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The potential social impact of blockchain exponential technology on the financial services in South Africa

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The potential social impact of Blockchain exponential technology on the financial services industry in South Africa

A research report



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A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

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ABSTRACT

The problem of inadequate access to financial services and products that suit a generally low income earning population in developing countries such as South Africa, can be viewed as a subset of the generally poor financial inclusion levels in such markets which are commonly referred to as third world. Developing worlds are generally characterised by problems with the government, high levels of corruption and issues with land ownership or distribution through land titles. Bank account penetration rates are accepted as a reasonable indicator for the usage of formal banking systems. Even though account penetration rates in South Africa are comparable to some European and Asian regions, Africa still has among the lowest bank account penetration rates when compared with the rest of the regions. The underlying notion is that the incumbent business models, used by financial institutes and banks, place the costs of attaining financial products/vehicles at a level that becomes unattainable to about fifty two percent of the South African population. Blockchain technology is an emergent new public, distributed ledger technology that has been demostrated to carry disruptive potential to the financial services industry through democratising trust; disintermedeating the numerous middle entities through which money must go through; and by also being the building block of Cryptocurrencies such as Blockchain, Ethereum, LiteCoin and Ripple amongst many others.

This study makes use of in-depth semi-structured interviews, analysed through cognitive maps, to explore issues and uncover emergent themes as understood by senior practitioners in the Information Systems, Technology and Fintech spheres of knowledge. The basic groundwork is laid through the help of documented lessons derived from proof of concepts and experiments with this nascent technology. Sorting through which of the blockchain use cases make the most sense and carry commercial viability is going to take a lot of effort, but organisations and governments will eventually get there through concerted efforts among CIOs, IT practitioners, IT vendors and software developers.

It is concluded that although industries in South Africa are awakened to Blockchain's disruptive potential, the mainstream adoption of Blockchain technology is still some way off, with some failures and consolidations still anticipated.

DECLARATION

I, Nobby Mandla Mabale, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to this or any other university.

_____

Nobby Mandla Mabale

Signed at Parktown, Johannesburg

On the …….. day of …….. 2017.

DEDICATION

Dedicated to the merciful heavenly father whom I did this through.

This research work is dedicated to my parents; my mother Millicent Thembi "Ncane" Mabale, my late father, John Lanyane "Daddy" Mabale, you both gave me the cornerstone and foundation of something you both never enjoyed – Education. I've since appreciated the value of reading and lifelong learning because of your sacrifices. A special feeling of gratitude goes towards you.

I also dedicate this dissertation to my late brother, Mpho Sylvester Mabale, whose words of encouragement and a push for tenacity will always ring in my ears. I miss you a great deal.

To my little sister Makagiso Rose Mabale "Kagi", your golden heart and far-reaching grace leave a lot of humans amazed, you are a remarkable person, thank you for your untainted belief in me and for keeping the family together.

To my beautiful older sister Boitumelo Noddy Mabale, thank you for the support and encouragement. To my nephews and nieces, your expectations of me to always understand how important it is that I just be an uncle and play with you, irrespective, has kept me honest.

This research is also dedicated to my girlfriend Gillian Mahumane; my queen, my rock, my fire: I probably would have not completed this MBA successfully without you. Till this day I'm amazed at God's exceeding, overflowing and unfathomable love that he showed me by sending you my way. As if instructed by the Most High, you took care of me, encouraged me, consoled me, engaged me, kept me honest, and dreamt with me. I am grateful towards you "nikka-boo".

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CHAPTER 1. Introduction

1.1 PURPOSE OF THE STUDY

South Africa's financial services sector, backed by a sound regulatory and legal framework, is sophisticated, boasting a lot of domestic and foreign institutions provides a wide range of services – commercial, retail and merchant banking, mortgage lending, insurance and investment (Brand.SA, 2017).

However, there are more than 12 million adults in South Africa without an account at a bank or other financial institution, and millions more who have poor access to formal financial services. (T. W. Bank, 2013).

In South Africa, the poor are argued to have constrained access to formal sector resources due to both institutional and household level factors (Okurut, 2012). At the institutional level, the banks are perceived to be exorbitant in the fees they require for the services they render and as such are inaccessible to the poor. At the household level, the low levels of income, asset accumulation and highly skewed income and asset distribution render the poor households to have a high risk profile, which makes them less attractive to formal lenders which further exacerbates the chances of participating formally in the economy (Okurut, 2012).

Inability to access such basic vehicles of the economy limits the ability, of the majority of the South Africans, to cope with shocks and increases their vulnerability to poverty.

Limited access to economic vehicles and exclusion from formal participation in the economy gives rise to one of South Africa’s grandest challenges of Poverty, which gives rise to many other challenges: poor access to good education, health care, food, quality of life to name just a few.

The (Deloitte, 2016) University Press postulates that most of these challenges can be viewed through a different lens. Disruptive, exponential technologies energize creative problem solving.

One such emergent and exponential technology is Blockchain, which, simply put, is a distributed ledger that provides a way for information to be shared and recorded by a community. Blockchain is classified as an exponential technology because of its speed of adoption and demonstrated power.

Exponential technologies are defined as technologies whose speed and/ or power more or less doubles each year in conjunction with a cost that is dropping in half each year (Rose, 2013).
Other examples of such technologies include the examples below:

- *Explosion in Connectivity* – It's reported that there will be an estimated six billion users of the internet or more by 2020, a trillion connected devices in the Internet of Things (IoT) like sensors, trackers and devices that we wear on our persons;
- *Cognitive and Quantum Computing* – This technology groups technologies such as Artificial Intelligence (AI) and Deep Learning;
- *Voice Recognition* – Providing real time automated translation, services include Google Translate, and Skype Translate;
- *Robotics* – A technology that has given rise to self-driving cars that are now so synonymous with companies such as Google, Tesla and Volvo;
- *Additive Manufacturing (3D Printing)* – Material Science;
- *Digitisation* – This technology has been responsible for the rise of Unmanned Aerial Vehicles (AEV);
- *Virtual Reality* – A technology that creates sensory experiences such as sight, sound and touch virtually and artificially;
- *Synthetic Biology* – This technology has given rise to the concept of Engineered Biology which synthesised complex systems not typically observed in nature (Haupt, 2016).

Blockchain is also referred to as distributed ledger technology, and its immutable and transparent properties are expected to revolutionise industry and commerce by redefining trust and enabling fast and trustworthy solution. This scale of shift in the industry could help empower people in developing countries with financial inclusion and asset ownership just to name but a few examples (Underwood, 2016).

Like the internet, Blockchain is an open, global infrastructure which allows individuals and companies to cut out the middleman, and Blockchain's ability to potentially replace intermediaries and middlemen, and thereby reducing the huge costs of transactions and the time lapse of working through intermediaries, is precisely why this technology matters (Piscini, Guastella, Rozman, & Nassim, 2016). The ledger is neither owned nor controlled by one central authority or company, it can be easily viewed by any or all users on the network.

It is the purpose of this study therefore to highlight the relative fast pace at which this technology is being adopted by financial institutes and Fintech companies, and to also evaluate the impact that this technology has on potentially changing the landscape of the financial system as we know it in South Africa and perhaps even democratise banking, creating real social benefit through financial inclusion.

1.2 CONTEXT OF THE STUDY

In South Africa, the banking system is considerably developed and effectively regulated. It has a central bank – the South African Reserve Bank – as well as many large, financially strong banks and investment houses, plus some other smaller banks (SAinfo, 2013).

According to the government law of South Africa, regulations exist to protect citizens and businesses, regulation is supposed to correct market failures, and also supposedly make many aspects of our lives easier. They can help give us lower prices due to increased competition, greater peace of mind in saving and borrowing, increased safety in our journey to work and so forth (Shrupti Shah, 2015).

Regulators and regulations play a critical role in society—but a role that may need to evolve to remain relevant and effective in the face of technology-induced change. Banking is a service like healthcare, in which "transactions" take place between two parties that differ in terms of information, knowledge and technical competence.

In recent years, the persistence and scale of technology-induced change have led many to doubt the value and practicality of government regulation. Although this discussion continues, the regulators and the regulations they enforce still play a critical role - but one that may need to evolve to remain relevant and effective (Shrupti Shah, 2015).

All reforms have costs and benefits which are usually distributed unequally across different groups of the population. Even the best planned reforms may have unintended impacts on the poor and vulnerable groups.

As alluded to earlier, Blockchain technology, simply explained, is a digital, distributed transaction ledger that makes it possible for the information recorded in the ledger to be shared by a community. The information stored could represent transactions, contracts, assets, identities or anything else that can be stored in digital form (Piscini et al., 2016) .

Blockchain is the technology underlying Bitcoin, which is a form of digital currency and perhaps the most explored implementation of Blockchain technology. Bitcoins are currently used as a convenient way to transfer money without a middleman, and the "no-chargebacks" value proposition to merchants has already created a healthy appetite for participation.

These use cases for Blockchain are big and important and could solve many real problems for many people in South Africa and indeed across the world where money becomes easier to move, making money frictionless and accessible universally (Swanepoel, 2016).

It's cited by the Deloitte University press that Blockchain technology owes its potential to its many valuable characteristics:

Reliable and available. There is a wide circle of participants sharing a Blockchain and as such it has no single point of failure; it is designed to be resilient to attacks or face any outages.

Transparency. Transactions in the Blockchain are visible to the participants.

Immutable. This refers to how nearly impossible it is to make changes to the Blockchain, and this reduces the opportunities for fraud.

Digital. Almost any document or asset can be expressed and stored digitally.

South Africa has one of the world's highest unemployment rates, high poverty levels and seemingly constantly present inequality levels with an almost two-fold economy characterised by an informal low-end and a developed high-end (T. W. Bank, 2013).

Financial inclusion is particularly important because of the positive impact it can have on societies, individuals and small businesses, as well as positively impact the South African economy itself.

In 2015, the World Bank Country Director for South Africa, Paul Noumba Um, stated that there are more than 12 million adults in South Africa without a formal relationship with a financial institution and millions more who have poor access to any formal financial services (World-Bank, 2014).

Furthermore, the director said that financial inclusion of ordinary South Africans should never be underestimated as it held "transformative powers" to unlock earnings opportunities and creates self-reliance for many

According to another recent World Bank report, South Africa's highly-developed financial infrastructure and well-developed mobile technology could increase access to financial services, help reduce poverty and inequality and stimulate job creation for poor South Africans (T. W. Bank, 2013).

1.3 PROBLEM STATEMENT

1.3.1 *MAIN PROBLEM*

The main research problem is to establish the potential social impact carried with the adoption of Blockchain technology by South Africa's financial services industry on improving financial inclusion, through the provision of inexpensive infrastructure to citizens.

1.3.2 *SUB-PROBLEM 1*

The first sub-problem is to assess the level of adoption of the Blockchain technology in South Africa, but more specifically adoption by upcoming Fintech start-ups as well as financial institutions and banks alike.

1.3.3 *SUB-PROBLEM 2*

The second sub-problem is to establish the potential social impact that Blockchain technology has on South Africa's relatively unbanked and financially excluded majority, through improving financial inclusion and improving access to financial vehicles necessary for a meaningful change in the standard of living.

1.4 SIGNIFICANCE OF THE STUDY

Bitcoin, which is the most known Blockchain application to date, is a so called cryptocurrency, which means it's a medium of exchange like Rands, but it is designed for the purpose of exchanging digital information by special means made possible by principles of cryptography, it's a digital currency.

This cryptography is used to secure the transactions and control the "manufacturing" of new coins. Bitcoin was the first of these cryptocurrencies to be developed in 2009 and today there are many other alternatives (Graydon, 2016).

In April 2011 came Namecoin, and later on that year in October was the beginning of Litecoin all to target different objectives.

In the same year Ripplecoin was developed, built on the same protocol as Bitcoin it served as a payment system like PayPal which supports any fiat of cryptocurrency (Graydon, 2016).

Bitcoin and other cryptocurrencies are operating in a market that is said to be ripe for disruption. The payment systems in the U.S and indeed the rest of the world are in need of a serious improvement to make them faster, more secure, more efficient and promoting more collaboration (Muraskin, 2015)

Cryptocurrencies are well positioned to help deliver most of these outcomes.

In Kenya, Nairobi, founder of BitPesa, Elizabeth Rossiello, says most of the transactions on the BitPesa platforms are used to facilitate affordable means transferring money between accounts in different countries. While BitPesa is a bitcoin exchange platform optimised for that role it does exhibit early adoption and cryptocurrencies appetite in other parts of the African continent already (ZUCKERMAN, 2016).

A known South African company integrated bitcoin payments into smart utility metering systems to allow customers to prepay for utilities digitally. Even the unbanked are able to use this and the company insists that it's easier to administer than cash payments (Muraskin, 2015).

Bitcoin has the potential to push forward the conversation about financial inclusion in really interesting ways. This study will attempt to highlight the relative speed and scale of adoption of Blockchain technology by looking at a few case studies that highlight key use cases as well as conducting some site visits and interviews locally in the country where companies and organisations are harnessing the power of this or other exponential technologies for a better return and greater social impact.

1.5 DELIMITATIONS OF THE STUDY

Included:

- Analysis of minimum requirements for opening basic accounts at the big 5 banks in South Africa
- Some business or industry historical data that will give more context to the situation.
- How Blockchain technology works
- How Blockchain technology is used in the financial services industry.

Excluded:

- Other uses cases of Blockchain that don't have a high social impact potential.
- Extensive Bitcoin applications

1.6 DEFINITION OF TERMS

Table 1

Blockchain	A Blockchain is a data structure that makes it possible to create a digital ledger of transactions and share it among a distributed network of computers. It uses cryptography to allow each participant on the network to manipulate the ledger in a secure way without the need for a central authority (Blockchain@Berkeley, 2017)
Cryptocurrency	A cryptocurrency is a medium of exchange like *normal* currencies such as USD, but designed for the purpose of exchanging digital information through a process made possible by certain principles of cryptography (Graydon, 2016)
Cryptography	Cryptography systems can be broadly classified into symmetric-key systems that use a single key that both the sender and recipient have, and *public-key* systems that use two keys, a public key known to everyone and a private key that only the recipient of messages uses (Newman, 2010)
CIO	Chief Information Officer
Distributed ledger	A database in which portions of the database are stored in multiple physical locations and processing is distributed among multiple database nodes; Blockchain systems are referred to as distributed ledgers (Rouse, 2016)
Hash/ hashing	the transformation of a string of characters into a usually shorter, fixed-length value or key that represents the original string (similar the creation of a bitly link) (Rouse, 2005)
Namecoin, Litecoin, Ripplecoin, BitPesa	All of these are technologies/cryptocurrencies built on top of Blockchain and they are used to different purposed since technically Blockchain can house any type of data.
Exponential Technology	Technology trends that are on an exponential growth trend.
South African Reserve Bank (SARB)12	The South African Reserve Bank is the central bank of the Republic of South Africa. The primary purpose of the Bank is to achieve and maintain price stability in the interest of balanced and sustainable economic growth in South Africa. Together with other institutions, it also plays a pivotal role in ensuring financial stability (Bank, 2017)
Information Communications Technology (ICT)	ICT (information and communications technology - or technologies) is an umbrella term that includes any communication device or application, encompassing: radio, television, cellular phones, computer and network hardware and

	software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. ICTs are often spoken of in a particular context, such as ICTs in education, health care, or libraries. The term is somewhat more common outside of the United States (Pagani, 2008)
Bitcoin	Bitcoin is a form of digital currency, created and held electronically. No one controls it. Bitcoins aren't printed, like dollars or euros – they're produced by people, and increasingly businesses, running computers all around the world, using software that solves mathematical problems. It's the first example of a growing category of money known as cryptocurrency (Mohan, 2016)
Database	A database is a collection of information that is organized so that it can easily be accessed, managed, and updated. In one view, databases can be classified according to types of content: bibliographic, full-text, numeric, and images (Rouse, 2017)
Smart Contracts	Smart contract is a term used to describe computer program code that is capable of facilitating, executing, and enforcing the negotiation or performance of an agreement (i.e. contract) using Blockchain technology. The entire process is automated can act as a complement, or substitute, for legal contracts, where the terms of the smart contract are recorded in a computer language as a set of instructions (BlockchainTechnologies, 2016)
Distributed Networks	Distributed networking is a distributed computing network system, said to be distributed when the computer programming and the data to be worked on are spread out across more than one computer. Usually, this is implemented over a computer network (Wikipedia, 2017a)
Decentralised Networks	Decentralization is an attempt to improve speed and flexibility by reorganizing networks to increase local control and execution of a service (Target, 2008)
Centralised Networks	Network centralization is an attempt to improve efficiency by taking advantage of potential economies of scale (Target, 2008)
Peer to Peer (P2P)	Peer-to-peer (P2P) is a decentralized communications model in which each party has the same capabilities and either party can initiate a communication session. Unlike the client/server model, in which the client makes a service request and the server fulfils the request, the P2P network model allows each node to function as both a client and server (Rouse, 2014)

Financial Inclusion	Access and usage of a broad range of affordable, quality financial services and products, in a manner convenient to the financially excluded, unbanked and under-banked; in an appropriate but simple and dignified manner with the requisite consideration to client protection. Accessibility should be accompanied by usage which should be supported through the financial education of clients (The_Banking_Association_South_Africa, 2018)
Cognitive and Quantum Computing	Quantum computing is the area of study focused on developing computer technology based on the principles of quantum theory, which explains the nature and behaviour of energy and matter on the quantum (atomic and subatomic) level (Rouse, 2007)
Artificial Intelligence (AI)	Artificial intelligence is the simulation of human intelligence processes by machines, especially computer systems. These processes include learning (the acquisition of information and rules for using the information), reasoning (using the rules to reach approximate or definite conclusions), and self-correction. Particular applications of AI include expert systems, speech recognition and machine vision (Rouse, 2007)
Voice/Speech Recognition	Voice or speech recognition is the ability of a machine or program to receive and interpret dictation, or to understand and carry out spoken commands (Rouse, 2007)
Robotics	The branch of technology that deals with the design, construction, operation, and application of robots (Wikipedia, 2017b)
3D Printing/ Additive manufacturing	3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file (3DPrinting.com, 2017)
Virtual Reality	The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors (Dictionaries, 2017)
Synthetic Biology	Synthetic biology is an emerging area of research that can broadly be described as the design and construction of novel artificial biological pathways, organisms or devices, or the redesign of existing natural biological systems (Clarke, 2007)
electronic remittance	A sum of money sent, especially by mail or electronic transfer, in payment for goods or services or as a gift.
smart contracts	A computer program that directly controls the transfer of digital currencies or assets between parties under certain conditions; stored on Blockchain technology (Naga, 2017)

1.7 ASSUMPTIONS

Although Blockchain technology is older than 5 years, it has had very few applications in business around the world, and even lesser in South Africa so the interview content might be limited to only what a Chief Information Officer (CIO)/Chief Technology Officer (CTO) roughly understands about the topic.

Because most Blockchain projects are still on going as companies "play" and look deeper into the technology in order to extract some business value out of it through so called innovation projects, the envisioned value might be expected to make part of the broader value offering of the firm and as such interviewees might not be at liberty to share some of the use cases they are enabling with the technology, this might impact on the depth of detail that can be readily extracted from the interviews.

CHAPTER 2. Literature Review

"We see huge potential for financial institutions in Africa to embrace disruptive technologies like Blockchain, and use them to empower individuals and improve the lives of their customers. However, its true value will only be realized if we work together to co-develop and share solutions to common problems" (Andrew Baker, 2016).

2.1 Introduction and background

This chapter of the research includes a review of the literature related to Blockchain and other Cryptocurrencies, and the transformative power that they have on disrupting the traditional financial systems as we know them. It examines the meaning and need for a digital/alternative currency and explores the traditional financial systems approaches to dealing with financial inclusion and serving as a vehicle for improved economic activity and ultimately general improved welfare.

The chapter will be divided according the research problem's two sub-problems. First it's going to explore the level of adoption of alternative currencies and financial system platforms in South Africa, specifically Blockchain, and secondly it's going to review what potential value Blockchain carries as a technology in the process of improving access to financial systems by greatly reducing the costs associated with carrying out financial transactions and the exchange of money between parties. By enabling large banks and financial institutions to provide services of inexpensive transactions to its clients. This chapter will also look at the impact of financial inclusion on general citizens as a means of alleviating poverty, and ultimately improving human welfare.

Virtual Currencies and Blockchain

Since the beginning of trade, "people initially swapped what they had for what they preferred, by bartering, but when people accepted what they didn't necessarily want personally, because some third party person who did have what people wanted would accept it, the means of exchange became called money. Almost everything has been used as money before from shark's teeth, cigarretes to stones, and slaves" (Nieman, 2015).

Virtual currencies, which are to date the most widespread application of Blockchain technology, similarly are a proxy for value and they can take a variety of forms and use across industries and payment scene examples being air miles, credit card points, loyalty/reward points, bitcoins etc (Nieman, 2015).

The South African Reserve Bank (SARB) defines virtual currencies as "A digital representation of value that can be digitally traded and functions as a medium of exchange, a unit of account and/or a store of value, but does not have a legal tender status" (FATF, 2014).

Blockchain is the technology underlying Bitcoin and other cryptocurrencies, maintained by a decentralised computer network (Nguyen, 2016).

Blockchain is often referred to as an open ledger where all transactions (online) are recorded and all members are permitted to verify transactions, send them or connect to them. In other words, it is an accounting system of record which records elaborately, all transactions according to a strict set of mathematical rules to prevent tempering. Research on the field has indicated that cryptocurrencies are potentially powerful tools to minimise costs and not only create drastic change in the nature of banking but can potentially shape the entire economy as we know it (Nguyen, 2016).

Financial Inclusion

Blockchain as a technology carries the potential of improving access to financial systems by greatly reducing the costs associated with carrying out financial transactions and exchange of money between parties. It achieves this by enabling large banks and financial institutions to provide services of overall inexpensive transactions to individuals.

This expansion and access to financial services allows the participation of previously undeserved groups of the population in developing countries, thereby improving financial inclusion. This increased access to financial services for previously undeserved people helps to narrow the financial infrastructure gap especially in countries like South Africa where the costs of distance and time are very high for formal banking services. A bolstered financial inclusion base stimulates, among other things, private investment and hence economic growth (IMF, 2011).

There is a tremendous interest in finding innovative and new ways of increasing financial inclusion in the general Africa using Information Communications Technology (ICT) and technology such as Blockchain. It is therefore of the utmost importance for this study to assess the potential of Blockchain on improving financial inclusion and therefore economic growth in the financial services sector.

2.2 Economic participation and financial inclusion in Africa and other developing worlds

"Financial inclusion is critical in reducing poverty and achieving inclusive economic growth. When people can participate in the financial system, they are better able to start and expand businesses, invest in their children's education and absorb financial shocks"

(World-Bank, 2014)

2.2.1 *Financial inclusion in the developing world*

The problem of inadequate financial services or products that are designed to the suitability of a general low to middle income earning citizen in developing countries such as South Africa can be viewed as a subset of the general poor financial inclusion in emerging markets or so called third world countries.

There are several definitions of financial inclusion that have been brought forward. This study will use the multi-dimensional framework developed by the Financial Inclusion Data Working Group of the Alliance for Financial Inclusion (AFI).

The dimensions for financial inclusion under this framework are presented in **Figure 1.**

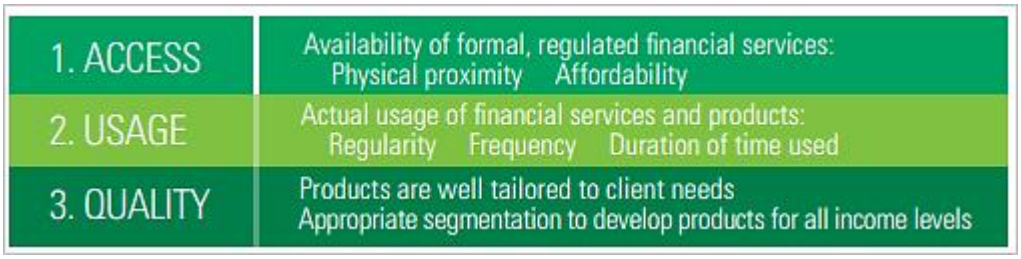


Figure 1 Dimensions for Financial inclusion (A. D. Bank, 2013)

Based on the dimensions above, financial inclusion can be defined as general access to affordable, quality and sustainable financial services directed at individuals who find it useful in meeting financial requirements and obligation (A. D. Bank, 2013.

An immediate observation made by (Chinaka, 2016) is that addressing the problem of financial inclusion requires the development of measures that will address/incorporate all of the dimensions either at the same time or individually in steps. He further strengthens his argument by stating that developing these measures will require an understanding of the root causes of the inadequacies underlying each of the dimensions. Some of the causes of the inadequacies under each dimension are suggested in **Figure 2**.

No.	Dimension	Causes of Deficiency
1	Access	• Lack of services due to high cost to financial institutions of providing access to less densely populated areas or to small markets • Low income levels to warrant use of financial services, considering the cost of using the facilities e.g. in some countries in Africa, fixed fees on a bank account are as high as 25% of GDP per capita • Identity issues- documentation is a major problem in many places in developing economies, particularly in Africa, making the use of financial institutions a challenge for many. This extends to aspects such as ownership records of assets that may be used as collateral for financial products.
2	Usage	• Lack of education regarding benefits of current financial services • Low trust of financial institutions
3	Quality	• Inability to provide tailored products that meet unique needs of target markets. This may be related to the cost aspects as it is sometimes expensive to customize services to meet unique market needs. When such a market is small, financial institutions have less motivation to provide custom products.

Figure 2 Common causes for the deficiencies underlying the dimensions of financial inclusion (Chinaka, 2016)

2.2.2 *The outreach of Sub Saharan Africa's financial systems*

The underdevelopment of Africa's financial systems and their limited outreach is said to be well documented. (Chinaka, 2016) identified the following factors as noteworthy in explaining the underdeveloped financial sector and its limited outreach;

- Low and volatile income levels
- Inflationary environments
- High illiteracy rates
- Inadequate infrastructure
- Governance challenges
- Limited competition within the banking industry and
- The high costs of banking

According to the European Investment Bank, there are a several global measurements that have been used to determine the level of financial inclusion in geographical locations, the different metrics provide different information but often related to the extent that the market has developed financial inclusion (E. I. Bank, 2013).

For the purpose of highlighting specific aspects of the research, this section provides data for two of the main cited metrics/measures; bank account penetration rates and savings by individuals.

Bank account penetration rates are accepted as a reasonable proxy of usage of a formal banking system. The adult account penetration rates by region are reflected in Figure 3

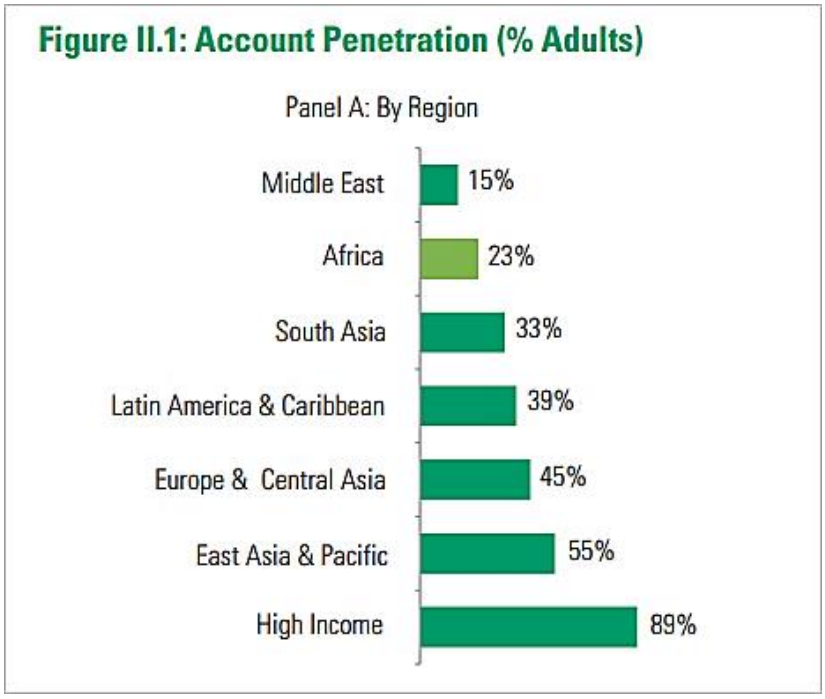


Figure 3 Global Bank Account Penetration by Region (A. D. Bank, 2013)

The summary for adult account penetration rates within Africa are summarised in **Figure 4** below

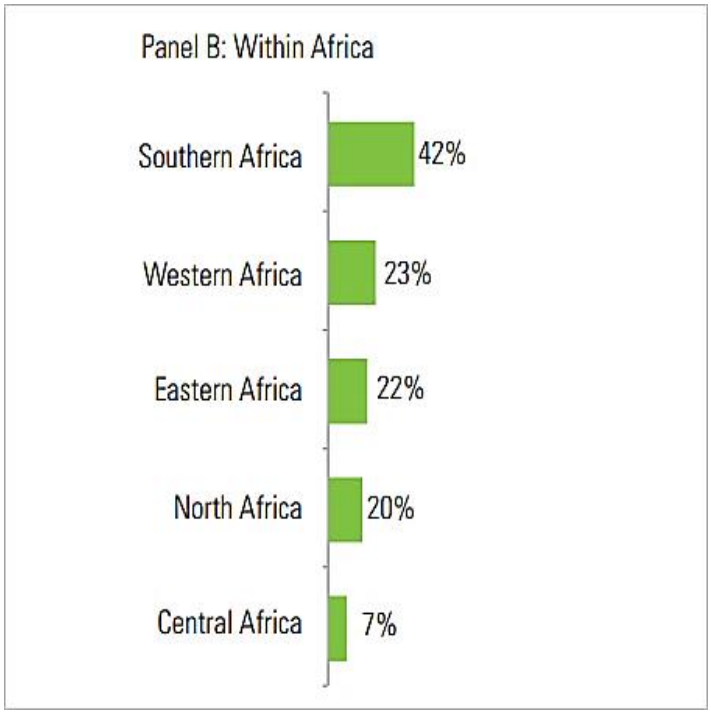


Figure 4 Africa Bank Account Penetration by Region (A. D. Bank, 2013).

