Explaining the early responses to blockchain technology

Categorizing, investigating and explaining the early responses from countries around the world.

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Introduction

Blockchain technology (DLT) is a relatively new concept that could have far reaching consequences for society. It is a very relevant topic, because it is a recent development that has grown into a multi-billion dollar industry and is on the agenda of most countries in the world in the span of a few years. Blockchain technology started with the bitcoin whitepaper some 10 years ago and has since developed into a multi-billion dollar industry reaching into all kind of different facets of life and society (Nakamoto, 2009). Since it is a relatively new topic, there has not been a lot of research done on blockchain and most research that has been done, focussed on bitcoin more so than on blockchain technology. Blockchain technology however, is being investigated and implemented by big corporations globally, and also governments and governmental institutions or banks have been actively investigating blockchain technology and its potential (Jin-young, 2018; Ono, 2018). Throughout the world countries and governments have been responding to blockchain technology in different ways and in most cases were or are unsure on how exactly to react to this new phenomena and how to regulate it, with new laws and regulations coming out regularly. This paper will try and investigate what the early responses are towards blockchain technology by countries throughout the world and then try and investigate if there are macro variables that might explain why there is a difference.

Main research question:

How can the early responses of countries to blockchain technologies, including cryptocurrency be categorized and how could this be explained?

Subcategories:

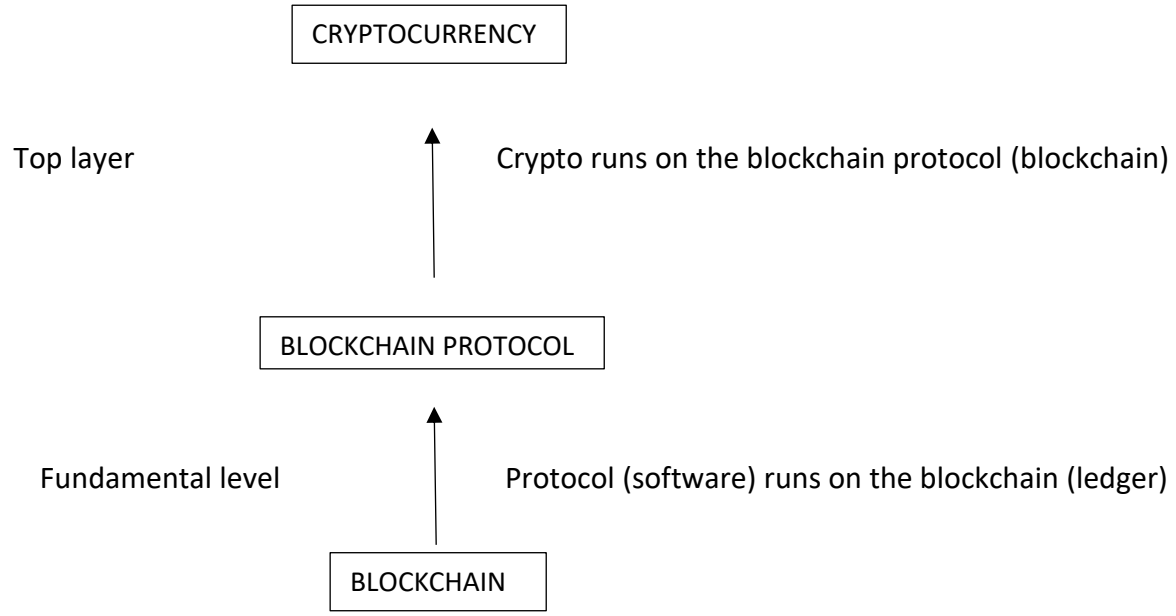
-What is blockchain technology including cryptocurrencies.

-What are the early responses and the macro variables.

-How can the early responses be categorized and explained.

In order to investigate this question, first of all what blockchain technology and cryptocurrencies are, should be explained. Blockchain technology will be explained in detail in the literature review, but blockchain is a ledger technology on which code runs and

cryptocurrencies can interact with this ledger (e.g. a transaction is recorded on it). Cryptocurrencies are a part of blockchain, it's the top layer, so you can have blockchain without cryptocurrencies but you cannot have cryptocurrencies without blockchain. Cryptocurrencies are a part of blockchain technology.



Blockchain technology goes beyond just cryptocurrencies and while cryptocurrencies have been investigated to some extent, especially bitcoin, the response towards blockchain technology as a whole, including cryptocurrencies has not yet been investigated. Due to the fact that this research is looking at blockchain technology as a whole, the early responses that are being looked at are from between 2017-2018.

Timeframe

This is done because bitcoin might be much older, however blockchain is much bigger than just bitcoin and in order to include the response to blockchain as a whole, it should be taken from around 2017 when blockchain evolved, additionally, 2017-2018 (June) are the years that most countries started to actively started to investigate and potentially regulate outside of bitcoin. So the early response that are being investigated are those in 2017-2018 (June).

This paper will look at what are some of the early responses towards blockchain technology (mainly focussing here on bitcoin, due to a lack of available research) with regard to regulations. So the early responses will be categorized by looking at:

- cryptocurrency regulation.
- how a country is reacting and potentially implementing blockchain technology as a whole.

From previous research on blockchain and cryptocurrency adoption, categories will be created with regard to 'what the early responses towards blockchain' will be in this paper. These categories will be filled with countries throughout the world and then macro level variables will be added to try and see what might help explain the early response reaction of these countries.

The main categories of variables used, will be economical, because blockchain mostly has to do with economics and finance (e.g. cryptocurrencies). Political, because this paper is looking at the response from government, so the actual political situation might have an impact here. Cultural, previous research has shown the prominence of blockchain technology in economics and the topic itself is very technical and economical but culture is forgotten about in a lot of research and debate around blockchain. Since blockchain technology has (theoretically) the potential to disrupt or change the whole system of society, mainly through decentralization, it seems a very important but overlooked topic that should be investigated, since culture is an integral part of society.

Literature review

What is blockchain technology

First of all, the question what blockchain technology is, should be answered. This proves to be more difficult than it seems, because blockchain technology is in such early stages, there is a lot of uncertainty around the whole topic. This is also seen in the concept blockchain and how that is used throughout the world. Another word for blockchain technology that is commonly used is, distributed ledger technology or DLT (Johnson, 2018). Broken down this touches upon the main aspects of what blockchain is, it is decentralized (distributed), it is a (mostly public) ledger and of course a technology. Other explanations of DLT include, networking technology, which cannot be tampered with and which is self-executing and which holds an underlying ledger with all the transactions or information that also needs to be public (Davidson, 2016; Johnson, 2018). It is like a decentralized database. It is important to note that blockchain technology in itself is not necessarily decentralized, there are cases of a so-called private blockchain, mainly used to store information or as a underlying infrastructure for new innovations. However, these kind of private blockchains are an adaption on DLT and are not the main aspect of this paper. This paper will focus on blockchains as DLT, being public, transparent and decentralized (Reyes, 2017). The main focus is to gauge the course of action a country took with regard to blockchain technology, investigating possible (centralized) solutions is one way to respond to blockchain technology. The question whether it is still DLT, in that case, goes beyond the scope of this paper, mainly due to the fact that there is too little evidence currently of real life use cases of governments that have implemented their own blockchain technology.

The main aspect of blockchain technology is that it uses so called ‘trustless’ proof mechanisms to record and check transaction on the network (Davidson, 2016; Sas, 2017). In conventional methods of peer-to-peer interaction transactions there is always a question of ‘trust’, in mainstream transactions the trust question is being put on the institution or government that controls it. For example with a money transaction in euros, the intermediary, the bank, needs to be trusted otherwise people won’t make the transaction (Nekrasenko, 2018). Generally banks are understood to be reliable and most people trust

them to make transactions. However, in the case of decentralization or peer-to-peer networks, there is no trusted intermediary and there is a bigger chance of fraud or not enough trust to initialize a transaction (Sas 2017). Blockchain technology combines both of these to create a decentralized peer-to-peer network, in which there is a transparent public ledger (Bjørnstad, 2017). So individuals would not have to trust each other anymore, they would only have to trust in the overall system (on a macro level even above governments and banks) (Sas, 2017; Nekrasenko, 2018) The public ledger, can be viewed by everyone and everyone can download it on their own machine and it is secured and held online through a decentralized system (e.g. mining). It also moves past borders on to a global scale since states and governments aren't needed in this framework to police it. Blockchain is not just a ledger though, it has evolved over time into several different stages, to include for example smart contracts and into other areas of life (Jutila, 2017).

The concept of trust in bitcoin and DLT as a whole is an important concept, especially due to the decentralizing aspect of DLT, in most cases when talking about trust it is in a framework that is centralized with for example corporations, but this is not the case with DLT (Sas, 2017). In this case trust is conceptualized, as the willingness of someone to be vulnerable. In the case of bitcoin there are three levels of trust, there is the technical trust, in which trust is put in the technology or DLT behind bitcoin. There is social trust, which is trust within the bitcoin ecosystem, of fellow users, but also the miners, cryptocurrency exchanges and merchants accepting bitcoin. Institutional trust, which is the trust of government in the DLT technology. Previous research for online trust has showed that, credibility, divided into honesty, expertise, predictability and reputation, alongside ease of use and risk are the main factors to determine the level of trust (Sas, 2017). A small scale interview of 20 people also showed that a large part of the appeal to cryptocurrencies is that it is seperate the institutional systems that those people tend to distrust (Sas, 2017). The idea of removing the third party or the middle man from a transaction so that people have the feeling of doing the transaction themselves improves trust in the overall system, or ironically in the trustless system. Additionally the speed of transactions was shown to foster trust in the system, above traditional banking where payments can be locked for a longer time. Additionally those transactions on DLT are transparent, so everyone can see them, which is positive for trust. However, possibilities of losing the cryptocurrencies due to the difficult process of

storing them (this has been made simpler now) and the potential of losing all of ones funds, had a negative impact (Sas, 2017). The study also found however, that in line with the distrust of government this also plays into the people seeing the market not being regulated as something positive. This has subsequently happened however. The complexity of the whole process of bitcoin mining and DLT is something that fosters some idea of expertise and therefore trust. It should be noted that due to the anonymous aspect of DLT (or at least in some cases) it has been used for illicit activities, although fiat has of course also been used for criminal activities. This did not seem to have a large impact on the level of trust, however this could be biased since it seems that those doing the study were already very in favour or interested in DLT (Sas, 2017).

3 stages of blockchain technology

This is best explained by Melanie Swan and her three stages of blockchain, blockchain 1.0, 2.0 and 3.0 (Swan, 2015). Blockchain 1.0 is currency, the biggest example of this is bitcoin, bitcoin runs over the underlying blockchain infrastructure. There are three levels to this, first the cryptocurrency bitcoin, that on the second level runs on the bitcoin protocol (the code) that runs on the bitcoin blockchain or 'the blockchain' (Swan, 2015). Other cryptocurrencies would have a different blockchain, since every blockchain is a ledger with transaction details, so every specific coin would have its own ledger. The main issues that blockchain 1.0 in currency solved, were the double-spending problem and Byzantines generals computing issue (Davidson, 2016). Double-spending means that a digital asset is spent more than once, an easy example is that for example a piece of code or an email attachment can be stored infinitely and can be copied (Swan, 2015). With blockchain technology any transaction of a shift in ownership of a particular bitcoin is being stored in the ledger. And by checking the blockchain all ownership of a specific piece of cryptocurrency can be traced back to its owner and all previous transactions related to it (Davidson, 2016). The generals computing issue, is with regard to trust, if there would be multiple generals on a battlefield who would not trust one another but would have to be able to communicate effectively, how would they do this? The answer is through blockchain. So how does cryptocurrency work, in short, cryptocurrencies are stored in 'wallets' which are encrypted and can only be accessed with a private key (Swan, 2015). If a transaction is to be made, someone uses the private key to unlock the wallet and send the transaction. This transaction is then broadcasted to the

network and depending on several factors like the transaction fee is processed in a specific timeframe. It works like a radio, when a transaction is made, this is broadcasted throughout the network and all the decentralized miners pick up on this broadcast and add it to the next mineable block in the blockchain(Swan, 2015). This wallet is not stored in any centralized entity, but it is stored decentralized on the blockchain itself, so wherever you are you could, given there is access to the blockchain, access the wallet with the encrypted key.

