will also increase. It is a long way to global DLT implementation, but when networks grow, advantages will also increase. The G20 established an initiative for increasing financial stability called the Global Legal Entity Identifier Foundation (GLEIF) in the year 2014. With this standardized system, it is possible to identify corporate ownership structures and other relevant business data. There are

currently 500.000 companies suited with a Legal Entity Identifier (LEI). Another way of increasing standardization is the World Trade Board's Digital Standards in Trade (DST) started in January 2018. It addresses lacking standards in the trade system like data sharing and communication with seamless end-to-end trade transactions worldwide (Beck, 2016).

4.2.5 Sustainability / Charity / Aid Sector

4.2.5.1 Aid Monitoring

Aid Monitoring and Results-Based Disbursements

As was already mentioned in the first chapter, one major problem of aid support is monitoring and reacting to the right problems. There is often not enough data available and whole aid processes can't be tracked until the beneficiary gets the money. Tracking and monitoring of paid-out development initiatives and verifying their impact are major critical points of international development. DLTs are able to create real-time data of all changes within a system, which is very suitable for tracking these valuations. For instance, lenders or donors can design, and in the later stage, finance development with pay-for-performance systems. These two main points (real-time, pay-per-performance) and the highly flexible setup of DLTs allows it also to be integrated within existing projects, whose parameters and settings can be adjusted much faster to their needs. Pay-per-performance models unfolding their true power in combination with systems like the Internet of Things (IoT or satellite imaging. Real-time data within their areas of application showing its local impact and can be regulated if necessary. All tracked data integrated into DLT can be automatically analyzed and in combination with smart contracting, guides for instance, to automatic payouts (Postscapes, 2019).

The usage of DLT within aid projects in South America shows its positive impacts. Indigenous people are getting incentivised for taking care of their surrounding rain forest and preventing them from clear-cutting the forest. Satellite images from the particular fields tracking these changes within the forest. Locals are getting paid with an amount of money higher than what

they could hope to gain from timber wood market prices. Blockchain handles payouts, land titling and forestation via smart contracts (Schijf, 2019).

Benefits. Integrating DLTs into these frameworks can release a positive impact on their efficiency. Sensor technologies (IoT) and visual tracking enable it to "digitize" data and make integration to DLTs possible. This reduces the amount of "off-chain"data which reduces latency and is paving the way for Artificial Intelligence (AI) and other data evaluating mechanisms. Fully verticalized processes collected on the blockchain offer many advantages. Especially payments who normally getting transferred over many different payment channels, creating bureaucracy and increasing costs.

Risks and implementation challenges. DLTs within aid projects and conditionality assessment strategies have some implementation hurdles. Their success is dependent on integration of sensor technology who captures relevant data. These data recording devices must be designed in a way that makes it impossible to modify them. Hardware and maintenance costs are the major limiting factors next to access to constant connectivity.

4.2.5.2 Humanitarian cash transfer - cut the middle men

Philantropy and aid spendings in general are an important contribution to helping people out of extreme conditions and poverty. But in the last couple of years, for instance, humanitarian aid drop about 8% (Wood, Johnny. 2019).

Issues about misuse and re-direction of funds along the distribution chain let shrink the willingness to spend. People who are willing to spend are missing insights about the distribution and the processing of funds which is often not visible. Questions about how successful the results of the money spent, are increasing (Transparency International,b. 2010).

Within big organisation fraud becomes a problem as we saw in the case of Medicaid and Medicare with 600 people involved and a financial loss of $2 Billion Dollars (La Pointe, 2018).

Other reports, like the survey of the Association of Fraud Examiners (ACFE) saying that the cost of fraud is about 5% lost of the income of aid organisations (Mintz, 2018).

There is a high demand for more efficient, direct aid mechanisms without third-party intervention and transparent processes, where results can be rewarded. Blockchain in combination with smart contracts is able to make donations more secure and transparent and efficient.

4.2.5.2.1 Direct & decentralised fundraising

Current aid funds work with many middlemen till the money is transferred to the recipients. Lawyers, notaries, banks, NGOs on-site or governmental institutions and many more are involved in the process of collection and distribution. Blockchain is able to cut many of the intermediaries and speed up the process of delivery to much lesser costs. Fundraising and donation platforms can serve with higher standards and new levels of transparency in real-time. The market for direct fundraising is already well established. Companies like Kiva.org, GiveDirectly, are providing all necessary services for the donors and the beneficiary. People can donor money directly to organisations and individuals, without intermediary. But these platforms are still centralized with all of its side effects, like lack of security, questionable data ownership and missing control mechanisms. Using blockchain technology within that context will extend its degree of efficiency in a much bigger scale.

A report from the Charities Aid Foundation (CAF) highlights topics and advantages of blockchain relevant for aid in general:

- “Transparency and openness
- Reducing transaction costs
- Increasing trust
- Integrating the digital and physical world"

  (Davies, 2015)

Charities Aid Foundation sees a greater willingness to donate if the payment corridors are more transparent and secure and the progress is more visible (Davies, 2017).

The report from the Charity Aid foundation highlights three areas where blockchain will be relevant in the field of philanthropy:

1. Cutback of transaction costs by cutting intermediaries
2. Fully automatic operations, executed by smart contracts
3. Increased transparency by immutable tracking mechanisms and savings on the blockchain

The company Disberse uses blockchain for tracking and managing funds as a service for aid organisations. The entire funding chain from the initial donation to the final receiver is recorded by Disberse, who is fully regulated Financial Institution supervised by the Financial Conduct Authority (FCA) in the United Kingdom. The company builds its service on the distributed Ledger Technology (DLT) with several services like multi currency accounts, end to end traceability, direct cash transfers, treasury managements and compliance. Organisations like the Netherlands Red Cross, Caritas Rwanda, oder SOS children's Villages and many more are using the blockchain based services of Disberse (Disberse.com, 2018).

The company Alice connects blockchain technology with social funding and provides a platform, where funding and general impact management can be handled over the Ethereum blockchain. Their goal is to incentivise aid organisations, like NGOs, charities and others to run projects on the Alice platform with a transparent, more efficient process. If their performance goals are met faster and cheaper, they get paid more. All KPIs and overall achievement are publicly accessible, creating additional trust between all participants. When the promised goals of charities are achieved, smart contracts issue the money automatically. This automation reduces the costs of reporting for acting more effectively (Alice.io, 2019).