Africa has among the lowest bank account penetration rates at 23% when compared with the rest of the regions. However, within the African region, Southern Africa at 42%, reports penetration rates as high as those reported for Europe and central Asia on the Global Bank account penetration study. Southern Africa has seen better economic growth and has better infrastructure investment vehicles that help fast track such initiatives and agenda.

(Chinaka, 2016) postulates that the saving behaviour of individuals in different geographical regions, which is inclusive of the channels used to save, provides and indication of how financially inclusive the region is. The choice between using formal bank systems and other informal channels to save becomes an indicator of potential hindrances that may drive individuals to chose one channel over the other. The reluctance to use formal banking systens as well as poor access to formal banking systems are said to be both indicators of inadequate financial inclusion (Chinaka, 2016). The above mentioned factors lead to an overrall poor participation in the formal saving channels with formal institutions in that geographic region, the use of formal and informal channels of saving is reflected in **Figure 5.**

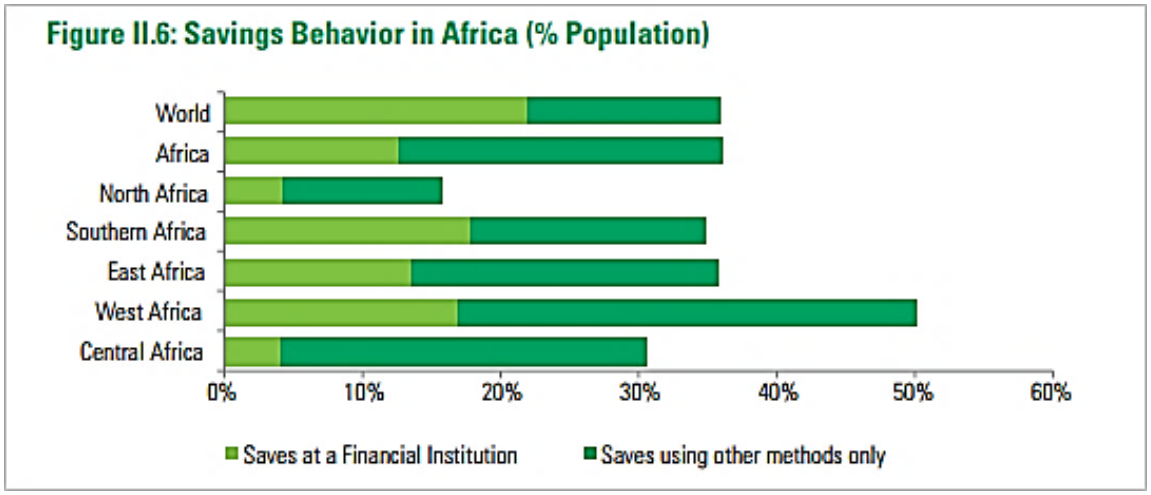


Figure 5 Savings Behaviour in Africa (A. D. Bank, 2013).

The correlation between the use of formal banking channels and the bank account penetration is as expected, positive. The more individuals opt for formal channels of saving and transacting the better the penetration rate levels of these formal facilites.

2.2.3 *Research propositions*

To evaluate Blockchains potential of having a significant social impact through its ability to improve financial inclusion.

2.3 Blockchain and the future of financial infrastructure

2.3.1 *Blockchain Technology*

A natural progression

Human commerce has evolved over the past couple of thousands of years from direct swapping of one's goods or services for another in a system called bartering, to indirect bartering which involved swapping for a scarce and valuable good which can then in turn be exchanged for a good or service. Then came standardised coinage where metal coins which a perceived inherent value could be exchanged for goods and services, and finally to fiat money which has no backing by a physical commodity or good and no inherent value other than the value it was given through governments declaring it a legal tender (Gump & Leonard, 2016).

Looking back in time at how trade began, the concept of value transfer has always fundamentally been between two parties with no intermedeary restrictions. This is not to

invalidate their function however, as they have played a useful role in facilitating usability, scalability and trust. The point illustrated here is that the idea of "open financial systems" is certainly not new.

Today fiat money is not even so much represented by coins or bank notes but is merely electronic entries in bank's ledgers, which has meant banks and other service providers are necessary to intermedeate payments and transactions by debiting ledger entries on one account and crediting another (Gump & Leonard, 2016).

The intermedearies play another vital role of "trust", for instance in a transaction, a ledger cannot be debited more than once, this ensures that the systems prevent money from being double spent.

"If we couldn't exchange money for goods and services, it would have very little value to society. Money therefore is simply data, a simple way to keep track of exchanges in value, or accumulations of wealth" (Hoffman, 2015).

Bitcoin, along with other cryptocurrencies, are by definition a means of indirect exchange and in that sense they resemble gold and other goods that were once used for bartering many years ago. In the Bitcoin ecosystem, the Bitcoin is valued by the people that use it as a medium of exchange because of it's scarcity and that it can only be spent once. It is scarce because the computer protocol that is responsible for the currency governs how frequently it is produced as well as the total number of Bitcoins that can ever be produced. Central to Blockchain technology, which is the technology underlying Bitcoin and other cryptocurrencies, is the cryptography property of these virtual currencies which ensures that no coin can ever be transferred by its owner more than once, this guarantees the currency's value and utility.

Just like a nugget of gold can be exchanged for a good or service only once, Blockchain technology (which uses a distributed ledger system), therefore allows a valuable commodity/good to be stored electronically and transferred without an intermedeary like a bank or other third party (Gump & Leonard, 2016).

On this digital ledger, that resides on computers that run BitCoin's software or other cryptocurrencies, every time one party exchanges some amount of BitCoin with another party, information about this transaction is validated and checked against existing entries in the Blockchain. If one party attempts to spend bitcoins he/she doesn't own, then the validation checks will reveal that. Also if the recipient of the transaction isn't a valid account holder this would also be revealed. This high degree of security has made Bitcoin very popular over the years and some have even contrasted it with the bank's propritary ledgers that actually offer more centralised and single points of attack for criminals to target and corrupt.

The Anatomy of Blockchain technology

In general terms and for the sake of simplicity, the technology underlying Blockchain does not differ much from that governing databases except for the ways in which the users interact with the database. Blockchain is a technology that allows for transactions to be carried out between any permutation of parties reliably and indubitably without the need of a central authority, it's also a bunch of decentralised computers (Mougayar, 2015).

Blockchains are distributed ledgers that use encryption to store permanent and temper proof records of transaction data. The data is stored using a peer-to-peer system type of network using what is termed a "consensus" principle to validate each transaction (McLaughlin, 2016).

How Blochchain works

Central to the way that Blockchain works is a benefit of the technology which holds a promise to significantly reduce friction and costs in many applications, but most prominently the financial services because it does away with the need for a central authority, such as a clearing housing, in conducting as well as validating transactions. It is being explored in parallel for being the foundational technology for systems of records such as property ownership, smart contracts and mobile payments.

(McLaughlin, 2016) deems it important to understand how a unit of value moves from party A to party B in a transaction, the figures below

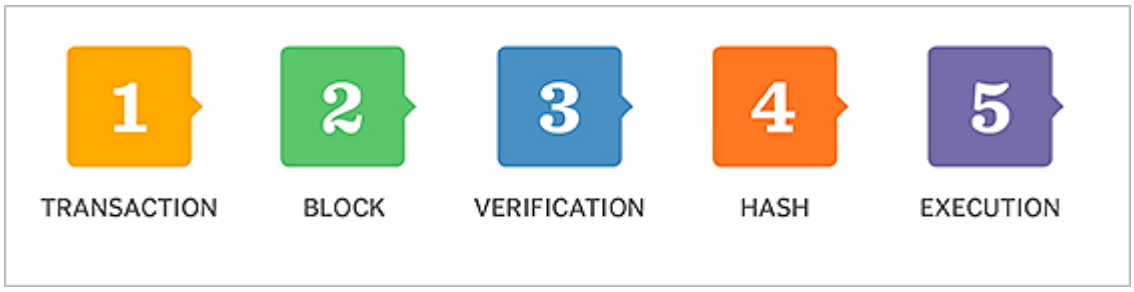


Figure 6 Steps in a Blockchain transaction (McLaughlin, 2016).



Figure 7: The transaction initiation (McLaughlin, 2016)

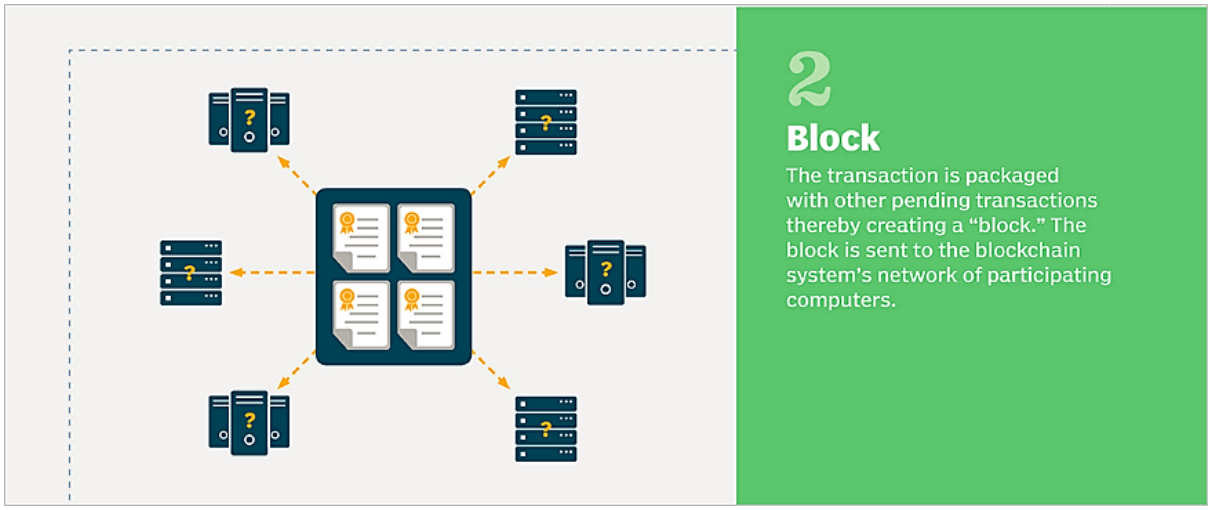


Figure 8: The formation of a "block"

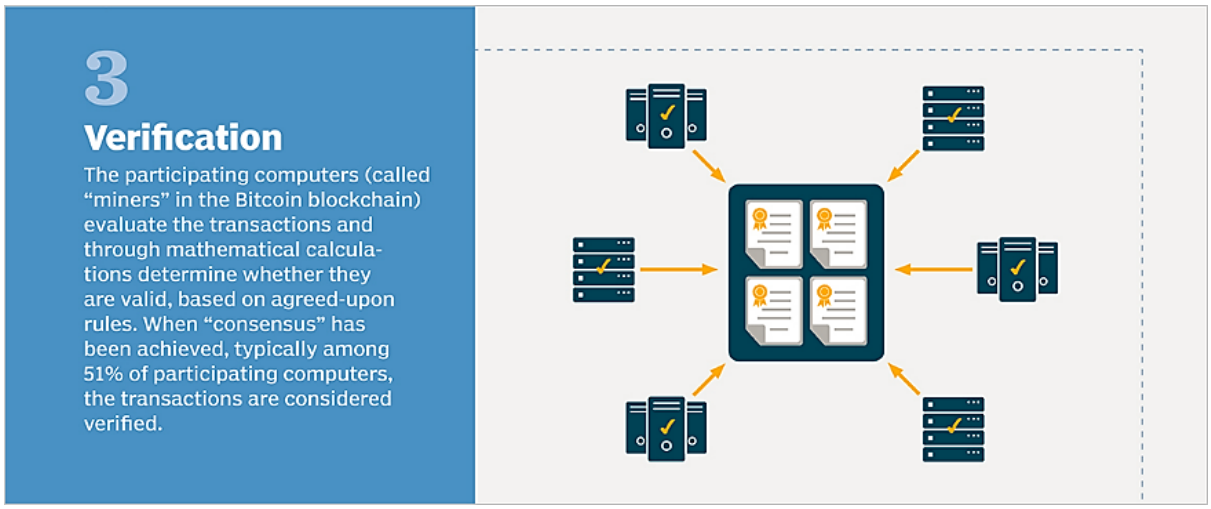


Figure 9: The "consensus"

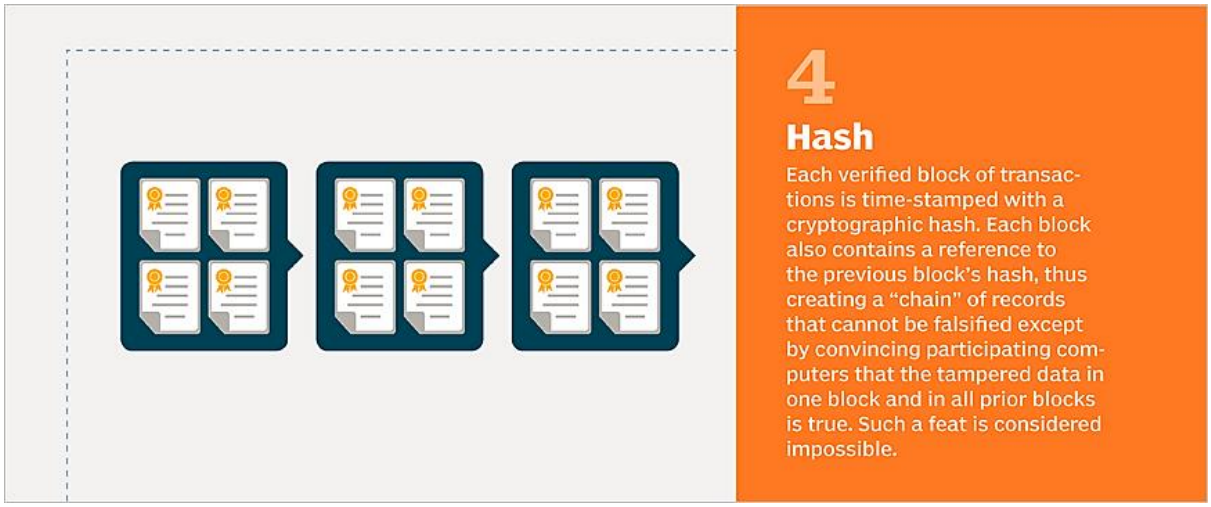


Figure 10: The hashing principle to create a "chain" of records

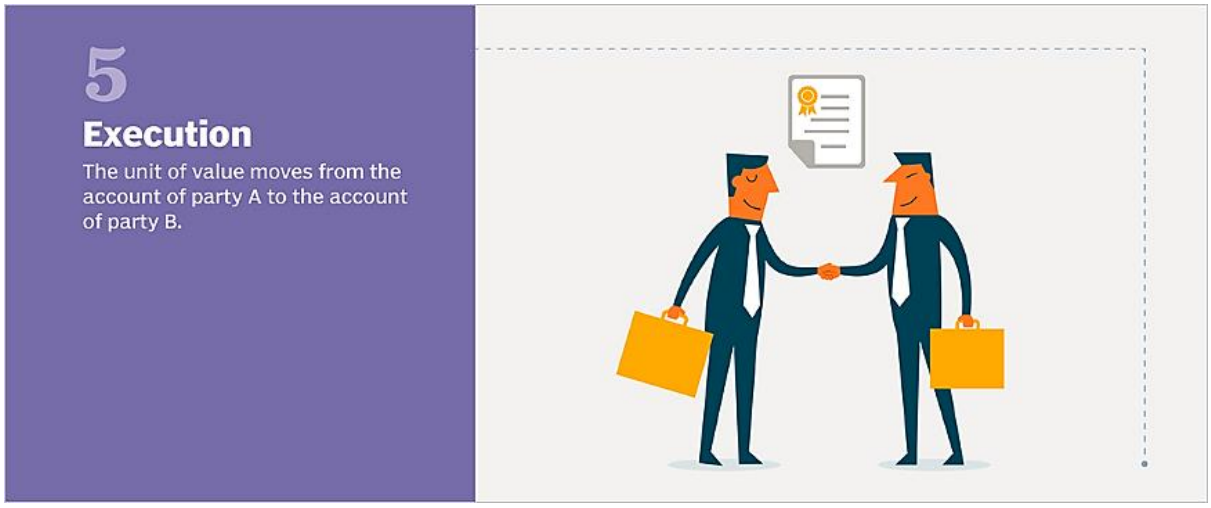


Figure 11: value transfer

Blockchain has a number of properties as a technology but there are mainly about four key concepts underlying the technology which are :

a. ***Decentralised Consensus***

This construct or design replaces the traditional centralised consensus model, where the validity of a transaction is controlled by a central database. In the decentraliased construct of Blockchain authority is transferred across a decentralised network where nodes, which are programs that run on distributed machines to validate transactions and blocks, continuasly and sequentially record transactions on a public block, creating a unique chain in that operation. Each successive block in that chain will have a unique identifier of the previous code in a form of a hash (Mougayar, 2015). The Hash based cryptography facilitates the authentication of transactions as well as providing security and eliminating the need for a central authority in the process. It is this combination of the cryptography and Blockchain that results in no possibility of duplicated transactions, this whole peer to peer mechanism that

occurs is enabled by the, very key, distributed network architecture of the internet depicted in Figure 12.

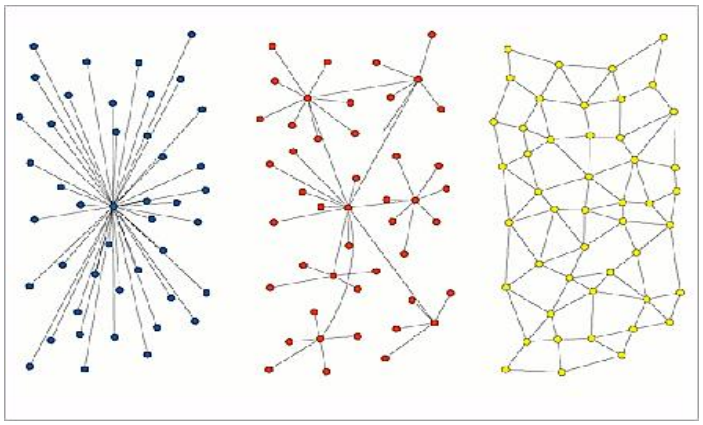


Figure 12 Centralised, Decentralised and Distributed Network designs (Banker, 2016)

b. ***Smart Contracts***

Smart contracts in simple terms are small programs that run on Blockchain nodes that can be entrusted with a unit value. The key characteristic of smart contracts is that transaction governance can be carried out on the Blockchain as opposed to being administered through a central authority. In the Blockchain ecosystem, smart contracts are defined as digital assets, whose ownership is directly linked to the Blockchain and can be transferred through the Blockchain (Chinaka, 2016).

c. ***Trusted Computing***

The trust element in the Blockchain backbone stems from the knowledge that Blockchain will provide validation for the transactions, digital assets are transferred on a peer to peer basis without the need for a central authority.

d. ***Proof of work/stake***

Records in Blockchain are immutable, and a change to a record would require changes to the proof of work, making it difficult or almost impossible to to manipulate transactions or the underlying platform.

Other features of a Blockchain network are that it's peer to peer: assets transfer directly between the parties that control the assets; it also doesn't need the bitcoin currency, the networks are built to transfer any asset; the Blockchain network is very fast, conformations happen in seconds not minutes; the network is also scalable (Gump & Leonard, 2016).

2.3.2 *Applications of Blockchain*

Many publications agree around the fact that despite Blockchain being peer to peer, it will probably still need supervision from an intermediary at least in its infancy. As a technology, Blockchain has already proved it's worth in a number of fields.

Blockchain in Financial Activities

Succesful experiements and use cases about credit swaps on record keeping technology behind Bitcoin has assisted the financial services industry to better understand major financial flows. It has also helped the understanding of handling money transactions without an intermediary, allowing start-ups to send and receive money as well as exchange the virtual currency to the native currency.

Blockchain in Management Activities

The Federal government? in the U.S is currently investigating ways to regulate short term loan agreements, also called contracts between agencies, can be handled using Blockchain. Currency control agencies around the world are conducting their own experiements with Blockchain on how to regulate new banking technologies.

Blockchain in Cooperation Opportunities

- There are reports of Blockchain potential in contributing to journalism as people can somehow easily pay several cents to view a single article that may be of interest to them because of the way micro-value payments have suddenly become feasible.
- A growth of economy and blossom can be expected for artists in terms of culture, they will be able to sell their art online directly, artists, bloggers, writers, game producers and other people seling innovation.
- The media industry will transform as new forms of media are made possible for Real life prediction games (RPGs), online interactive dramas and novels and just new ways of combining art, music and storytelling.
- Crowdsourcing also stands to benefit, examples such as contributing content to Wikipedia, or improvig the Linux source code.
- Blockchain could also see the breakup of cable TV monopolies who always prefer bundling their services, the technology can finally help viewers to only ever pay for what they want to watch and from their desired supplier without wastinmg money on other channels that they don't need (Nguyen, 2016).

In brief, (Tapscott, 2016) alludes to a future where redistributing wealth will become distributing wealth and doing so in a fair and transparanet way. He forecasts billions of people

in the global economy; protecting rights through immutable records like land titles; ending the remittance "rip-off" as he puts it and helping the diaspora return funds to their ancestral lands; helping accountable governments through transparency, smart contracts and revisited models of democracy.

The Gartner Hype Cycle

Every new technology has bold promises, yet some never realise their full potential which makes it difficult to discern the hype of the technology from what's really commercially viable or carries significant social impact potential. (Gartner, 2017) has come up with a methodology termed the Gartner Hype Cycle which provides a graphical representation of the plot of the maturity and adoption of technologies and applications. The Gartner Hype Cycle plot gives a view of how the technology or application will develop over a period of time (Gartner, 2017).

The depiction of the Gartner Hype Cycle as shown below Figure 13 drills down into the five key phases of a technology's life cycle, which are briefly explained below the depiction.

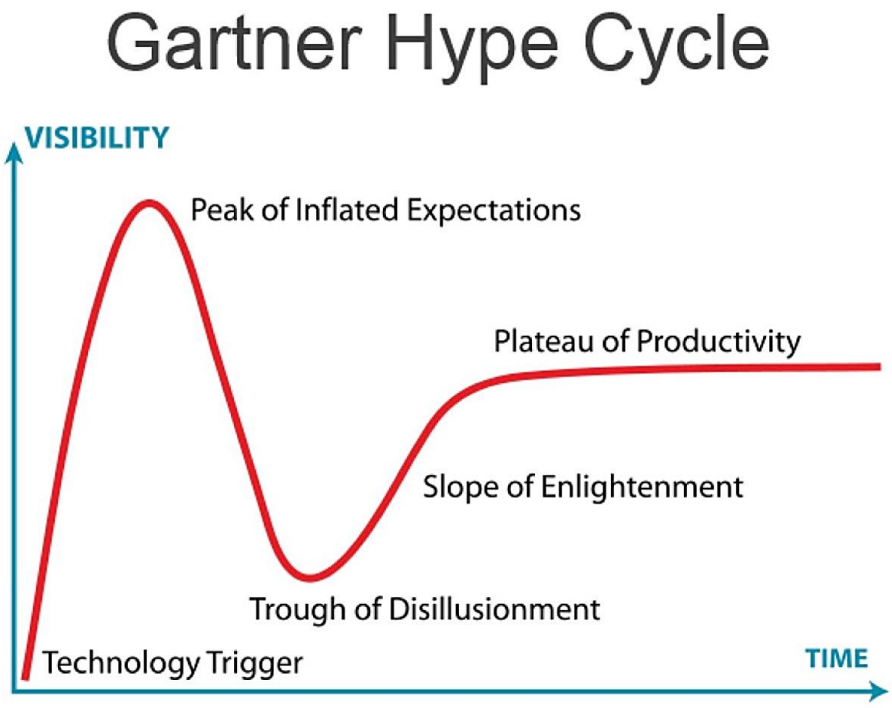


Figure 13 The Gartner Hype Cycle (Gartner, 2017)

Technology Trigger – This phase describes the period where a potential technology breakthrough kicks things off, often no usable products yet at this stage.

Peak of Inflated Expectations – this phase is characterised by some success stories owing to some early publicity.

Trough of Disilusionment – in this phase interest wanes as early experiments fail to deliver.

Scope of Enlightenment – The benefits of the technology start crystalising in this phase as more use cases or business cases are uncovered.

Plateau of productivity – Mainstream adoption starts to take off in this phase.

2.3.3 *Societal Impact of Blockchain technology*

(Tapscott, 2016) of the Tapscott Group says that the promise that technology carries concerning how wealth is created around the world across the globe is one of the most significant societal impacts to note.

- People who live in the developing world, who currently own no bank acccounts, will be offered an opportunity to participate in the digital economy.
- The improvement of the process of sending money to family members in foreign countries vial what is termed electronic remittance.
- Improve accountability in sectors of society like governments where officials are held accountable with smart contracts.
- Greatly reduce the cost of doing business in general (Tapscott, 2016).

2.3.4 *Blockchain Adoption in South Africa and Sub-Saharan Africa*

"Blockchain is still maturing and has yet to gain the trust of financial institutions and consumers alike. But if and when it happens, widespread adoption will happen quickly. Change is currently focused on disruptive innovation but will become more mainstream as industry alliances such as R3 and regulatory acceptance grows." (Andrew Baker, 2016).

South Africa has reported a growing activity with Blockchain experiementation and some use case applications. There are a number of interesting reports by Euroclear and Deloitte (Meijer, 2016). There has been growing activity in the financial industry around distributed ledgers by tech start-ups, banks, central banks, advisory firms, companies and other central government bodies.

The big four South African banks along with Strate, the country's central securities depository are reported to have setup a Blockchain network amongs themselves. The South African Reserve Bank as well as the Financial Services Board have also been playing observer roles in the effort. The banks have since exchanged assets using a distributed ledger in a very low cost and fast manner.

Absa Bank, has joined up with R3 CEV consortium, and they have been focused on a private version of the Ethereum Blockchain product and are heavily experimenting with smart contract technology (Andrew Baker, 2016).

R3 is said to have made significant breakthroughs to test how Blockchain can be adopted by financial institutions.

2.3.5 *Potential Hurdles and Regulatory Issues that may impede efforts to adopt Blockchain*

As Blockchain adoption widens and strengthens, a few hurdles that may impede further adoption are starting to get uncovered as well. The maturity of the technology therefore is going to require thorough preparation on various aspects, particularly on legal matters and policy development (Nguyen, 2016).

According to (World-Bank, 2014), the nature of level classification of Blockchain is somewhat fundamentally different from that of traditional policy model, and as such difficult to give a definition of aspects such as customer protection, money laundering, terrorism sponshorship, Tax, as well as general monetary policy.

While the desire for freedom and innovation should remain unstiffened, (Nguyen, 2016) iterates that legal frameworks for digital currencies should still be considered for both domestic and international measurements. Legislation however should follow innovation.
Also it has become a general consensus in the Blockchain communities that policies should only ever be designed so that the community benefits from the technology while illegal use of Blockchain for activities such as money laundering, terrorism sponsorship as well as capital control should be strictly prevented (Nguyen, 2016).

2.3.6 *Research propositions*

To illustrate the the level of adoption of the Blockchain technology in South Africa through direct use of the technology itself or innovations that are built upon Blockchain technology the researcher looked into :

- The size of investements that financial institutions are making towards Blockchain and Blockchain related projects.
- The number and breadth of Blockchain use cases that the banks and financial institutes are currently employing.

2.4 Blockchain and Financial Inclusion

Today, the internet has totally transformed the way in which we communicate and use information. If I am in South Africa and wish to talk to my friend in Germany I can download programs like Skype and talk to him in a matter of minutes. And similarly communicating via email, it's frictionless, fast, free and easy to access and use.

Money however, has not followed this progression pattern. It's still relatively difficult to open a new bank account, send money to another individual in another country or even locally. It's difficult to connect our products, that use money, to one another, and where it somewhat works it doesn't leave the client with a high quality of experience. Dealing with money or products that use money can be slow, inconvinient and most importantly expensive (Chinaka, 2016).

When thinking about the unbanked population and where most would be located, the answer alludes to very little infrastructure and technology solutions, let alone brick and mortar solutions to bring service delivery to the individuals. According to the Global Findex published in 2014 there were still over 2 billion people unbanked globally. It is reported that 46% of adults in developing countries are without a basic bank account, while 50% of women do not have an account (World-Bank, 2014). The chart below shows the number of people that are unbanked per region illustrated as **Figure 14.**

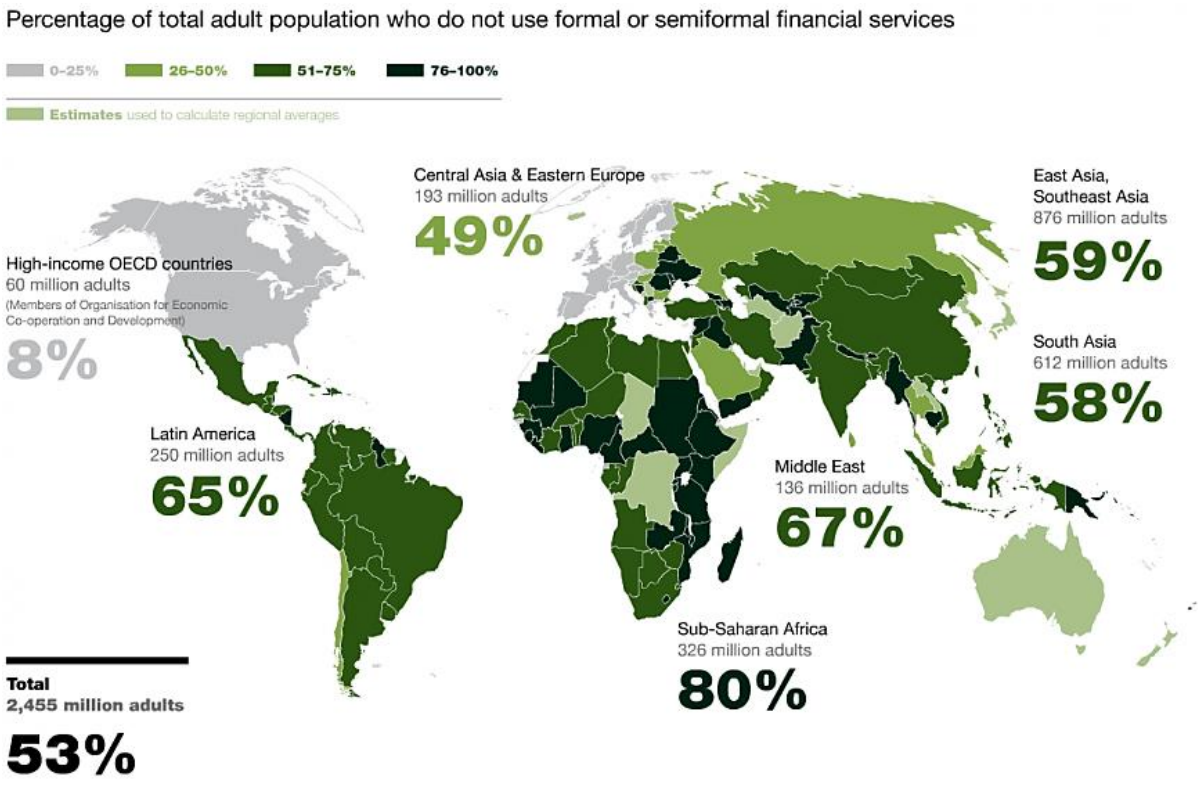


Figure 14 The global unbanked population by region (Strajnar, 2014)

Mobile Money and Financial Inclusion

The World bank made an observation that for the first time in history, technology, in particular mobile technology is making it possible to reach many people in these regions. Mobile technology plus mobile banking with the use of Blockchain technologies for financial inclusion can allow value transfer (World-Bank, 2014).