Blockchain 2.0 are smart contracts or 'contracts' in general, in the whitepaper Satoshi Nakamoto published on bitcoin it was always envisioned to go beyond just currency requirements, or so called programmable money. The main aspects of blockchain 2.0 are the smart contracts, smart property and so called decentralized applications (Dapps) and decentralized autonomous organizations (DAOs) (Swan, 2015). In this stage, blockchain decentralizes other kind of markets and assets beyond currency. Some of the information and records that could be sent and stored on the blockchain can range from public and private records, think about for example property rights, stock and intellectual property (Swan, 2015). For example with intellectual property storing it encoded on the blockchain would timestamp it and protect it, one key aspect here is that blockchain is 'one way' you use a security code or key to check or access information but this cannot be removed or altered (only transferred through a transaction). Additionally, it would be encrypted. The main function, smart contracts are self-executing contracts which in this case are on the blockchain (Jutila, 2017). It uses blockchain technology to form agreements between people on the blockchain. In this case as well, the blockchain removed the problem of trust. Normally you need to trust the other person when you make a contract that the other person abides by the contract (Swan, 2015). But with a smart contract on the blockchain it can be programmed to be self-executing when certain parameters are met. For example with money, a company can lock their cryptocurrency in a smart contract to make sure that they cannot access it, only at the given time in the smart contract (Jutila,2017). A smart contract is also autonomous, it can run without any of the involved parties having to do anything with it after it is launched (apart from abiding by the smart contract otherwise it won't execute) (Jutila, 2017). The full extent to which this use of smart contracts influence contract law still has to be investigated. Blockchain 2.0 has many different blockchain projects that started, the most well-known being Ethereum. Ethereum allows developers to

build Dapps on the Ethereum blockchain and incorporate smart contracts. Another aspect that should be mentioned here, is 'tokens' (Swan, 2015; Reyes, 2017). A lot of companies now use tokens instead of coins, coins are mineable cryptocurrencies, tokens are created on top of an existing blockchain (most are on Ethereum) (Swan, 2015). Tokens are used as security and utility tokens, security tokens could be seen as 'shares' for example think about dividend paying tokens for a company. Utility tokens on the other hand are tokens which are used to engage with the specific platform or Dapp that is created, without the token the Dapp would not work. The main aim of tokens is in most cases also to raise funding through so called ICO, initial coin offerings (Swan, 2015; Reyes, 2017). This can be seen as big (decentralized) crowdfunding platforms, although the main incentive for participants is to either use the token on the platform created or make money later on should the token price go up in value.

Blockchain 3.0 goes beyond economics, currency and markets. The previous instalments of blockchain were mostly focussed on monetary, financial or otherwise economical markets (Swan, 2015). However the blockchain solution could go beyond this realm, blockchain removed the intermediary which could be used in a lot of different fields. This 'evolution' of blockchain is rather illusive, it focusses on how those concepts from blockchain could be potentially applied to overall society (Swan, 2015). An extreme example is for example to have blockchain instead of government, where people can have the option for decentralized self-governing. For example paying more or less taxes on certain budgets depending on what someone finds important or certain benefits someone wants (Swan, 2015).The main aspect of blockchain 3.0 is that it also goes beyond the geographical limitations of states, since the decentralized peer-to-peer network that would be implemented globally would due to its decentralized nature not need a geopolitical system to keep it in check (Swan, 2015). A more functional example, that has been around for several years is Namecoin, it is a blockchain that uses blockchain technology to register and verify DNS without the current need of geopolitical institutions doing that. For example '.com' is in principle controlled by the American government. The DNS servers from Namecoin are global and decentralized and there is no geopolitical institution that has any or should have any power over it (Swan, 2015).

Focus

So this paper focusses on blockchain technology as a whole including cryptocurrencies, the key point here being technology and how the early responses were of countries with regard to blockchain technology. Unfortunately, this is a very hard topic to investigate, mainly due to the fact that it is still very recent and the industry is constantly innovating. The main aspect of blockchain that has been under a regulatory scope for some time now is blockchain 1.0, cryptocurrency with the aim of being mostly a payment method. Additionally, the implications of Ethereum's tokens and smart contracts (blockchain 2.0) has been the focus point of the most recent regulatory investigations. However these regulations are still only at the top level of the technology, namely at a cryptocurrency level. The main overall dilemma that regulators face is first of all that there is no global structure, while blockchain is a global phenomenon and secondly that it is not yet clear as what blockchain technology and cryptocurrencies or tokens actually are (Walch, 2017). This next section will mostly focus on how all these different cryptocurrencies are being approached from a regulatory point of view. This is done because as explained earlier the response to blockchain is being divided into the application, investigation or implementation of the actual technology and the regulation of the top layer of the blockchain, the cryptocurrencies.

Regulation

Blockchain technology and cryptocurrencies are decentralized in nature and therefore are transnational. Which makes regulation tricky, according to Cerny, when there is no world government, the regulation of transnational financial markets can only be done in one of three ways (Cerny, 1994). This also applies to the crypto market since it are transnational transactions of something that has monetary value, regardless if crypto is real money or not, it has a underlying value that society ascribed to it through trading. The three ways are, 'through workable international institutions; through a hegemonic state or group of states working through less formal mechanisms of power and influence; or through the reestablishment of much closer and more direct state control over the markets' (Cerny, 1994). The case currently is that the existing institutions in the World bank and the IMF have only very recently, in June 2018 started to come up with guidelines on DLT (He, 2018). When looking at the corporation between nation-states in the international arena on blockchain and cryptocurrencies, this is mainly restricted to some level of regional cooperation in some

cases. The main examples are the EU who set up a group together, some other countries have been working together on developing DLT solutions, for example by testing DLT for cross-border transactions, but not really for a combined regulatory response (Reuters, 2017; European Commission, 2018). However, the European union is itself already '1 actor', so this might bias the previous comment. What is mostly happening in the case of blockchain regulation, is that there is an increase of state regulations and regulatory frameworks. This might be logical given the fact that one of the core principles of cryptocurrencies are that it circumvents the traditional payment structures, so the countries try to assert power to get it 'under control' (Yelowitz, 2015). This is clearly seen in countries like China and Iran that banned cryptocurrencies, but also a lot of other countries that took a less than positive approach to the up rise of cryptocurrencies. It's also possible that at some point a more united approach might be adopted.

So how did those countries try and regulate cryptocurrencies or blockchain technology. This is an ever evolving field with reports coming out daily to usher in changes to the regulatory landscape throughout the globe. First of all with regard to blockchain there are a lot of possible regulations, for example against money laundering (AML) and KYC (know your customer) (Fawcett, 2017). Then there are legal regulations for corporations trying to work with blockchain and regulations for consumer protection (or the lack thereof) and possibly others. However the main underlying point which has to be addressed first is, legally speaking what 'is' cryptocurrency, and how is it classified (Walch, 2017). There has been a lot of research done on bitcoin and how to classify bitcoin, the classifications used in that research can be used to potentially explain most classifications in the blockchain, however as stated before this can still be different among countries (Mandjee, 2015).

The first classification is, as a form of a method of payment, or an alternative form of money. There are different classifications of what money is, but a broad classification is, that money is accepted, issued or sanctioned by a government, which would be legal tender (Litwack, 2015). A second option to be seen as a method of payment is, so called digital or electronic money. Before there were cryptocurrencies there was already an idea of digital money or electronic money. The best way to understand what electronic money is, is to look at how this is explained by the European Central Bank. 'Electronically, including magnetically, stored monetary value as represented by a claim on the issuer which is issued on receipt of

funds for the purpose of making payment transactions . . . which is accepted by a natural or legal person other than the electronic money issuer' (European Central Bank, 2018). The main aspects of electronic money, is that it has as a goal to make payment transactions and that it is accepted by both parties that partake in the transaction. Additionally, it is of course, electronically stored and very important in this case, there is an 'issuer' of the electronic money (European Central Bank, 2018).

This idea was already envisioned in 1982 by David Chaum, but not much attention was paid to it. Later on Chaum commercialized his research and ideas and created electronic money and others soon followed suit (Litwack, 2015). Companies like Webmoney that is still In existence came about, although many had issues following the legal regulations and were eventually shut down, there have also been rumours that a lot of these systems were used by criminals. This can be seen however as one of the forerunners of cryptocurrencies, the main difference with DLT for regulatory purposes is that there is no issuer in DLT (Litwack, 2015). However this is not the case for, for example tokens, tokens are issued in most cases by a company. There are either security tokens, which as explained would possibly fall under security regulation. But also utility tokens, which do have issuers, however the main use is not necessarily to make a transaction but more so to use the platform or engage with the smart contract (which is done through a transaction). This shows that electronic money regulations might be used as a blueprint to regulate certain areas of DLT (Litwack, 2015). However digital or electronic money needs to have an issuer as well. Apart from a new cryptocurrency that would be issued by a government, DLT would not fit this description. Since blockchain is such a new technology, it might be better to look at, if it has the same functions as 'old' money.

The functions of money (from the ECB) are, store of value, means of exchange and it needs to have a unit of account (Litwack, 2015; Trautman, 2016). Store of value, is when it retains its purchasing power over a longer period of time, with high certainty. Medium of exchange, is when it transfers from person to person without issue and it is accepted by all parties, for settling of debts and paying for goods. Unit of account, is when a value of goods can be referenced using the unit of account. Arguably DLT and cryptocurrencies can meet the second and third condition, depending on the adoption of blockchain. However the store of value of cryptocurrencies is considered extremely volatile and by some even a bubble. The

only exception are DLT projects that peg their cryptocurrencies to a fiat currency, but most projects do not do this (Trautman, 2016).

The second classification would be as an investment, this follows from the reasoning that DLT is very volatile. Should cryptocurrencies be a speculative instrument this would mean that it would be classified as a security (Litwack, 2015). However overall this would be problematic to put on all the DLT projects, since some (try to) act like money and others use utility tokens to perform certain tasks. However so called security tokens are exactly what fit in this classification. These are DLT projects that give tokens that have no utility apart from trying to gain in value over time (this can also be through dividend payments) (Litwack, 2015). The problem with the classification of a security as a whole on DLT can be seen with the bitcoin issue. The SEC in America has gained supervisory power and power to demand security regulation towards certain companies using bitcoins in certain ways, for example a hedge fund (Fawcett, 2017). However bitcoin itself was not seen as a security, but in this case was stated as if it was 'trading in money', while bitcoin is also not classified as money, so there is a lot of confusion. Another side note, in order to be a security, profit should be made by efforts of another, because of the mining in certain DLT, this 'mining' can be seen as an effort, which makes it all more complicated (Litwack, 2015).

The final classification is as a commodity, which is an economic service or good with some level of fungibility. This means that, markets do as if the commodity is always the same or very similar, without taking into account the actual producer (Investopedia, 2018). However here the main concern as was with money, is the extreme volatility of most cryptocurrencies. One of the most well-known commodities is gold, when gold is compared to cryptocurrencies, there is a limited supply (not all DLT is limited though, but most that aren't, are tokens), there is no one that can claim to own it and there is not one single geopolitical institution that oversees it (Mandjee, 2015). Important here is that it needs to be tangible and useful. Cryptocurrencies can be owned (in wallets) and are also useful as in they can be used on DLT platforms or traded for items or fiat.