The company BitGive developed Givetrack, a blockchain based asset and goal tracker for aid organisations, which provides financial transparency in real-time. Their framework allows, to fully track the flow of money, which will only be transferred, when recent goals are fulfilled. The advantages for aid organisations of using blockchain secured platforms is, that third-party

verification and additional regulatory frameworks will lapse, because the platforms are already regulated and verified (Davies, 2016).

4.2.5.2.2 Direct Aid

The World Food program (WFP) started a couple blockchain initiatives within the context of aid. Ten years ago, the WFP decided to hand over refugees in a functioning economies cash money directly, instead of food, to support the local community, which was more efficient and effective and triggers growth in local economies. But cash transfers across different countries needed multiple intermediary banks, which increases costs, time-delays, next to financial risks when they worked together with small local banks. What was initiated as a test pilot in Pakistan in May, 2017 is now in full operation in Jordan with more than 10.000 Syrian refugees. Displaced people from Syria can pay for food directly via Iris Scan over the Ethereum blockchain. People paying in the supermarket with food stamps on the blockchain. All transactions and other information are sent directly, without any intermediary like the bank, to the WFP. Real-time data about payments allow the WFP a better forecasting about consumer behavior and their needs, which then saves additional costs. Other advantages are the security and confidentiality of the system, because personal information is not shared with banks and telephone companies. The WFP currently saves 98% of the costs of regular transaction fees (WorldFood Programme, 2019).

4.3 Implementation Challenges of blockchain

The report "Blockchain Applications and the Sustainable Development Goals" by Rocamora and Amellina found many challenges, potentially slowing down the adaptation process or preventing it completely. As mentioned before, the technology may disrupt many dominating markets, whose dominant market players will more or less, slow the implementation process. The report categorizes the challenges in three topics. Technical, regulatory challenges and social challenges.

Additionally, the survey mentioned that the biggest hurdles are the lack of regulatory framework, confidentiality issues and institutional reluctance (Hileman & Rauch 2017).

Figure 14: Main challenges to blockchain adoption

Figure 11: Rocamora & Amelina, 2017, p. 69, Main challenges of blockchain adoption

All three topics will be explained to get a better overview of the topic.

Technical Challenges

Transaction Speed and energy consumption

The technology's various benefits can be technologically answered and manifested in many ways. Because of its early stage of the market, there are no dominant designs available, which are proven and can be applied easily. Hence, why there are remaining open questions regarding the topics of speed and energy consumption, system security, confidentiality and Interoperability. Many of these issues can only be answered by systemic experts in the context of the network, where these technologies need to be tested. Only then security risks and other challenges can be addressed. That's why a couple of consulting firms developed sand boxes and test runs together with potential companies of the market, for finding all relevant use cases and technological hurdles (Deloitte Touche Tohmatsu India LLP, 2017).

Regulatory Challenges

In many countries it is not clear how to handle blockchain and crypto assets in general and how to classify them. Slow regulatory uncertainty in major countries and world wide hinders innovation and adoption. This uncertainty creates risks for all participants. For all surveyed people, nonexisting regulatory frameworks creates most uncertainty. Governments will aim for a global solution, because they already know about the borderlessness of the internet, which underminded any natural boarder (Samuelson, Pamela. 2000).

Governmental authorities are further afraid about its decentralization and cryptographic abilities to keep information secret. In the same way, however, public institutions are forced to create a secure environment for public and private companies, guarding them from unwanted commercialising processes and fraud. The European Union addressed this with General Data Protection Regulation (GDPR) (EU GDPR, 2018).

Social Challenges

As with every highly disruptive technology, the impact of disruption on the sectors and their markets can not be really estimated. But in that case many jobs based as intermediary will not be necessary anymore in the long run, despite the fact that this change will take many years. The Harvard Business Review (HBR) describes blockchain not as a disruptive technology, which is threatening existing business models with a cheaper solution. "Blockchain is a foundational technology: It has the potential to create new foundations for our economic and social systems. But while the impact will be enormous, it will take decades for blockchain to seep into our economic and social infrastructure. The process of adoption will be gradual and steady, not sudden, as waves of technological and institutional change gain momentum." (Iansiti & Lakhani, 2017).

As today, the shared knowledge about the technology in society is very limited. There is a necessity for education and simple labelling obligation standards which can be understood globally. Many applications will not change in the front-end but will change in the back-end. Currently, the amounts of experts in the field are not widely available and very rare in companies. The knowledge of financial executives in companies is still very limited, found out

the consulting agency PwC, where only 14% are aware of blockchain and have the skills necessary (Smith, 2018)

Ownership of data

Another point is the opportunity of bringing back personal data back to its producers and redistribute ownership and value creation. The technology has the ability to specify access and permission of all streams of information generated on a blockchain by their producers. Ownership of information can be redistributed to its producers who then are able to monetize it or exchange it against other services. In the way before, the user is the product and has often no control over the monetization and sharing of his personal information. Technically, it is already possible to change that in favour of the data creator. Major platform players, like Facebook or Google, who's the main business model is based on monetization of personal information of users are not interested in supporting these technologies which would harm their own value chains. Facebook sees a general advantage in ecosystem wide currency, allowing users purchasing within its social media services. They announced its own blockchain based money backed by fiat currencies in June 2019. Time will tell, which effect it has and how it will be used.

How to bring analog data on the blockchain by connecting the analog with digital worlds

Data is secured on the blockchain. Decentralised and cryptographically safe, but before it needs to be verified. Institutions who are responsible for the transition from analog to digital have to work responsibly and needed to be audited (Deloitte, 2017a). Otherwise, data is false from the beginning. Human mistakes at the transition from analog to digital are always possible. For instance, in hospitals, nurses can record new borns on the blockchain, but they can still mistakenly interchange names and assign a wrong name to a baby (Tucker & Catalini 2018).The solution might be found in human nature itself. What made Bitcoin so famously successful is that governance is implemented into its system. Miners who are taking care of keeping the public ledger alive are incentivized and will get paid with the currency itself. It depends on the overall design of the system, if people and organisations at the point of transition to digital will incentivised sufficiently for taking care of (Casey, 2017).

As more data points are available, as more will Artificial Intelligence and other analytics tools help to supervise the system. It still needs strong control mechanisms at the transition points of data streams, despite the fact that Distributed ledger systems will solve many trust-related problems.