The World bank made an observation through the study that Mobile is actually the preferred banking channel in the developed world as illustrated in Figure 15 below

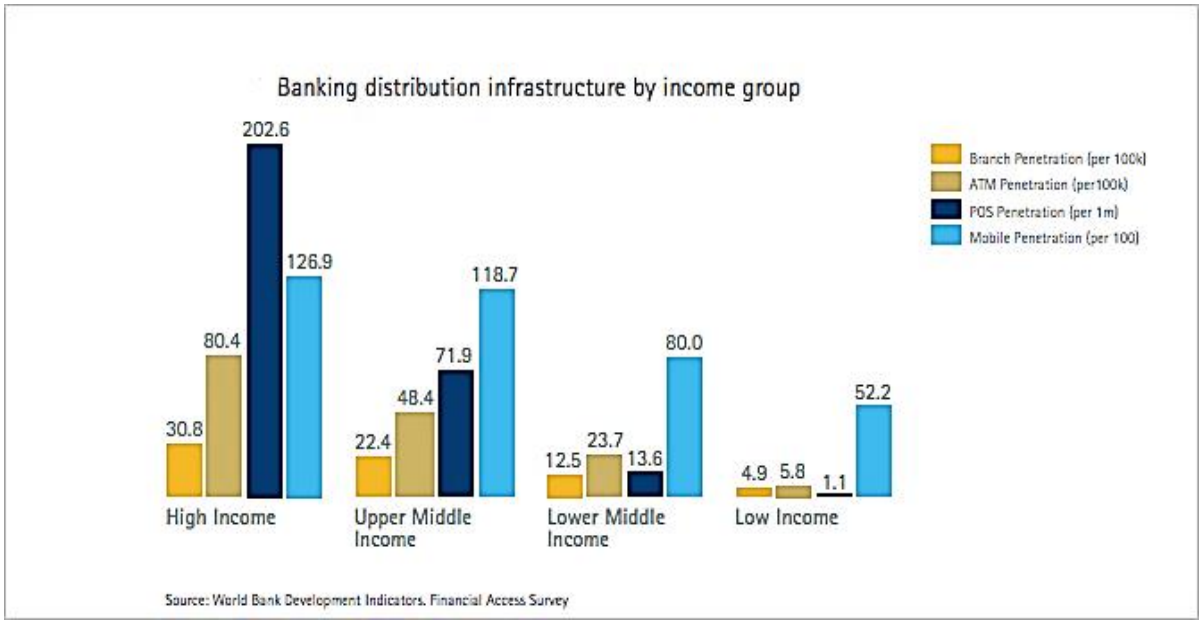


Figure 15 Banking channel distributions amongst the various income groups (World-Bank, 2014)

Mobile and Blockchain will allow the Last Mile for financial inclusion (World-Bank, 2014), and there has been growth in financial inclusion as depicted in the figures below Figure 16 and Figure 17.

In Sub-Saharan Africa, Mobile money account ownership is driving a huge expansion of financial inclusion.

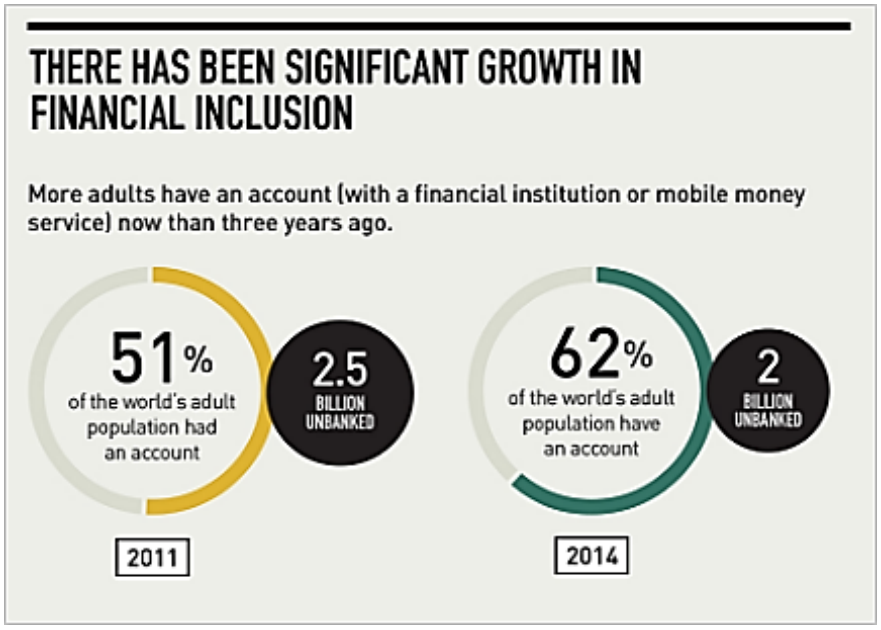


Figure 16 Global Financial Inclusion between 2011 and 2014 (World-Bank, 2014)

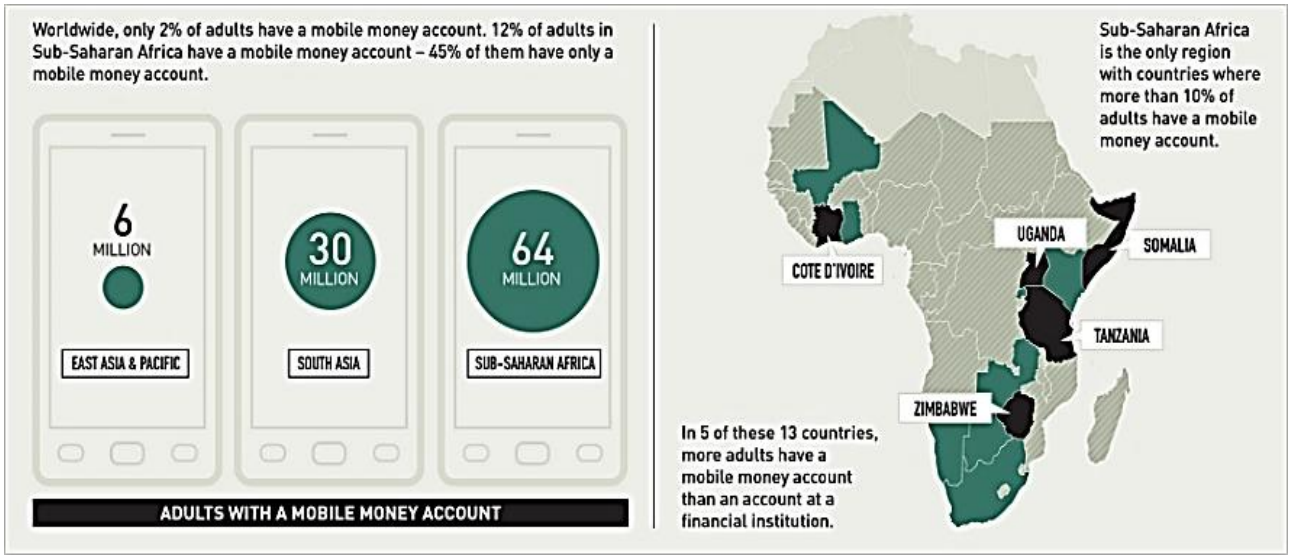


Figure 17 Mobile Money Account Ownership in Africa (World-Bank, 2014)

2.5 Conclusion of Literature review

The cites that distributed ledger technology could reduce the banks' infrastructure costs that can be traced to cross-border payments, regulatory compliance, trading securities by about 15 to 20 billion per annum by 2022 (World-Bank, 2014). Blockchain can cut the operational costs and allow customers ownership of bank accounts which become the gateway to access to all types of financial products and infrastructure in the formal ecosystem.

Formal financial products and vehicles remain expensive, significant savings can be realised by banks, other financial institutions and indeed individuals by bypassing the existing infrastructure networks. Recording transactions in one automatically shared, tamper proof repository/database could decimate the need for complex procedures and so called clearing houses that are used to make sure that banks and financial institutions have the same aligning bits of information, saving time and money and significantly reducing the margin for error.

Without intermediaries, payments and settlements can be carried out really rapidly and cheap. The allowance of frictionless formal access to financial systems gives people more control over their financial destiny (SAMMANTICS, 2015).

It will take some time to mature the Blockchain ecosystem, but this growth is more rapid than one might be tempted to think. Comprehending the potential of the Technology as discussed in the above sections of the report, leads a researcher to pass this particular use case as quite strong.

Research questions

The research questions can be phrased as:

Research question 1

To illustrate the the level of adoption of the Blockchain technology in South Africa through use of the technology directly or through adoption of innovations that are built upon Blockchain technology.

Research question 2

To evaluate Blockchains potential of having a significant social impact through its ability to improve financial inclusion.

CHAPTER 3. Research Methodology

This section of the report outlines the methodology that was followed in the research process in order to establish the extent of Blockchain technology adoption in South Africa, more especially by major financial institutes and Banks. However the study was extended to explore start-ups and Fintech companies around Johannesburg as well, together with some perspectives from ex-South Africans Technology practitioners who have had an opportunity to compare experience and insight from South African market with that of the United States.

It's also in this section that the study developed an idea of the level of impact that Blockchain has on playing a role towards facilitating financial inclusion for citizens that would otherwise find it traditionally difficult to transact against and use any formal financial vehicle/product.

"Financial inclusion is critical in reducing poverty and achieving inclusive economic growth. When people can participate in the financial system, they are better able to start and expand businesses, invest in their children's education and absorb financial shocks"(World-Bank, 2014).

3.1 Research Methodology/ Paradigm

This research was qualitative in nature. The approach was selected for its relevance on research work that seeked to determine the level and extent of investment that financial institutes are making towards technologies and trends that have a potential to disrupt their sectors and their traditional ways of doing business, threatening their continued existence. Blockchain is a nascent technology therefore most of the initiatives and investments only exist as research studies and proof of concepts. These pilot projects will be categorised according to the allocated total annual budgets. The increasing budgets and scope of the projects will give an indication towards the level of commitment by the financial institutes to extract some real value out of this emergent technology.

South Africa has reported growth in activity with Blockchain experimentation as well as developing relevant use case applications. There are a number of interesting reports by Euroclear and Deloitte (Meijer, 2016).

Organisations involved in innovation studies of any kind often require draw up strict Non-Disclosure Agreements (NDA) for participants to protect the ideas and any Intellectual Property (IP) inherent to the study. There was a general anticipation of limited data to collect for the study.

However the recent activity around Blockchain in South Africa has created enough excitement as well as collaboration between companies and even sectors. South Africa's financial institutions are beginning to realise that there is a greater probability of success around

Blockchain if they work together and share learnings in order to extract the full end-to-end benefits that the technology stands to offer.

The study made use of semi-structured interviews with CIOs, CTOs, Technology and ICT practitioners with sufficient Blockchain knowledge and exposure. A semi-structured interview allowed the interviewer to prepare questions beforehand in order to guide the conversation but it was also flexible enough to allow the respondent to respond in their own terms and provides comparable data (Cohen & Crabtree, 2006).

This study based its definition of financial inclusion on that provided by the Alliance for Financial Inclusion (AFI), which states that financial inclusion can be defined as general access to affordable, quality and sustainable financial services directed at individuals who find it useful in meeting financial requirements and obligations (A. D. Bank, 2013).

The (World-Bank, 2014) recognised Africa as the continent with the world's fastest growing market for mobile phones. The high mobile penetration rates have presented opportunities for business due to the fact that the gadgets provide multiple functions that enable internet connectivity, data and voice communication, transfers of photos, videos and notably money. Given this statistic that many people in Africa, with special reference to South Africa, now have internet access via smart mobile devices means that a Blockchain foundation is already being laid and that Blockchain stands a good chance of adoption as a payment system or intermedeary. Bitcoin or any cryptocurrency as a payment system, as seen in places like Kenya and the uptake of MPESA, relies on the internet as the essential physical network for conducting financial transactions (Banker, 2016).

It is for the reason above that smartphone penetration rates in South Africa can serve, and will be used, as an early proxy indicator/predictor of Blockchain-uptake and infrastructure readiness in South Africa. Moreover, it is the same aggressive mobile penetration rates that have enabled mobile money solutions to thrive and offer access and participation from the traditionaly unbanked populations in rural South Africa. As a secondary data source, data from reputable sources ranging from the past five to ten years on smart phone penetration and internet penetration rates attributable to the smart phones will be used.

3.2 Research Design

According to (Walker.R, 1985), the more complex research topics are, actually generally better suited to qualitative analysis methods and in-depth interviews in particular.

Furthermore (Myers, 1997) argues that as the focus of information systems research shifts from technological to managerial and organisational type issues then qualitative research methods become increasingly better suited.

The choice of research approach and design is therefore underpinned by the complexity of the topics pertaining Blockchain technology. The research approach is, rather than being driven purely by the technical aspects of the technology, informed by the topics around the business applicability of the technology and the technology's correlation to a potential, wider social impact through financial inclusion.

3.3 Population and Sample

3.3.1 *Population*

The population for this research consists of, to a high degree, technology practitioners with fairly senior positions and influence, and in their respective organisations they are frequently prevy to and participate in research as well as business development initiatives. The participants have key roles in innovative undertakings in their organisations. The population consists of subject matter experts (SMEs) in the capacity of Chief Information Officers, Chief Technology Officers, Software Development Managers, Business Development managers, Innovation Officers, Software Engineer Lead roles etc. across a variety of financial institutes in South Africa such as:

- Absa
- Barclays
- First National Bank
- Standard Bank
- Deloitte
- Accenture
- SETA
- Multichoice

3.3.2 *Sample and sampling method(s)*

Bryman, (Bryman, 2012), argues that research samples should be selected on their suitability to the purpose of the investigation. All the respondents chosen for the interviews are IT practitioners, researchers, innovation officers and business development professionals who are familiar with Blockchain and Cryptocurrencies.
The number of respondents for the interview was 9. Table 2 below represents the profile of the respondents. Contact means were established with about 50% of the respondents prior to the initiation of the study and the rest were contacted during the study as they became available.

Table 2: Respondents by Job title

Job Title	Number of respondents
Business Development Managers	1
Head of Development/ Development Leads	2
CIO	3
CTO	3

Table 3 The table below represents the spread by sector in the Industry

Sector of the industry	Number of respondents
Banking	4
Media	1
Fintech	1
Technology Consulting	2
Government agency	1

3.4 Research Instrument

The interviewer prepared a list of core questions that define the areas to be covered and prepared in paper format for the respondents. Unlike with quantitative interviews based on highly structured questionnaires (Britten, 1995), the order in which the questions were asked varied somewhat from participant to participant depending on the flow of the interview and the level of knowledge of the participant but an effort was made to standardise the wording.

The questions were designed based on the literature review. The full interview guides can be found in the Appendix 2.

3.5 Procedure for data collection

The researcher initiated the interview process by first sending introduction letters to respondents, which were then followed by formal meeting requests for the interviews. As part of the meeting request, a list of questions were also sent through in order to allow the respondents to adequately prepare for the topic. To ensure the confidentiality of the interview process, a formal request for permission to record the interview was extended to each participant at the start of each interview. The interview was recorded through a digital recorder as well as through scribbed notes for enriching the collected data.

The data collection period lasted for about a month and a half, and was largely a function of the interviwees's availability.

The questions asked during the interview were according to the prepared guide, but further inquisitory was formulated based on the responses given by the respondents. The respondents were also informed on how the output of the interview process was going to be used and inform the overall research.

The second sub-problem sought to investigate the potential impact that Blockchain technology could have in improving financial inclusion in South Africa. A report was requested from worldbank.org, an organisation that publishes various financial statistics on a wide range of topics with financial interest. The data requested contained growth in financial inclusion in Africa, with a focus on South Africa. The financial inclusion growth is specific to growth that is attributable to mobile banking initiatives that have thrived on the back of an increased smartphone and mobile penetration rates. With an increased smartphone penetration rate as a causal factor in the increase of internet penetration rates, the World Bank indicates that in Sub-Saharan Africa Mobile Money account ownership is driving a huge expansion of financial inclusion (World-Bank, 2014). The data from the World Bank was consumed as a secondary data source to the study.

Using the European Investment Bank's measurement of financial inclusion, which is increasingly becoming an acceptable global standard, bank account penetration rates and savings accounts was used as a measure financial inclusion. The study was able to determine simple accelerating or decreasing financial inclusion trends over the years from the data obtained (E. I. Bank, 2013).

Mobile penetration rates have given rise to, and spurred, the growth in internet penetration rates, and the latter has been key in enabling financial institutions to attain access to the previously unreachable and unbanked populations (E. I. Bank, 2013). More and more financial institutions started offering mobile enabled solutions of their products and indeed creating some new products to better serve the needs of this base. As a result of all these technological

advancements, the mobile money bank account ownership rates are also on an upward trajectory. As one of the measurements and indicators of financial inclusion, bank account ownership rates, have also been growing as a result. Blockchain technology requires an active connection to the internet and therefore the upward trend in internet connectivity in Sub Saharan Africa and South Africa is going to be crucial as a prerequisite for establishing a technology such as Blockchain.

The correlation illustrated above enables this research to use, as an early proxy for representing approximate Blockchain adoption rates, the current internet penetration rates attributable to mobile devices.

The similarity in the trends is how they enable access to finance and associated vehicles through offering inexpensive ways to open and own a bank account.

3.6 Data analysis and Interpretation

To analyse the data in this study, the researcher used "Cognitive Mapping" technique. According to the definition provided by (Eden, 2004), A cognitive map is the representation of a thought process about a problem or an issue through a map. The maps are a network of nodes linked by directional arrows, where the direction of the arrow implies a believed causality (Harary, Norman, & Cartwright, 1965). Cognitive maps are usually formulated from interviews and they are said to be intended to represent the immanent world of the interviewee (Eden, 2004). (Ahmad & Ali, 2003) extrapolate that their proper use could yield great value and allow better comprehension of the subtleties of the research as applied by (Ngubane, 2015).

The ability to manage a huge amount of qualitative information generally improves the interview capability (Ahmad & Ali, 2003), the authors suggest that when represented graphically, data can lead to a structured thought approach. We are able to properly classify and discriminate research phenomena through coding, storing, recalling and decoding information about objects in our world (Willment, 2010) as applied by (Ngubane, 2015) in his use of cognitive mapping to analyse and interpret data.

To uncover underlying themes from the responses of the different participants, (Van der Linde, 2013) suggests that individuals maps (representing responses from the different participants) are combined per interview question. To illustrate this principle, all individual responses to the question "Do you think mobile penetration rates were a significant prerequisite to the rate at which financial inlcusion has changed in South Africa" will be combined to produce a single map to uncover any underlying themes. This process is then followed iteratively for all the responses.

3.7 Limitations of study

The original intended respondent population sample size was 15, and turned out too numerous for semi-structured interviews, taking into account the high profile nature of some of the respondents some scheduled interviews were cancelled, increasing the risk of securing enough interviews. This was mitigated through prioritising the high profile respondent over the entire group, their insight and contribution was far more thorough in comparison.

Collecting data requires great planning and organisation. Given the inherent and demanding nature of being in the employ of one of the biggest consulting firm meant travelling for work and being away from home, long working hours and strenuous work load. There was always a challenge around the time allocated to research tasks such as data collection. The risk was mitigated by the by researchers' decision to join a Blockchain Community of Practice (CoP) as well as the Blockchain Centre of Excellence (CoE) at the workplace in order to bring day to day occupational activities and academic research work a little closer together. The researchers' depth of knowledge and understanding was widened through gaining insight on these forums, about some of the real life applications nuances of Blockchain at even very early precursor stages.

3.8 Validity and Reliability

(Kalof, Dan, & Dietz, 2008) refer to reliability as the ability to reproduce finding of a research in a consistent fashion.

Validity, according to (Kalof et al., 2008) is defined to be concerned with the suitability and appropriateness of details from the research and the findings that were outlined.

Furthermore (Bryman, 2012) states that although reliability and validity are analytically somewhat different, they are nevertheless related because validity presumes reliability, and it's for this reason that the research established a reasonable balance between the two.

3.8.1 *External validity*

External validity refers to the ability to the ability to generalise and infer through logic, the findings of the study to a larger population (Kalof et al., 2008).

The research subject matter required that the researcher interview a group of highly knowledgeable candidates who provided direct insight into current Blockchain exercises in their organisation and also demonstrated knowledge and understanding of industry trends. In conjunction this study used published statistical data and therefore the study can claim generalisability and transferability.

(Thomson, 2011) points out that "for qualitative research generalisability is problematic. Qualitative research is concerned with the concepts and idiosyncratic characteristics of a select group; therefore, the findings or theory may only be applicable to a similar group".

3.8.2 *Internal validity*

Central to this study is internal reliability, this study needs to test or measure what it actually intends to measure.

The way the data collection in the study is designed was such that data was derived through transcribing recorded interviews into scripts, which were shared again with the respondents to confirm validity. The researcher placed a satisfactory amount of confidence on the study that internal validity was achieved.

However, through the use of a proxy measurement, i.e. the mobile devices-associated internet penetration rates, the study infers the potential adoption rates of Blockchain through this phenomenon and therefore reducing the extent of internal validity of the study as the researcher cannot guarantee, with an above 95% confidence, that another influencer of adoption rates will not surface as the business cases unfold with time.

3.8.3 *Reliability*

(Patton, 2002) argues that reliability is the consequence of the validity of the study, therefore through rigorous efforts of the researcher to maintain validity of results during the data collection and transcript validation process the study is reliable.

3.9 Demographic profile of respondents

The table below captures the demographics of the intended respondents

Table 4: Respondents by role and institution

Role / Company	Absa	Barclays	FNB	Standard Bank	Deloitte	Accenture	SETA	Mutichoice	Fintech A	Fintech B
Business Development Manager	1				1					
CIO		1	1		1					
CTO										
R&D Officer/ Manager							1			
Head of Software Development						1		1	1	

CHAPTER 4. Presentation of Results

4.1 Introduction

As asserted by (Van der Linde, 2013), composite cognitive maps that are created by mapping the combined responses of the candidates to the interview questions in order to uncover underlying themes. The below sections presents the results of the interview in the form of cognitive maps. To iterate, the main themes in the research questions were identified as:

- To illustrate the the level of adoption of the Blockchain technology in South Africa through use of the technology directly or through adoption of innovations that are built upon Blockchain.
- To evaluate Blockchains' potential of having a significant social impact through its ability to improve financial inclusion.

Cognitive mapping is recognised as a formal modelling technique and there are rules for how maps are developed (Eden, 2004). According to (Eden, 2004), the formal basis for cognitive maps is derived from what is referred to as personal construct theory, which as the author states, proposes a way of how humans make sense of the world around them through the need to want to manage and control it. Futhermore the author stipulates that it is this focus on seeking to manage and control that makes cognitive maps so valuable in research activities.

Eden (2004) refers to a personal contruct theory as explained by (Kelly, 1955), which highlights the appropriateness of cognitive maps for "problem structuring" steming from how focused the maps are on problem solving and action.

These techniques are accurately applied in an example study by (Ngubane, 2015), in his investigation of managing IT knowledge workers in the South African Financial Services Industry. This study makes use of similar application techniques and logical arguments around the use of cognitive maps as it shares similarities with the aforementioned study in terms of approximate sample population size, focus industry as well as how the authors rationalise the themes that emerge from combining individual maps.

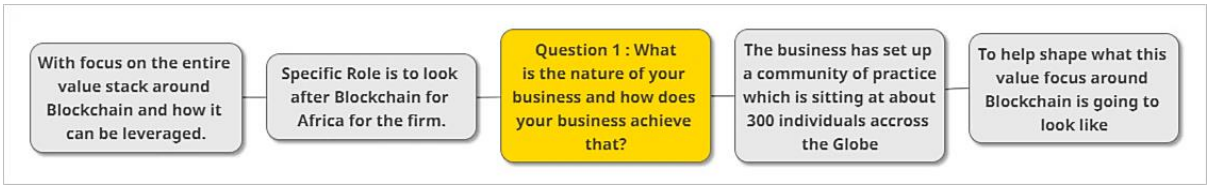
4.2 Results from Subject Matter Experts

Figure 4.2.1: Cognitive Map for Interview 1

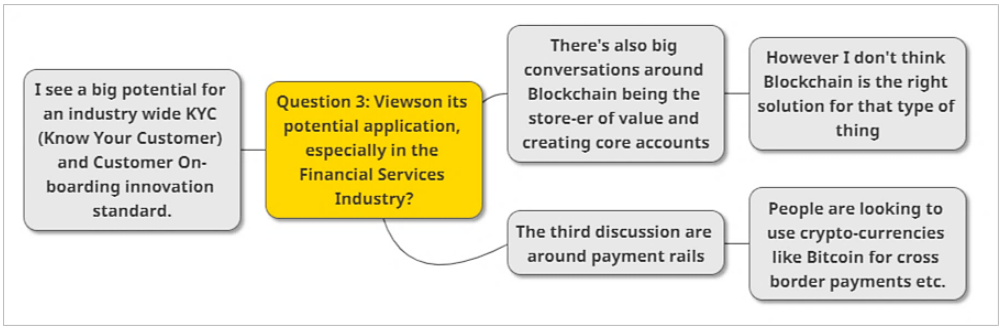
Company Profile : Technology – Financial Services

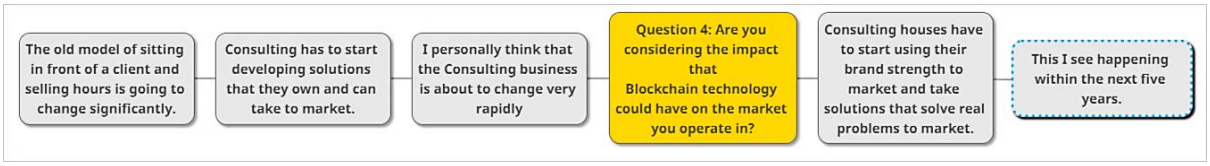
Industry Focus : Fintech and Innovation

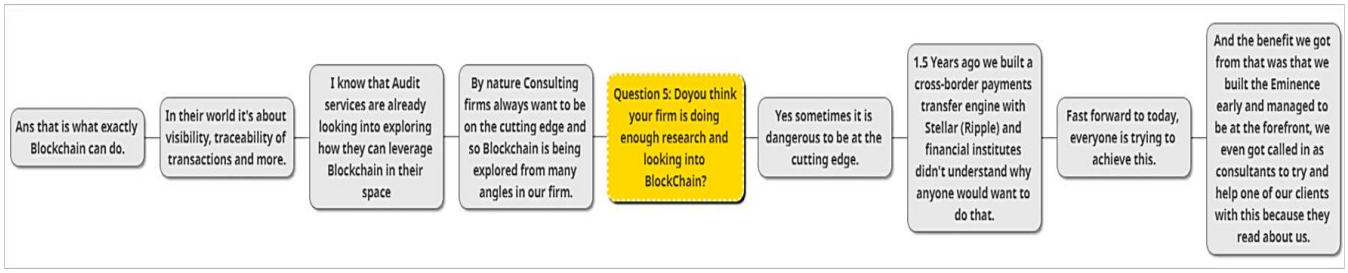
Respondent Role : Director/Partner

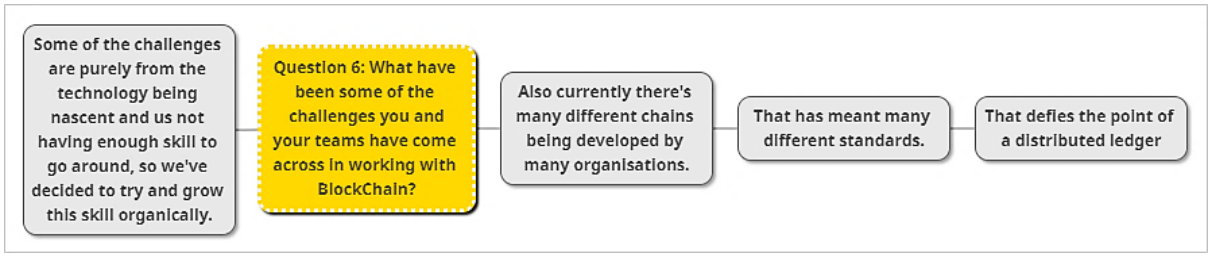


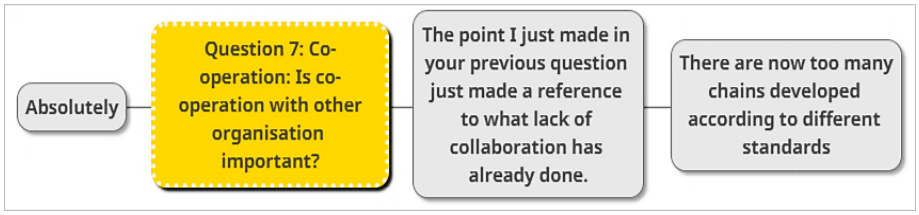







Ans that is what exactly Blockchain can do.
In their world it's about visibility, traceability of transactions and more.
I know that Audit services are already looking into exploring how they can leverage Blockchain in their space
By nature Consulting firms always want to be on the cutting edge and so Blockchain is being explored from many angles in our firm.
Question 5: Doyou think your firm is doing enough research and looking into BlockChain?
Yes sometimes it is dangerous to be at the cutting edge.
1.5 Years ago we built a cross-border payments transfer engine with Stellar (Ripple) and financial institutes didn't understand why anyone would want to do that.
Fast forward to today, everyone is trying to achieve this.
And the benefit we got from that was that we built the Eminence early and managed to be at the forefront, we even got called in as consultants to try and help one of our clients with this because they read about us.