So, the three main classification that DLT as a cryptocurrency can be classified are, as payment method, as an investment or security and as a commodity. It seems that depending on the actual form and implementation that DLT takes all of these classifications seem to be

possible in some way. It is being used as a method of payment although it would not official be as such but might be regulated as such in the future. Many tokens on the Ethereum blockchain are security tokens and are as such classified as securities. Other DLTs, like bitcoin could be classified as a commodity. The problem is, that these classifications would not cover all the different forms of DLT and innovation that will most likely happen in the future, but it is a good starting point. Regulation on KYC, AML and consumer protection are more general and don't need specific classifications to be implemented. Additionally, tax payments are very important and probably the main driver to identify what cryptocurrencies are, in order to know at what % and how it should be taxed (Litwack, 2015).

Previous research on categorization of responses towards DLT

'Global advocates', these are countries that are actively trying to get virtual currencies on par with already existing systems and are so-called pioneers in the industry.

'Developing', these are countries that are looking to incorporate cryptocurrencies into the system, but currently there are still a lot of obstacles.

'Fence-sitters', this group does nothing, individuals are not impeded upon, but also no active steps have been done to regulate the market for consumer protection or anything.

'Hostile', this group are governments that actively try to restrict cryptocurrency, but did not ban it yet completely.

'Banned', cryptocurrencies and related DLT (apart from maybe the government) is illegal.

(Thomson Reuters, 2017).

Other research has come up with a similar distinction, this consists of:

1. 'Virtual sovereigns': the cryptocurrency reigns supreme here, the idea is that the cryptocurrency through DLT is self-regulating and the government doesn't interfere at all.

2. 'Prohibition': governments could try to block their citizens from using virtual currencies that don't abide by government restrictions and regulations (governments have not been able to completely block access to Web sites nor will total prohibition on virtual currencies succeed).

3. ‘Selective prohibition’: only certain parts of cryptocurrency use would be prohibited, take as an example the buying of ‘real’ goods that could be prohibited, or anything else that does not completely prohibit cryptocurrencies but just selectively.

4. ‘Selective regulation’: some parts of cryptocurrency are regulated, think for example about tax regulation here.

5. ‘Real-world assisted virtual currency self-governance’: governments provide support for mechanisms whereby users of virtual currencies can agree upon and enforce their own ‘community standards’ and rules of conduct.

(Guadamuz, 2015).

Hypotheses

Hypothesis 1: Western democratic countries are much more in favour of blockchain technology than any other country, due to democratic and liberty values.

*Blockchain technology, at least in its ideological form, has as an aim, to be completely transparent and also moving away from any form of censorship or control by a centralized entity, through potential complete decentralization. Since these were part of the main aims when blockchain technology was created and introduced, this paper believes that societies valuing freedom and liberty would be more positive toward blockchain than societies that are not (*Atzori, 2015).

Hypothesis 2: Countries that value progress and innovation are more in favour of blockchain technology.

Blockchain technology is currently in its early stages and can be called an innovative technology or at least being in a state of innovation. This means that countries that are actively looking for constant innovation would be positive about blockchain technology, additionally it is a knowledge based field, with actual blockchain creation or adoption mostly being in the ICT field. This means that countries that have a high level of innovation would be potentially more active with DLT (Swan, 2015).

Hypothesis 3: Socialism (or collectivism) has a positive effect on the response towards blockchain technologies.

This is an interesting hypothesis, blockchain technology was from the start considered a libertarian ideal of sorts, this is also represented in hypothesis 1 to an extent. However, what is also very interesting is that, the main idea of decentralization through blockchain can move away from centralization and possibly the state. This is something that is in line with anarchist and some other socialist doctrines. It is to be noted that blockchain technology is a tool, it could potentially be used as a libertarian individualistic tool but also potentially as an anarchist tool to potentially create a decentralized society or community. Potentially organizing society in communities as peer-to-peer networks, means that the ideological idea

*of blockchain and therefore the early response towards blockchain, could be positive in societies that are considered socialist (*Huckle, 2016).

Hypothesis 4: Stronger economies are more in favour of blockchain technology than weaker economies.

*Due to the potential or claimed disruptive effect of blockchain technology especially in the economic sector. Additionally due to cryptocurrencies potential to circumvent, financial infrastructure in place and move beyond it. These reasons might be potentially detrimental for weaker economies that might not be able to 'sustain' this 'disruptive impact'. While stronger economies might be more resilient. Additionally, stronger economies have more funds to actively investigate and develop blockchain technology, its potential and risks (*Swartz, 2017).

Hypothesis 5: Cultures that look more towards the future and are not afraid to take risks are more in favour of DLT.

Because blockchain technology is in its early stages there still is a lot of uncertainty and problems, especially in the short term it is very unclear. This means that societies that are not inclined to take risks would not feel comfortable with blockchain technologies. Additionally, long term thinking would also be needed to see past the short term problems and the potential of the technology. In order to investigate this, Hofstede's dimensions of uncertainty avoidance and short vs long term thinking will be used here.

Methods

The focus of this paper is to categorize and explain the early response to blockchain technology in the form of cryptocurrency regulation and blockchain technology adoption and investigation. As discussed earlier, the main point of focus would be with regard to cryptocurrency regulation since that's part of DLT and also the most regulated, since it's hard to regulate technology. However since DLT is not just cryptocurrencies, the focus will also be on how a country responded to the technology of DLT and lastly tax regulation are the most common sort of regulation, this will be looked at to help investigating the early response of a country. The previous research has shown that in most cases there are around 5 different categories, which possibly include a neutral category (Guadamuz 2015; Thomson Reuters, 2017). The other categories range from total restriction towards adoption or promotion of cryptocurrencies. This paper will try and be more concise and has therefore used the previous categorization to come up with 4 categories.

Categorization

The main categorizations in cryptocurrency regulation that have been found in the previous research can be summed as follows:

Regarding cryptocurrency regulation: no regulation at all, pro-active positive regulation, only tax regulation, restrictive regulation and hostile regulation (or ban)

Regarding blockchain technology: no action, openly stating against it, investigating, developing, implementing.

These can be divided into 4 different categories to categorize the sort of response a country has towards DLT as a whole, so the technology and the regulation:

- 0 pushing or promoting DLT | positive
- 1 uncertain non-restrictive | neutral or slightly positive
- 2 cautious | slightly negative
- 3 restrictive | negative

0: This category are countries that are actively trying to regulate and implement DLT. These are the front-runners in the industry or those that actively and openly speak about DLT in a positive way and try to implement DLT. Cryptocurrency regulation is common here and is either neutral or progressive. Additionally blockchain technology is actively trying to be implemented in the country. While category 1 is more investigatory or fence-sitters, this category is trying to act and implement.

1: This category is not restricting DLT, including cryptocurrencies but it is also not openly trying to push for DLT or is actively trying to implement DLT. Cryptocurrency regulation is possible here but actual implementation of progressive regulation or active implementation of the technology by the government is lacking (business/citizens are mostly excluded). These are countries that do not really know yet what to do, 'neutral cautionaries or fence-sitters'.

2: This category are countries that are cautious about DLT. These are countries that to some extent try to limit DLT, think for example of restrictive cryptocurrency regulation. But are not opposed to the idea of DLT and are actively investigating or trying to develop blockchain solutions.

3: This category are countries that are outspokenly negative about DLT and have banned parts of DLT. It must be noted here that it is still possible that the technology itself is being investigated. But this will be discussed in more depth in the research.

What is restrictive regulation, restrictive regulation in this paper are regulations that try in some way to limit the access or accessibility of the use of DLT. This should not be confused with for example KYC or AML regulations, these are standard regulations that are implemented to avoid money laundering. In some way they can restrict users from using a service, but assuming everyone is a law-abiding citizen, KYC or AML regulations do not restrict a user from using DLT in any way. This is like tax regulations; tax regulations are not restrictive as long as they are not 'over the top'. For example, in certain cases the DLT related taxes are much higher compared to regular taxes, that would be considered restrictive.

Research

Category 0:

Canada

Canada is actively investigating DLT through its financial institutions and has also delineated certain risks with relation to DLT but has not cracked down on the market (CSA Staff Notice, 2018). It has however shown interest in creating its own blockchain solution to settle transactions, while at the same time also having a pro-active approach to regulate, not restrict DLT (Bank of Canada, 2018). In June of 2018, Canada amended AML and KYC regulations with regard to cryptocurrencies which would see crypto exchanges as money service businesses. To help customers and boost the market, these policies are not legally binding yet but are being reviewed (Canada Statutory authority, 2018).

Mexico

The problem with the Latin American countries is that they started much later with actively developing a blockchain ecosystem. This means that there are less companies there and also in the case of Mexico a brain drain towards the USA (Kendall, 2018). However being a late bloomer might be very positive with regard to the actual response to DLT, seemingly a lot of uncertainty of the previous years has been cleared up, so there is a much more positive outlook towards the future of DLT, the main problem for Mexico is keeping the talent locally. The Mexican government is also actively working towards DLT solutions to be implemented in the country (DEBATE, 2018).

Malta

Malta, a tax paradise, unsurprisingly called itself the blockchain island, the country's financial authority has taken a proactive approach trying to tackle the issues with DLT and its classification and positively trying to regulate it to attract business (Government Malta, 2018). Malta also tries to create regulatory frameworks in the blockchain market to have more structure, while working closely with people in the space, its overall a very big supporter of DLT (Financemalta, 2018).

Switzerland

Is very DLT friendly, a lot of companies actively try to establish themselves there and there are a lot of research centres focussing on DLT. Additionally, the Swiss government has set up working groups to assess the impact of DLT and make sure that the potential negatives like fraud can be dealt with and is actively trying to regulate the industry (Swiss Federal Council, 2017; FINMA, 2018).

Spain

Spain has been actively investigating DLT as solutions to solve corruption, by using blockchain and AI. Additionally Spain is trying to adjust the taxes in the country to be favourable towards blockchain companies in order to attract them to the country (Duarte, 2018). Additionally several branches of the Spanish civil society and government are working together to investigate blockchain projects to make certain systems more efficient (Nikolova, 2018).

UK

The UK has set up working groups to investigate how to best regulate the DLT market to make it favourable for the country (Dew, 2018). In addition to that it has set up work groups to look at how DLT can be implemented in the payment systems in the UK, this is also being done by their central bank (FCA, 2018). Additionally other sectors are also testing DLT and its use case, for example by the national archive (Green, 2018).

Ethiopia

Ethiopia has a very underdeveloped DLT market, however the government in Ethiopia is actively looking to incorporate DLT in the country. The government signed a memorandum of understanding with DLT and cryptocurrency company, Cardano to help track certain products during the supply chain, mainly coffee (Duffin, 2018).

South Africa

The South African government actively sought to work with blockchain companies to look for a good way to regulate DLT in their country, the central bank is also involved in this process (Finextra, 2018). It is actively trying to be inclusive of DLT , it's for example possible to pay fines with bitcoin. (Slabbert, 2017).

Singapore

Singapore has not spoken out towards DLT and has called for investigations to make sure it adopts a correct DLT related regulations which are 'beneficial'. The government of Singapore is also actively involved in trying to implement and better understand DLT in mainly the banking sector (MAS, 2016). The main aim is to create a good regulatory framework (MAS, 2018).

Thailand

Thailand is actively trying to regulate the cryptocurrency market, with an eye on protecting investors, not to limit or restrict the market. However the regulations are being considered unclear currently and hard to comply with. The intention is good though (Bangkok Post, 2018). Additionally, DLT technology is being actively investigated by government and banks in Thailand to see how it can be implemented (Ono, 2018).

Argentina

Also one of the late bloomers in South America, it seems to be a very pro blockchain country, creating new legislation which allows third party use in the transaction industry, although not directly quoting cryptocurrencies or DLT (Popper, 2015; Infobae, 2018). Argentina has also hosted big DLT events in which people spoke very favourable about the future of DLT in Argentina. Additionally the futures market in Argentina is actively looking to incorporate cryptocurrencies. The government is registering official bulletins on the blockchain (BrandBoletín, 2018).