4.4 Common denominators of DLTs

A study from the Asian Development Bank (ADB) shows DLTs have significant potential in the context of Asian development. There are five use cases regarding deployment, tracking, financing and evaluating development assistance who are showing promising results and improvements. Common denominators of the advantages of DLTs are cited:

"

- Increased transparency and accountability
- Reduced transaction and monitoring costs
- Improved real-time data collection and analysis possibilities
- Expanded participation
- Opportunities for currently vulnerable, excluded, and underserved populations"

(Ferrarini, et al, 2017, p.20)

The study stated that DLTs "produce immediate significant benefits, others where midterm potential can be released with a moderate amount of further research and investment, and still others where important technical pieces are still missing and hence longer-term potential can only be realized after considerable additional technical, infrastructural, or regulatory development." (Ferrarini, et al, 2017, p.20)

Furthermore, their outlook looks promising, as they describe in their conclusion: "Overall, the positive disruptive potential of distributed ledger technologies in the development context is enormous. By assessing them carefully and investing in them strategically, international development lenders can play a key role in helping unleash their positive developmental impact throughout the Asian region." (Ferrarini, et al, 2017, p.21)

4.4.1 Implementation Challenges – Adoption

Despite all the fields of possible applications and first successful business cases, companies in general have concerns and are not able to handle risks. They don't have the insights about the upcoming challenges with the usage of blockchain. Nevertheless, many companies are experimenting with blockchain. PricewaterhouseCoopers (PwC) interviewed 600 executives in a survey across 15 countries, to find out the state of blockchain in their companies. The results of the survey showed that "84% say their organisations have at least some involvement with blockchain technology."(PwC Global, 2018, p.1)

The World Economic Forum wrote a report together with PricewaterhouseCoopers and Stanford Woods Institute for the Environment about the potential of blockchain and formulated six different main challenges regarding the implementation of blockchain (Herweijer, et al, p. 22, 2018):

Figure 6 – High-level summary of blockchain risks and challenges

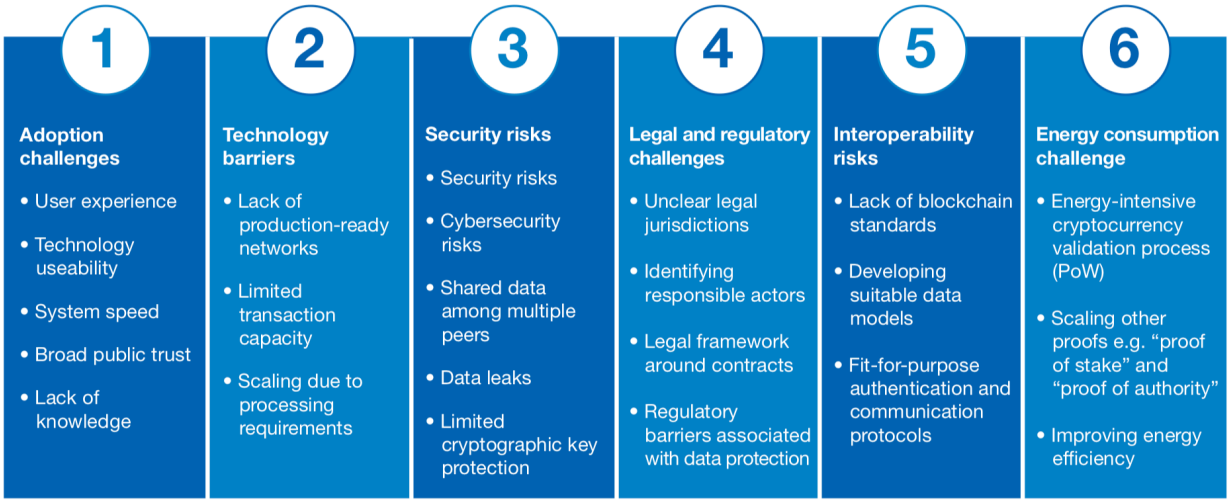


Figure 12: Herweijer, et al, p.22, Blockchain risks and challenges

Adoption challenges

Scalability for a new technology is very important to capture the demand of big markets and wide user adoption. Programmers are very rare and the technology is sometimes very complex, which requires extra time and resources. User Experience design and the user interfaces are in

its early steps and then usability becomes a big issue. Another point is that blockchain protocols are often not standardized and interoperability of them is not perfect or not even existing.

When it comes to regulation, blockchain and crypto currencies are currently unregulated in the USA and many other countries which prevents investors from investing on a bigger scale. Also because of its deregulation, the levels of trust in the technology are low. Investors or users need a high level of expertise in that field, to understand market, business models and competitors (Herweijer, et al, p. 22, 2018).

Technology barriers

Startups are currently dominating the field of applying blockchain to specific market needs. These inventions are often tailored to their needs. Market-ready, plug & play products are currently not widely available. Technology- wise, big corporates left PoW blockchain and is more interested in resource-friendly and faster Proof protocols, like staking or permission-private networks. The number of transactions and the density of information which can be recorded on the blockchain are important factors, when it comes to make a decision to choose the right blockchain for the right field of application, to meet the needs (Herweijer, et al, p. 23, 2018).

Security risks

Despite the fact, that blockchain is more or less hackable and very safe against attacks, because of its decentralization, the increasing complexity on the networks becomes at risk. In the next years a new generation of supercomputers and quantum technologies will appear, who are able to decrypt the algorithms. Not many blockchains are ready and flexible enough for upgrading their cryptographic securities. Access to ledgers are regulated by public and private keys. If a person has the keys he has access to the ledger. Handling keys in the proper and secure way are one of the most relevant questions for the market. Saving the keys securely, is for companies and individuals a challenge. If the private keys can be stored securely in a bank safe on a big scale, big investment firms will enter the market (Herweijer, et al, p. 23, 2018).

Legal and regulatory challenges

What also must be established are regulatory frameworks and jurisdiction at a global level.

"Current vital regulatory and legal challenges for blockchain scaling include:

'Distributed' jurisdiction and 'networks' of laws: Legislative frameworks are currently defined by each jurisdiction. Blockchain ledgers do not have a specific or clearly identified location for each transaction, with each node potentially being located in a different part of the world. This means it is not clear which jurisdiction a blockchain will fall under, with the potential to create complex, duplicative, and, at worst, conflicting regulatory and compliance demands for entities implementing blockchain solutions." (Herweijer, et al, p. 23, 2018)

Legal workflows should be pre-designed and questions like the right court in a case of a dispute should be addressed. The law has to accept blockchain as immutable.

With in an increasing number of smart contracts will the also increase the number of disputes and intersections. That's why "the current legal basis for contract formation will need to evolve so that there can be no doubt when a 'smart' agreement is deemed to be valid and enforceable." (Herweijer, et al, p. 24, 2018)

Another point is the topic of accountability for blockchain itself, which is often challenging to identify. Programmers, Users, Companies, it depends on the case who will me made responsible for it. Especially decentralized autonomous organisations (DAO) needed to be regulated in order to make somebody accountable for its behavior.