Some of the challenges are purely from the technology being nascent and us not having enough skill to go around, so we've decided to try and grow this skill organically.
Question 6: What have been some of the challenges you and your teams have come across in working with BlockChain?
Also currently there's many different chains being developed by many organisations.
That has meant many different standards.
That defies the point of a distributed ledger


Absolutely
Question 7: Co-operation: Is co-operation with other organisation important?
The point I just made in your previous question just made a reference to what lack of collaboration has already done.
There are now too many chains developed according to different standards


Blockchain might certainly not take off, in some regions of the world, the way it's been envisioned to.
Question 8: Mobile Penetration Rates andFinancial Inclusion: Any prerequisites for BlockChain adoption that you foresee?
Internet connectivity is going to play a big role in the adoption definitely.

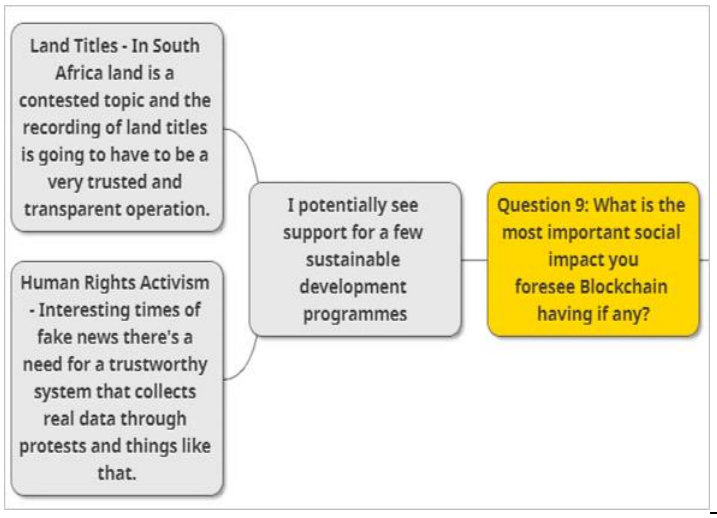
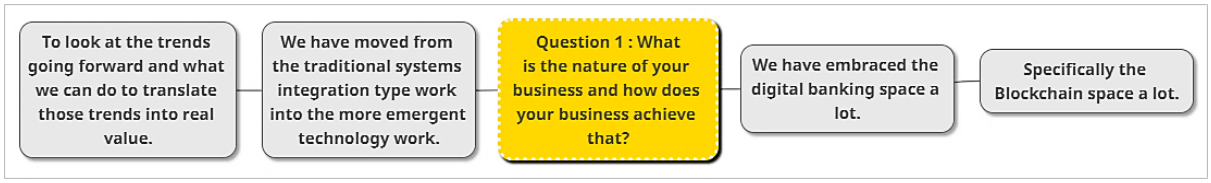

Land Titles - In South Africa land is a contested topic and the recording of land titles is going to have to be a very trusted and transparent operation.
Human Rights Activism - Interesting times of fake news there's a need for a trustworthy system that collects real data through protests and things like that.
I potentially see support for a few sustainable development programmes
Question 9: What is the most important social impact you foresee Blockchain having if any?

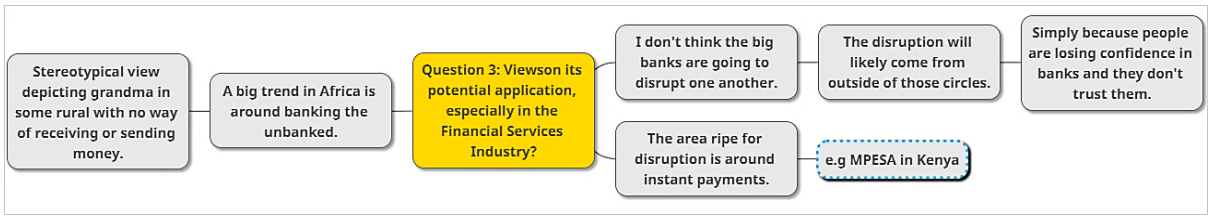
Figure 4.2.2: Cognitive Map for Interview 2

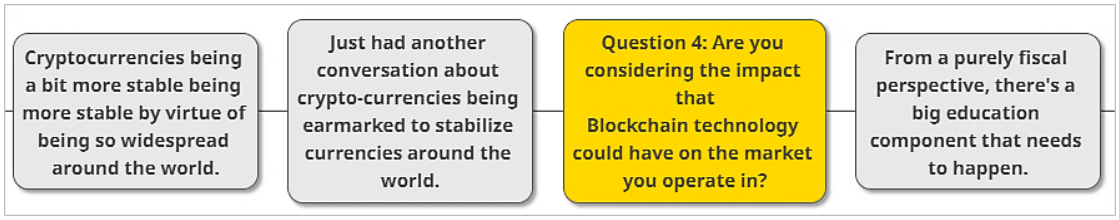
Company Profile : Technology – Financial Services

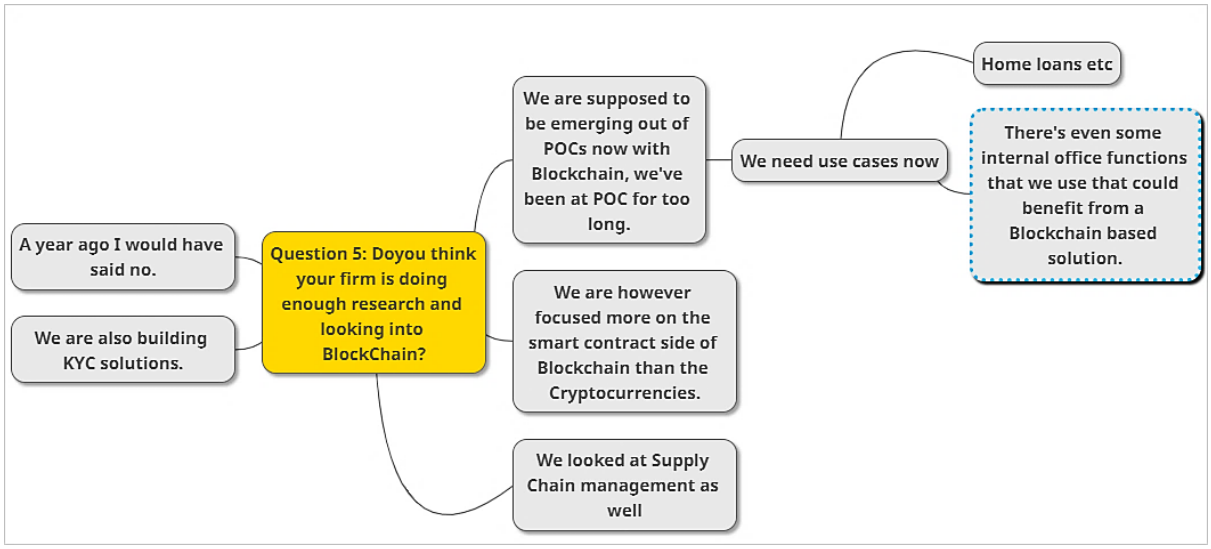
Industry Focus : Fintech and Innovation

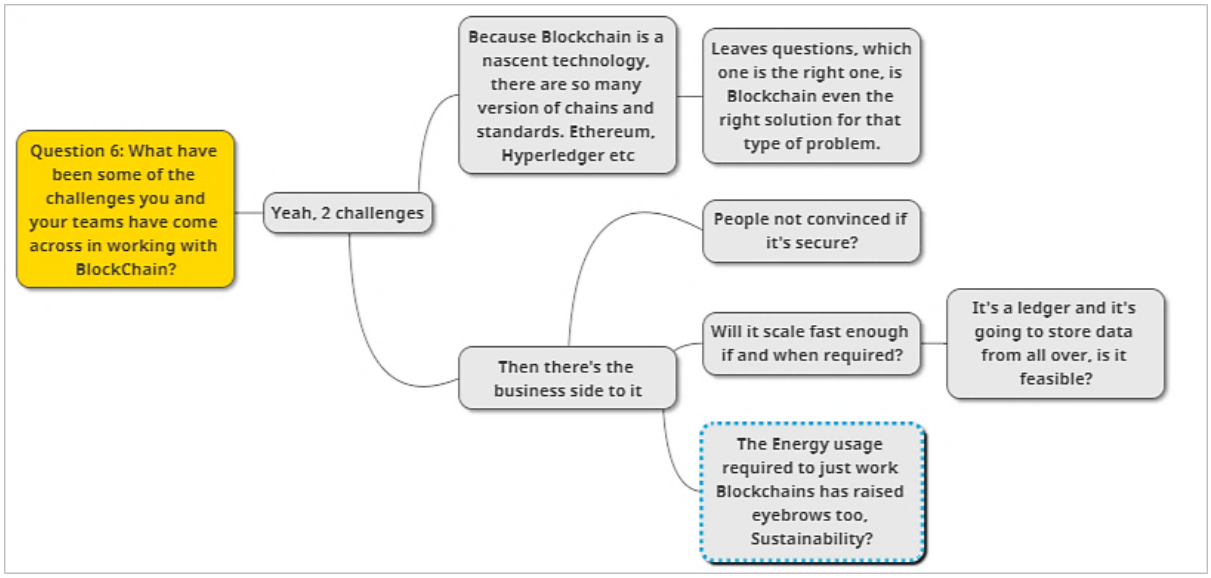
Respondent Role : Lead Architect

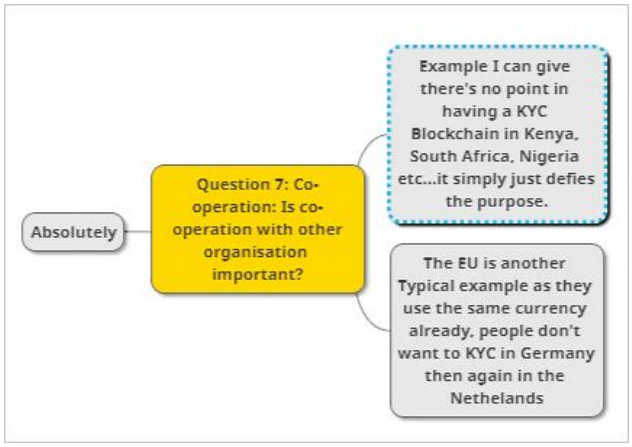


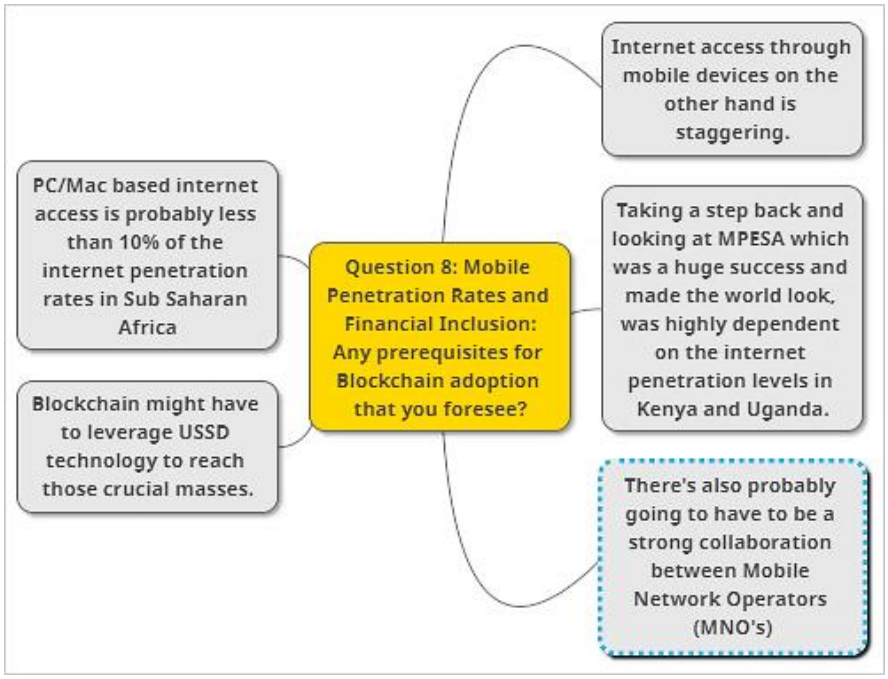







Question 6: What have been some of the challenges you and your teams have come across in working with BlockChain?
Yeah, 2 challenges
Because Blockchain is a nascent technology, there are so many version of chains and standards. Ethereum, Hyperledger etc
Leaves questions, which one is the right one, is Blockchain even the right solution for that type of problem.
Then there's the business side to it
People not convinced if it's secure?
Will it scale fast enough if and when required?
It's a ledger and it's going to store data from all over, is it feasible?
The Energy usage required to just work Blockchains has raised eyebrows too, Sustainability?


Absolutely
Question 7: Co-operation: Is co-operation with other organisation important?
Example I can give there's no point in having a KYC Blockchain in Kenya, South Africa, Nigeria etc...it simply just defies the purpose.
The EU is another Typical example as they use the same currency already, people don't want to KYC in Germany then again in the Nethelands


PC/Mac based internet access is probably less than 10% of the internet penetration rates in Sub Saharan Africa
Blockchain might have to leverage USSD technology to reach those crucial masses.
Question 8: Mobile Penetration Rates and Financial Inclusion: Any prerequisites for Blockchain adoption that you foresee?
Internet access through mobile devices on the other hand is staggering.
Taking a step back and looking at MPESA which was a huge success and made the world look, was highly dependent on the internet penetration levels in Kenya and Uganda.
There's also probably going to have to be a strong collaboration between Mobile Network Operators (MNO's)

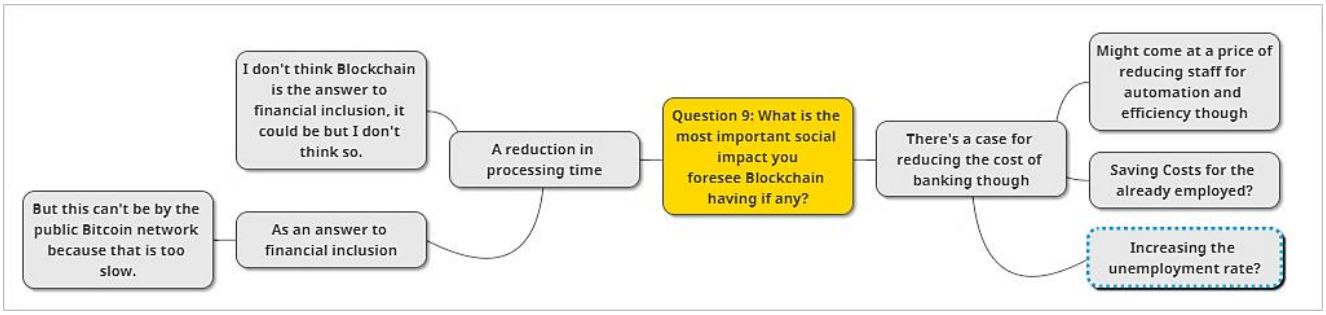
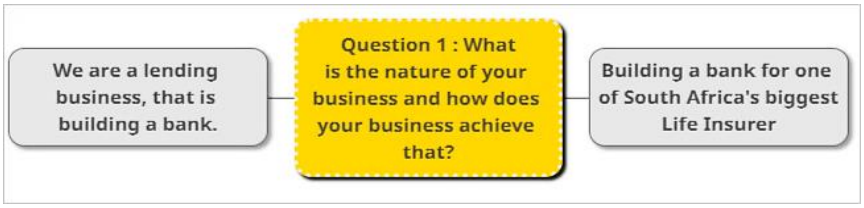


Figure 4.2.3: Cognitive Map for Interview 3

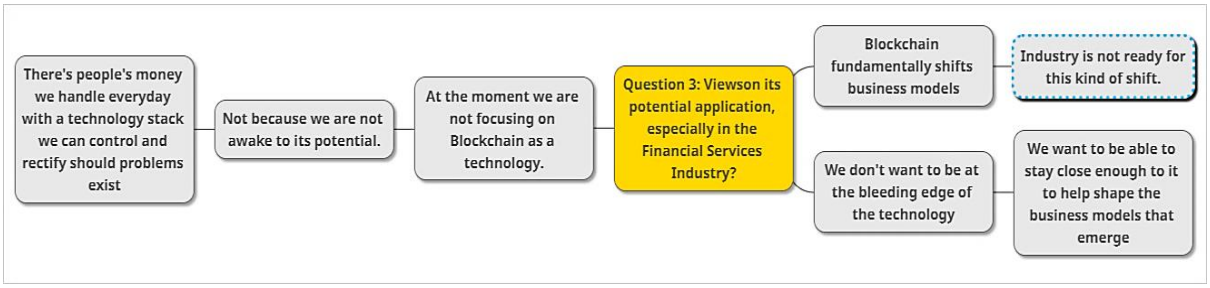
Company Profile : Technology – Insurance

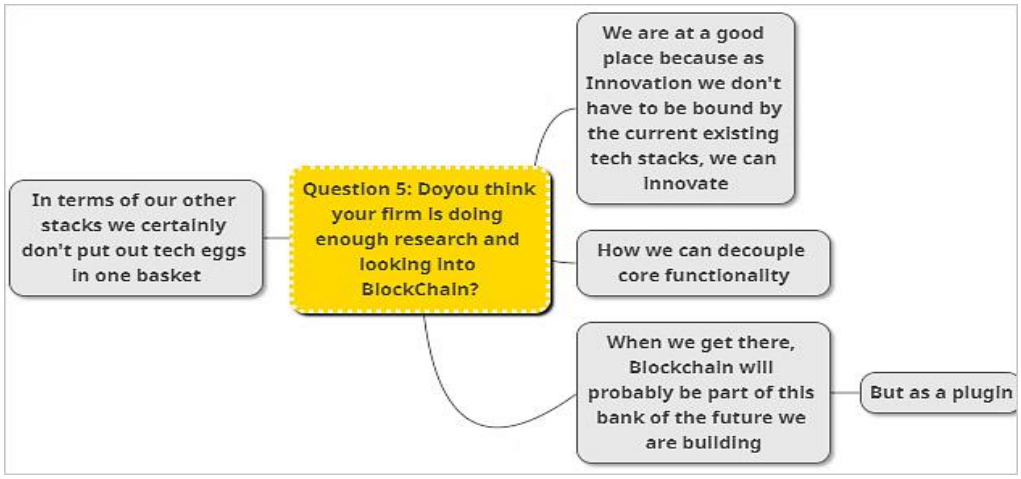
Industry Focus : Life Insurance and Financial Services

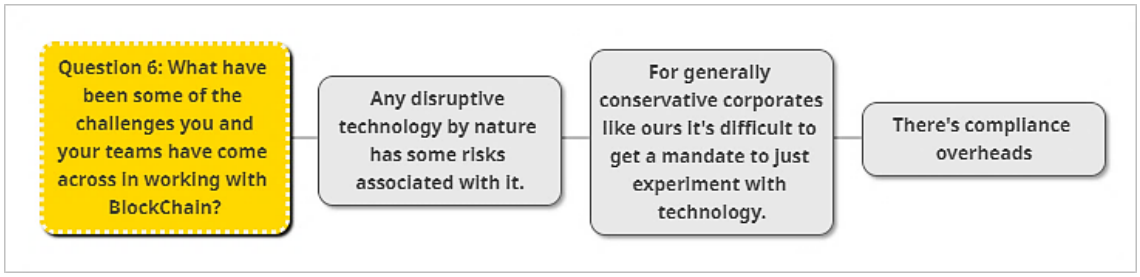
Respondent Role : Head of Innovation

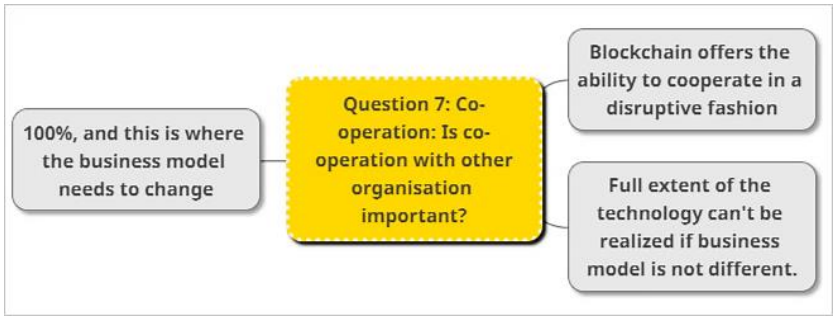


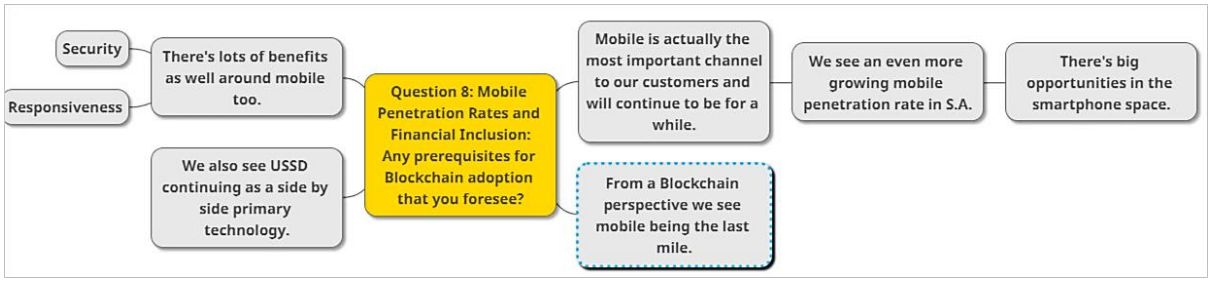





We are at a good place because as Innovation we don't have to be bound by the current existing tech stacks, we can innovate
In terms of our other stacks we certainly don't put out tech eggs in one basket
Question 5: Doyou think your firm is doing enough research and looking into BlockChain?
How we can decouple core functionality
When we get there, Blockchain will probably be part of this bank of the future we are building
But as a plugin


Question 6: What have been some of the challenges you and your teams have come across in working with BlockChain?
Any disruptive technology by nature has some risks associated with it.
For generally conservative corporates like ours it's difficult to get a mandate to just experiment with technology.
There's compliance overheads


Blockchain offers the ability to cooperate in a disruptive fashion
100%, and this is where the business model needs to change
Question 7: Co-operation: Is co-operation with other organisation important?
Full extent of the technology can't be realized if business model is not different.


Security
There's lots of benefits as well around mobile too.
Responsiveness
Question 8: Mobile Penetration Rates and Financial Inclusion: Any prerequisites for Blockchain adoption that you foresee?
Mobile is actually the most important channel to our customers and will continue to be for a while.
We see an even more growing mobile penetration rate in S.A.
There's big opportunities in the smartphone space.
We also see USSD continuing as a side by side primary technology.
From a Blockchain perspective we see mobile being the last mile.

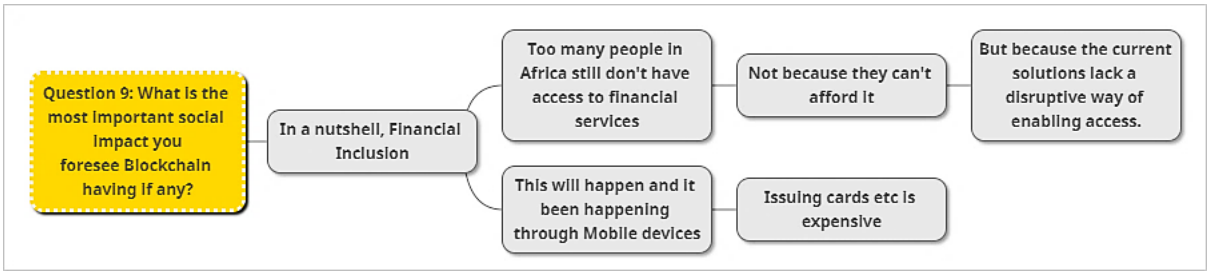


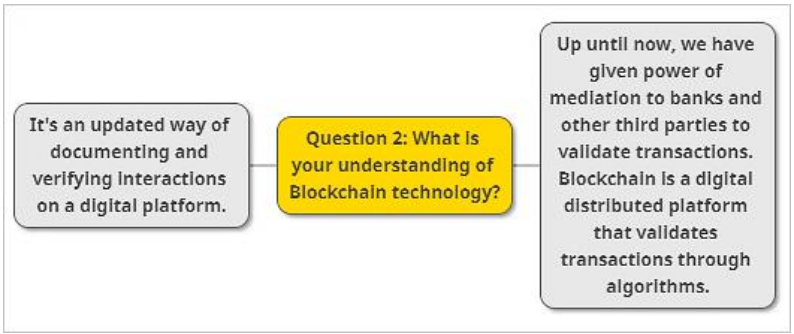
Figure 4.2.4: Cognitive Map for Interview 4

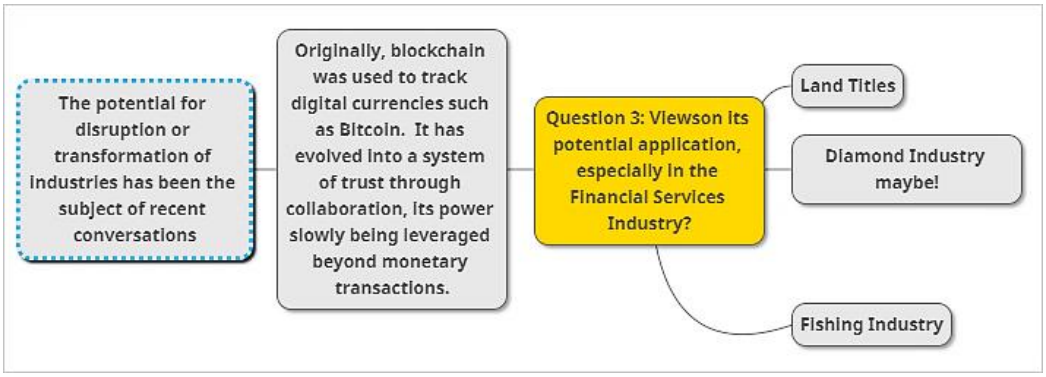
Company Profile : Technology – Consulting

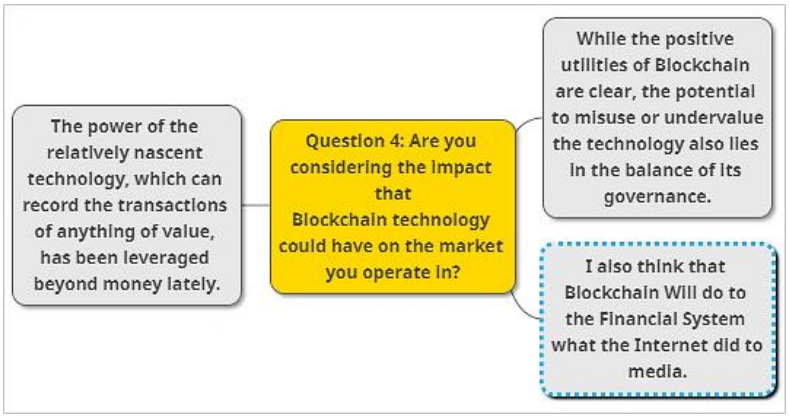
Industry Focus : Technology, Media & Telecommunications

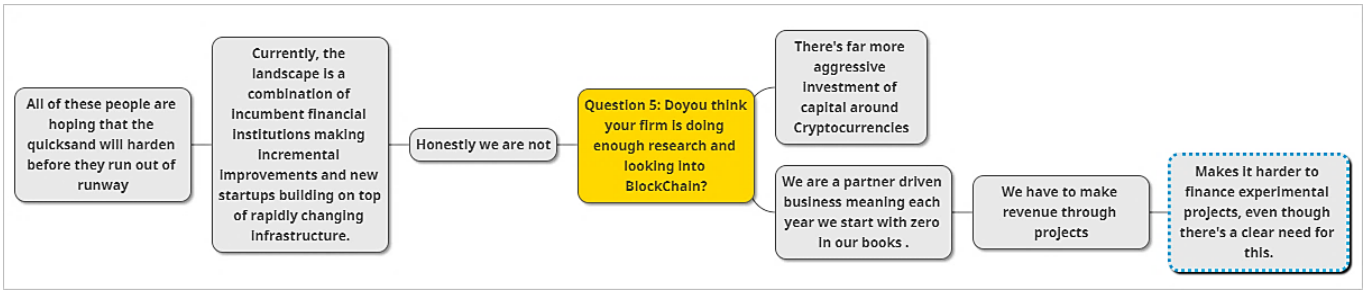
Respondent Role : Chief Information Officer

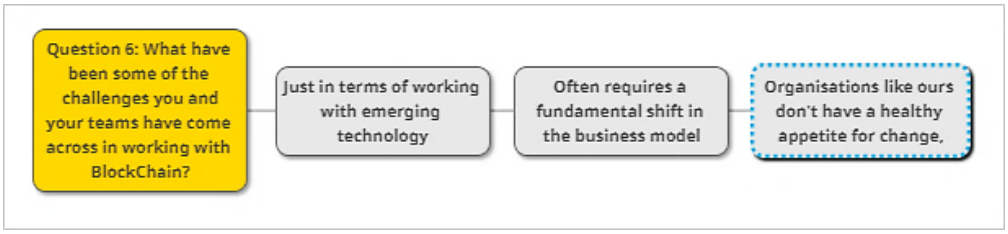


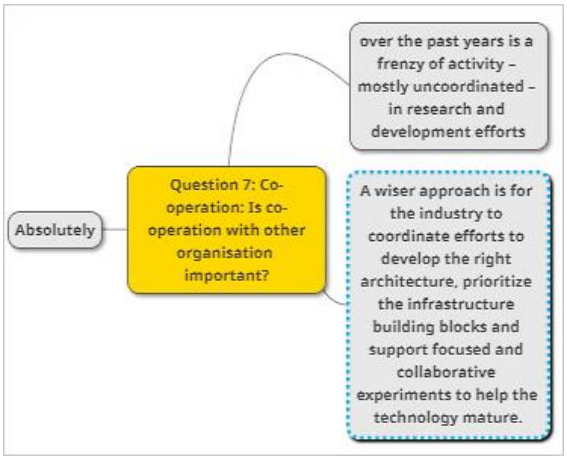





The power of the relatively nascent technology, which can record the transactions of anything of value, has been leveraged beyond money lately.
Question 4: Are you considering the impact that Blockchain technology could have on the market you operate in?
While the positive utilities of Blockchain are clear, the potential to misuse or undervalue the technology also lies in the balance of its governance.
I also think that Blockchain Will do to the Financial System what the Internet did to media.