Estonia

Estonia is one of the front-runners in the EU on DLT, they try to not restrictively regulate DLT and try to be clear on what is and what is not regulated and what that means (Schwarz, 2018). The main aim of Estonia on DLT is to attract foreign investments currently. KYC and AML regulations are enforced (HandelsHaus, 2018).

Japan

Japan is one of the biggest pro-DLT countries there is, however what should be noted this is not necessarily due to the government and regulation, but companies in Japan that actively

try to use DLT and the public that massively trades in cryptocurrencies (Ellis, 2017). The government has however tried to impose favourable conditions for DLT, but after several security issues, Japan has also started to somewhat restrict DLT but only to try and increase consumer protection (Nikkei staff writers, 2018). Japan is also actively trying to set up new regulations to create a useable regulatory framework for blockchain and create a safe and welcoming place for DLT (Kharpal, 2017).

South Korea

There is debate currently on the extent of crypto-friendliness in South Korea. Several regulations that South Korea has implemented or hinted towards have caused bear markets (markets going down) in the cryptocurrency world (Ramirez, 2018). However, the main regulations were about, not allowing anonymous accounts, this can be considered a normal regulation, since it's not restrictive if someone is acting legally (Kim, 2018). Additionally, the sentiment in South Korea is very much in favour of DLT, from the population to several governmental institutions actively investigating DLT solutions, like creating their own public blockchain, which would provide a range of services (Jin-young, 2018).

United Arab Emirates, UAE

The UAE is actively making plans to incorporate DLT in several sectors, this will be done by high government officials and plans till 2021 have been made (Sutton, 2018). Regulators are also looking to make inclusive regulations and not restrictive regulation (ADGM, 2018).

Chile

Chile is a very interesting case, like all other Latin American countries it is part of the late bloomers. It also had a lot of issues with regulations, several cryptocurrency exchanges had their bank accounts closed (Russo, 2018). However they appealed this decision and won, in addition to this the government seems to want to regulate crypto and set up work groups in addition to be positively outspoken about DLT (Russo, 2018) Additionally, the Chilean government will use DLT to track energy data (Subdepartamento Energia, 2018).

Category 1:

Australia

Australia went from a very hands-off initial response to regulating stricter KYC and AML laws and hints towards further regulation, it's still unclear to what extent and how those regulation would actively look beyond AML/KYC (Australia Government, 2018).

Israel

Israel has not banned or supported cryptocurrencies and DLT, there were plans to get definitive regulations of DLT which would give security and framework and was considered as something positive. However this has been postponed by Israel (Golstein, 2018). Israel has not been very favourable towards DLT, but sentiment is still positive for the future, with some negativity due to uncertainty from the government (Golstein, 2018). The business sector with regard to DLT is booming in Israel though (AFP, 2018).

Netherlands

The Netherlands overall has a positive outlook on DLT, investigating DLT and tax regulation surrounding DLT. However apart from that it seems very uncertain still, the central bank of the Netherlands has tested DLT but did not see it working yet (DNB, 2018).

France

In the international space it seems that the ministers in France know about DLT and are also positively speaking about it and its potential for the future (Maire,2018). However the market in France seems underdeveloped, since that smaller countries like Switzerland have a much bigger market. However France has cut tax on cryptocurrency gains which signals intention to be pro-DLT. (lemonde.fr, 2018). The government also set up working groups, unfortunately it's still a bit unclear for the future since not a lot has actually been put in practice yet and sentiment is switching from positive to negative (Martinet, 2018).

Saudi-Arabia

Saudi-Arabi can be seen as one of the places in the middle-east that looks reasonably favourably upon DLT, there have been some reports of the banks in the region looking to use DLT to settle cross border payments (Reuters, 2017). Additionally, it's not banned and DLT

will very likely not be banned in any way although regulation is needed. That is the main problem currently, there is no real active regulation, the market still needs to 'mature' according to officials (Chaparro, 2018).

Bulgaria

The country itself has not done much in the DLT space, it made some tax regulations pretty soon after cryptocurrencies started to pop up but hasn't done much after that (Kostov, 2018). However the banking sector in Bulgaria has 'declared war' on cryptocurrency exchange companies and shut down all cryptocurrency exchange accounts (Sedgwick, 2018).

Poland

Poland is hard to classify, they made a statement regarding tax, only to later rescind this to do more in-depth analysis before forcing tax regulations (Stooq, 2018). The central bank has also openly fought against cryptocurrency trading and forex trading, however they also stated it is completely legal (Bereznicki, 2018).

Category 2:

USA

The USA is an interesting case with regard to DLT, on the one hand they can be considered front runners with DLT regulations and were also one of the first countries to categorize bitcoin and implement derivate products for cryptocurrencies. On the other hand the USA is one of the few countries in which ICO, initial coin offerings, are strictly regulated (Cheng 2 ,2018). This resulted in most ICOs and blockchain companies excluding American investors (except in certain cases where it is either strictly regulated or it are accredited investors), but it severely hampers the market (Reeves, 2018).

Kenya

Kenya has had a reasonably negative stance for a long time with anything related to DLT, however they have recently begun investigating DLT to see how it can benefit the country, as of now there is no clear guidelines or directive (Dahir, 2018). The central bank although not banning cryptocurrencies but has repeatedly spoken out against it and called bitcoin a Ponzi-scheme (Alushula, 2018).

Brazil

Given that the DLT revolution came quite late to Latin America, countries like Brazil have to play catch up. However international companies like IBM who are actively investigating DLT, opened a 5.5 million dollar hub in Brazil for DLT (Ammachchi, 2018). However the internal response, was not very positive, prohibiting local investment funds from investing in cryptocurrencies and the initial regulations around tokens were rather strict (Reuters, 2018). There are lobby groups actively trying to sway the government to 'step up' on regulations to make sure that Brazil can compete in the blockchain space, there seems to be a lot of interest.

Turkey

There are reports that Turkey is looking to implement its own DLT and create a cryptocurrency (Cetingulec, 2018). However it was stated from the religious authorities that certain cryptocurrencies were not good for Muslims. However it was not completely banned.

Therefore it seems that there is interest in DLT but the sentiment is negative currently, mainly due to religious reasons (Hooper, 2017).

Russia

Russia is also not certain on how to deal with DLT, the country is actively researching DLT usages and DLT implementation for its own use but the actual regulatory response is not clear, it went from non-regulation to uncertainty (Popper, 2018; Proffitt, 2018). It is likely that Russia might try to turn into a DLT paradise.

India

India turned from a very DLT friendly environment quickly into a very cautious country, not outright banning DLT, although hinting towards this, it is uncertain what the future is of DLT in India (Rooney, 2018). On the one hand DLT is being researched in India, as stated in a press release, but due to all the fraud and risk concerns the country is restrictively regulating DLT (Infosys Limited, 2018).

Iceland

Iceland has made bitcoin trading illegal, since its classified as electronic currencies (Tatar, 2018). On the other hand however, Iceland is one of the biggest DLT mining countries in the world (Hern, 2018). Later on alternative cryptocurrencies were made exempt from cross border trading using exchanges and Iceland also created its own coin (Reese, 2017). So Iceland is in fact not that negative but theoretically its cautious, in reality it would be more positive.

Category 3:

China

China actively banned cryptocurrency trading and most things that have to do with DLT. What has to be noted here is that the Chinese government itself is in favour of DLT and is actively trying to research DLT and its possible implementations for China (Cheng, 2018). However, potentially due to the censorship in China and the decentralizing aspect of DLT it has completely banned DLT still. There are rumours this will change in the future (Cheng, 2018).

Ecuador

Ecuador has banned cryptocurrencies and whenever new things pop up like bitcoin ATMs or anything related to DLT it bans it (PanAm, 2014). The interesting point of Ecuador is that although they keep banning DLT related technology, they are one of the first countries to try and release their own cryptocurrency (Banco Central del Ecuador , 2018). Which of course is the only 'legal' form of cryptocurrency in the country.

Indonesia

Indonesia is pretty negative towards DLT technology, banning crypto transactions pretty fast, after which it set up a working group to investigate the issue and future of DLT, the results will most likely be positive but this is too recent. Cryptocurrency as a commodity is legal, but not as a payment method (Bank Indonesia, 2018; SSEK Indonesian Legal Consultants, 2018). Indonesia will very likely be much more positive in the near future.

Egypt

Egypt is very negative towards DLT, there has been no real initiative taken to implement DLT and the religious authorities have spoken against bitcoin due to its volatility (Daily News Egypt, 2018). The market is also very underdeveloped in Egypt, possibly due to all the unrest in the country. Currently it is negative (Egypt Today staff, 2018).

Bolivia

Bolivia banned bitcoin and cryptocurrencies years ago and haven't shown much interest to change that (Marty, 2014).

Morocco

Morocco has banned cryptocurrencies, authorities claim to be looking at the market, but not much is happening yet (Abdel-Qader, 2017).

Pakistan

The state bank of Pakistan has banned cryptocurrency investment and trading, the market in Pakistan was not very mature when this ban was implemented. The government itself is actively looking at how DLT could be implanted in the future (Hanif, 2018; Siddiqui, 2018).

Variables

The main purpose of this paper is to categorize responses towards DLT and then try and investigate why countries responded in a certain way. Due to the scope of this research three main macro variables will be used, economic, political and cultural. These are sub-divided into several indicators to measure this. The economic variables are looked at through the Human Development Index and the Global Innovation Index. The political variables are divided into the Human freedom index and the Economist Intelligence Unit Democracy Index. The cultural variables are subdivided in Hofstede's model of cultural dimensions and religion. These subdivision variables try and cover a very macro level approach to this research. The HDI which also includes other variables and not only GDP (Human Development Data, 2015). The GII which would measure the innovation of the countries and since DLT is new technology this is a potential big variable on economy (Index, 2017). Political and social variables in the Democracy index and freedom index, which would encompass how free a country is and what kind of political system a country has, these have been specifically chosen due to the decentralization aspect of DLT, which might link to level of freedom (The Economist, 2017; Vásquez, 2017). The culture variables are several, they are the levels of cultural dimensions that Hofstede has delineated, those levels were more so used for research in business throughout the world and it has also been criticised for cultural bias, however it is one of the most readily available models for culture and gives information of almost all the countries in question (Hofstede, 2010). Religion was also added to this list because after the initial research of the countries it showed that several countries used religious reasons in their response towards DLT, for example in the case of Muslim countries, those religious authorities have openly stated against cryptocurrencies (Hooper, 2017). So it seemed a potentially important variable to include. However, it is noted that religion is problematic variable to use, in this research religion is not meant in a way that someone their religious denomination has a direct effect on the response of a country towards DLT. Religion in this context is mostly used as a variable for cultural heritage, to explain the macro variable of culture, the cultural heritage of a country needs to be considered and religion seems to have a big impact on how countries have formed over the decades, also regarding norms and values.

The economic variables included measure:

- Technological innovation
- Standard of living, GNI
- Knowledge, education
- Life expectancy

(Human Development Data, 2015; Index, 2017).

Political variables that will be included will consist of:

- Freedom of speech
- Press freedom
- Level of Democracy

(The Economist, 2017; Vásquez, 2017).

The final category of variables are cultural variables, the region in the world a country is from will be included as the base variable here. In order to look at culture, although noted that this is very problematic due to cultural biases and other criticism, Hofstede's model of cultural dimensions will be used. This model is one of the most well-known models and, although not flawless and neither unbiased, it still offers global data on several cultural dimensions for the scope of this paper. Additionally, religion will be used as a cultural heritage variable, which potentially has shaped how societies nowadays act.

These include:

- Cultural region
- Power distance index
- Individualism vs. collectivism
- Uncertainty avoidance index
- Masculinity vs. femininity
- Long-term orientation vs. short-term orientation
- Indulgence vs. restraint.
- Religion

(Hofstede, 2010; CIA factbook. 2018).

It has to be noted here that there might be issues with regard to correlation and causation with these variables. Due to DLT being very new it is unlikely that DLT itself would be causing any of the variables. However between the variables it will be difficult to assess whether there is a real correlation or causation or if it is spurious. Additionally, it is possible that there are causations between the variables itself, economy influencing the politics or religion influencing the regime. It is unclear if a potential correlation between DLT and a variable is caused by a causation between variables or another not included variable.