When it comes to data privacy, there is a question how personal information needs to be treated. Blockchain with its fixed recording of every change and transaction is in contradiction to the current discussion of the "right to forgotten". These different dimensions are a wide field for new legal frameworks, who needs to be fixed upfront, to not slow down the innovation process.

(Herweijer, et al, p. 23-24, 2018)

Interoperability risks

For enabling a high adoption rate and increased network effects, the integrity and handling of the different blockchains will be fundamental. Different standards are often not interoperable with other IT platforms, which increases costs. Authentication and communication protocols need to follow other established systems for guaranteeing interoperability, which can be very complex for instance, in the banking remittance market or in global supply chains (Herweijer, et al, p. 24, 2018)

The energy consumption challenge

Proof of work (Pow) as a verification system within blockchain is very energy consuming. PoW has meanwhile a serious negative impact on the environment. In the case of Bitcoin, many Miners using electricity of coal power plants in China. But there are already second-, and third generation blockchain out, who need much less energy or even better, renounce on PoW and use other verification protocols, like Proof of Stake (PoS), which needs much less resources (Herweijer, et al, p. 24, 2018).

Conclusion of the chapter

In many areas of blockchain is still a knowledge gap on the business and consumer site. Also, there is a shortage of skilled workers for addressing the high demand for implementation. Filling this gap for education, more and more university courses and consulting firms are providing a wide variety of services. The many remaining questions left can only be clarified by practice and depend on the willingness to use the technology for good.

5. Conclusion

5.1 Discussion

As part of this thesis I wanted to answer the question: „How can digital platform ecosystems and blockchain technologies stimulate growth in developing countries?" for finding out if platforms and blockchain technologies can achieve positive impact in countries with many different forms of scarcity.

In order to answer the research question most conclusively for readers, I went into literature research and found two respected economists who's work built the foundation of getting an understanding of the challenges developing countries facing. Regarding blockchain technology and platform business models I have chosen scientific sources, books, reports and online articles for getting contemporary insights. Several use cases showed the positive impact of how

platform and blockchain technologies can address general challenges of developing countries and strengthen the circumstances for stimulating growth.

For getting new perspectives and a broader view of capital per se, I looked into the different forms of capital. In some cultures, it is not intended to focus solely on financial capital, and not just to grow, but rather to live in harmony with nature and their resources. Especially today in the context of global warming, pollution and overpopulation other forms of capital might change the view of our resources and how relevant they are for a human being in the global and local context. For instance, protecting and investing in natural capital becomes a future source for tourism and scientific research and will build the foundation for other forms of capital.

The first part of the thesis identifies challenges of developing countries and the underlying reasons for them. Research focuses on the most common challenges developing countries, their institutions and citizens are facing. External and internal challenges are influencing the environment for growth. For instance, low levels of trust within a society, or no identification of people and ownership causes many secondary and tertiary problems. Foreign aid programs tried to change the situation since the 1960s with moderate or sometime contrary results. It created an un-sustainable environment, where regarding countries are dependent on malfunctioning aid systems. De Soto's solution framework created the question: How today's technologies are able to address the regarding challenges and execute a solution?

The second part opened the scope on what can be mobilized in countries surrounded by scarcity. Trust as an essential part of human interaction affects the entrepreneurial risk taking. The relevance of trust as a main driver for social stability and economic growth led me to the different forms of capital. It turns out, that different forms of capital and their transfer among themselves could be a source of value creation. Subsequently, platform businesses and blockchain technology with all their features and applications are introduced. It showed that these two topics are able to address many of the mentioned challenges and can stimulate growth. For instance, platforms are able pushing former war zones towards open societies with open discussions of major challenges, where society and individuals can participate. Open

discussions within social networks can dismantle prejudices and replace fake news with facts. The transparency of governmental reforms in Libya showed exceptional results in guiding a society towards positive change and were able increase levels of trust within society for the newly elected administration.

The third part shows with use cases how platform businesses and blockchain technologies are able addressing many of the mentioned challenges and can positively enable growth. It demonstrates that the inherent capabilities of the technologies and their services are capable of addressing systemic issues and prepare society, governments and institutions for a sustainable future of positive growth in many dimensions.

The research shows that a positive impact of platform services, and DLTs in the context of ICT4D acts holistically and could affect many dimensions of life positively. They affect social areas, have a peace-building effect and influence political, social, and economical areas. Significant downsides of platforms, like centrality or misuse of customer insights in the hands of autocratic regimes would possibly aggravate the challenges in the regions. Hence why the research was extended to blockchain for addressing the weaknesses of platforms. Fully encrypted information transfer within trustless, decentralized networks will render trust-based systems with all of its institutional middle-men needless. It can open the door for new capabilities towards a trustless society without the downsides of platform businesses or classic trust-based systems, like centrality, or being hacked, or corruption. This featured technology and its services can be built on existing systems and create positive leverage effects without incurring much impact in terms of cost and effort.

This has also led to the orientation of the thesis and to the selection of technologies. The goal was finding technologies and services that can bring the biggest impact with the least amount of resources. Because of their variability and scalability, they can be adopted to the local requirements and the various grades of technology.

5.2 Limitations of the Thesis - what is missing?

The amount of available papers on blockchain in the context of development is still in an early phase. We are in an early stage regarding global implementation of blockchain technology and what it offers to society is often widely experimental. Currently, all missions of blockchain platforms calling for the"tokenization of the world." As mentioned, we are in an early stage without any dominant designs, where many solutions with different advantages are addressing like-minded problems. A closer examination in a more defined context might be helpful.

I was well aware that not all topics and challenges in different countries can not be mentioned in one Master Thesis. The reasoning why countries are struggling with development are not easy to seize as an outsider. For not to get lost in capturing the inner complexity of the countries, I have sought for literature that draws on the patterns across different countries. The results of my chosen literature are just a small excerpt of many internal and external challenges regarding regions are facing. With respect to local differences it was my aim to find repeating patterns and reasons within these regions, which are the most common patterns of missing development. Nevertheless, focusing more on one particular region or country might have several advantages: If there are well documented aid and development initiatives, it would be possible to draw conclusions about possible network effects and impact on development, regarding stakeholders and start a comparison study. Each market has its specific character, even that expectation may vary, similarities and common problems might be identified and faced as opportunity. Going into details is reserved for the next wave of scientific papers, which will hopefully be able to research these topics over a greater period of time and follow progress.