All of these people are hoping that the quicksand will harden before they run out of runway
Currently, the landscape is a combination of incumbent financial institutions making incremental improvements and new startups building on top of rapidly changing infrastructure.
Honestly we are not
Question 5: Doyou think your firm is doing enough research and looking into BlockChain?
There's far more aggressive investment of capital around Cryptocurrencies
We are a partner driven business meaning each year we start with zero in our books .
We have to make revenue through projects
Makes it harder to finance experimental projects, even though there's a clear need for this.


Question 6: What have been some of the challenges you and your teams have come across in working with BlockChain?
Just in terms of working with emerging technology
Often requires a fundamental shift in the business model
Organisations like ours don't have a healthy appetite for change,


Absolutely
Question 7: Co-operation: Is co-operation with other organisation important?
over the past years is a frenzy of activity – mostly uncoordinated – in research and development efforts
A wiser approach is for the industry to coordinate efforts to develop the right architecture, prioritize the infrastructure building blocks and support focused and collaborative experiments to help the technology mature.

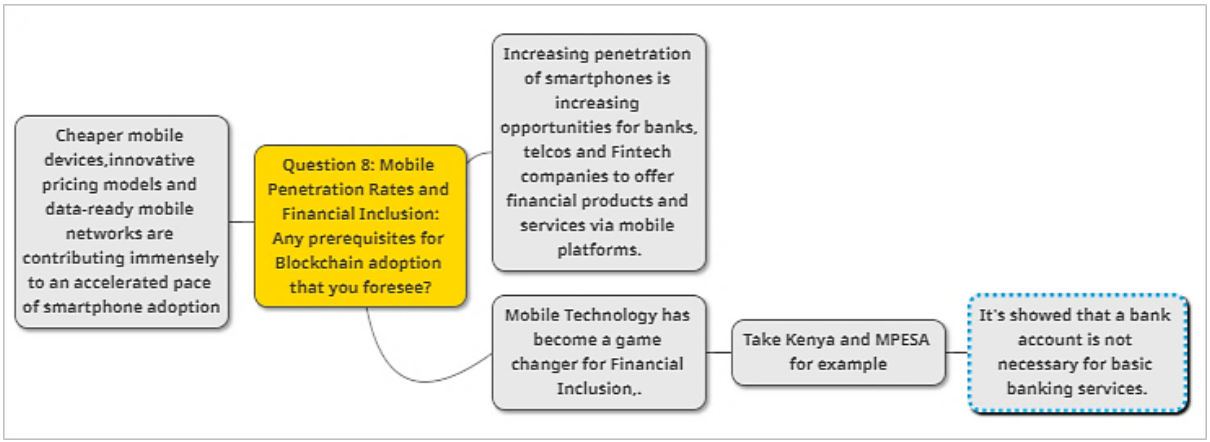


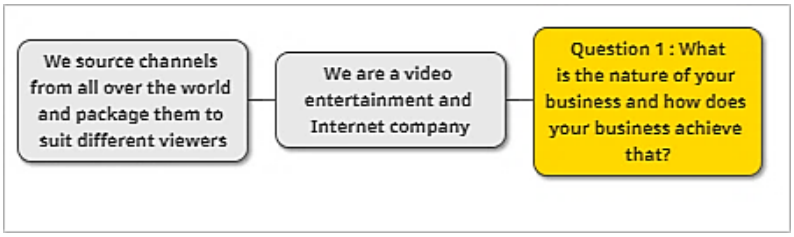


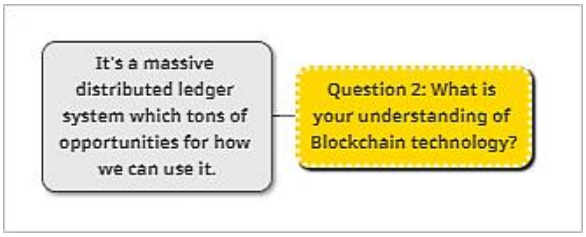
Figure 4.2.5: Cognitive Map for Interview 5

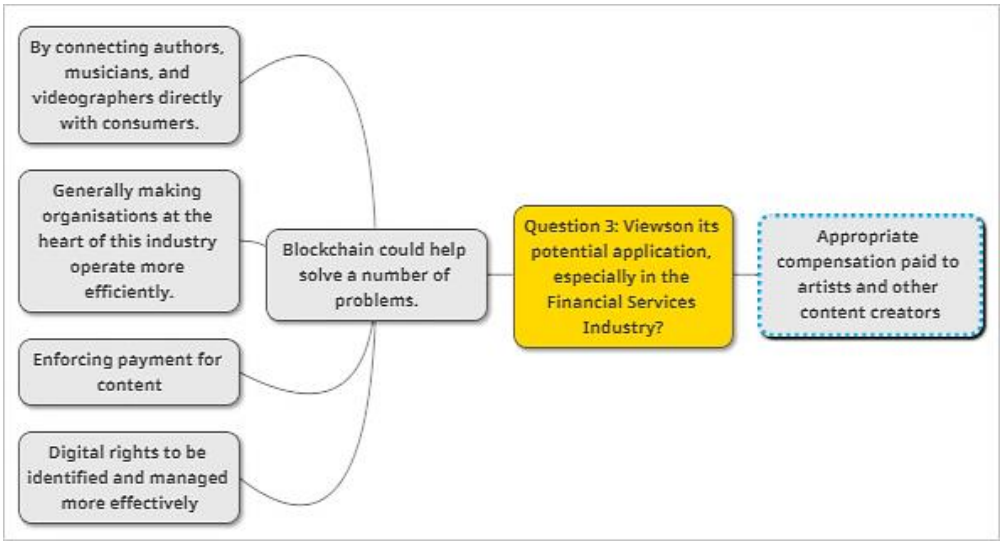
Company Profile : Media – Entertainment

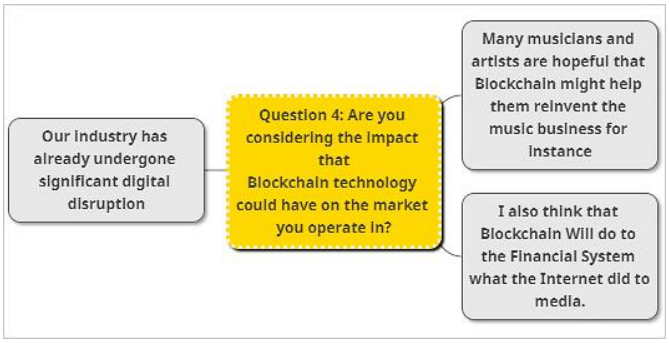
Industry Focus : Technology, Media & Internet, Pay TV

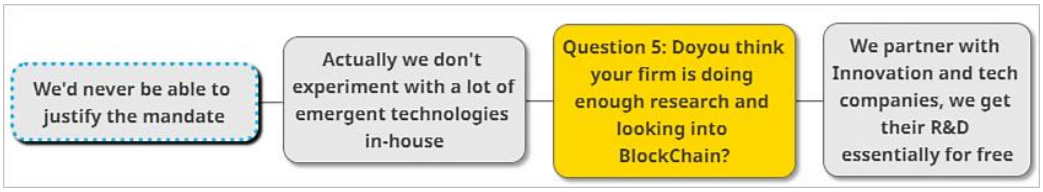
Respondent Role : Head of Software Development



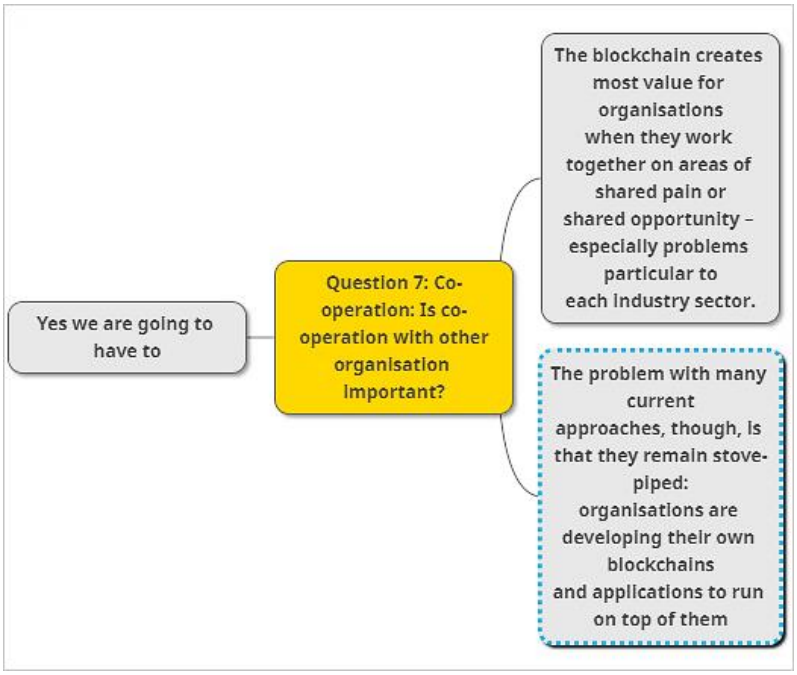


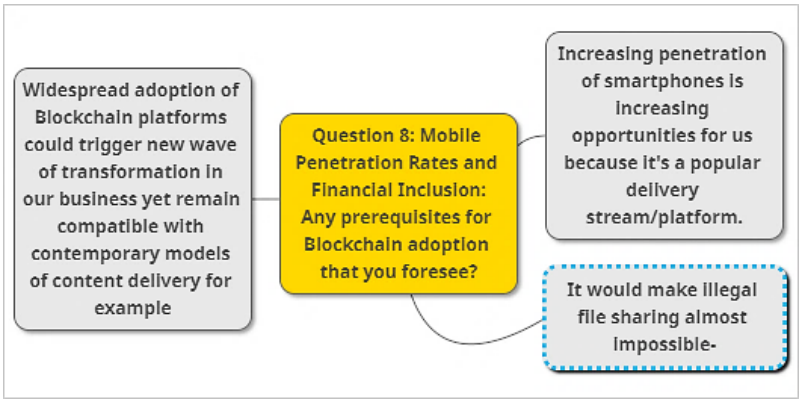

By connecting authors, musicians, and videographers directly with consumers.
Generally making organisations at the heart of this industry operate more efficiently.
Enforcing payment for content
Digital rights to be identified and managed more effectively
Blockchain could help solve a number of problems.
Question 3: Viewson its potential application, especially in the Financial Services Industry?
Appropriate compensation paid to artists and other content creators


Our industry has already undergone significant digital disruption
Question 4: Are you considering the impact that Blockchain technology could have on the market you operate in?
Many musicians and artists are hopeful that Blockchain might help them reinvent the music business for instance
I also think that Blockchain Will do to the Financial System what the Internet did to media.


We'd never be able to justify the mandate
Actually we don't experiment with a lot of emergent technologies in-house
Question 5: Doyou think your firm is doing enough research and looking into BlockChain?
We partner with Innovation and tech companies, we get their R&D essentially for free


The problems come when we have to significantly change our operating models to suit a piece of technology
Question 6: What have been some of the challenges you and your teams have come across in working with BlockChain?
The industry in general battles to keep up with the latest technology use cases.





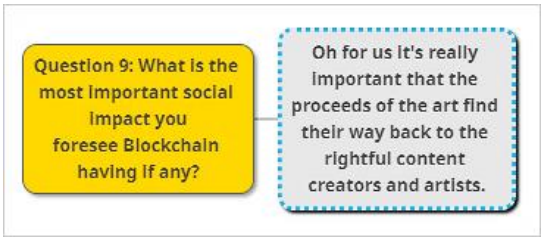
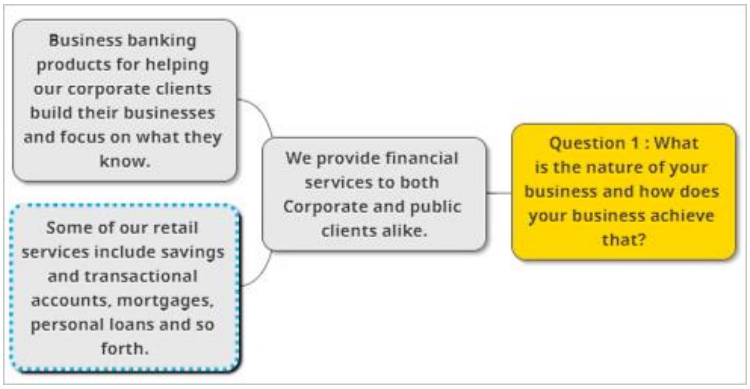


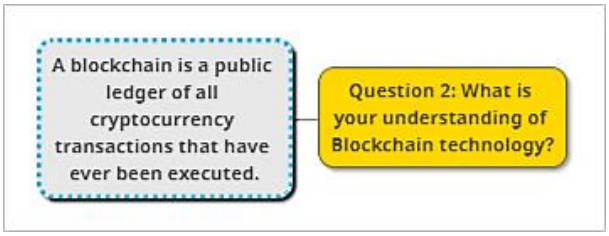
Figure 4.2.6: Cognitive Map for Interview 6

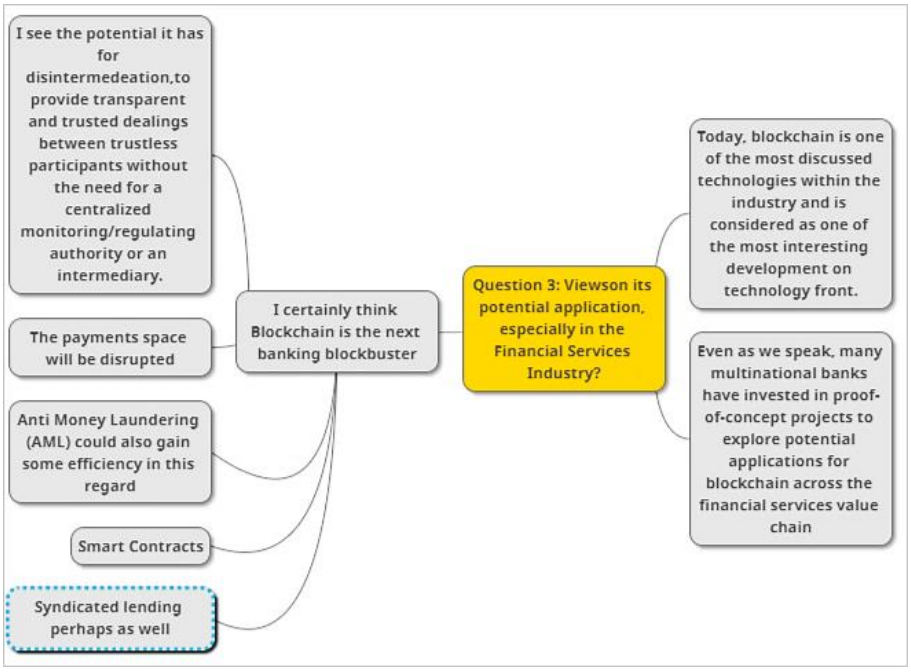
Company Profile : Corporate & Retail Banking

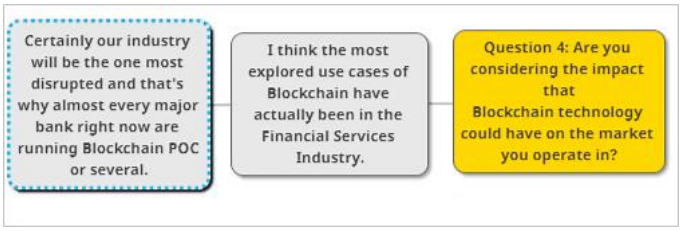
Industry Focus : Financial Services, Information Systems

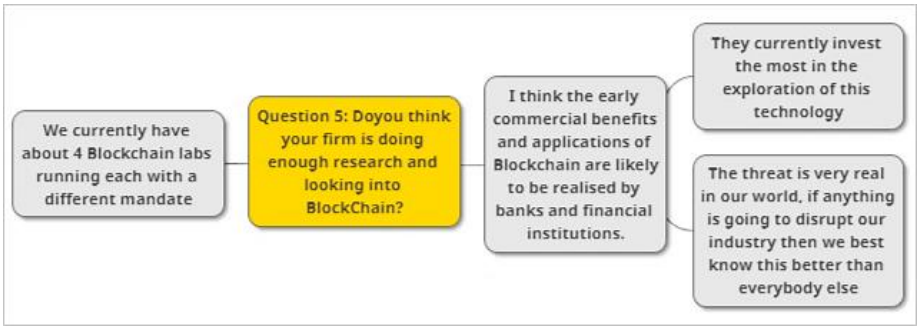
Respondent Role : Chief Technology Officer

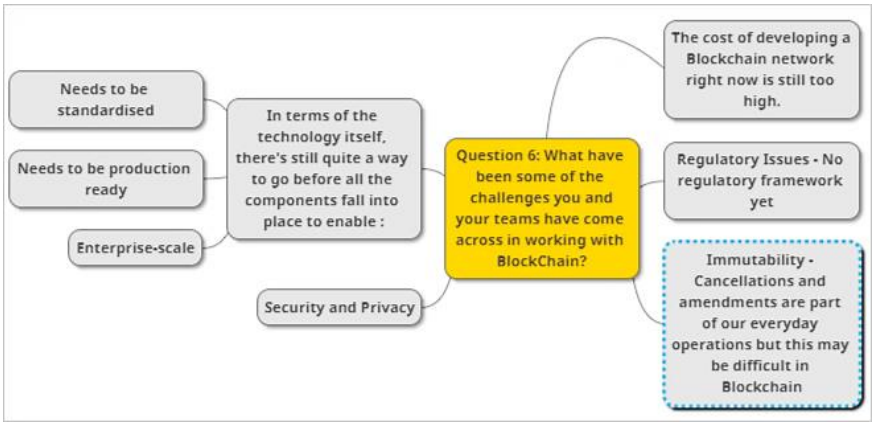

Business banking products for helping our corporate clients build their businesses and focus on what they know.
Some of our retail services include savings and transactional accounts, mortgages, personal loans and so forth.
We provide financial services to both Corporate and public clients alike.
Question 1 : What is the nature of your business and how does your business achieve that?

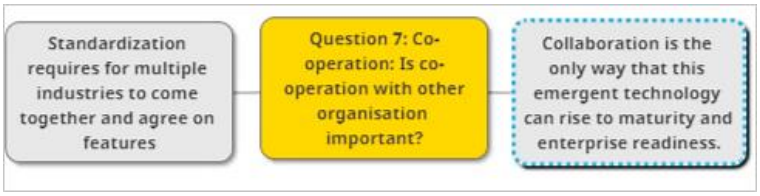

A blockchain is a public ledger of all cryptocurrency transactions that have ever been executed.
Question 2: What is your understanding of Blockchain technology?

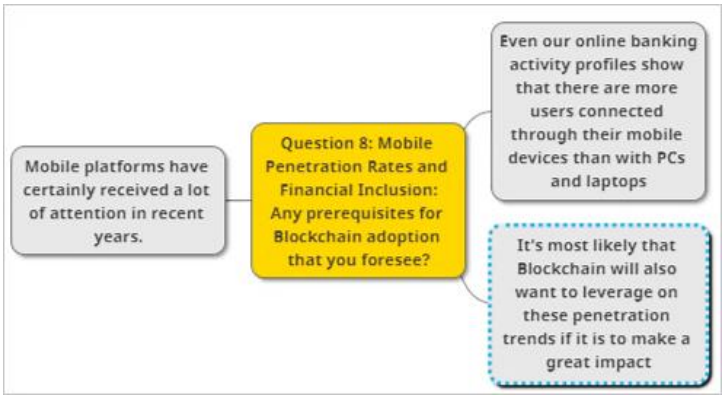

I see the potential it has for disintermedeation,to provide transparent and trusted dealings between trustless participants without the need for a centralized monitoring/regulating authority or an intermediary.
The payments space will be disrupted
Anti Money Laundering (AML) could also gain some efficiency in this regard
Smart Contracts
Syndicated lending perhaps as well
I certainly think Blockchain is the next banking blockbuster
Question 3: Viewson its potential application, especially in the Financial Services Industry?
Today, blockchain is one of the most discussed technologies within the industry and is considered as one of the most interesting development on technology front.
Even as we speak, many multinational banks have invested in proof-of-concept projects to explore potential applications for blockchain across the financial services value chain


Certainly our industry will be the one most disrupted and that's why almost every major bank right now are running Blockchain POC or several.
I think the most explored use cases of Blockchain have actually been in the Financial Services Industry.
Question 4: Are you considering the impact that Blockchain technology could have on the market you operate in?


We currently have about 4 Blockchain labs running each with a different mandate
Question 5: Doyou think your firm is doing enough research and looking into BlockChain?
I think the early commercial benefits and applications of Blockchain are likely to be realised by banks and financial institutions.
They currently invest the most in the exploration of this technology
The threat is very real in our world, if anything is going to disrupt our industry then we best know this better than everybody else


Needs to be standardised
Needs to be production ready
Enterprise-scale
In terms of the technology itself, there's still quite a way to go before all the components fall into place to enable :
Security and Privacy
Question 6: What have been some of the challenges you and your teams have come across in working with BlockChain?
The cost of developing a Blockchain network right now is still too high.
Regulatory Issues - No regulatory framework yet
Immutability - Cancellations and amendments are part of our everyday operations but this may be difficult in Blockchain


Standardization requires for multiple industries to come together and agree on features
Question 7: Co-operation: Is co-operation with other organisation important?
Collaboration is the only way that this emergent technology can rise to maturity and enterprise readiness.


Mobile platforms have certainly received a lot of attention in recent years.
Question 8: Mobile Penetration Rates and Financial Inclusion: Any prerequisites for Blockchain adoption that you foresee?
Even our online banking activity profiles show that there are more users connected through their mobile devices than with PCs and laptops
It's most likely that Blockchain will also want to leverage on these penetration trends if it is to make a great impact

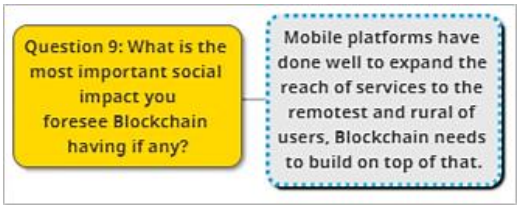
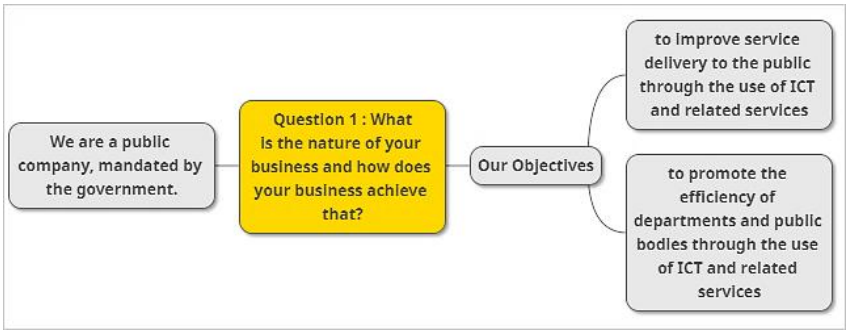


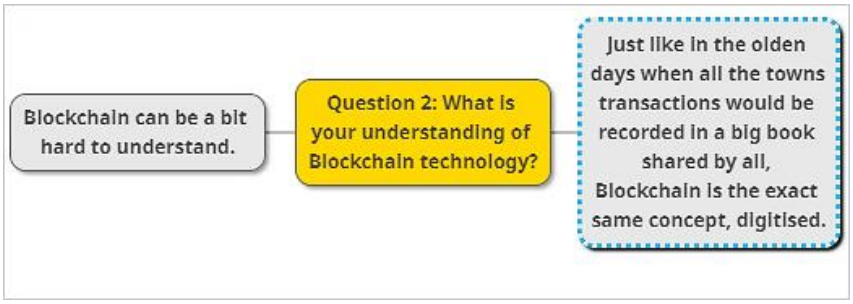
Figure 4.2.7: Cognitive Map for Interview 7

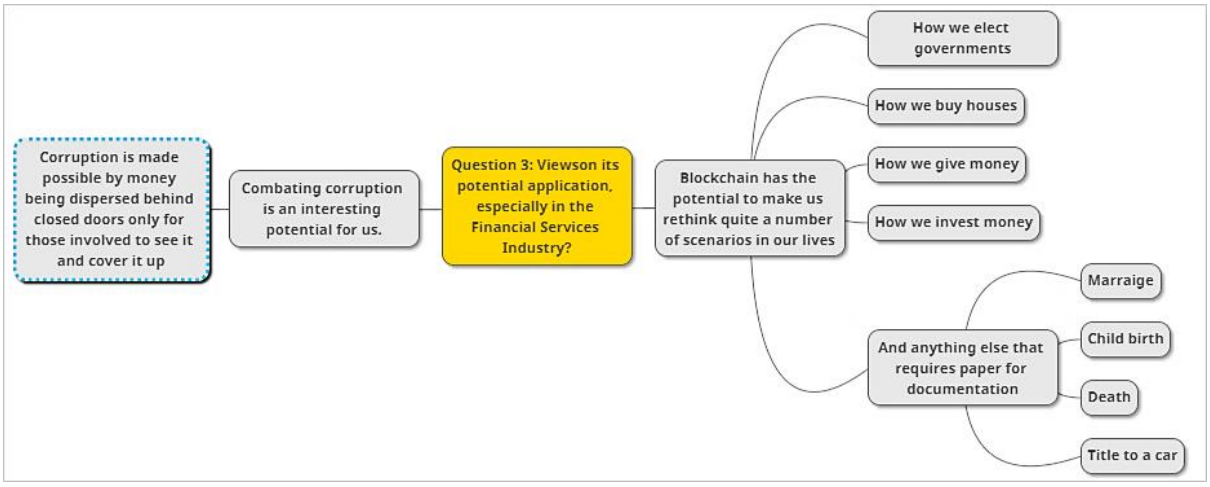
Company Profile : IT Backbone of the country's state

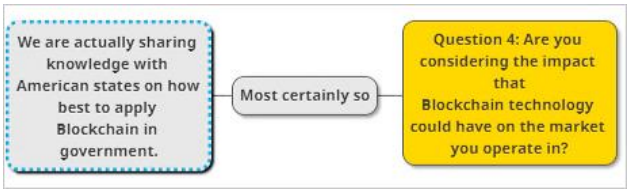
Industry Focus : Information Systems, Public Sector

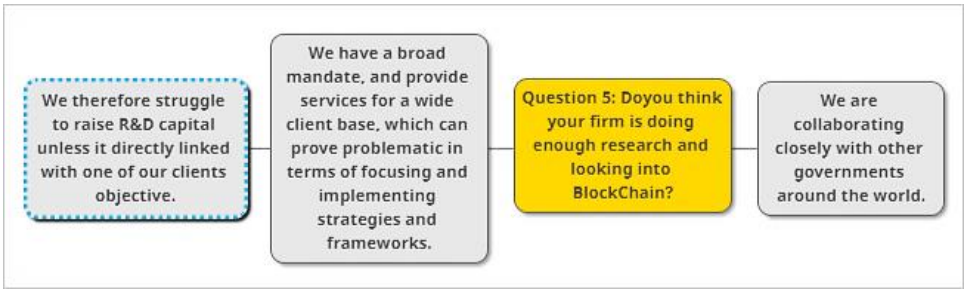
Respondent Role : Head of Projects

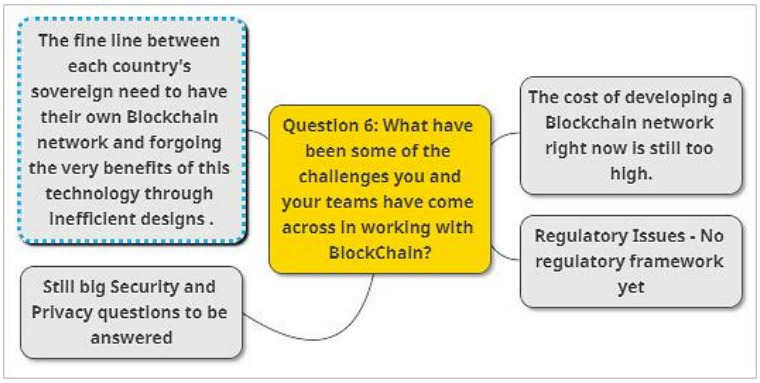


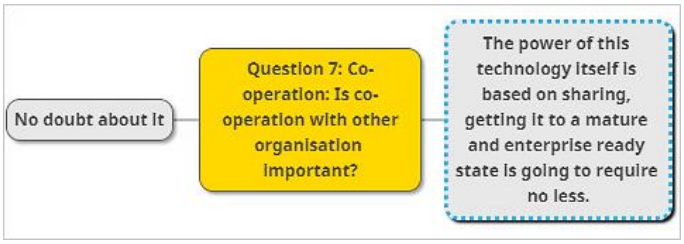


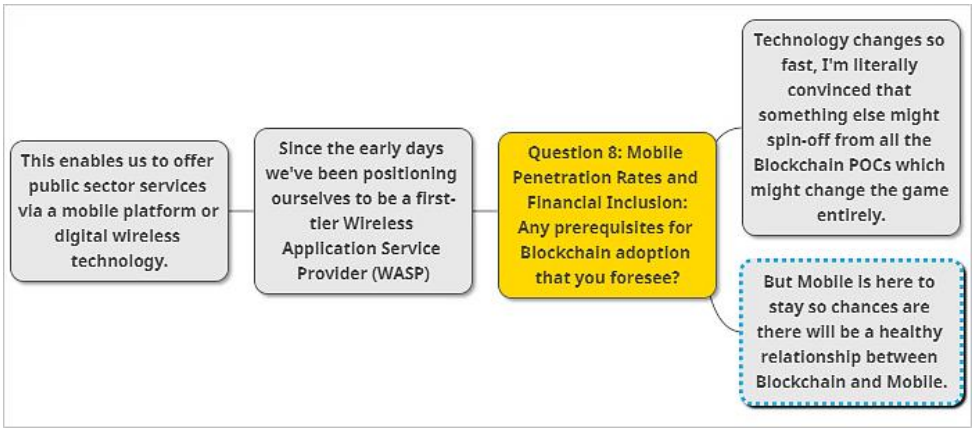



We are actually sharing knowledge with American states on how best to apply Blockchain in government.
Most certainly so
Question 4: Are you considering the impact that Blockchain technology could have on the market you operate in?