Results

Definitions

The total number of countries are 37

HDI: Human Development Index, data is from 2015 (Human Development Data, 2015).

GII: Global Innovation Index, data is from 2017 (Index, 2017).

FI: Freedom Index, or the human freedom index, data is from 2017 (Vásquez, 2017).

EIU: Economist Intelligence Unit Democracy Index, data is from 2017 (The Economist, 2017).

R: Region, 1-Europe and Australia, 2-North America, 3-South America, 4-Africa, 5-Asia (excluding middle east), 6-Middle east.

The data is gathered from the CIA world factbook, with 23 countries in North-America, 54 in Africa (minus 1 that goes to the Middle-east here), 12 in South America, 48 in Asia (minus 15 that are classified as Middle East here) and 51 in Europe (excluding Kazakhstan/Turkey/ Vatican City) (CIA, 2018).

Hofstede: PDI- Power Distance, IDV- Individualism vs Collectivism, UAI- Uncertainty Avoidance Index, MAS- Masculinity vs Femininity, LTO- Long-term Orientation vs Short-term Orientation, IND- Indulgence vs Restraint. This data is older, but that shouldn't be a problem since culture is something that doesn't change within a few years (Hofstede, 2010).

Religion: The main religion of the country, this is the predominant religion, in many cases there are multiple religions in a country, but if there is a clear predominant religion that has been used here. In very few cases there wasn't, in that case, two religions are named. The data has been collected from the CIA world factbook (CIA factbook, 2018). Australia was added to the Europe category due to the lack of other countries in that region.

Table 1.0 shows the countries used in the research and a breakdown of where those countries are located around the world. Most continents are covered by approximately 25%. In the case of north-America due to a lot of small islands that have been omitted from this research the % seems low but when looking at the big countries in that continent it is much higher. Africa is very low mainly due to a lack of available information on those countries or

a lack of a DLT market due to possibly the economic development of the region. South-America is potentially over-represented in this study, this is because in Latin America the responses to DLT are very different so a good sample was required.

Table 1.0: statistics

	Europe	**North-America**	**Africa**	**Sth-America**	**Asia**	**Middle East**
Total number of countries	52	23	53	12	33	16
Number in research	12	3	4	5	8	5
Percentage of total	23%	13%	8%	42%	24%	31%

Table 1.1 shows the total number of different religions in this study, from the 37 countries 21 are predominantly Christian, 7 Muslim and 10 something else. This shows that there might be a bias towards Christianity, however since a greater number of countries (Europe, large parts of Africa and the Americas) are predominantly Christian it seems a fair balance.

Table 1.1: religion

	Category	**0**		**1**		**2**		**3**	
Religion	total	NUM	%	NUM	%	NUM	%	NUM	%
Catholic	12	7	44%	2	29%	1	14%	2	29%
Protestant	5	2	13%	0	0%	3	43%	0	0%
Christian (other)	4	1	6%	2	29%	1	14%	0	0%
Muslim	7	1	6%	1	14%	1	14%	4	57%
Jew	1	0	0%	1	14%	0	0%	0	0%
Hindu	1	0	0%	0	0%	1	14%	0	0%
Buddhism	2	2	13%	0	0%	0	0%	0	0%
Mix	1	0	0%	1	14%	0	0%	0	0%
Other	2	1	6%	0	0%	0	0%	1	14%
None	2	2	13%	0	0%	0	0%	0	0%

Table 2.0: category 0

Country	HDI	GII	FI	EIU	R	PDI	IND	UAI	MAS	LTO	IND	Religion
Canada	0,92	53,7	8,54	9,15	2	39	80	48	52	36	68	Catholic
Mexico	0,762	35,8	6,93	6,41	2	81	30	82	69	24	97	Catholic
Swizz	0,939	67,7	8,89	9,03	1	34	68	58	70	74	66	Catholic
Spain	0,884	48,8	8,14	8,08	1	57	51	86	42	48	44	Catholic
Japan	0,903	54,7	8,2	7,88	5	54	46	92	95	88	42	Folk
UK	0,91	60,9	8,55	8,53	1	35	89	35	66	51	69	Prot.
Chile	0,847	38,7	8	7,84	3	63	23	86	28	31	68	Catholic
Sth-Africa	0,666	35,8	7,07	7,24	4	49	65	49	63	34	63	Prot.
Argentina	0,827	32	6,46	6,96	3	49	46	86	56	20	62	Catholic
Thailand	0,74	37,6	6,52	4,63	5	64	20	64	34	32	45	Budd,
Sth Korea	0,901	57,7	8,17	8	5	60	18	85	39	100	29	X | Prot.
UAE	0,84	43,2	6,39	2,69	6	90	25	80	50			Muslim
Singapore	0,925	58,7	8,34	6,32	5	74	20	8	48	72	46	Budd.
Ethiopia	0,448	24,2	5,39	3,42	4	70	20	55	65			Christian
Malta	0,856	50,6	8,33	8,15	1	56	59	96	47	47	66	Catholic
Estonia	0,865	50,9	8,48	7,79	1	40	60	60	30	82	16	Non
Average	0,827	46,9	7,65	7,01		57	45	67	53	53	56	

Table 3.0: category 1

Country	HDI	GII	FI	EIU	R	PDI	IND	UAI	MAS	LTO	IND	Religion
Australia	0,939	51,8	8,6	9,09	1	36	90	51	61	21	71	Christian
France	0,897	54,2	8,04	7,8	1	68	71	86	43	63	48	Catholic
Netherlands	0,924	63,4	8,55	8,89	1	38	80	53	14	67	68	Non/Chris
Saudi-Arabia	0,847	36,2	5,37	1,93	6	95	25	80	60	36	52	Muslim
Israel	0,899	53,9	7,68	7,79	6	13	54	81	47	38		Jew
Poland	0,855	42	8,08	6,67	1	68	60	93	64	69	29	Catholic
Bulgaria	0,794	42,8	7,83	7,03	1	70	38	85	40	38	16	Orthodox
Average	0,879	49,2	7,74	7,03		55	60	76	47	47	47	

Table 4.0: category 2

Country	HDI	GII	FI	EIU	R	PDI	IND	UAI	MAS	LTO	IND	Religion
Brazil	0,754	33,1	6,32	6,86	3	69	38	76	49	44	59	Catholic
Turkey	0,767	38,9	6,77	4,88	6	66	47	85	45	46	49	Muslim
USA	0,92	61,4	8,39	7,98	2	40	91	46	62	26	68	Prot.
India	0,624	35,5	6,55	7,23	5	77	48	40	56	51	26	Hindu
Russia	0,804	28,8	6,11	3,17	1	93	39	95	36	81	20	Orthodox
Kenya	0,555	31	6,68	5,11	4	70	25	50	60			Prot.
Iceland	0,921	55,8	8,12	9,58	1	30	60	50	10	28	67	Prot.
Average	0,764	40,6	6,99	6,40		64	50	63	45	46	48	

Table 5.0: category 3

Country	HDI	GII	FI	EIU	R	PDI	IND	UAI	MAS	LTO	IND	Religion
Pakistan	0,55	23,8	5,57	4,26	5	55	14	70	50	50		Muslim
Indonesia	0,689	30,1	6,83	6,39	5	78	14	46	44	62	38	Muslim
China	0,738	52,5	6,01	3,1	5	80	20	30	66	87	24	Confucian
Morocco	0,647	32,7	6,23	4,87	4	70	46	68	53	14	25	Muslim
Egypt	0,691	26	4,79	3,36	6	70	25	80	45	7	4	Muslim
Bolivia	0,674	25,6	6,58	5,49	3							Catholic
Ecuador	0,739	29,1	6,68	6,02	3	78	8	67	63			Catholic
Average	0,675	31,4	6,10	4,78		72	21	60	54	44	23	

Analysis

Category 0 and 1

When looking at tables 2.0 and 3.0 it can be seen that 9 out of the 12 European countries are either promoting DLT or have a more hands off neutral approach. The only exception here are Russia and Iceland, it should be noted that those are both none member states of the EU. And in the case of Iceland the only reason they are not in category 1 is because they technically have banned bitcoin, however their economy is geared towards 'mining' of cryptocurrencies and they are generally used and accepted there. The EU has actively been investigating DLT and has not been restrictively regulating, some regulation was adopted by the EU but those were mainly about categorization of cryptocurrencies, which could be seen as something positive (European Commission, 2018). Due to this overall positive DLT outlook in the EU this might explain why these countries are all in similar categories.

When looking at the economical variable in category 0 and 1, the HDI is very similar on average with 0,827 in category 0 and 0,879 in category 1. These numbers are much lower in category 2 and 3. As mentioned before this seems to be due to most EU countries who score very high on this being in category 0 or 1, the question now is whether being European influenced their attitudes towards DLT or because of the economical factor. When looking at non-European countries in category 0, it are Canada, Mexico, Japan, Chile, Argentina, South-Africa, Thailand, South-Korea, UAE, Singapore, Ethiopia. From this list only Mexico, South-Africa, Thailand and Ethiopia score under the average of that table. Of which South-Africa is rich in comparison to its region. Mexico, Ethiopia and Thailand however do score lower than average, respective to their region they aren't poor however but it should be noted that they do score a bit lower than the others. In category 1, Australia, Saudi-Arabi and Israel are non-European, but Australia is counted as European. It seems that economic variables are much higher in the positive categories 0 and 1. What should be noted is, that this is potentially skewed due to an underrepresentation of poor countries (Africa), mainly due to the fact that DLT is very early stage there and it is harder to find information. The same can be said for the GII with 49,2 in category 1 and 46,9 in category 0 they are very close while in 3 and 4 they are going down in leaps respectively, 40,6 and 31,4.

The political variables in category 0 and 1 are also very close with the FI at 7,65 in category 0 and at 7,74 in category 1 and the EIU at 7,01 in category 0 and at 7,03 in category 1. In category 2 and in 3 the FI and EIU both also go down to 6,40 and 4,78, so that seems to suggest it has an impact between a positive and negative response, the more democratic, the more positive. In category 0 the main outliers are Thailand, UAE, Ethiopia and with Argentina and Mexico also scoring a little bit lower. Mexico and Argentina could be explained due to the fact it aren't European countries, but compared to their region are still strong (The economist, 2017). However Thailand, UAE and Ethiopia score much lower than the rest, this seems to suggest there are other indicators at play here, possible country specific reasons would help to explain why those countries are pro-DLT.

On the cultural variables it is very striking that in category 0, 44% is Catholic and also more than half of the Catholic countries in the research are in category 0, while in category 1 this is a complete mix between different denominations. UAE is also in category 0 and Saudi-Arabi in category 1 while they are Muslim countries, however what is striking here that they are one of the richest Muslim countries in the middle-east, which suggest economic factors play a role here.

Category 0 and 1 score very close on most variables which seems to suggest that a neutral (which is positively perceived) or positive response can be taken together, while the other 2 categories, 2 and 3 score much lower on the economic and political variables.

Category 2

This category scores much lower on the economic and political variables than the averages of category 0 and 1 but scores better than category 3. On the economical variable the main outliers are Iceland and the USA. Iceland is potentially in another categorization, since how the country acts is not really negative but officially the laws make it negative, that's why Iceland is in the cautious category. This is problematic however and since it acts as if it's in category 0, it would fit much better there as well, however it did initially act cautious especially towards bitcoin. The USA on the other hand is also very specific case, just like China, there is not much in the variables here that could explain why the USA is cautious. What should be noted here is that from the Western countries they are both Protestant and the LTO is in both cases lower than the average of 46 , so a combination might explain their

initial reaction, but this is unclear since there are no overall trends with regard to LTO. On the other hand Russia and Turkey both score very low on EIU, however since they are in a negative category 2 this is understandable, the question is why aren't they in category 3, economically speaking it are both strong countries, the main determinant seems to be the political system here and potentially the strength of the economy or proximity to Europe that they are not in the most negative category.