5.3 Possible areas for future research

The areas of interest for future research could be found in several areas of development and can be of social, political, economic, technological nature. From the innovation point of view, now is a great time to track the different paths of innovation of the technology and how they influence markets and current business models, because of its early beginnings.

Comparison studies. Comparing the results within a time horizon from three to ten years shall allow better understand how technology and services are used by companies and other stakeholders. When usability and application rates of the services between people and organizations increase, it will be possible to compare their usability patterns and application fields, which will be a source for sustainable innovation development.

Private data handling back to the user. Platform economies are a dominant business model and the new norm across many industries. Blockchain is able to disrupt the "trading user data earnings model" and could completely privatise all user interactions. Otherwise, users can be empowered with their own data and are able to start trading it for additional services or capital. Are they able to replace platform businesses or just enhance them towards more security and privacy?

Regarding Innovation. Because of its novelty of blockchain in its application and its highly disruptive potential, it might be interesting to follow the progress of dissemination of innovation across the different stages of innovation, regarding the models of technology adoption cycle, for instance, Gardner's hype cycle**.** We are currently talking about blockchain technology like about e-commerce and mobile internet in the 1990s. Blockchain can create a zero-trust society, without middle-men institutions. How will impact our society and how will it look like?

From the potential of transformation and disruption across industries, the dangers of exponentials will be massive. In these exponential times, how will economies (re-)act on the massive influx of new innovations?

A focus on particular regions and patterns for deriving frameworks. From the learnings across different markets and regions it will be possible, to derive frameworks. If research focus on specified regions, like former war zones, or countries with high cultural and linguistic diversity, it could produce much more precise data sets. This may become a source for social, business and economic comparison studies in the later stage. Each region and market has its own

specific character, shared challenges can be determined and transformed into opportunities. In the later stage, this could end in frameworks, which can be applied in other regions as well.

Another interesting subject within organisations seeking to implement these mentioned technologies and business models, is providing them with recommendations of how to implement it and how to handle data sets. Methodologies can appear, how they set it up for their needs across different stages of implementation and scale or just set up the right measurements for business intelligence lifecycles set up.

Implementation. It works if it is only digital. To fully take advantage of blockchain and platform business models, it is necessary, to pair it with sensors like IoT, who are harvesting and transforming data for making them digitally available and processable. How to overcome the implementation hurdles and provide faster adoption? What will be the best complements for fast implementation? Which technologies and services are suitable for cross-pollination and able to jump on network effects? With all the fascination about the possibilities, there are always some doubts about possible, incalculable side effects. What might be the risks of implementation and broad usage within a society?

Change Management. How to handle rapid technological change in the context of human development and analog worlds in general? Transformative technologies creating disruptive pressure on social multi-generational contracts. Without any open and public discussion, it seems, it will result in populism and despotism where fear, uncertainty and doubts (FUD) will be spreaded across a society for separating communities. As it seems, "Divide and Conquer" after Sun-Tzu is still applicable in these enlightened times. Do we need more social initiatives, for compensating radical change in job markets or local markets for keeping competitiveness? How does a transparent open discussion about rapid technological change who is affecting whole economic core markets of a country within a society look like? Do we accept this radical change and see it as a chance and will implement for instance, a guaranteed basic income?

Social. How is the usage of tech able to safe local cultural peculiarities and at the same time create the base for international standards? How are cultures changing in the context of the

technology used? Facebook in developing countries started a shift and decay from native cultures to western ideals. How can you accept global interchange across different cultures without compromising one or the other?

These mentioned topics for further research might form a better overview of the technology, its services, and how they will act within the context of human usage and interaction. There are many more topics out there, who might be relevant for investigation. Every time when humanity discovered new technologies or a new context, new opportunities appear. It is then an interesting journey to watch how they will use it and how they will change society and maybe initiate a paradigm change.

5.4 Closing remarks

My contribution

I am fascinated of innovative technology, their products and services and how they impact its environment and how it will be used. Their catalytic effects can't often be foreseen and how they change markets, society and creating new paradigms over time.

Watching new technologies emerging from "being" to "becoming" is fascinating. From the innovation point of view, the provided technology can address many mentioned challenges, but it needs tailored approaches and many iterations for getting proper results. Its exponential scalability making them a good tool for stimulating growth. Especially under environments with extreme scarcity, ICT and DLTs can be very productive.

Prising this particular tech as the panacea for growth was not my intention, but merely looking for the catalytic potential and its opportunities. Showing that digital technology is able creating a big impact in development and multiple forms of capital, which will in reflection and participation within a society be much more sustainable.

Especially under environments with extreme scarcity, digital technologies with its small footprint can support growth in many ways, starting from capturing growth-relevant information to coordinating and transferring them into value. Addressing multiple needs at one place, can produce network effects and are able to create inclusivity and increase levels of trust in post-war areas.

Using these facts for development and showing that they are able to create a positive impact was my original intention.

Developing countries can use these technologies for triggering growth in different forms of capital beyond financial capital. The technology's inclusiveness is able stimulating peace processes and have the potential breaking down prejudices in-between hostile groups. It can address the needs of people, parties and businesses down to micro-granular levels. This will result in a robust society with increased levels of trust, where innovation and competitiveness can act freely

My intention was finding growth-enabler, who are able to connect worlds which existed only as islands before. Towards a more inclusive society where they can create value and simultaneously strengthen society and increase levels of trust.
The aim of this thesis was to explore the background of the challenges of people and society in general in developing countries and how technology can provide a meaningful contribution for growth and leading to more sustainable systems. Nevertheless, it needs people who are actively contributing to the field and creating services, who are supporting this mission for positive change and create a levsel playing field for more inclusion around the world.

We will see how its fundamental, disruptive power will be used. We will see if the "tokenization of everything" will give us the internet of value and helps humanity to understand that our resources on earth are limited. Our imagination and creative power is limitless. If one recognizes the inner nature of technologies, one also recognizes their potential and their possible positive contribution to society.

With this paper, I hope to shed some light on the technologies described here, their services and their practical applications in various economic contexts, as well as encouraging others to use their creative power in order to develop practical solutions for the common good.