We therefore struggle to raise R&D capital unless it directly linked with one of our clients objective.
We have a broad mandate, and provide services for a wide client base, which can prove problematic in terms of focusing and implementing strategies and frameworks.
Question 5: Doyou think your firm is doing enough research and looking into BlockChain?
We are collaborating closely with other governments around the world.


The fine line between each country's sovereign need to have their own Blockchain network and forgoing the very benefits of this technology through inefficient designs .
Question 6: What have been some of the challenges you and your teams have come across in working with BlockChain?
The cost of developing a Blockchain network right now is still too high.
Regulatory Issues - No regulatory framework yet
Still big Security and Privacy questions to be answered


No doubt about it
Question 7: Co-operation: Is co-operation with other organisation important?
The power of this technology itself is based on sharing, getting it to a mature and enterprise ready state is going to require no less.


This enables us to offer public sector services via a mobile platform or digital wireless technology.
Since the early days we've been positioning ourselves to be a first-tier Wireless Application Service Provider (WASP)
Question 8: Mobile Penetration Rates and Financial Inclusion: Any prerequisites for Blockchain adoption that you foresee?
Technology changes so fast, I'm literally convinced that something else might spin-off from all the Blockchain POCs which might change the game entirely.
But Mobile is here to stay so chances are there will be a healthy relationship between Blockchain and Mobile.

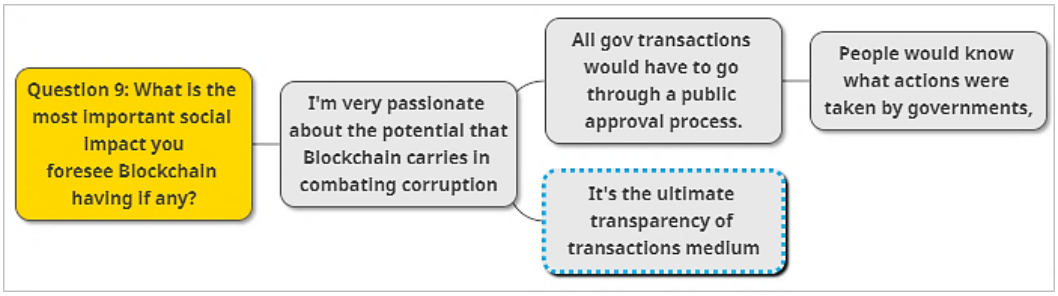


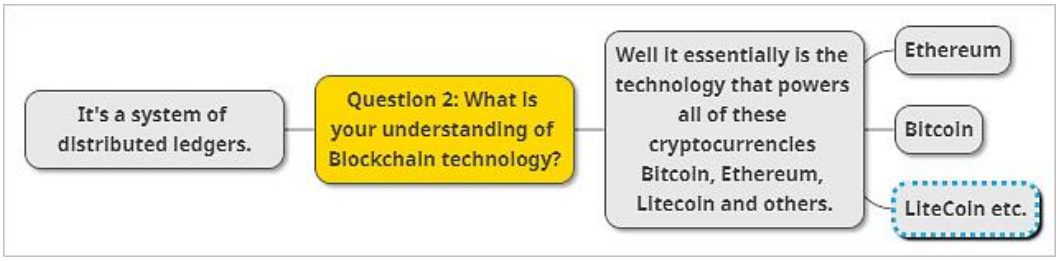
Figure 4.2.8: Cognitive Map for Interview 8

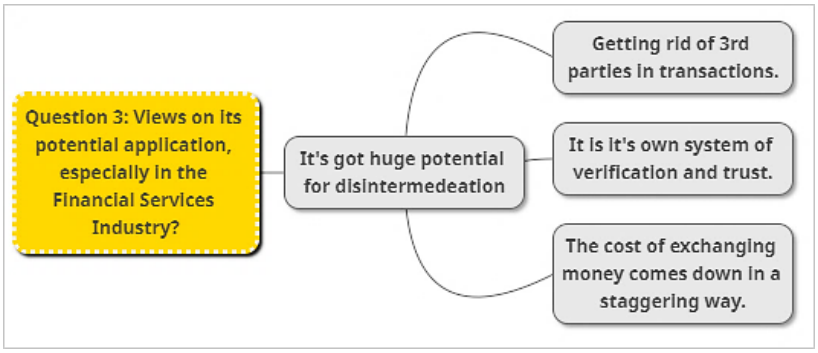
Company Profile : IT Backbone of the country's state

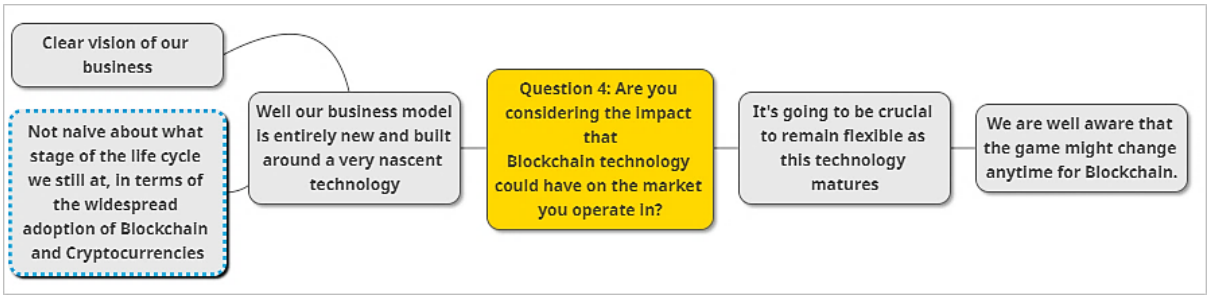
Industry Focus : Information Systems, Public Sector

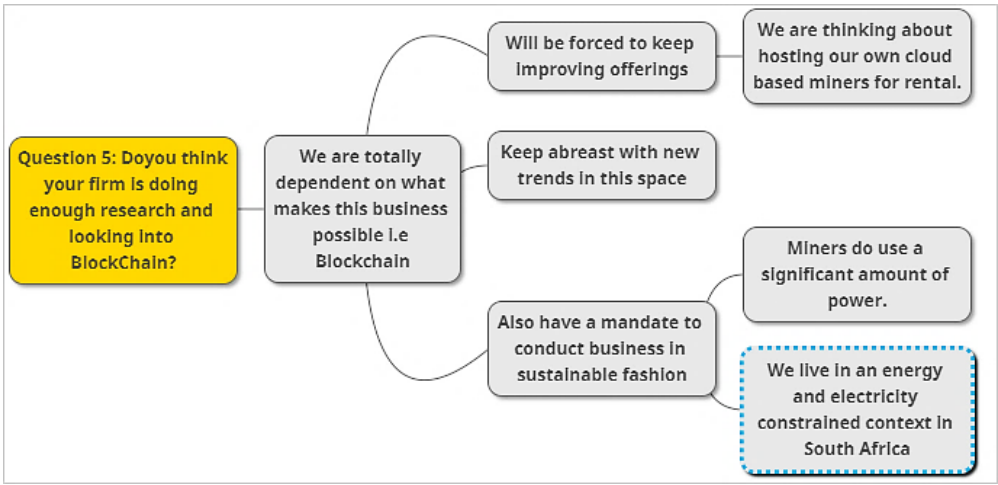
Respondent Role : Head of Projects



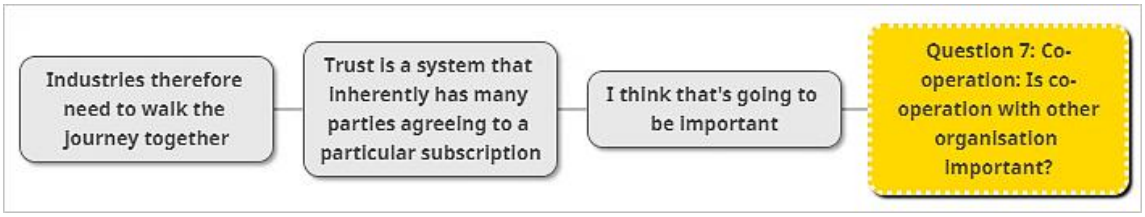




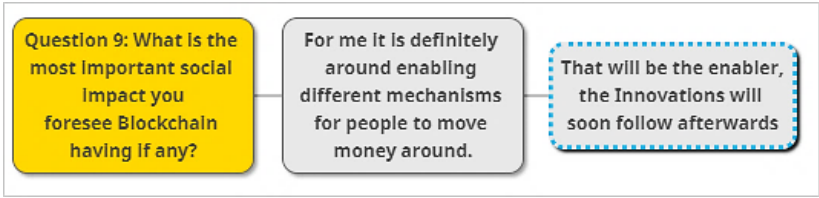

Clear vision of our business
Not naive about what stage of the life cycle we still at, in terms of the widespread adoption of Blockchain and Cryptocurrencies
Well our business model is entirely new and built around a very nascent technology
Question 4: Are you considering the impact that Blockchain technology could have on the market you operate in?
It's going to be crucial to remain flexible as this technology matures
We are well aware that the game might change anytime for Blockchain.


Question 5: Doyou think your firm is doing enough research and looking into BlockChain?
We are totally dependent on what makes this business possible i.e Blockchain
Will be forced to keep improving offerings
We are thinking about hosting our own cloud based miners for rental.
Keep abreast with new trends in this space
Also have a mandate to conduct business in sustainable fashion
Miners do use a significant amount of power.
We live in an energy and electricity constrained context in South Africa


We are mostly working on the hardware side of things
Excessive energy consumption y miners
Question 6: What have been some of the challenges you and your teams have come across in working with BlockChain?
The problem of pooling miners and the threat to decentralized nature of Blockchain


Industries therefore need to walk the journey together
Trust is a system that inherently has many parties agreeing to a particular subscription
I think that's going to be important
Question 7: Co-operation: Is co-operation with other organisation important?


The accelerated smart phone penetration rates in Sub Saharan Africa have opened up a string of oppertunities
Question 8: Mobile Penetration Rates and Financial Inclusion: Any prerequisites for Blockchain adoption that you foresee?
There may well be other unique platforms that are born during the life cycle of Blockchain and cryptocurrencies



4.3 Summary of the Results

This chapter's aim was to present the results in the form of cognitive maps without discussing them. These results were presented in the manner that demonstrated the subject matter expertise of the respondents who are by far all involved in the technology and financial services spheres. The next chapter provides a discussion of the results against the research propositions.

CHAPTER 5. Discussion of the Results

5.1 Introduction

The aim of this research was to describe the anatomy of Blockchain technology as one of the emergent technologies and to determine the current adoption rate of its, by far, most commercialised applications or implementations, i.e. Cryptocurrencies and Smart Contracts. The study also seeks to establish the potential social impact associated with the technology particularly in improving financial inclusion in the South African population. The research propositions developed from the literature review had the following focus areas: **Blockchain anatomy**; **Impact on Markets and Industries**; **level of research and development**; **applicable use cases**; **challenges working with Blockchain**; **cross-sector cooperation opportunities**; **mobile penetration driven financial inclusion** and **the probable social impacts**.

These focus areas logically informed the interview process and questions, whose responses were then used to construct cognitive maps per respondent. As qualified by (Van der Linde, 2013), a recommended technique for uncovering themes around a specific topic, is to combine individual responses/cognitive maps into composite cognitive maps. This similar technique is employed by (Ngubane, 2015) to further analyse emerging topics against identified themes from his study. A futher technique was applied in this study by depicting the differences and similarities between the emerging themes. The findings per focus area are then discussed.

5.2 Composite Cognitive Maps

This section focuses on the responses from the subject matter experts.

5.2.1 *Discussions on how well Blockchain is understood as a technology*

After the respondents were asked the question: What is your understanding of Blockchain technology? The below depicted themes were identified.

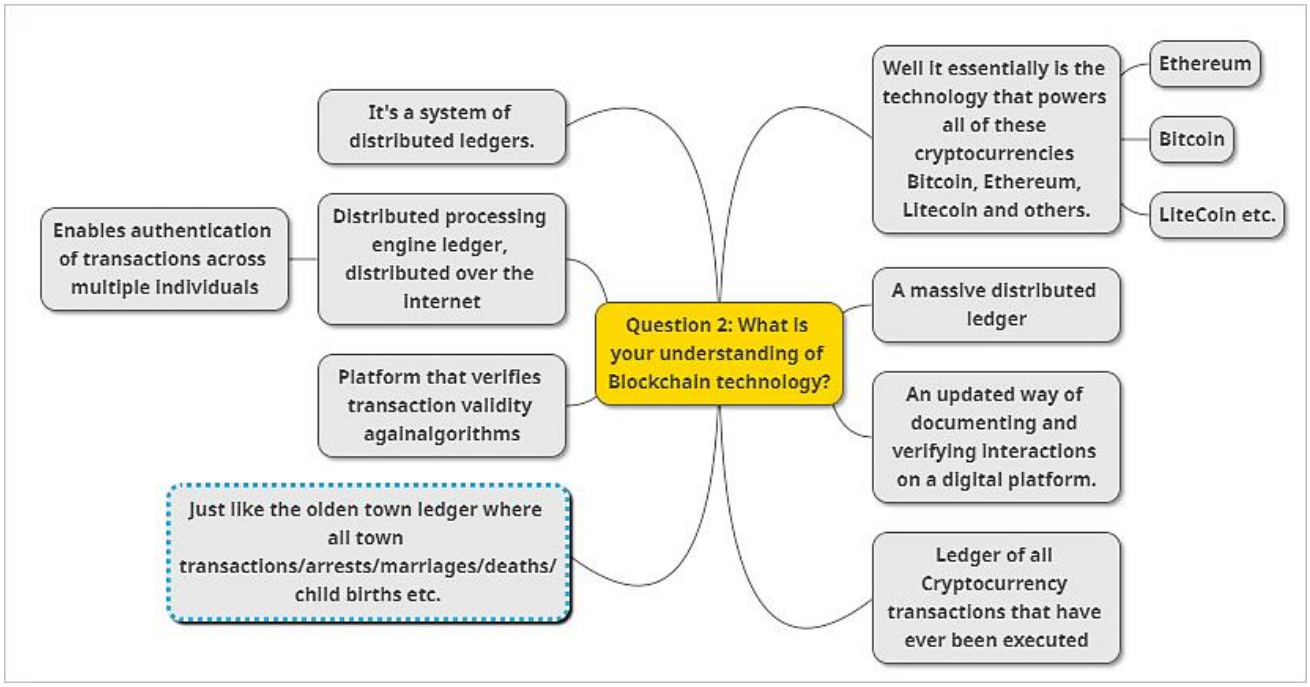


Figure 18 Composite Cognitive Map on the definition and understanding of Blockchain

The themes above were then compared to the literature review to produce the following depiction:

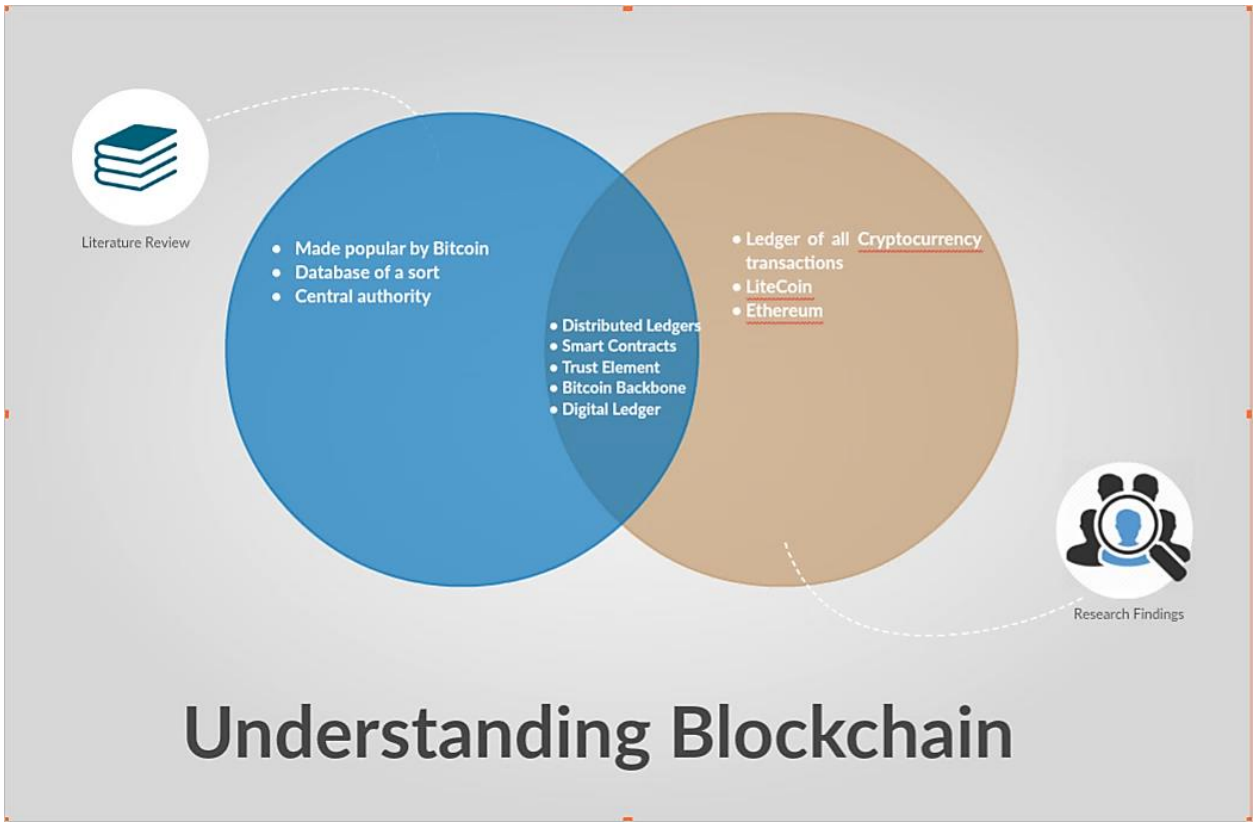


Figure 19 Blockchain definition Venn Diagram

The mapping above highlights establishes some new findings - Because cryptocurrencies are probably the most widely understood and successful Blockchain applications their definition is sometimes used synonymously with that of Blockchain by others. Blockchain was also defined as the ledger for all the Cryptocurrencies like Bitcoin, Ripple, Ethereum and LiteCoin. The respondents acknowledged that Blockchain is not the easiest of technologies to grasp and understand and they cited more use cases and applications as key for advancing this understanding. With the more successful implementation of KYC and other customer on-boarding platforms for instance, the immutable properties of Blockchain will start being better understood. Respondents added that the vast potential of Blockchain's other least understood properties is still locked in proof of concept (POC) projects across financial institutes, technology and Fintech companies around the country and around the world.

5.2.2 *Discussions on the envisioned industry impact and Blockchain use cases*

The figure below depicts themes that we identified from the responses received on the question: Do you have any views on Blockchain's potential applications especially in the financial services industry.

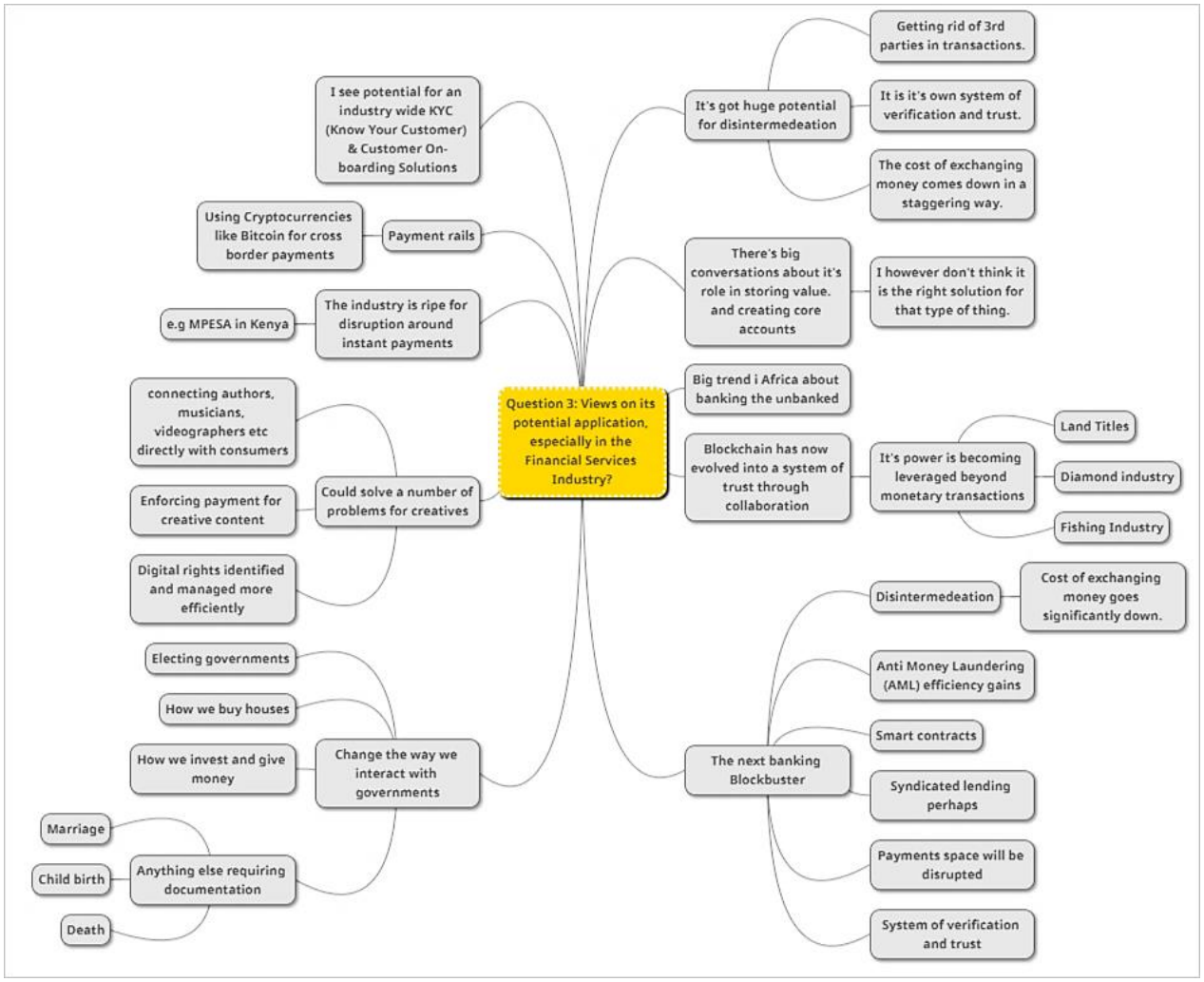


Figure 20 Composite Cognitive Map on Blockchain applications and use cases

The researcher then analysed the themes according to the literature review in order to identify overlaps and emergent. The figure below is a representation of this comparison.

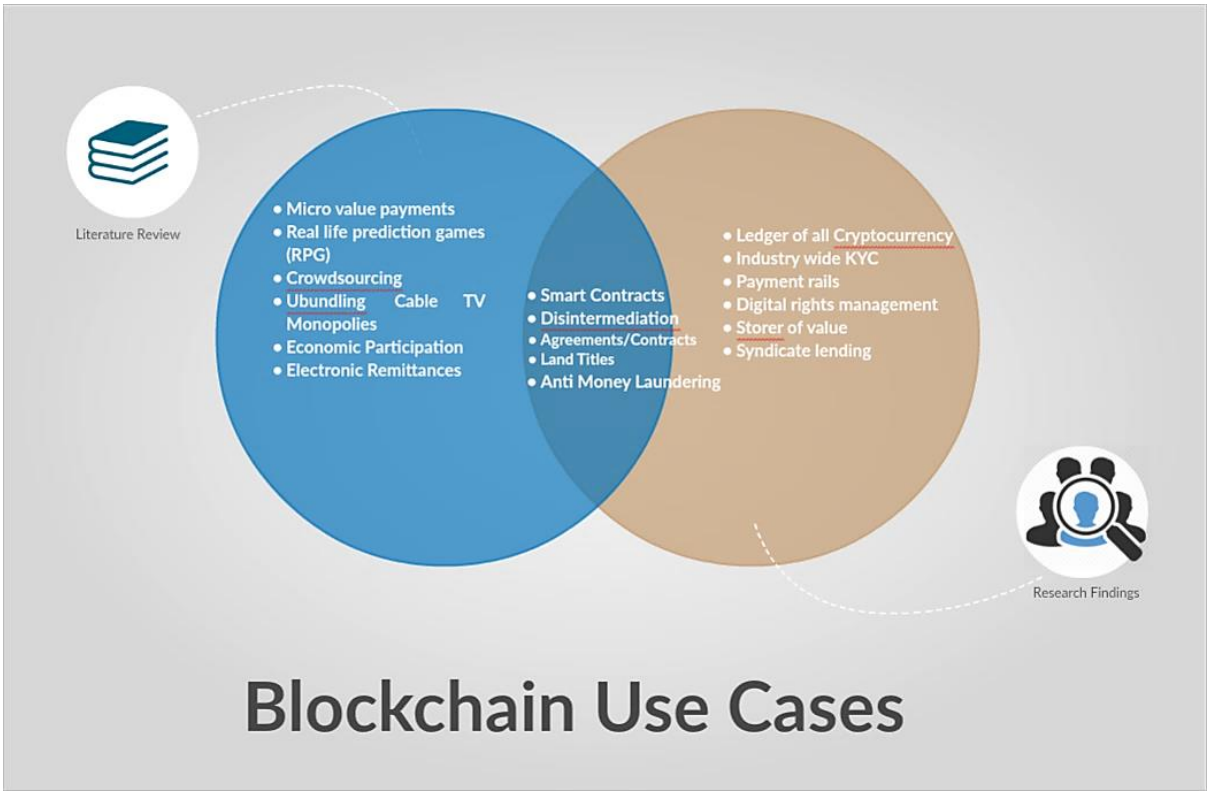


Figure 21 Blockchain Use Cases Venn Diagram

The reported early applications of the technology are in line with literature in terms of the financial services industry being the most impacted of all the industries, at least initially, and therefore facing the most risk of disruption. A consistent and well understood use case for Blockchain technology lies in its immutable property which makes it a visible and trusted source of truth. As suggested by literature and the respondents, this property alone puts the technology in the middle of:

- rights management
- systems that depend on documents or contracts to be produced
- storing value etc.

The majority of use cases envisioned by the respondents are inherently attached to some social value to an extent. The payment rails function is targeted at simplifying cross boarder payments, and the target focus is on nationalities in the diaspora who sought work employment in other countries or even other continents. This type of individual needed to send funds back home to their families. The digital rights management potential is targeted at creatives and other content producer who have to rely on mediators and third parties to reach their consumers. A syndicate lending platform is targeted at individuals who might be considered illegible for traditional financial assistance through traditional means. The anti-money laundering and anti-corruption potential was identified by both literature and the research findings. Some respondents stretched this potential and saw it potentially completely changing how we interact with governments in terms of electing them, how the government

could address the land issues in the country as well as administering things like child birth, death and marriage. Blockchain also seems to be placed, by some respondents, in the middle of the growing Africa trend of banking the unbanked. Both literature and research findings acknowledged mobile technologies for laying good foundation in this space however about 40% of the respondents believed that this industry is still ripe for disruption and that Blockchain could build on top of the achievements of mobile to advance the narrative.

5.2.3 *Discussions on the level of Research and Development in corporations using Blockchain*

The figure below depicts themes that we identified from the responses received on the question: Do you think that your firm or your partners are doing enough in terms of researching into Blockchain to avoid being disrupted.