Category 3

When you look at table 5.0 it has an overrepresentation of Muslim countries in comparison to Christian countries, with the main exception being 2 South American countries, Bolivia and Ecuador. 57% is Muslim in this category and additionally there are only 7 Muslim countries in the whole study of which 4 are in this category. Due to a potentially underdeveloped blockchain market in Latin American countries in comparison to the rest of the world (with the exception of Africa) this might explain why those countries are still negative, there was no time yet to develop. However on the other hand countries like Chile and Argentina are very much in favour of DLT and are also in Latin America. The difference that can be noted between Chile and Argentina on the one hand and Ecuador and Bolivia on the other hand that on the economic and political variables, Chile and Argentina score higher than Bolivia and Ecuador. HDI of 0,847 and GII of 38,7 for Chile and HDI of 0,827 and a GII of 32 for Argentina. While Bolivia has HDI of 0,674 and a GII of 25,6 and Ecuador has 0,739 HDI and a GII of 29,1. The EIU is much higher in Argentina and Chile, over 1 point higher in Argentina and 2 in Chile. The FI is more similar in the 4 countries, with only Chile being notably higher with a FI of 8,0. Also when Mexico would be included these conclusions would still hold true, although Mexico comes closer with its HDI value of 0,762 and FI value of 6,93 to Bolivia and Ecuador but is still higher. This seems to suggest that religion does not play a solitary role here but rather the economic and political variables and mainly the level of democracy.

The biggest economical outlier in this category is China, with a HDI of 0,738 and a GII of 52,5, which is even higher than the average of category 0. China is also not Muslim, so the cultural-religious variable doesn't help here either. Uncertainty avoidance is much lower than category 3 average and long-term orientation is much higher, but LTO and UAI do not show any overall trend between the averages of the 4 categories, so it's hard to use that as

an explanatory. In this case the low EIU or the political system of China is the most likely explanation here. However this is also biased since countries like the UAE also score low on EIU and are positive. China has banned cryptocurrencies due to of its decentralized nature, but at the same time is investing in DLT technology, if it wasn't for the ban it would be one of the big front runners. This ban could potentially be explained due to the potential loss of sovereignty over the internal monetary market due to cryptocurrencies.

From the other cultural variables in table 5.0 it can be noted that the individualism index is very low, seemingly hinting that collectivism has a negative effect. However there are also other collectivistic countries in the positive categories like South-Korea with a score of 18 in category 0. What is striking though is that all countries in category 3 score low on individualism (apart from Bolivia which information is missing). Morocco is highest scoring with 46 which is still under the average of all other categories. The countries also score very low on the indulgence index, but here there are 3 countries missing so it's hard to draw any conclusions. But an average of 23 is very low in comparison to the other categories.

Hofstede's model trends

Apart from the previously noted trends that category 3 scores very low on individualism and indulgence. There is only 1 other trend that could be found, the rest is all over the place. This is that the PDI, power distance, increases per category, 0 it is 57, 55 in 1 (very similar) and 64 in 2 while its 72 in 3. This seems to suggest that more egalitarian societies are more open towards DLT than those with a big power distance. Here again there are of course exceptions and outliers. However if Iceland would not have been in category 2 there would be a cliff between category 0 and 1 being close together and 2 and 3 being much higher. This shows that PDI potentially is an important indicator, to measure when someone is not negative towards DLT, because there are more outliers of high PDI countries that are positive, compared to low PDI countries that are negative.

Summary remarks

Overall it seems that a stronger economy, also comparatively to the region has a positive influence and a democratic free society also has a positive influence, this is also strengthened by the trend of a more egalitarian society having a positive influence. The extent to how positive this influence is seems to be guided by religious and cultural heritage

with Catholic heritage being more positive. Being very individualistic makes you very unlikely to be in category 3 and when taking into account the outliers of Catholics in category 3 and Muslims in category 0 and 1 the religious explanation is limited and is likely influenced by the strength of the economy, a very strong economy would make you more positive, while a comparatively neutral or low economy paired with a undemocratic society would be negative. The political variables however seem to have a smaller impact when looking at religion, economics seems to be the main determinant, when religion is included. There are still a few major outliers like China and the USA which seem to act mainly due to their political and legal system. Overall, category 0 and 1 score very similar and the negative categories score lower on economic and political variables and culture potentially also plays a role.

Discussion

This section will discuss the hypotheses and see what happened

Hypothesis 1: Western democratic countries are much more in favour of blockchain technology than any other country, due to democratic and liberty values.

Hypothesis 1 has not been rejected, overall it can be stated that the West is more favourable towards DLT than other regions. Whether this is due to the stance the European Union took, the fact that the Western economies are stronger or because of liberty and democracy is hard to answer. However it seems that when also looking at non-Western countries that democracy and liberty 'matters', countries that are less positive towards DLT also score lower on these indicators and when for example looking at Latin America those countries there that are negative towards DLT score also lower on these indicators than the countries that are more positive. There are some outliers here, mainly the USA and Iceland, but it has been noted already that Iceland is a special case.

Hypothesis 2: countries that value progress and innovation are more in favour of blockchain technology.

Hypothesis 2 is not rejected, when looking at the averages from all the tables the Innovation Index is going down the more negative a country gets with regard to DLT. There are some countries with a lower GII that still subscribe to be very positive to DLT, so having a high level of innovation is not a necessity. three outliers here, Iceland, China and the USA, it should be noted that neither of these countries are negative towards the technology of DLT. These countries have to some extent restricted access towards cryptocurrencies but they are all neutral or very favourable with regard to the technology. It seems that high innovation has a positive influence but isn't necessary.

Hypothesis 3: socialism (or collectivism) has a positive effect on the response towards blockchain technologies.

Hypothesis 3 is rejected, the opposite here seems to be true, overall a country that is more collectivistic (as determined by Hofstede) does not mean it is more or less positive or negative towards DLT. But when looking at the countries that reacted most negatively

towards DLT those all score very low on individualism or high on collectivism. Since there is no clear trend or correlation in the other categories, no real conclusion can be delineated from this, apart from being more individualistic means you are less inclined to respond very negative. It however cannot be said that collectivism has a positive impact, it is not clear here though if collectivism has a direct relationship towards the early responses to DLT or if there are other variables that influence this relationship.

Hypothesis 4: stronger economies are more in favour of blockchain technology than weaker economies.

Hypothesis 4 is not rejected, the trends that were discovered in the analysis seem to support this thesis, with the same outliers as before . Overall, a stronger economy as measured per HDI and GII seems to have a positive impact. But this does not mean that a stronger economy is needed to be favourable towards DLT since there are some countries with comparatively for the region stronger economies that do not favour DLT. Additionally, comparatively stronger economies like Russia, Ecuador and China score low on DLT, while they score low on democracy and liberty, so this seems to suggest that those variables seem to potentially have a bigger impact. Overall, it seems that stronger economies are a bit more positive though, but this might be due to selection bias or spurious relationships.

Hypothesis 5: Cultures that look more towards the future and are not afraid to take risks are more in favour of DLT.

Hypothesis 5 is rejected, when looking at Hofstede his model there were not a lot of overall trends, especially with regard to uncertainty avoidance and long term orientation, this did not seem to have any overall trend when looking at the averages from the categories. Potentially, on a country specific level it might have some influence, but that is beyond the scope of this research.

Limitations and further research

This research has a lot of limitations, mainly because it is such a recent topic there is barely any theoretical framework or academic literature available. Additionally, the market is also constantly innovating, so the theory out there is in some cases already outdated, even though it is relatively recent. Due to this, certain assumptions have been made throughout this research, which have been backed up by what is reported by governments and the news. This is mainly in the research section, the blockchain specific news sources are not considered fit for academic purposes, so to look for other news sources or official governmental or institutional sources has proven to be a challenge in certain cases. In the research as well, the timeframe that has been adopted was 2017-2018 but a lot of the conclusion drawn about this early response is changing. By the end of 2018 or early 2019 it is very likely that these conclusions here have changed, however since it then would not be an early response anymore, it would not invalidate the research, but it is something to take into account for potential future research.

What is blockchain has been described in this paper but this might be different then how others might consider blockchain due to no uniform approach being available yet. Due to this there might be differences when another conceptualization of the theory and categorizations would be used. Additionally, the categorization of the countries might be disputable when conceptualizing the categories in another way or when looking at it from a different angle or point in time.

Due to the scope of this paper, only a select number of countries could have been used in this research and as also mentioned in the research section, there is likely a selection bias with regard to richer and Western countries. Possibly due to the fact that information is more readily available for those areas. Additionally, Africa as a region has probably been the most underrepresented, which might have skewed some of the results. This is also an interesting point for further research, to investigate the adoption of DLT in Africa. The indicators used for the variables were also limited due to the scope of this paper, there are many more potential indicators that could be used to investigate a potential link to responses towards DLT. The cultural variable and indicators of Hofstede are also culturally

biased and that model is mostly applicable to business not necessarily where it was used for here.

Because of this there is a likelihood of biased results and an uncertainty regarding correlation and or causation and potential spurious relationships. In further research this should be investigated in more depth. Also the religious category is problematic, it has been put in due to the results that the per country research uncovered. It has also been noted it is used as a cultural heritage variable in this paper. However it is still very likely that this variable is potentially non-correlative or spurious.

Conclusion

Blockchain technology, or distributed ledger technology, is a very relevant and recent topic that has a lot of different early responses around the world. Blockchain, has evolved very quickly and is still innovating, from just a distributed ledger to self-executing contracts and blockchain 3.0. This paper wanted to take into account DLT as a whole so looked at not just blockchain 1.0 but tried to also look at blockchain 2.0 and 3.0, which is all very recent. The aim of this research was to categorize these early responses and then try and understand why the countries acted with regard to DLT how they did. This was done by looking at cryptocurrency regulation, cryptocurrencies run on blockchain technology, whereby the blockchain is a distributed database that stores all the information. And by looking at how a country reacted to blockchain technology, whether or not they were just investigating or also actively trying to implement DLT. To answer the why question, the macro variables of political, economic and cultural were used, all with several indicating sub-variables. The theory came up with 4 categorizations for DLT ranging from a positive to a negative response. The research including 37 countries, showed that it is very hard to see any macro variables in economic, political or cultural to be the main determinant of response towards DLT. Categories 0 and 1 scored very similar on the economic and political variables, with those variables going down in category 2 and 3. There is no definite answer towards the why question, it seemed that this research was able to create categories. Some trends were discovered in the analysis, political variables in democracy and liberty seemed to have the biggest impact, meaning the higher the level of democracy or liberty that the response was more positive on average. Being a strong economy also was favourable. However both of these trends are not exclusive, there are exceptions. What was interesting that the research found that religion might play a role, especially with regard to cultural heritage. In the case of Muslim majority countries it was noticed that those were rather negative towards DLT, unless they had a (comparative to the region) strong economy, which could act as a mitigating factor. All the countries that were in the most negative countries they also scored very low on individualism, but no clear trend apart from that in the other categories. Power distance was also noted to have a minor negative effect, meaning the less egalitarian a country is, that the early response was more negative, on average. However here as well

there were exceptions. Overall, only some general trends with regard to category averages were found. The West seems most positive overall, but everywhere in the world countries are trying to regulate and investigate the possible potential of blockchain technology. It is a very complex topic and due to the increasing interest by countries, companies and people all over the world it is a very relevant topic that should definitely be investigated further. Blockchain technology seems to be here to stay.