6. Description of terms

3D Printing
a printing process that involves making three-
dimensional objects from digital models by applying many thin layers of quick-dryingmaterial on top of each other

Additive Manufacturing
Instead of the old approach of carving a usable part out of a large block of material, additive manufacturing builds an object up layer by layer.
— Larry Greenemeier

Blockchain
a digital database containing information (such as records of financial transactions) that can be simultaneously used and shared within a large decentralized, publicly accessible network

Blockchain Mining
Blockchain mining involves adding transactions to the existing blockchain ledger of transactions distributed among all users of a blockchain. While mining is mostly associated with bitcoin, other technologies using a blockchain employ mining as well. Mining involves creating a hash of a block of transactions that cannot be easily forged, protecting the integrity of the entire blockchain without the need for a central system. Mining is typically done on a dedicated computer, as it requires a fast CPU, as well as higher electricity usage and more heat generated than typical computer operations. The main incentive for mining is that users who choose to use a computer for mining are rewarded for doing so.
https://www.techopedia.com/definition/32530/mining-blockchain

Blockchain protocol
The blockchain protocol discourages the existence of multiple blockchains through a process called “consensus.” In the presence of multiple, differing copies of the blockchain, the consensus protocol will adopt the longest chain available. More users on a blockchain mean that blocks can be added to the end of the chain quicker. By that logic, the blockchain of record will always be the one that most users trust. The consensus protocol is one of blockchain technology’s greatest strengths but also allows for one of its greatest weaknesses. A protocol is the program which forms the software backbone of the network. A protocol is defined as the primary rules of a blockchain and the algorithm as the mechanism through which these rules will be followed.
https://medium.com/edchain/a-comparison-between-5-major-blockchain-protocols-b8a6a46f8b1f
https://logimp.wordpress.com/2018/12/15/what-is-blockchain-technology/
https://www.binance.vision/blockchain/what-is-a-blockchain-consensus-algorithm

Consensus Algorithm
A consensus algorithm may be defined as the mechanism through which a blockchain network reach consensus. Public (decentralized) blockchains are built as distributed systems and, since they do not rely on a central authority, the distributed nodes need to agree on the validity of transactions. This is where consensus algorithms come into play. They assure that the protocol rules are being followed and guarantee that all transactions occur in a trustless way, so the coins are only able to be spent once.
https://www.binance.vision/blockchain/what-is-a-blockchain-consensus-algorithm

Cryptography
Cryptography involves creating written or generated codes that allow information to be kept secret. Cryptography converts data into a format that is unreadable for an unauthorized user, allowing it to be transmitted without unauthorized entities decoding it back into a readable format, thus compromising the data.
https://www.techopedia.com/definition/1770/cryptography

DApps
A DApp has its backend code running on a decentralized peer-to-peer network. Contrast this with an app where the backend code is running on centralized servers. A DApp can have frontend code and user interfaces written in

any language (just like an app) that can make calls to its backend. Furthermore, its frontend can be hosted on decentralized storage such as Swarm or IPFS.
https://ethereum.stackexchange.com/questions/383/what-is-a-dapp

Decentralised autonomous organisation (DAO)
A decentralized autonomous organization (DAO) is an entity in a digital system facilitated by smart contracts. Smart contracts involve digital tools and protocols that help support specific transactions or other contract elements. DAO is a form of contract in which the processes and laws of a decentralized organization are inserted as a permanent code of the smart contract, and operates through a distributed consensus protocols.
https://www.techopedia.com/definition/32500/decentralized-autonomous-organization-dao

Developing Countries
The World Trade Organization does not have a set framework for what constitutes a developing country; member nations declare themselves as such. Other WTO members are able to challenge a country's declared status, but it is rare for any to do so. For the 2018 fiscal year, the World Bank designated countries with around $1,005 per capita income as low-income countries. Lower-middle income countries, meanwhile, included those with a gross national income between $1,006 and $3,955. Both low and lower-middle income countries are developing countries by the World Bank's estimation. Developing countries have low levels of living and productivity, high population growth, underdeveloped industry and a reliance on agriculture and exports for economic sustainability.
https://bizfluent.com/info-10002682-difference-between-developing-countries-emerging-countries.html

Digital Standards in Trade (DST)
A new World Trade Board initiative, Digital Standards for Trade (DST), is aiming to fuel interoperability in the trade supply chains among banks, shippers, customs, ports, and exporters and importers through standards and novel solutions. The project, originally incubated by MasterCard and launched in Singapore with the collaboration of multiple organisations, is now part of the World Trade Board.
https://worldtradesymposium.com/partner-organisations/dst/

Distributed Ledger Technology (DLT)
Distributed Ledger Technology refers to the technological infrastructure and protocols that allows simultaneous access, validation and record updating in an immutable manner across a network spread across multiple entities or locations.
https://www.investopedia.com/terms/d/distributed-ledger-technology-dlt.asp

Evolving Countries
Emerging countries are those with high levels of economic development, usually with rapid industrialization. Some countries, which were formerly developing nations without much opportunity for industrialization, have become emerging nations with unprecedented growth in energy, information technology and telecommunications. They differ from developing countries in that they no longer rely primarily on agriculture, have made impressive gains in infrastructure and industrial growth, and are experiencing increasing incomes and quick economic growth.
https://bizfluent.com/info-10002682-difference-between-developing-countries-emerging-countries.html

Global Legal Entity Identifier Foundation (GLEIF)
The Global Legal Entity Identifier Foundation (GLEIF) is tasked to support the implementation and use of the Legal Entity Identifier (LEI). GLEIF was established by the G20's Financial Stability Board to oversee the implementation and use of the LEI. A legal entity identifier (LEI) is a unique 20-digit alphanumeric code used to identify the entities in a financial transaction. Your global LEI is publicly-available information about your company that becomes part of a global directory for worldwide transparency and helps to maintain the integrity of global financial markets, financial institutions and your transactions.
https://www.cogencyglobal.com/legal-entity-identifier
https://www.gleif.org/en/about/this-is-gleif

Hyperledger protocol
Hyperledger is an umbrella project, which offers the necessary framework, standards, guidelines and tools, to build open source blockchains and related applications for use across various industries. Using the available artifacts

under the Hypeledger project, a business can apply various available blockchain solutions and services to significantly improve the performance of their operations and the efficiency of their business processes.
https://www.investopedia.com/terms/h/hyperledger.asp

Internet of Things
The Internet of Things (IoT) refers to a network comprised of physical objects capable of gathering and sharing electronic information. The Internet of Things includes a wide variety of "smart" devices, from industrial machines that transmit data about the production process to sensors that track information about the human body.
https://www.investopedia.com/terms/i/internet-things.asp