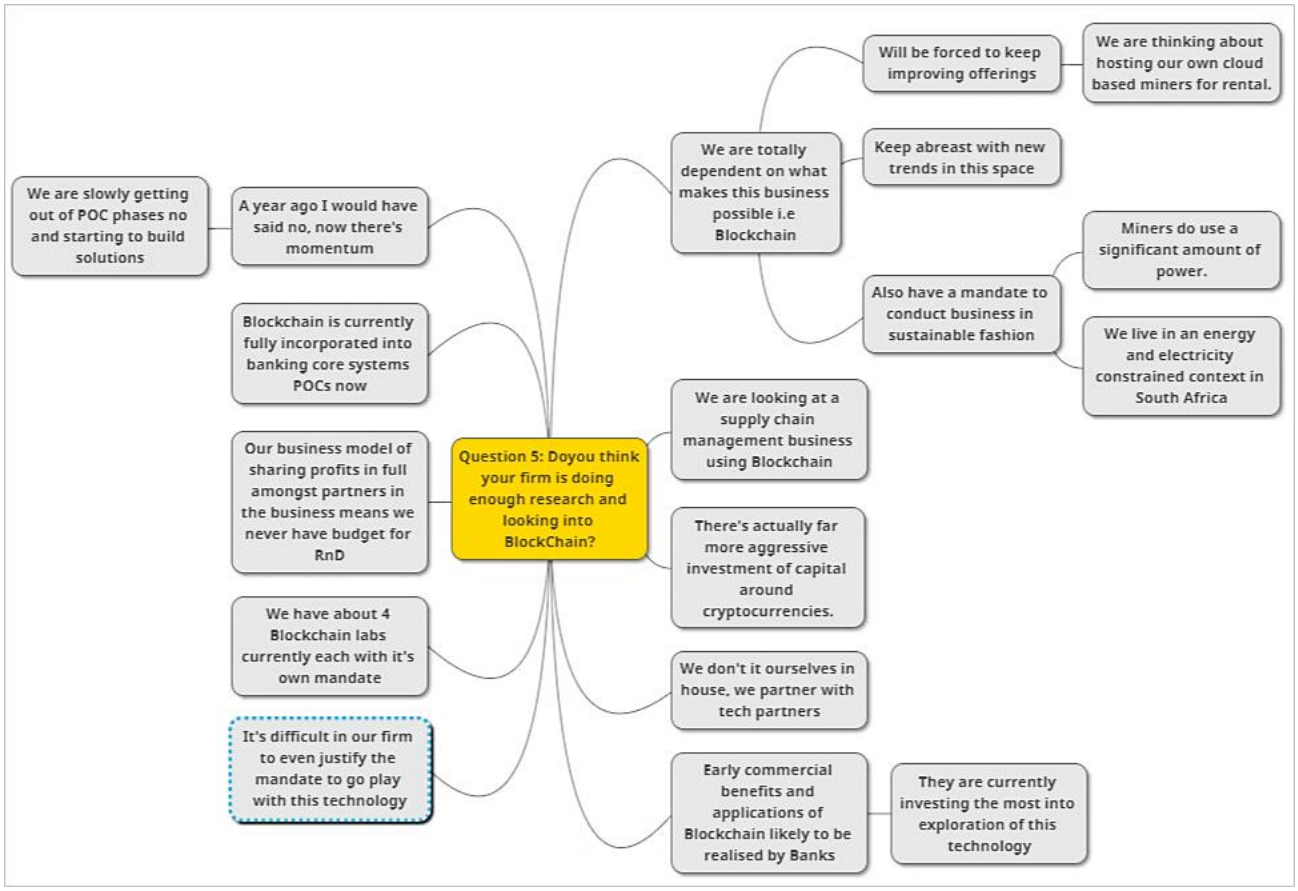


Figure 22 Composite Cognitive Map on the level of Blockchain adoption in South African firms

In the figure below, the themes reflected above were again compared with what literature cites for adoption levels in South African firms.

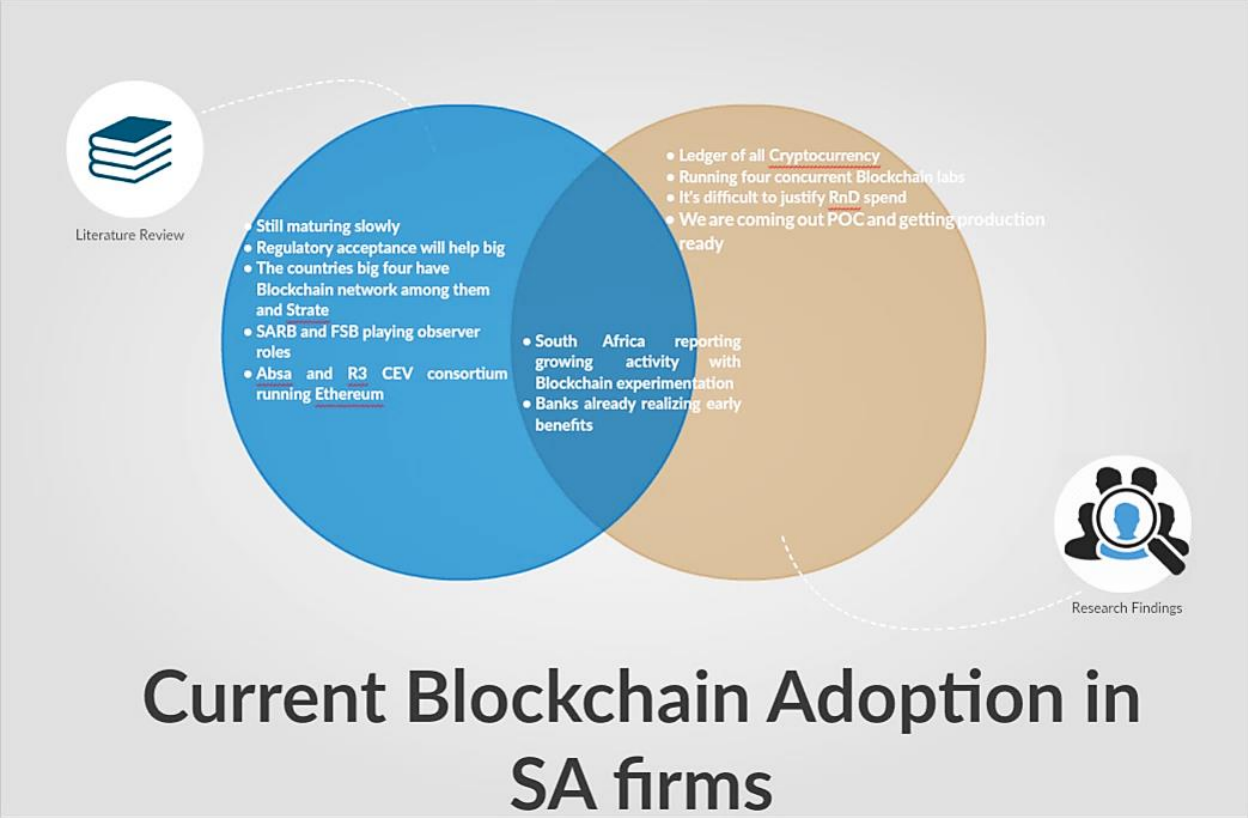


Figure 23 Blockchain Adoption Venn diagram

The newly identified themes around Blockchain's adoption is South African firms revealed that South Africa has picked up usage and experimentation with Blockchain than it has ever done before as evident from the country's own flavours of Cryptocurrencies that have surfaced very recently. One of the respondents is an owner of a hardware and engineering firm focused on mining bitcoins, an operation which currently requires very sophisticated computer hardware and a subscription to a Blockchain. He added that this niche industry has received a lot of attention recently to a point where there's almost a new entrant every four months or so.

A review of literature shows that even though South Africa's majority interactions with Blockchain technology is initially tightly coupled with a cryptocurrency of one form or another, it is nonetheless seen as making headway with Blockchain and that's viewed in a positive light. There's likely to be many spinoffs in this journey and South Africa is getting better suited to take advantage of these opportunities.

Another new theme that emerged through the comparison served to highlight how inflexible business models were an actual hindrance to the business's ability to show agile adaptation or respond to a trend. The more risk aversive organisations had very little budgets or mandates for research and development. Companies in the insurance business were a case in point. The less risk averse firms such as technology consulting houses and fintech start-ups were running more than one Blockchain lab at the same time with each designed for a unique mandate.

One of the technology consulting firms was already realising the benefits of their investments through advising some of their clients and partners on preparing better for this disruptive trend.

5.2.4 *Discussions on the challenges of working with this Blockchain nascent technology*

The question: What have been some of the challenges you and your teams have come across in working with BlockChain? Identified the illustrated themes below.

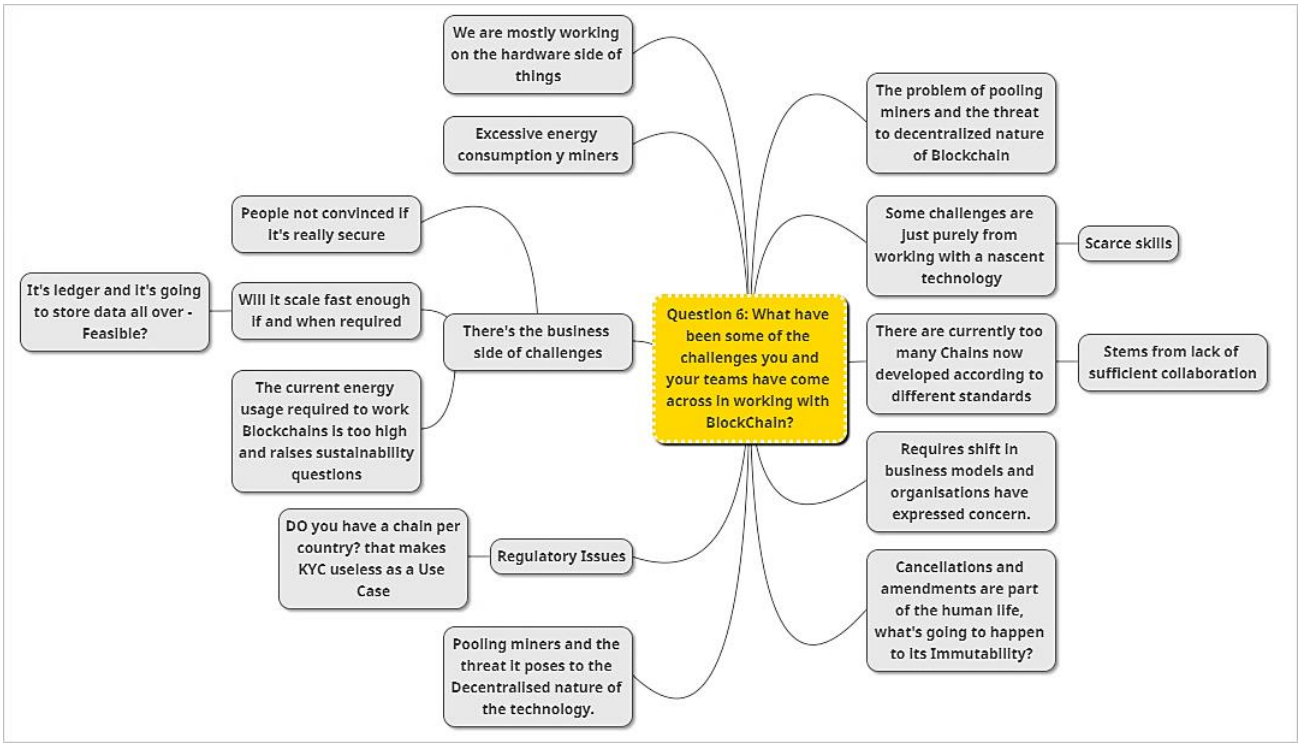


Figure 24 Composite Cognitive Map on Blockchain challenges

A comparison of the themes to the literature review is presented in the figure below.

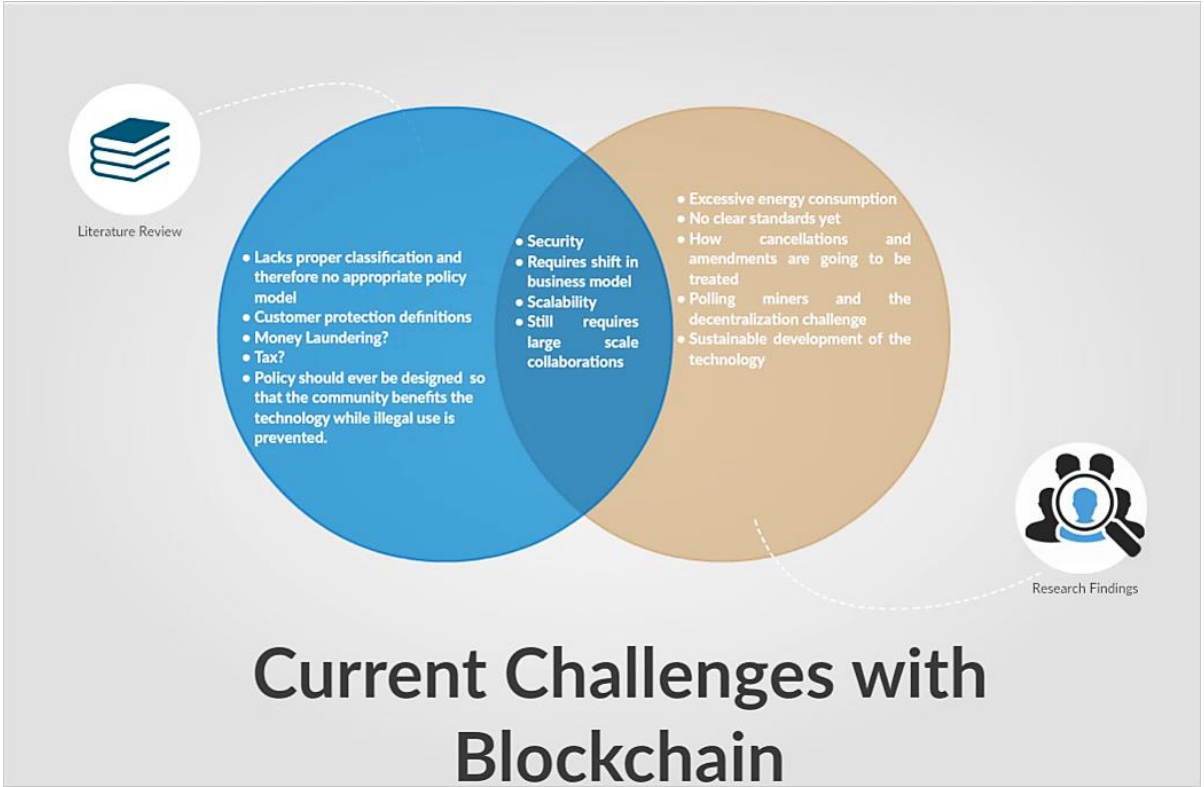


Figure 1 Blockchain challenges Venn Diagram

Respondents from the Bitcoin mining organisation noted that it's not an easy business to be in as there are still so many sustainable development questions that their business cannot answer satisfactorily. Also, cited among the challenges was the current infrastructure complexities of mining cryptocurrencies. A recent trend to boost processing capacity is to poll miners together. Polling miners together is generally accepted in the Blockchain community as threatening the very decentralised architecture of the technology. A lack of clearly defined standards was also reported as a challenge in that it is currently impossible to develop the right architectural building blocks and prioritise on infrastructure. The later was however not seen in a negative light as it is a trend that is common in nascent technologies and that this question of standards normally answers itself with maturity. The security challenges around Blockchain are also quite topical at the moment, most practitioners were well aware of the security concerns but saw it as another question of maturity just like standards. Literature states the security hurdles as the one question that will need a very convincing solution approach especially if we are going to replace intermediaries that have been entrusted with "trust" all these years. There was general consensus among respondents on the steps required to mature this technology: such as a thorough preparation of policy aspects by sharing this journey with all necessary stakeholders. Any policy being developed should only give definition to things like customer protection, money laundering etc. and not used to stiffen innovation.

5.2.5 *Discussions on the importance of industry wide collaboration*

The figure below depicts themes that we identified from the responses received on the question: do you think we need to co-operate with others in order to fully realise the benefits that BlockChain could offer?

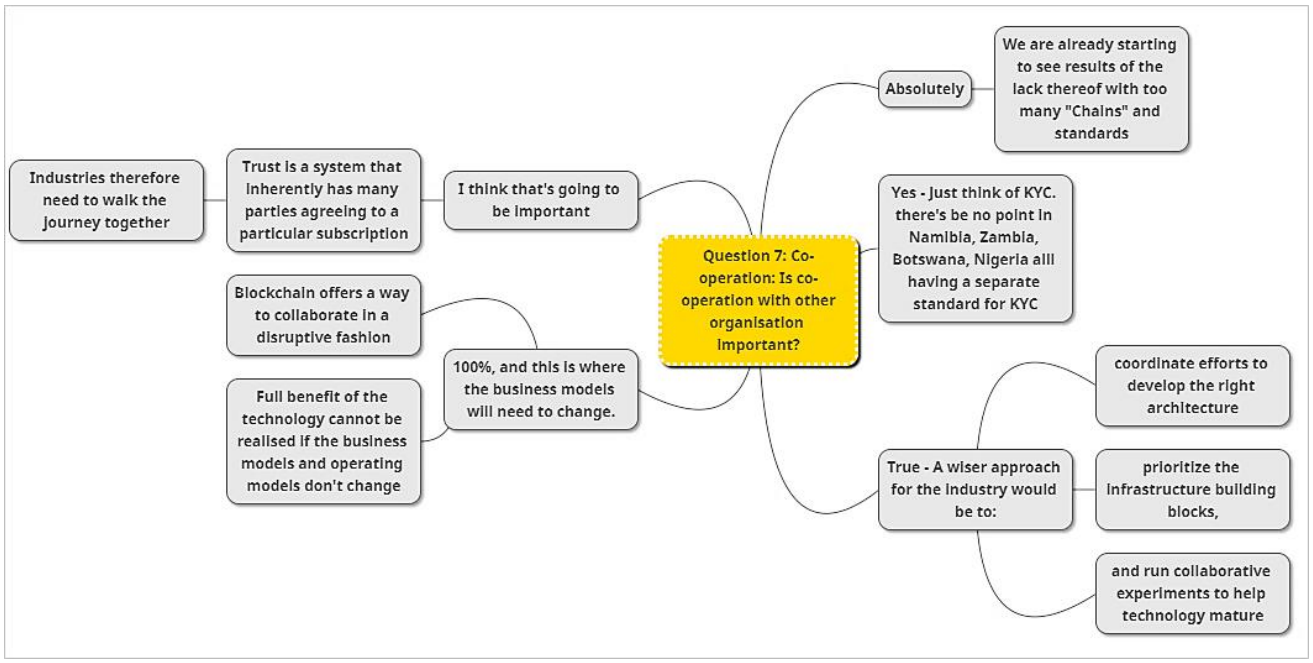


Figure 26 Composite Cognitive Map on Blockchain collaboration

Iteratively, these themes emerging were juxtaposed against literature review themes.

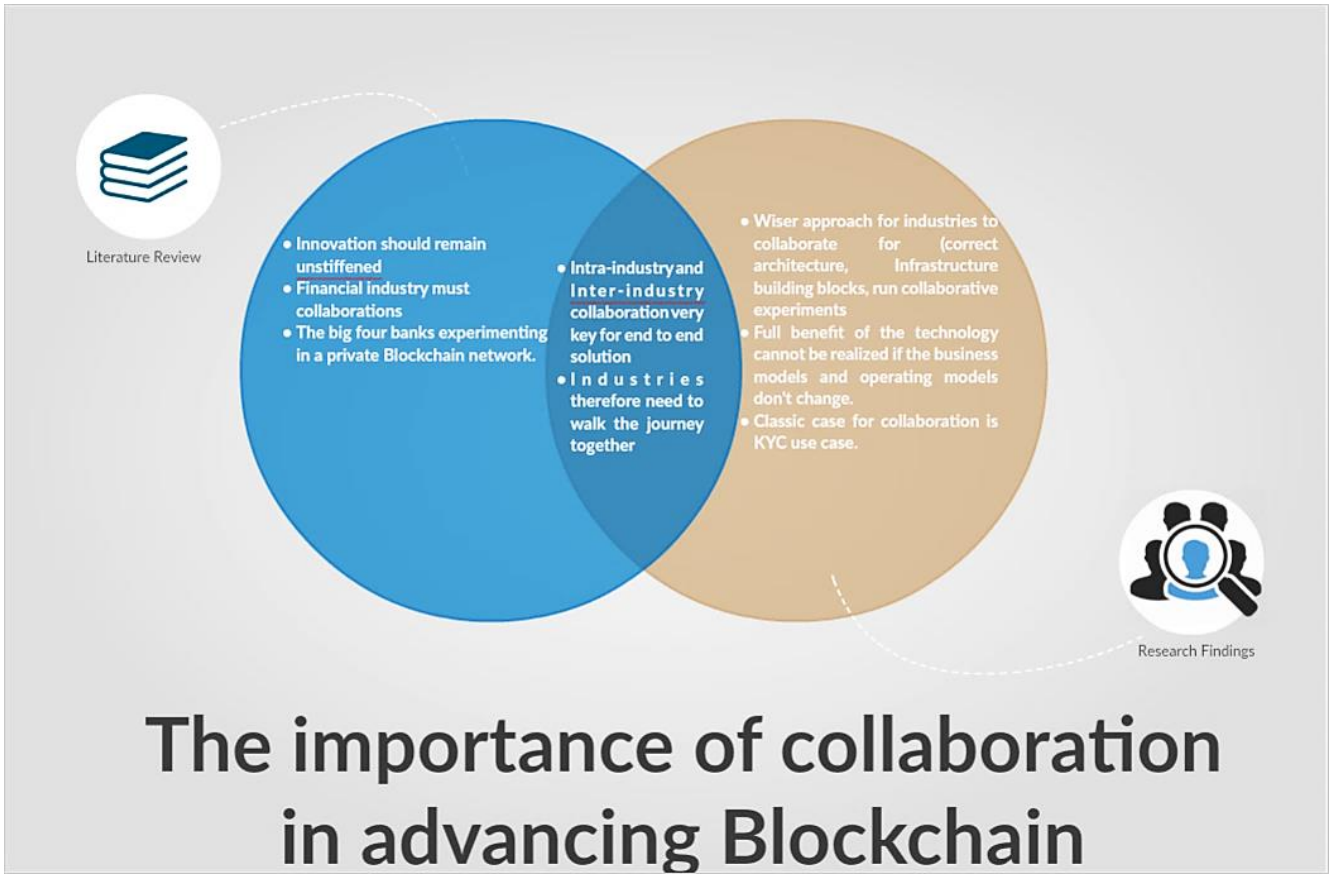


Figure 27 Blockchain collaboration Venn Diagram

A review of literature maintained the idea that to mature Blockchain is going to require thorough preparation on issues such as legal matters and policy development. There was much concern expressed around the "by-stander" and "on-looker" roles that authorities like the South African Reserve Bank (SARB) and the Financial Services Board (FSB). Some policies could even become impediments in and of themselves when insufficient thought is applied. With benefits such as accountability as a means of reducing corruption amongst governments and preventing money laundering, the respondents expressed unsatisfactory levels of involvement by the government. The KYC use cases were said to likely require a coordinated level of collaboration between authorities, governments and financial institutes. This level of preparation from stakeholders requires a very clear understanding of the platform and its capabilities. Collaboration was also seen as important for bedding down the right architecture, determining the right infrastructure building blocks and for running end-to-end experiments.

5.2.6 *Discussions on the likely prerequisites and infrastructure building blocks needed for wide Blockchain adoption*

The figure below depicts themes that we identified from the responses received on the question: What are some of the prerequisites you see playing out to ensure a significant adoption of the technology in the country?

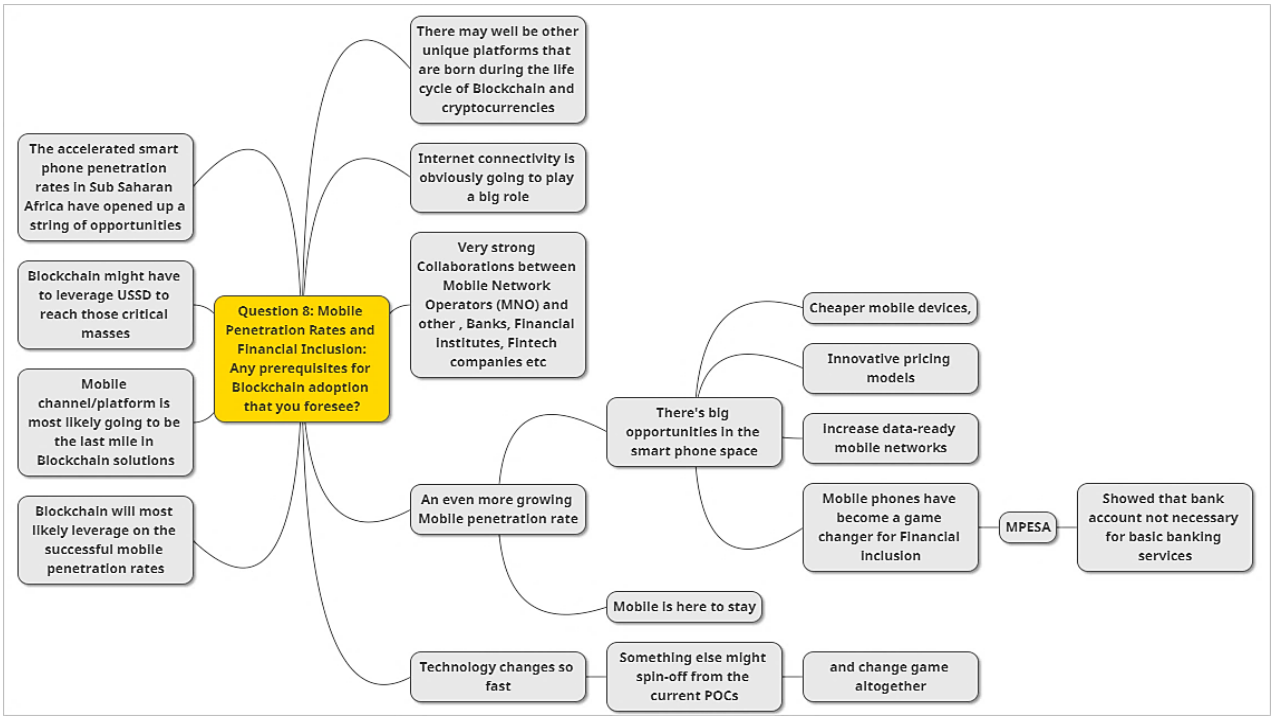


Figure 28 Composite Cognitive Map on Blockchain pre-requisites

The combination of the themes above with those emerging from literature, regarding the mobile penetration rates and internet penetration rates in shaping financial inclusion, resulted in similarities and emergent themes depicted below.

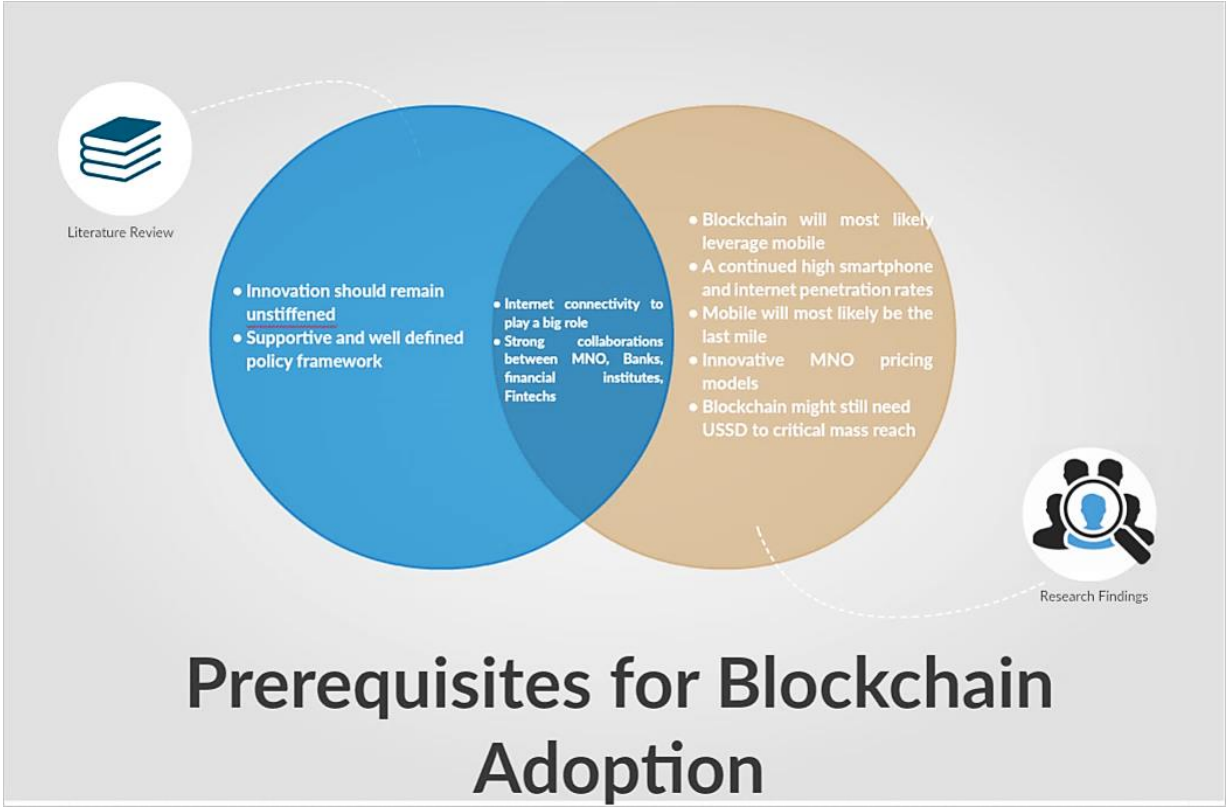


Figure 29 Blockchain pre-requisites Venn Diagram

Over and above what literature says about the potential prerequisites/building blocks for a successful Blockchain adoption, the respondents cited USSD as a critical technology to be leveraged if adoption of Blockchain and related products is to reach the critical mass that mobile money platforms attained.

The research findings showed belief from respondents that this instant payment space was still ripe for even more disruption and also that we will have to see a further increase in mobile and internet penetration rates in South Africa.

Using some of the lessons learnt in mobile adoption, the respondents cited innovation around pricing as a factor that is going to play a big role. It's an unwavering opinion amongst the respondents that Blockchain and its related products will have to leverage on mobile and mobile trends in order to reach critical mass adoption too. The "last mile" of Blockchain transactions is likely to be some mobile platform or product of some sort.

The traditional internet penetration rates were also reiterated as remaining very important still even for this Blockchain journey. as important, but building from what they've seen a significant contributor of those reported internet penetration rates was mobile devices. Respondents therefore that the authorities should continue the innovation around policy development and removal of hurdles as they have done to advance the reach of mobile channels.

5.2.7 *Discussions on the most important envisaged social impact from adopting Blockchain*

The figure below depicts themes that we identified from the responses received on the question: What is the most important social impact you see Blockchain having if at all?