Bibliography

Abdel-Qader, A. (2017). Morocco Authorities Impose Ban and Penalties for Cryptocurrency Use | Finance Magnates. *Finance magnates*. Retrieved from https://www.financemagnates.com/cryptocurrency/news/morocco-authorities-impose-ban-penalties-cryptocurrency-use/

ADGM. (2018). ABU DHABI GLOBAL MARKET REVIEWS AND CONSIDERS REGULATORY REGIME FOR VIRTUAL CURRENCY EXCHANGES AND INTERMEDIARIES. Retrieved from https://www.adgm.com/mediacentre/press-releases/abu-dhabi-global-market-reviews-and-considers-regulatory-regime-for-virtual-currency-exchanges-and-intermediaries/

AFP. (2018). Israel stock market bullish on blockchain, cagey on cryptocurrency. *Times of Israel.* Retrieved from https://www.timesofisrael.com/israel-stock-market-bullish-on-blockchain-cagey-on-cryptocurrency/

Akintola, K. (2018). Reps task CBN, NDIC on regulation of cryptocurrency - BusinessDay : News you can trust. *Businessday online.* Retrieved from http://www.businessdayonline.com/news/article/reps-task-cbn-ndic-regulation-cryptocurrency/

Alushula, P. (2018). Central Bank warns investors against Bitcoin. *Standard media.* Retrieved from https://www.standardmedia.co.ke/business/article/2001267065/bitcoin-is-a-bubble-avoid-it-warns-central-bank-of-kenya

Ammachchi, N., & Ammachchi, N. (2018). IBM Bringing Blockchain Solutions Hub to Latin America. *Nearshores Americas.* Retrieved from http://www.nearshoreamericas.com/ibm-brings-blockchain-technology-latin-america/

Atzori, M. (2015). Blockchain technology and decentralized governance: Is the state still necessary?.

Australia Government. (2018). New Australian laws to regulate cryptocurrency providers | Australian Transaction Reports and Analysis Centre (AUSTRAC). Retrieved from http://www.austrac.gov.au/media/media-releases/new-australian-laws-regulate-cryptocurrency-providers

Awosanya, Y. (2018). The crackdown on cryptocurrency: Why Nigeria should switch sides. *Kyc360.* Retrieved from https://kyc360.com/article/bitcoin-in-nigeria-regulatory-challenges-and-the-stubborn-fraud-factor/https://techpoint.ng/2018/04/11/cryptocurrency-nigeria-should-switch-sides/

Banco Central del Ecuador. (2018). COMUNICADO OFICIAL SOBRE EL USO DEL BITCOIN. Retrieved from https://www.bce.fin.ec/index.php/boletines-de-prensa-archivo/item/1028-comunicado-oficial-sobre-el-uso-del-bitcoin

Bangkok Post. (2018). Cryptocurrency law takes effect. *Bangkok Post.* Retrieved from https://www.bangkokpost.com/business/news/1464522/cryptocurrency-law-takes-effect

Bank of Canada. (2018). Digital Currencies and Fintech. Retrieved from https://www.bankofcanada.ca/research/digital-currencies-and-fintech/

Bank Indonesia. (2018). Bank Indonesia Warns All Parties Not to Sell, Buy, or Trade Virtual Currency - Bank Sentral Republik Indonesia. Retrieved from https://www.bi.go.id/en/ruang-media/siaran-pers/Pages/sp_200418.aspx

Bereznicki, J. (2018). Czarnym PR-em w kryptowaluty. NBP wyda ponad 90 tys. z na negatywn kampani na YouTube i na Facebooku. *Money.pl.* Retrieved from https://www.money.pl/gospodarka/wiadomosci/artykul/kryptowaluty-kampania-nbp-knf,65,0,2398529.html

Bjørnstad, M. V., Krogh, S., & Harkestad, J. G. (2017). A study on blockchain technology as a resource for competitive advantage (Master's thesis, NTNU).

BrandBoletín Oficialde la República Argentina. (2018). OTS-PDF. Retrieved from https://otslist.boletinoficial.gob.ar/ots/

Canada Statutory authority. (2018). Canada Gazette, Part I, Volume 152, Number 23: Regulations Amending Certain Regulations Made Under the Proceeds of Crime (Money Laundering) and Terrorist Financing Act, 2018 [online]. Retrieved from http://www.gazette.gc.ca/rp-pr/p1/2018/2018-06-09/html/reg1-eng.html

Cerny, P. G. (1994). The dynamics of financial globalization: Technology, market structure, and policy response. Policy Sciences, 27(4), 319-342.

Cetingulec, M. (2018). Turkey mulls 'national' bitcoin. *Al-monitor.* Retrieved from https://www.al-monitor.com/pulse/originals/2018/02/turkey-mulls-national-bitcoin.html

Chaparro, F. (2018). Saudi Arabia is working on an official policy for bitcoin but a ban is unlikely. *Business Insider.* Retrieved from https://www.businessinsider.in/Saudi-Arabia-is-working-on-an-official-policy-for-bitcoin-but-a-ban-is-unlikely/articleshow/62716798.cms

Cheng, E. (2018). Chinese President Xi Jinping calls blockchain a 'breakthrough' technology. *CNBC.* Retrieved from https://www.cnbc.com/2018/05/30/chinese-president-xi-jinping-calls-blockchain-a-breakthrough-technology.html

Cheng, E. 2 (2018). The SEC just made it clearer that securities laws apply to most cryptocurrencies and exchanges trading them. *CNBC.* Retrieved from https://www.cnbc.com/2018/03/07/the-sec-made-it-clearer-that-securities-laws-apply-to-cryptocurrencies.html

CIA (2018). The World Factbook — Central Intelligence Agency. [online] Cia.gov. Available at: https://www.cia.gov/library/publications/the-world-factbook/fields/2203.html

CIA factbook. (2018). The World Factbook — Central Intelligence Agency. Retrieved from https://www.cia.gov/library/publications/the-world-factbook/fields/2122.html

CSA Staff Notice 46-307 Cryptocurrency Offerings. (2018). Retrieved from http://www.osc.gov.on.ca/en/SecuritiesLaw_csa_20170824_cryptocurrency-offerings.htm

Dahir, A. (2018). Kenya is finally softening its stance on blockchain technology. *Gz.* Retrieved from https://qz.com/1222541/kenya-has-created-a-blockchain-task-force/

Daily News Egypt. (2018). Do cryptocurrencies have a future in Egypt? - Daily News Egypt. *Daily news Egypt.* Retrieved from https://dailynewsegypt.com/2018/03/28/cryptocurrencies-future-egypt/

Davidson, S., De Filippi, P., & Potts, J. (2016). Economics of blockchain.

DEBATE. (2018). México desarrolla sistema de licitaciones con criptomonedas. *Debate.* Retrieved from https://www.debate.com.mx/mexico/Mexico-desarrolla-sistema-de-licitaciones-con-criptomonedas-20180403-0268.html

Dew, L. (2018). Treasury to look into regulation of Bitcoin and blockchain in cryptocurrency inquiry. *Investment week.* Retrieved from https://www.investmentweek.co.uk/investment-week/news/3027088/treasury-committee-set-up-to-investigate-bitcoin-and-blockchain

DNB. (2018). DNBulletin: DNB experiments with blockchain technology - De Nederlandsche Bank. Retrieved from https://www.dnb.nl/en/news/news-and-archive/DNBulletin2018/dnb376502.jsp

Duarte, E. (2018). Spanish Party Weighs Tax Incentives to Lure Blockchain Firms. *Bloomberg.* Retrieved from https://www.bloomberg.com/news/articles/2018-02-15/rajoy-s-party-weighs-tax-breaks-for-spanish-blockchain-companies

Duffin, A. (2018). Cardano Signs Agreement with Ethiopian Government to Introduce Blockchain Technology to Agritech. *Cryptoslate.* Retrieved from https://cryptoslate.com/cardano-signs-agreement-with-ethiopian-government-to-introduce-blockchain-technology-to-agritech/

Ellis, J. (2017). Tech in Asia - Connecting Asia's startup ecosystem. *Tech in Asia.* Retrieved from https://www.techinasia.com/japan-financial-blockchain-adoption

Egypt Today staff. (2018). Bitcoin leads to fraud in its banks, value: Grand Mufti. *Egypt today.* Retrieved from https://www.egypttoday.com/Article/2/39058/Bitcoin-leads-to-fraud-in-its-banks-value-Grand-Mufti

European Central Bank. (2018). Electronic money. Retrieved from https://www.ecb.europa.eu/stats/money_credit_banking/electronic_money/html/index.en.html

European Commission. (2018). European countries join Blockchain Partnership. Retrieved from https://ec.europa.eu/digital-single-market/en/news/european-countries-join-blockchain-partnership

Fawcett, J. P. (2017). Bitcoin regulations and investigations: A proposal for US policies (Doctoral dissertation, Utica College).

FCA. (2018). Regulatory sandbox. Retrieved from https://www.fca.org.uk/firms/regulatory-sandbox

Financemalta. (2018). Malta to regulate blockchain technology services sector. *Finance Malta.* Retrieved from https://www.financemalta.org/publications/articles-interviews/articles-and-interviews-detail/malta-to-regulate-blockchain-technology-services-sector-legal-framework-2018/

Finextra. (2018). South Africa's central bank mulls cryptocurrency regulations. *Finextra.* Retrieved from https://www.finextra.com/newsarticle/31907/south-africas-central-bank-mulls-cryptocurrency-regulations

FINMA. (2018). FINMA publishes ICO guidelines. Retrieved from https://www.finma.ch/en/news/2018/02/20180216-mm-ico-wegleitung/

Guadamuz, A., & Marsden, C. (2015). Blockchains and Bitcoin: Regulatory responses to cryptocurrencies.

Golstein, S. (2018). Israeli Cryptocurrency Regulation to Be Delayed, Dealing Blow to Industry | Finance Magnates. *Finance magnates.* Retrieved from https://www.financemagnates.com/cryptocurrency/news/israeli-cryptocurrency-regulation-delayed-four-months-least/

Government Malta. (2018). Consultation Paper in relation to the establishment of Malta Digital Innovation Authority (MDIA) and the framework for the certification of Distributed Ledger Technology Platforms and related service providers. Retrieved from https://meae.gov.mt/en/Public_Consultations/OPM/Pages/Consultations/ConsultationPaperinrelationtotheestablishmentofMaltaDigitalInnovationAuthorityMDIA.aspx

Green, A. (2018). Trustworthy technology: the future of digital archives. Retrieved from https://blog.nationalarchives.gov.uk/blog/trustworthy-technology-future-digital-archives/

HandelsHaus. (2018). Cryptocurrencies Estonia - Regulations and Authorisations. *HandelsHaus.* Retrieved from https://hshaus.com/dealing-cryptocurrencies-estonia-regulations-authorisation/

Hanif, U. (2018). As Pakistan bans cryptocurrencies, people may find alternative means | The Express Tribune. *Tribune.* Retrieved from https://tribune.com.pk/story/1708782/2-pakistan-bans-cryptocurrencies-people-may-find-alternative-means/

He, M. D., Leckow, M. R. B., Haksar, M. V., Griffoli, M. T. M., Jenkinson, N., Kashima, M. M., ... & Tourpe, H. (2017). Fintech and financial services: initial considerations. International Monetary Fund.

Hern, A. (2018). How Iceland became the bitcoin miners' paradise. *The Guardian.* Retrieved from https://www.theguardian.com/world/2018/feb/13/how-iceland-became-the-bitcoin-miners-paradise

Hofstede, G. (2010). National cultural dimensions. Retrieved from https://www.hofstede-insights.com/product/compare-countries/

Hooper, D. (2017). Bitcoin 'not compatible with Islam', Turkey's religious authorities say. *Euronews.* Retrieved from http://www.euronews.com/2017/11/28/bitcoin-is-not-compatible-with-islam-turkeys-religious-authorities-say

Human Development Data. (2015).Human Development Data (1990-2015) | Human Development Reports. Retrieved from http://hdr.undp.org/en/data

Huckle, S., & White, M. (2016). Socialism and the blockchain. Future Internet, 8(4), 49.

Index, G. I. (2017). Global innovation index 2017. The Local Dynamics of Innovation. Retrieved from https://www.globalinnovationindex.org/analysis-indicator.