KYC Know your customer
The Know Your Customer or also called, Know your Client form is a standard form in the investment industry that ensures investment advisors know detailed information about their clients' risk tolerance, investment knowledge, and financial position. KYC forms protect both clients and investment advisors. Clients are protected by having their investment advisor know what investments best suit their personal situations. Investment advisors are protected by knowing what they can and cannot include in their client's portfolio. KYC forms protect both clients and investment advisors. Clients are protected by having their investment advisor know what investments best suit their personal situations. Investment advisors are protected by knowing what they can and cannot include in their client's portfolio.
https://www.investopedia.com/terms/k/knowyourclient.asp

Paradigm Innovation
Intellectual perception or view, accepted by an individual or a society as a clear example, model, or pattern of how things work in the world. In the context of a scientific discipline paradigm can refer to a thought pattern. When the words paradigm and innovation are used together it's more related to people more readily adopting an innovation due to a group of peoples changed thoughts or perceptions of something.
http://www.businessdictionary.com/definition/paradigm.html
https://answers.yahoo.com/question/index?qid=20110209055249AA2oiAt
http://www.businessdictionary.com/definition/paradigm.html

Peer-to-Peer lending
Peer-to-peer (P2P) lending enables individuals to obtain loans directly from other individuals, cutting out the financial institution as the middleman. Websites that facilitate peer-to-peer lending have greatly increased its adoption as an alternative method of financing.
https://www.investopedia.com/terms/p/peer-to-peer-lending.asp

Sharing Economy
The sharing economy is an economic model defined as a peer-to-peer (P2P) based activity of acquiring, providing, or sharing access to goods and services that is often facilitated by a community-based on-line platform.
https://www.investopedia.com/terms/s/sharing-economy.asp

Public blockchain
If one desires to create an open blockchain similar to bitcoin, which enables anyone and everyone to join and contribute to the network, they can go for an open, public blockchain. A public blockchain network is completely open and anyone is free to join and participate in the core activities of the blockchain network. Anyone can join or leave, read, write and audit the ongoing activities on the public blockchain network, which helps a public blockchain maintain its self-governed nature.
https://www.investopedia.com/news/public-private-permissioned-blockchains-compared/

Permissioned Blockchain
Permissioned blockchains maintain an access control layer to allow certain actions to be performed only by certain identifiable participants. These blockchains differ from public as well as private blockchains.
https://www.investopedia.com/terms/p/permissioned-blockchains.asp

Permissionless Blockchain

Permisionless is a positive quality, where anyone is permitted to join and participate in an activity. Permissionless is oftne used when describing blockchain technologies because anyone can download the digital record known as the blockchain and participate in recording and verifying information.
https://decryptionary.com/dictionary/permissionless/

Proof of Stake (POS)
Proof of Stake or PoS is defined as a process for achieving consensus and building on a digital record known as a blockchain. With PoS, users put up a collateral of tokens (or a “stake”) and use a process that is more energy and cost-efficient than previous solutions. With Proof of Stake, users can participate after depositing and risking a certain amount of their crypto. This is known as a “stake”. Users cannot spend or move their stake. If they are caught recording false information or doing something against the rules, they risk forfeiting their entire stake. People who provide a stake are known as “validators”.
https://decryptionary.com/dictionary/proof-of-stake/

Proof of work (POW)
Proof of Work or PoW is defined as a process for achieving consensus and building on a digital record known as a blockchain. With PoW, users compete with each other via their computers to solve a puzzle. With Proof of Work, computers compete to solve a tough math problem. The first computer that does this is allowed to create new blocks and record information. Because mining requires computer power, people do this work in return for money. The first computer to solve this problem can record information earning them a reward in brand new digital money plus fees paid for each transaction.
https://decryptionary.com/dictionary/proof-of-work/

Private Blockchain
A private blockchain network requires an invitation and must be validated by either the network starter or by a set of rules put in place by the network starter. Businesses who set up a private blockchain, will generally set up a permissioned network. This places restrictions on who is allowed to participate in the network, and only in certain transactions. Participants need to obtain an invitation or permission to join. The access control mechanism could vary: existing participants could decide future entrants; a regulatory authority could issue licenses for participation; or a consortium could make the decisions instead.
https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-public-and-private-blockchain/

Public Key
Public key is defined as a string of letters and numbers that allows cryptocurrency to be received. However, public keys are not considered as safe to use as public addresses.
https://decryptionary.com/dictionary/public-key/

Private Key
Private key is defined as a string of letters and numbers known only by the owner that allows them to spend their cryptocurrency. If you share your private key, someone else is to be able to take all of the coins. A private key is very similar to a password to access crypto.
https://decryptionary.com/dictionary/private-key/

QR code
A QR code (short for "quick response" code) is a type of barcode that contains a matrix of dots. It can be scanned using a QR scanner or a smartphone with built-in camera. Once scanned, software on the device converts the dots within the code into numbers or a string of characters. For example, scanning a QR code with your phone might open a URL in your phone's web browser.
https://techterms.com/definition/qr_code

Real-time gross settlement (RTGS)
Real-time gross settlement (RTGS) is the continuous process of settling payments on an individual order basis without netting debits with credits across the books of a central bank (e.g., bundling transactions). Once completed, real-time gross settlement payments are final and irrevocable.
https://www.investopedia.com/terms/r/rtgs.asp

RFID
Radio Frequency Identification (RFID) is a technology that uses radio waves to identify a tagged object.
https://www.investopedia.com/terms/r/radio-frequency-identification-rfid.asp

Settlement services as a Bank
A settlement bank is the last bank to receive and report the settlement of a transaction between two entities. It is the bank that partners with an entity being paid, most often a merchant. As the merchant's primary bank for receiving payment it can also be referred to as the acquiring bank or the acquirer.
https://www.investopedia.com/terms/s/settlement-bank.asp

SHA-256 Hash functions
Secure Hash Algorithm 256 or SHA 256 is defined as one of the most secure ways to protect digital information. SHA 256 is a math process that generates a 256 bit (64 character long) random sequence of letters and numbers (hash) out of any input. A hash is as a mathematical computer process that takes information and turns it into letters and numbers of a certain length. Hashing is used to make storing and finding information quicker because hashes are usually shorter and easier to find. Hashes also make information unreadable and so the original data can become confidential.
https://decryptionary.com/dictionary/secure-hash-algorithm-256/

Smart Contract
A smart contract is a computer protocol that facilities the transfer of digital assets between parties under the agreed-upon stipulations or terms. It is similar to a traditional contract in most ways including definition of rules and penalties around the agreement except for the fact that it can also enforce the agreed-upon obligations automatically.
https://www.techopedia.com/definition/32499/smart-contract