Infobae. (2018). El Banco Central reglamentó la conexión de los cajeros automáticos no bancarios con la red financiera. *Infobae.* Retrieved from https://www.infobae.com/economia/finanzas-y-negocios/2018/04/11/el-banco-central-reglamento-la-conexion-de-los-cajeros-automaticos-no-bancarios-con-la-red-financiera/

Infosys Limited. (2018). Infosys Finacle Pioneers Blockchain-Based Trade Network in India in Consortium with Seven Leading Banks. *Infosys.* Retrieved from https://www.infosys.com/newsroom/press-releases/Pages/pioneers-blockchain-based-trade-network.aspx

Investopedia. (2018). Commodity. Retrieved from https://www.investopedia.com/terms/c/commodity.asp

Jin-young, C. (2018). LG CNS to Launch First Public Blockchain Platform for KOMSCO. *Business Korea.* Retrieved from http://www.businesskorea.co.kr/news/articleView.html?idxno=22936

Johnson, K. D. (2018). BLOCKCHAIN TECHNOLOGY.

Jutila, L. (2017). The blockchain technology and its applications in the financial sector.

Kim, C. (2018). South Korea to ban cryptocurrency traders from using anonymous bank... Retrieved from. *Reuters.* https://www.reuters.com/article/us-southkorea-bitcoin/south-korea-to-ban-cryptocurrency-traders-from-using-anonymous-bank-accounts-idUSKBN1FC069

Kharpal, A. (2017). Bitcoin value rises over $1 billion as Japan, Russia move to legitimize cryptocurrency. *CNBC.* Retrieved from https://www.cnbc.com/2017/04/12/bitcoin-price-rises-japan-russia-regulation.html

Kendall, M. (2018). Mexico “Three-Out-Of-Ten” on the Global Blockchain Scale, Despite Robust Opportunities. *Nearshore Americas.* Retrieved from http://www.nearshoreamericas.com/mexico-global-blockchain-robust-opportunities/

Kostov, V. (2018). The legal framework of cryptocurrencies in Bulgaria | 1Legal.net. Retrieved from https://1legal.net/en/blog-read129-the-legal-framework-of-cryptocurrencies-in-bulgaria

lemonde.fr. (2018). Le Conseil d’Etat change la fiscalité sur les gains générés par les bitcoins. *Lemonde.* Retrieved from https://www.lemonde.fr/argent/article/2018/04/26/le-conseil-d-etat-change-la-fiscalite-sur-les-gains-generes-par-les-bitcoins_5291137_1657007.html

Litwack, S. (2015). Bitcoin: Currency or Fool's Gold: A Comparative Analysis of the Legal Classification of Bitcoin. Temp. Int'l & Comp. LJ, 29, 309.

Maire, B. (2018). Tribune : Cryptoactifs, blockchain & ICO : comment la France veut rester à la pointe, par Bruno Le Maire - Politique - Numerama. *Numerama.* Retrieved from https://www.numerama.com/politique/336943-tribune-cryptoactifs-blockchain-ico-comment-la-france-veut-rester-a-la-pointe-par-bruno-le-maire.html

Mandjee, T. (2015). Bitcoin, its legal classification and its regulatory framework. Journal of Business & Securities Law, 15(2), 157.

Martinet, S. (2018). French Crypto Regulation à la carte: Context, News, Perspectives. *Coin telegraph.* Retrieved from https://cointelegraph.com/news/french-crypto-regulation-a-la-carte-context-news-perspectives

Marty, B. (2014). Bolivia, el primer país americano en prohibir Bitcoin. *Panam post.* Retrieved from https://es.panampost.com/belen-marty/2014/06/19/bolivia-el-primer-pais-americano-en-prohibir-bitcoin/

MAS. (2016). MAS, R3 and Financial Institutions experimenting with Blockchain Technology. Retrieved from http://www.mas.gov.sg/News-and-Publications/Media-Releases/2016/MAS-experimenting-with-Blockchain-Technology.aspx

MAS. (2018). Consultation paper; Review of the Recognised Market Operators Regime [Ebook]. Monetary Authority of Singapore. Retrieved from http://www.mas.gov.sg/~/media/MAS/News%20and%20Publications/Consultation%20Papers/2018%20May%2022%20RMO%203P/Consultation%20Paper%20on%20RMO%20Regime.pdf

Nakamoto, S. (2009). Bitcoin: A peer-to-peer electronic cash system. Whitepaper, 2009.

Nekrasenko, L., Kalinichenko, A., Brzozowska, A., & Lazurenko, B. (2018). Decentralized social and economic network as an alternative economic relations development in society. Journal of Fundamental and Applied Sciences, 10(4S), 580-585.

Nikkei staff writers. (2018). Japan fleshes out crypto market rules to prevent Coincheck 2.0. *Nikkei.* Retrieved from https://asia.nikkei.com/Spotlight/Bitcoin-evolution/Japan-fleshes-out-crypto-market-rules-to-prevent-Coincheck-2.0

Nikolova, M. (2018). Spanish regulators, financial institutions collaborate on blockchain project - FinanceFeeds. *FinanceFeeds.* Retrieved from https://financefeeds.com/spanish-regulators-financial-institutions-collaborate-blockchain-project/

Ono, Y. (2018). Thailand's leading banks to share blockchain platform. *Nikkei.* Retrieved from https://asia.nikkei.com/Business/AC/Thailand-s-leading-banks-to-share-blockchain-platform

PanAm Post. (2014). Ecuador Bans Bitcoin, Initiates Government-Run Digital Currency. *Panam post.* Retrieved from https://panampost.com/panam-staff/2014/07/25/ecuador-bans-bitcoin-initiates-government-run-digital-currency/

Popper, N. (2015). Can Bitcoin Conquer Argentina?. *NY times.* Retrieved from https://www.nytimes.com/2015/05/03/magazine/how-bitcoin-is-disrupting-argentinas-economy.html

Popper, N. (2018). Blockchain Will Be Theirs, Russian Spy Boasted at Conference. *NY times.* Retrieved from https://www.nytimes.com/2018/04/29/technology/blockchain-iso-russian-spies.html

Proffitt, C. (2018). Russian Crypto Regulations Active by 'July 1' Urges Putin - DisruptorDaily. *Disruptor daily.* Retrieved from https://www.disruptordaily.com/russian-crypto-regulations-active-by-july-1-urges-putin/

Ramirez, E. (2018). Facts And Myths Surrounding Crypto In South Korea: Death, Taxes And Bans. *Forbes.* Retrieved from https://www.forbes.com/sites/elaineramirez/2018/02/28/facts-and-myths-surrounding-crypto-in-south-korea-death-taxes-and-bans/#79b44d5857e4

Reese, F. (2017). Bitcoin Regulations by Country (Updated 2017) – Bitcoin Market Journal. *Bitcoin market journal.* Retrieved from https://www.bitcoinmarketjournal.com/bitcoin-regulation-by-country/

Reeves, C. (2018). ICOs are abandoning US investors - Premier Offshore Company Services. *Premier offshore.* Retrieved from http://premieroffshore.com/icos-are-abandoning-us-investors/

Reuters. (2017). UAE and Saudi Arabia work on cross-border digital currency plan. *Reuters.* Retrieved from https://www.thenational.ae/business/technology/uae-and-saudi-arabia-work-on-cross-border-digital-currency-plan-1.684176

Reuters. (2018). Brazil regulator bans funds from buying cryptocurrencies. *Reuters.* Retrieved from https://www.reuters.com/article/brazil-bitcoin/brazil-regulator-bans-funds-from-buying-cryptocurrencies-idUSL1N1P71DV

Reyes, C. L. (2017). Conceptualizing Cryptolaw. Neb. L. Rev., 96, 384.

Rooney, K. (2018). India's central bank bans financial firms from dealing with cryptocurrency. *CNBC.* Retrieved from https://www.cnbc.com/2018/04/05/indias-central-bank-bans-financial-firms-from-dealing-with-cryptocurrency.html

Russo, C. (2018). Chilean Court Orders Banks to Re-Open Crypto Exchange Accounts. *Bloomberg.* Retrieved from https://www.bloomberg.com/news/articles/2018-04-25/chilean-court-orders-banks-to-re-open-crypto-exchange-accounts-jgfocim8

Sas, C., & Khairuddin, I. E. (2017, May). Design for Trust: An exploration of the challenges and opportunities of bitcoin users. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (pp. 6499-6510). ACM.

Sedgwick, K. (2018). Bankers Have Shut Down All of Bulgaria's Bitcoin Exchanges - Bitcoin News. *Bitcoin news.* Retrieved from https://news.bitcoin.com/bankers-shut-bulgarias-bitcoin-exchanges/

Schwarz, M. (2018). Comment: Why cryptocurrencies are so popular in Estonia - International Investment. *International investment.* Retrieved from http://www.internationalinvestment.net/comment/comment-cryptocurrencies-popular-estonia/

Slabbert, A. (2017). 'Pay your traffic fines in bitcoin'. *Moneyweb.* Retrieved from https://www.moneyweb.co.za/news/south-africa/pay-your-traffic-fines-in-bitcoin/

Siddiqui, S. (2018). Pakistan pegs future of capital markets with blockchain technology | The Express Tribune. *Tribune.* Retrieved from https://tribune.com.pk/story/1696300/2-pakistan-pegs-future-capital-markets-blockchain-technology/

SSEK Indonesian Legal Consultants. (2018). Virtual Currency Is Here, So How Is Indonesia Going to Regulate It? | Lexology. Retrieved from https://www.lexology.com/library/detail.aspx?g=6bbb6d6e-43e7-49d7-96f7-b2371d538be2

Stooq. (2018). MF chce czasowo zaniechać poboru podatku PCC od sprzedaży waluty wirtualnej - Stooq. *Stooq.* Retrieved from https://stooq.pl/n/?f=1235115

Subdepartamento Energia. (2018). Ministra Jiménez lanza tecnología Blockchain en datos del sector energético.- - Comisión Nacional de Energía. Retrieved from https://www.cne.cl/prensa/prensa-2018/04-abril-2018/ministra-jimenez-lanza-tecnologia-blockchain-en-datos-del-sector-energetico/

Sutton, M. (2018). HH Sheikh Mohammed launches UAE Blockchain Strategy 2021. *Commsmea.* Retrieved from https://www.commsmea.com/business/regulation/17358-hh-sheikh-mohammed-launches-uae-blockchain-strategy-2021

Swan, M. (2015). Blockchain: Blueprint for a new economy. " O'Reilly Media, Inc.".

Swartz, L. (2017). Blockchain dreams: Imagining techno-economic alternatives after Bitcoin. Another economy is possible, 82-105.

Swiss Federal Council. (2017). Federal Council initiates consultation on new Fintech regulations. Retrieved from https://www.admin.ch/gov/en/start/documentation/media-releases.msg-id-65476.html

Tatar, J. (2018). Iceland - Time to Free Bitcoin!. *The balance.* Retrieved from https://www.thebalance.com/iceland-time-to-free-bitcoin-4030896

The Economist. (2017). The Economist Intelligence Unit's Democracy Index. Retrieved from https://infographics.economist.com/2018/DemocracyIndex/

Thomson Reuters. (2017). Cryptocurrencies by country. Thomson Reuters. *Thomson Reuters.* Retrieved from https://blogs.thomsonreuters.com/answerson/world-cryptocurrencies-country/

Trautman, L. J., & Harrell, A. C. (2016). Bitcoin Versus Regulated Payment Systems: What Gives. Cardozo L. Rev., 38, 1041.

Vásquez, I., & Porcnik, T. (2017). The Human Freedom Index - 2017 [Ebook]. Cato institute. Retrieved from https://www.cato.org/human-freedom-index

Walch, A. (2017). The path of the blockchain lexicon (and the law).

Yelowitz, A., & Wilson, M. (2015). Characteristics of Bitcoin users: an analysis of Google search data. Applied Economics Letters, 22(13), 1030-1036.