Sustainable development goals (SDG)
The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including those related to poverty, inequality, climate, environmental degradation, prosperity, and peace and justice. The Goals interconnect and in order to leave no one behind, it ís important that we achieve each Goal and target by 2030.
https://www.un.org/sustainabledevelopment/sustainable-development-goals/

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1. Appendix: Overview: Platform& Blockchain Cases

Platform Cases			
Company	**Field of Application**	**Advantage of the platform**	**Link**
Platforms			
FrontlineSMS	Marketplace platform for fish products	Checking market prices of fish in real-time and trade fish for fair prices on the local national and international level.	https://www.frontlinesms.com/blog/2009/12/15/fishing-meets-texting-in-banda-aceh?rq=fish%20marketing
RONGEAD in collaboration with INADES	Platform provides cashew nuts producers with tips and tricks all around their market.	SMS service supports around 8.000 farmers with improvement tips for increasing their revenue and develop higher quality products. A real-time data updates about the best harvesting time and selling time to the market.	http://www.cashewinfo.com/country_profiles/Cote%20d'Ivoire.pdf
World Bank Institute	Information and communication platform for development	ICT4D creates positive impact on peace building, acquisition, in conflicted regions	https://integrityaction.org/sites/default/files/publication/files/ICT%20for%20Open%20Contracting%20March%202013.pdf
Liberia Media Centre (LMC)	Platform for sharing the process of governmental initiatives. Cititzens can follow the progress and debate on the initiatives	The platform trigger inclusivity within society and increases transparency for governmental activities.	https://integrityaction.org/sites/default/files/publication/files/ICT%20for%20Open%20Contracting%20March%202013.pdf
BlaBlaCar	Sharing platform for bringing car owners with empty seats and travellers together	The platform connects people with same goals and increases levels of trust. Car driving becomes more sustainable.	https://www.blablacar.com
Blockchain Cases			
Company	**Field of Application**	**Advantage of blockchain**	**Link**
Public Sector			
Evernym & UN	Know your customer (KYC)	ID systems can be stored in a decentralized way and pave the way for financial inclusion and access to health services. Personal information and identities are stored on blockchain can be used in different applications across the internet. Users can decide how much data will be shared.	https://www.evernym.com
Aragon	democratic, decentralised autonomous organisation	A decentralized outonomous platform based on blockchain, where individuals can set up their governmental-like system without intermediaries.	https://aragon.one
Voatz	Secured Voting / Elections	Voting via a blockchain-powered app on the mobile phone combines convenience with security.	https://voatz.com
BenBen in Ghana	Landtitling	Land Information Queries, Property Record Management, Electronic Land Transactions secured and recorded on the blockchain,	http://www.benben.com.gh
BitFury together with De Soto's Institute for liberty and democracy	Landtitling in Georgia	The usage of blockchain technology reduced corruption in Georgia by reducing the number of human touchpoints. Land titling can be audited in 10 mintues and reduced costs and friction in the whole process. Blockchain is used as a kind of notary service.	https://www.forbes.com/sites/laurashin/2016/04/21/republic-of-georgia-to-pilot-land-titling-on-blockchain-with-economist-hernando-de-soto-bitfury/#7604645844da. http://www.ild.org.pe/176-frontpage-contents/1181-georgia-to-store-real-estate-documents-in-blockchain-system-with-bitfury-group-and-hernando-de-soto
Financial Sector			
BITSOKO	Banking the unbanked	Blockchain wallet for SMEs combined with a POS system.	http://www.bitsoko.org/soko.html https://www.mpesa.in/portal/
Kiva	Addressing the unbanked in Sierra Leone	Platform built on the Hyperledger protocol, where citizens can store financial activities on the blokchain.	Kiva.org
Ripple	Remittances	The company uses cryptocurrency XRP for cross-boarder payments via their Xrapid software for banks. This results in faster payments (3sec./transaction), and lower the costs secured by blockchain technology.	https://ripple.com/use-cases/banks/
R3 with Ripple	Automated Clearance and settlement systems	Settlement services over the Ripple network allows banks to safe 30% and more of the costs, secured by blockchain and the DLT.	https://www.r3.com
Zidisha	Peer-to-peer banking & lending	this Micro-lending platform, connects lenders and entrepreneurs directly with the security and KYC procedures of a blockchain.	https://www.zidisha.org/why-zidisha

Business Sector			
Sawtooth	Tracking of Seafood	Sawtooth tracks seafood from catch till the market with RFID chips, secured by blockchain and smart contracts for payments and insurances.	https://sawtooth.hyperledger.org/examples/seafood.html
Banqu	Access to credit and marketplace for farmers	Blockchain secures the identity of both parties and providing additional information for a secure ecosystem with features based on the blockchain protocol without unnecessary intermediaries.	https://banqu.co
stratumn & lemonway	Micro Insurances	Automation, End-to-End traceability, Data privacy, customer consent powered by blockchain.	https://stratumn.com https://www.lemonway.com/en/
Sweetbridge	The company supporting SMEs in their cash flows and strenghtens their payment cycles.	Liabilities and assets are safed on the blockchain. Within this secured ecosystem, companies can use their future earnings and bridge-finance upcoming demands.	https://sweetbridge.com
Sustainability / Charity / Aid Sector			
GiveDirectly & OmiseGo	Direct, de-centralized fundraising	Blockchain will extend the degree of efficiency and allow data security via KYC services and protection across the whole network.	https://www.givedirectly.org/operating-model/ https://blog.omisego.network/update-givedirectlys-findings-from-the-field-and-what-it-means-for-omisego-3f66b9b54e23
Disberse	Tracking and managing funds of as a service of aid organisations.	Blockchcain is used to track and manage funds across the whole aid process. Additional services, like multi-currency accounts, end-to-end traceability, compliance, and direct cash transfers are completing the service.	https://disberse.com
Alice.io	Platform who manages social funding and impact management. Fully automatic and transparent operations for all participants	Blockchain allows all participants to have access to all processes for full transparency. Smart contracts are executing payments after the promised goals of charities are achieved. Automation reduces costs and time.	www.alice.io
BitGive	goal tracker for aid organisations and NGOs	Third-party verification and special, already verified regulatory frameworks are operating on the blockchain, which saves additional costs and third-party intermediaries.	https://www.bitgivefoundation.org
World Food Program	Direct Aid as payments for refugees via blockchain.	Blockchain handles the payments to refugees without intermediary banks.	https://innovation.wfp.org/project/building-blocks