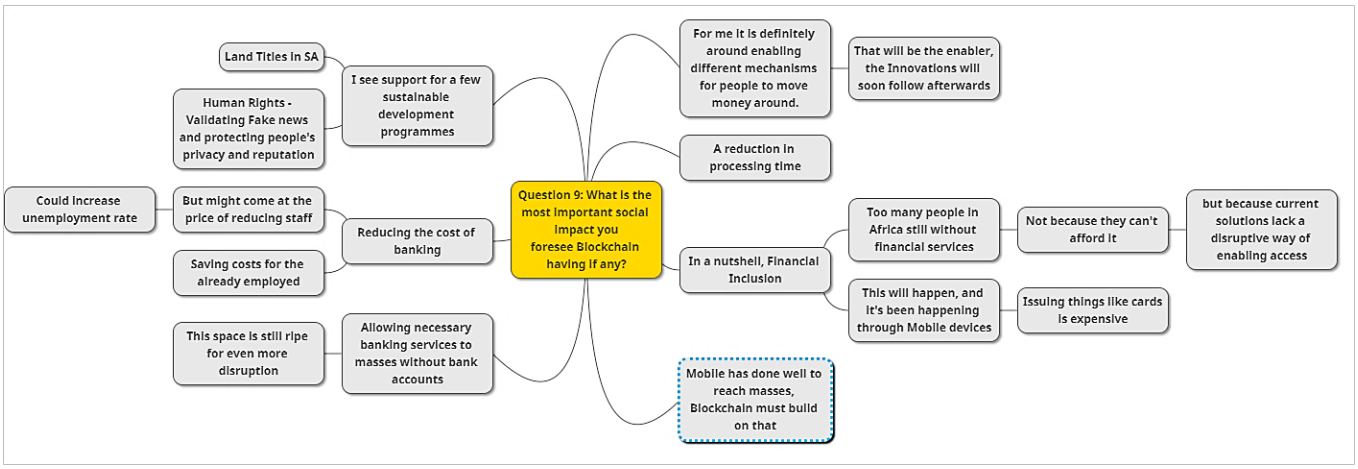


Figure 30 Composite Cognitive Map on Blockchain Social Impact Potential

The themes arising from the combined responses to the questions regarding the key potential social impacts of Blockchain above are ordered in the figure below.

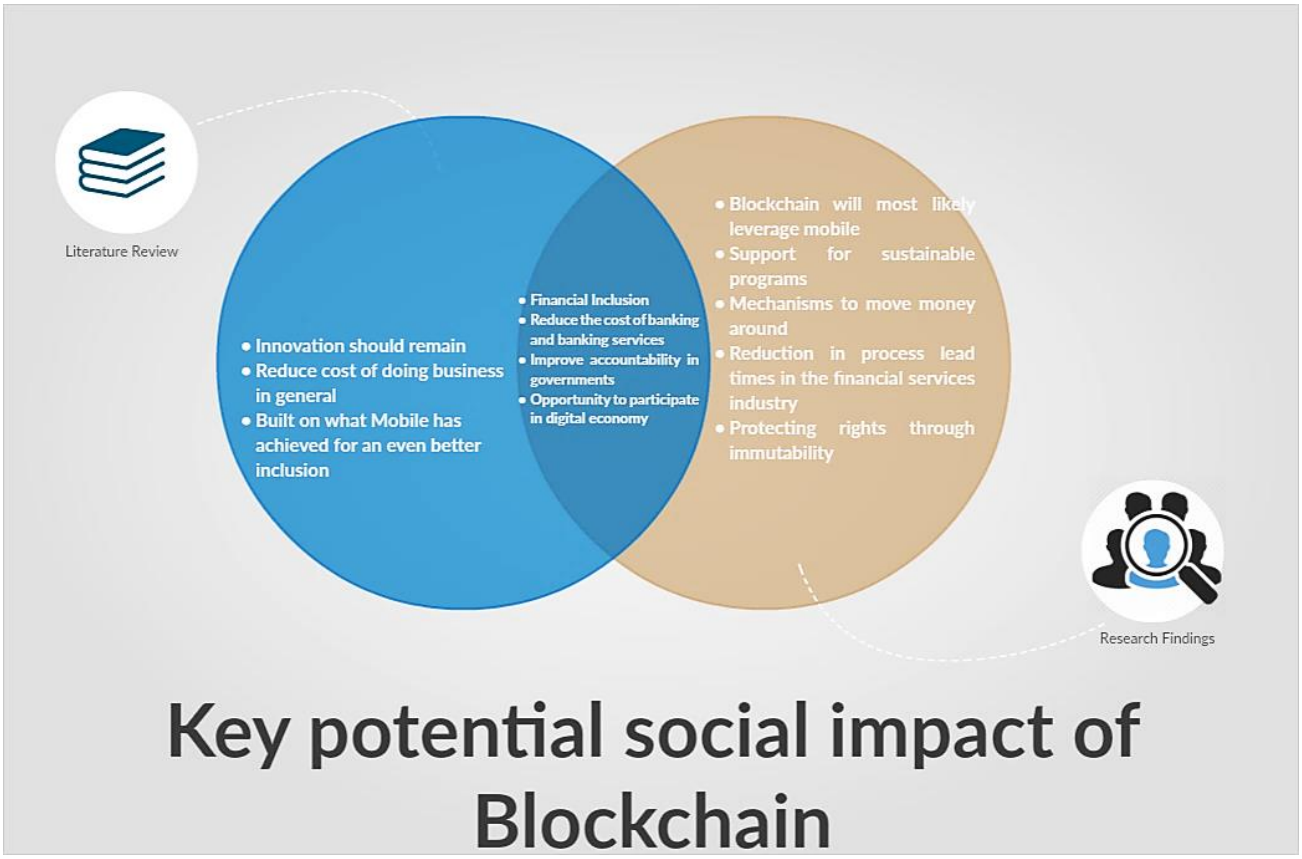


Figure 31 Blockchain potential social impact Venn Diagram

"The cost of banking, on traditional banking platforms in traditional ways has failed most of the people", said one respondent, citing this situation as the cause of desolate circumstances in which the country's poor found themselves. The respondents not only saw Blockchain as a technology that could change this, but also offer access to the digital economy, which is where the world is headed.

The other new emerging themes were about Blockchain improving the cost of doing business even in the traditional systems. This could greatly reduce the service fees that have made the formal banking systems so inaccessible to many. Even though a review of literature has shown that mobile trends have proved that people don't necessarily need a bank account for their day to day moving around of money, the respondents still placed emphasis in the formal economic participation with access to formal financial vehicles like debt for the much bigger goals such as purchasing a house, a vehicle, starting a business or sending a child to university.

The research findings associated with the giant media firm focused on the digital rights management potential of Blockchain as very key for their sphere. The findings further indicated the unearthing of completely new ways of earning money that should be leveraged by anyone who produces content that is consumed by a client base.

The accountability in governments was another topic of wide concern among the participants. Curbing corruption and remaining accountable to citizens is the responsibility of every government and the most successful of governments understand this well and have long devised reporting mechanisms and shaped their entire procurement processes to be transparent and available for inspection by all, they said.

5.3 Conclusion

In this chapter, the discussion is focused on comparing the research finding to the literature review in order to draw similarities and differences. The study lays a foundation with a set of focus areas derived from the literature review, which helped guide the discussion of the research findings around these focus areas. The focus areas were:

Describing the technology and what it does, the use cases, the level of investment on Blockchain, the challenges experienced in working/experimenting with the technology, the industry collaboration implications as well as the potential social impact harnessed by the technology and its applications.

CHAPTER 6. Conclusion and Recommendations

6.1 Introduction

This chapter of the research paper summarises the main research findings and discusses how the research objectives were attained. This chapter also identifies some of the recommendations for technology leaders, management and researchers. In addition are some suggestions for future research.

6.2 Conclusion of Study

In addition to what the literature review reported around the focus areas, the researcher has uncovered new themes and findings. The new findings were however congruent and consistent with the literature views. They further enlightened the existing assertions in the literature on the subject of Blockchain and its potential application.

The discussed areas of focus for this study were around Blockchain's potential in improving financial inclusion by elaborating on the following themes: Establishing how well understood the technology is and what it does, the Blockchain use cases, the level of Blockchain adoption in South African financial institutions, the challenges encountered in working/experimenting with the technology, the importance of industry collaborations as well the perceived social impact potential.

6.2.1 *On what Blockchain is understood to be*

South African technology SMEs and practitioner are well versed with technology trends and all understood what Blockchain is and how it works. There were however still views and definitions that were tightly coupled with its cryptocurrency identity perhaps as the earliest and to date, the only ever successfully productionised use case of Blockchain.

There were strong views and great attention to detail throughout the interactions and interviews. The shortfalls of traditional financial systems were just as understood, with most respondents making reference in one form or another to the classic example of a family breadwinner forced to abandon shores for better opportunities elsewhere and later faced with the challenge of being able to send financial support and aid back to their families.

The problem of different flavours of chains and inconsistent architecture standards was well articulated and understood. As mentioned this eventuality was not perceived in a negative light as it formed part and parcel of working with a nascent and emergent technology, very similar to how cloud technology was first explored, everyone had a private cloud. The diagram below captures some of the types of chains discussed in the interviews:

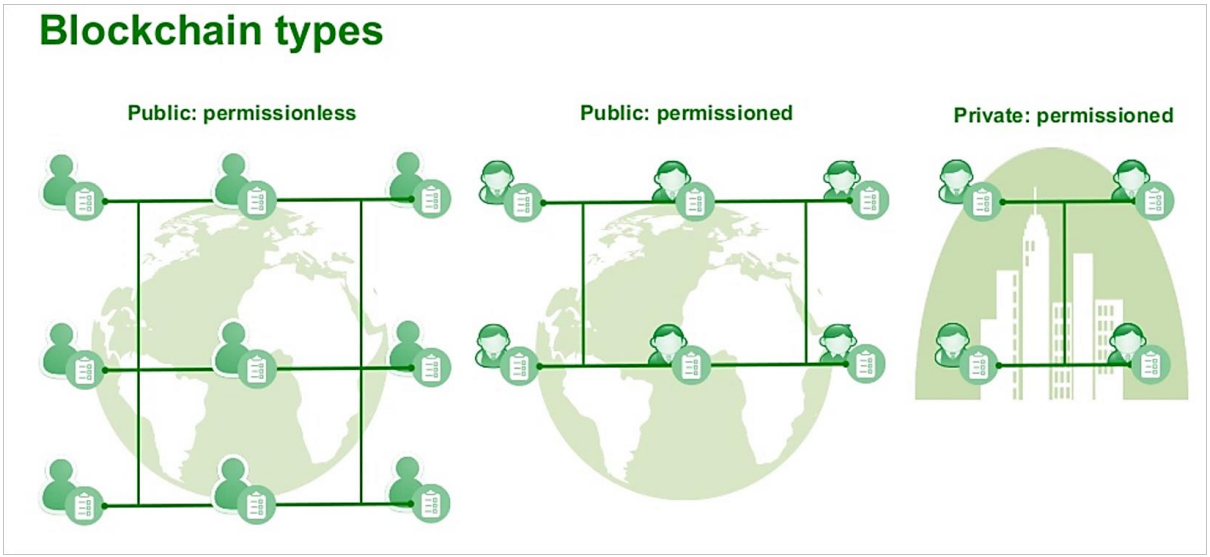


Figure 32 The types of BlockChain known

6.2.2 *The envisioned use cases for Blockchain*

The results discussion section of this report shows more use cases for Blockchain that came out of the research findings than from the literature review, these additional use cases such as digital rights management; Industry wide KYC; payment rails and store of value were uncovered as the respondents familiarised themselves more and more with the technology and started understanding what it really offered.

Another consensus was around the important foundations that mobile technology platforms had laid and the role that mobile money has played in reaching out to critical masses of the unbanked population. Mobile technologies and platforms were therefore seen as a foundation rather than a competing trend with some respondents going as far as identifying the mobile ecosystem as the most likely prerequisite platform.

Syndicate lending is another unique theme that emerged out the research findings and refers to a loan that gets offered by a group of lenders who work together to provide funds for a single borrower, this borrower could be an individual, a corporation or even government. Figure 33 depicts some of the current and highly debated use cases in the Blockchain community currently.

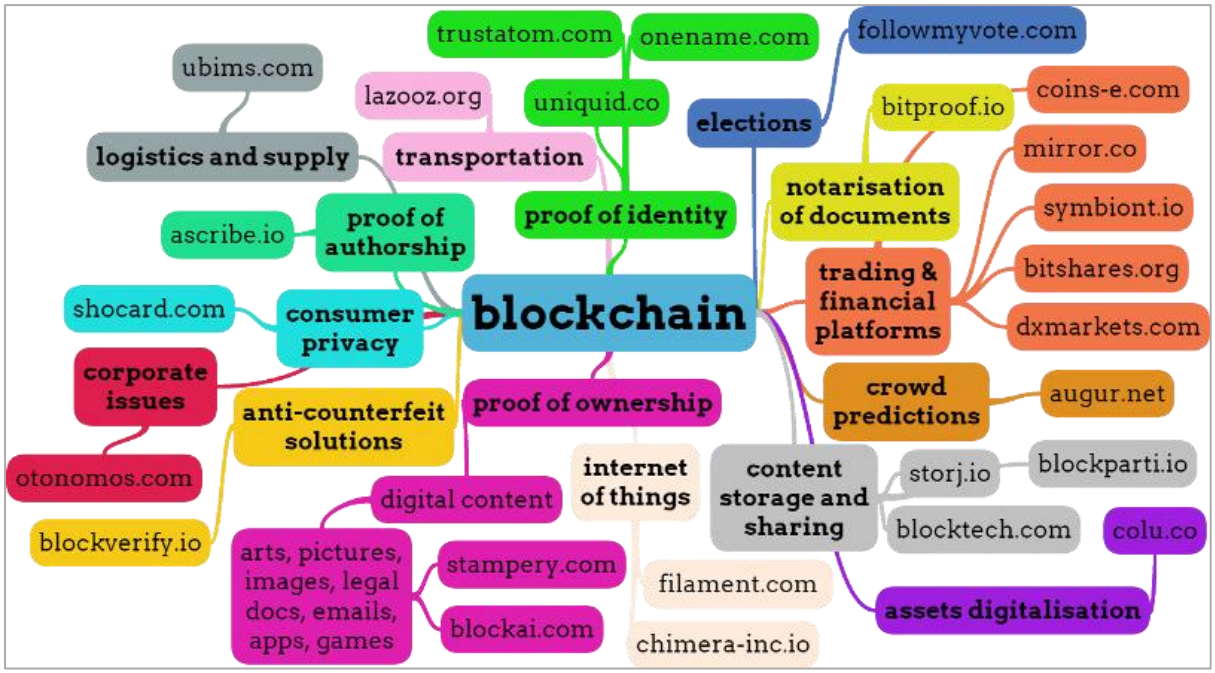


Figure 23 Blockchain Use Cases, source: https://za.pinterest.com/pin/829999406296415649/?lp=true

6.2.3 *Blockchain adoption in South African organisations*

The response to this question ranged from "we are not using this technology in any of our facilities at all yet", to "we have deployed our fourth Blockchain lab last month to focus on a different mandate". The respondents cited challenging economic climates and generally low risk appetite of organisations operating in the traditional financial services industry. The austerity measures in the country at large was a well understood necessity but caution was raised against not doing enough with this technology, after all our South African context is one of the ripest for this type of disruption. Some of the most opportune business cases are born in tough economic climates such as ours.

Disruptive trends inherently require organisations to revisit their business models in order to take advantage of ripe opportunities but the inflexible nature of most traditional financial services firms places them on a path of disruption as Fintech companies, telecom operators and technology firms try their hand at financial services. There was a significant number of respondents that expressed enthusiasm at the level of innovation seen within the South African financial services sector.

The research findings cited a number of reasons why South Africa is not adopting Blockchain at the rate that it ought to, but the most common reason was that not enough experimentation is currently being done by organisations and authorities alike.

6.2.4 *On the challenges of working with the technology*

The views held by the respondents who are directly working with Blockchain technology or any form of cryptocurrency in a POC or production environment alluded to the concerning excessive computing power required to "work" a Blockchain. This scale of consumption was not seen as sustainable given the energy context of the country in the wake of a power crises and power cuts. The organisation that supplies computing power to Blockchain and cryptocurrency networks has significant overhead attributable to hardware spend, and the chairman explained how he cannot start reporting any profit until break-even point because the hardware investment was significant he exclaimed.

The lack of clear architecture standards in developing chains was iterated again under this theme, there are currently quite a number of BlockChain standards which are all different and all developed to fulfil a different mandate.

Also central to the challenges theme was a workaround to increase processing power resulting in the polling of miners at the expense of the distributed architecture of the technology itself. Mining is the process by which transactions are verified and added to the public ledger and it's also subsequently a process through which new bitcoin are released. The polling of miners is seen as a necessary evil at this stage since Blockchain requires serious hardware to function but decentralised processing is one of the technology's great features. More than half of the respondents saw this as a temporary measure which should probably be abandoned with the advancement of processing power and the availability of cheaper hardware.

In line with literature, the security surrounding the operation of a Blockchain is still a contentious topic even within the Blockchain community.

Cancellations and amendments are seen to be part of everyday life but currently pose questions when considering Blockchain's immutable property.

Regulations and strengthening the Blockchain ecosystem:

There has been many discussions and advancement of narratives in the blockchain community. A recent example is a report by the US securities and Exchange Commission concerning digital tokens issued by the Decentralised Autonomous Organisation (DAO). The DAO's aim is to provide new and decentralised business models for organising commercial and not-for-profit endeavours/enterprises.

The DAO has no conventional management structure nor board of directors and is tied to no nation, the plan around it's conception was to allow for its participants to receive tokens that allow them to vote for which projects to fund, essentially relying on the "wisdom of the crowds" (Hertig, 2016) . Whilst there are still questions about how government regulators would deal with such a stateless entity, the securities and exchange commission made one of the first regulatory intervention by declaring the digital tokens as securities and therefore subject to federal law regulations (Gutsol, 2017).

This decision by the commission, although having caused ripples in the blockchain community, was viewed by many as positive as it signalled positive developments for blockchain markets (Gutsol, 2017).

Blockchain technology can be a very complex topic and therefore attempts to regulate it without fully understanding it might actually hinder the much anticipated progress and evolution of the technology. Community members like Yitzi Weiner believe that regulating bodies leveraging off subject matter experts, who use and understand the technology very well, will lead to mutual benefits in the future and give rise to what he terms "smart regulation" (Stojanow, 2018). It is also noted from this literature that countries like Liechtenstein, Switzerland, Malta, Gibraltar, and Singapore are driving forward regulation and legal frameworks and even implementing them as early as current year and 2019.

The author draws attention to a common characteristic of these countries, which is their relatively small size and consequently the small size of their regulating bodies. In markets like the EU, the US and ASIA the bodies are larger and decision making takes very long due to the process time of implementing new regulations.

The author's opinion is that moving at the speed of these small countries will pave way for crypto-friendly jurisdictions to create enabling environments where research organisations and companies can focus on their core work and bring the focus to the technology itself instead of figuring ways of working around limitations and restraints (Stojanow, 2018).

6.2.5 *The intra-industry, inter-industry and even inter-country collaboration question*

The highest degree of unanimity about Blockchain among the respondents and also between literature and the research findings is around the extent of collaboration which is perceived as necessary to advance the technology to a mature state. Collaboration was seen as necessary for coordinating efforts to developing the right sort of architecture and to prioritize the infrastructure building blocks. All respondents from all the sectors expressed the need for running collaborative experiments to help mature Blockchain as a technology. Another important view highlighted was that Trust is a system that inherently has many parties agreeing to a particular subscription making it even the more necessary for industry to walk this journey together.
A key example illustrated in the research finding was about KYC and how defeating non-standard KYC repositories between countries would be and that this potential to curb money laundering would essentially be lost.

Furthermore, the full benefit of the technology is believed to be attainable only if business models and operating models in organisation was to significantly change. The depiction below highlights some of the possibilities that were discussed.

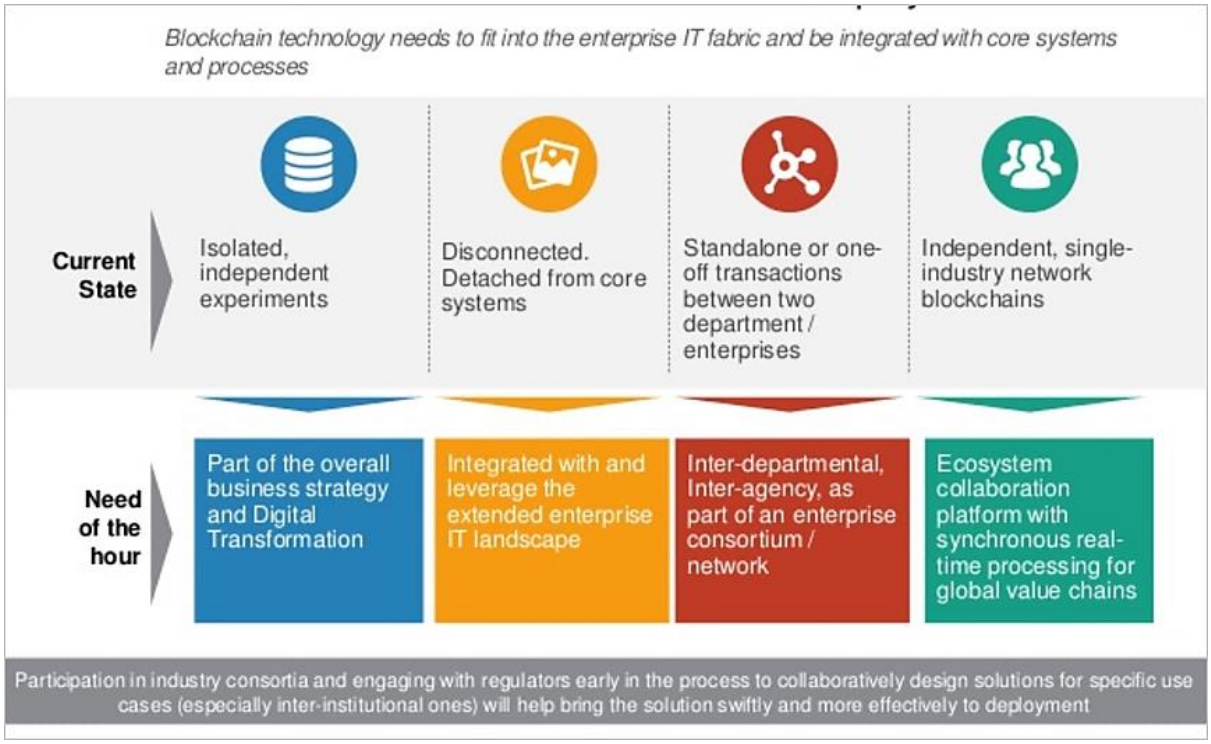


Figure 34 Collaborating to advance Blockchain maturity, Source: https://www.slideshare.net/floyddcosta/blockchain-a-nextgen-platform-for-enterprise-digital-transformation

6.2.6 *Early prerequisites*

The SMEs expressed a concrete articulation that mobile technology had established itself as the platform to be leveraged to reach the critical mass of the country's unbanked. There was also a view that there should be a continued high smartphone penetration rates which anticipated to push for even more innovative pricing models from mobile network operators (MNO). An interesting mention in the research findings was the realisation that USSD has probably enabled mobile money to reach the critical masses and that Blockchain initiatives should consider USSD as a viable and successful platform. Both the literature references and a large number of respondents cite internet connectivity as a definitive prerequisite and necessary foundation.

A very key link to the collaboration theme was made in this prerequisites theme again, research findings suggest that very strong collaboration between MNOs, Banks, Financial institutes and technology companies is going to become key in the advancement and subsequent adoption of Blockchain.

Surprisingly the respondents made little reference to policy frameworks needed to support and define important artefacts.

6.2.7 *Key social impact areas*

The findings of the key social impact areas were in line with literature and were mostly focused around financial inclusion. The respondents of this study held the views that Blockchain was either going to achieve this by significantly reducing the current cost of banking and access to financial vehicles through disintermediation or by significantly changing the business model around financial services and how financial vehicles and products are accessed.

Another strong theme was around Blockchain enabling different mechanisms for people to move money around and reducing the processing time for more instantaneous money transfers. Corruption in governments and missed opportunities of help was a common concern among respondents and therefore it is expected that the immutable properties of the technology could finally lead to accountability systems that allows us to track government's spending and pick up corrupt practices.

A strong case for digital rights management for people like artists and content producers of sorts was also made in the interviews.

BlockChain's role in global sustainable development:

Although the concerns around the computing power, required to work with BlockChain technology, are significant, some parallel work has been done to investigate the technology's potential role in achieving the UN sustainable development goals.
It's ability to be integrated into various and multiple industries from logistics to healthcare, from energy to agriculture has led to Blockchain being referred to as a truly disruptive technology (Sekhon, 2017).

The author articulates a list of highly probable use cases for BlockChain technology to potentially produce solutions to many of the development challenges. The key observation made by (Sekhon, 2017) is through using Blokchain as an integrating platform, linked through global innovators, policy makers and investors together, to create solutions through multi-sector and multi-stakeholder processes and knit them in Global compact integrated reporting sort of sustainability framework to achieve sustainable development goals (SDG).

The envisaged use cases of the blockchain technology in SDG are summarised below, the goals are all underpinned by more specific targets and require global cooperation, transparency, trust, and better managed resources.

- ***Poverty & financial exclusion*** – A South African based company, Wala, is leading the charge. They are a mobile financial platform not too different from M-Pesa but base their technology on blockchain and they have teamed up with M-vendr, the provider of mobile point of sale apps for small retailers and informal traders. This collaboration is hugely significant as it combines free banking with a simple & accessible way to buy goods with an excess of 30 000 merchants across 15 countries (Piscini et al., 2016)
- ***Carbon footprint*** – This premise is founded on the fact that every financial transaction has a climate consequence, whether filling a car up with petrol, increasing a cloud

storage plan or booking a long distance flight are daily choices that all leave a carbon footprint. Carbon credits, put a price on the reduction of carbon and devise revenue realisation schemes for projects that protect the environment. However since its inception carbon trading has faced many challenges such as lack of visibility, which keeps people from trusting carbon credits as useful and of any value. Differing standards and regulations per jurisdiction, double counting have all reduced confidence around the market. A carbon loyalty programme founded on blockchain technology, CarbonX, converts carbon credits into cryptocurrencies that people can use to spend on real things and greatly incentivising sustainable behaviour (Sekhon, 2017).

- ***Reducing Inequality*** – The American based project BanQu uses blockchain technology to allow individuals in developing worlds, such as farmers, to create an economic identity on the blockchain irrespective of how little land or income and gender is involved. This has since allowed these individuals to access to global economic platforms and credit because of an identity that can be asserted (Chinaka, 2016).
- ***Responsible consumption & production –*** Provenance is a UK based company that has built a blockchain platform that allows traceability & transparency of the procurement of fish (or raw materials in their other applications) throughout the supply chain. This ensures that products are always sourced in line with their sustainability claims (Nguyen, 2016)
- ***Zero Hunger –*** A collaboration between Wal-Mart and IBM resulted in using blockchain technology to track packaged produce in the U.S and pork products from China. The data obtained from the system allows Wal-Mart and suppliers to identify where food was grown, which farm it came from and who inspected the produce so that in case of contamination they recall only the affected produce and not the entire product ranges, thus avoiding wastage (Sekhon, 2017).

Blockchain applications may provide a way for people to manage and host sustainability data as well as empower markets such as carbon trading to promote transparency, traceability and build trust with decision makers aroud the world (Sekhon, 2017).

6.3 Recommendations

This research produces a number of novel key learnings and findings highlighted below:

6.3.1 *Evolution, and why Blockchain hasn't taken off yet*

The South African Financial services industry and market holds views that are congruent with the literature regarding what Blockchain is and what it can do in this space. However there is a need to understand that the technology will probably not take off in all markets in the same way. If in South Africa, there is a huge potential for it to spur the much needed financial inclusion then we need to shape that narrative ourselves.

There is almost always a network effect witnessed and needed in the uptake of any technology or trend in that it becomes more valuable because more and more people that you know and

do business with are on it, an example of this could be Facebook or WhatsApp. It is going to take everyone agreeing that it's worthwhile coordinating a move to Blockchain or some other system that has to revolve around it. It will take time but the positive response to the need for collaboration question that emerged out of the research findings is a positive sign.

6.3.2 *Use cases, Blockchain as a driver of financial inclusion*

The use cases deliberated upon in the research findings were almost all leaning strongly towards financial services and are clearly informed by the current context in South Africa as a developing nation. Developing worlds are generally characterised by problems with the government, high levels of corruption and issues with land ownership or land titles. The cryptocurrency ideas are gaining popularities because in that system there is no government, no powerful oligarchs and banks or any other thing preventing people from participating in the financial system. Financial exclusion stems from banks not wanting a certain type of customer in their books because they have too little money. The banks deem them expensive customers to service, but in a decentralised system, which could be Blockchain based, it would be relatively simple to give people means of digital payments and meet most people's needs.

Mainstream adoption of the technology is still some way off, there will still be some failures and consolidations along the way but Blockchain can offer businesses a powerful infrastructure that can be attained at very low cost and Blockchain as an idea and way of working is about to arrive in an impactful way.

6.3.3 *Blockchain will completely alter business models as we know them*

If the internet was controlled by an entity, then the services allowed on it would most likely be dictated by this entity. Users decided what they wanted to use it for and it is this very characteristic of the internet that subsequently enabled businesses that would have otherwise never be imagined.

In the same way that the internet is not controlled by a single entity shaping its development according to profitability or some other interest, Blockchain is going to offer businesses a decentralised network of trust not controlled by an entity for profits or any other agenda.

6.3.4 *Collaboration is key*

The conversations around Blockchain are certainly lively, and this was also very clearly indicated by the research results. People really want to be part of this conversation, and that is the first step to this technology. This technology is about allowing people to own and transact their own value. There are plenty other use cases but plotting and sorting through which ones make sense is going to take some work. But companies and governments will

eventually get there through concerted efforts among CIOs, IT practitioners, IT vendors and software developers.

6.4 Attainment of research objectives

The main objective of this research was to investigate the current Blockchain adoption rates in South African financial institutions and to examine Blockchain's potential social impact in improving financial inclusion.

To achieve this, a process of in-depth semi structured interviews was carried out in which IT practitioners and Blockchain subject matter experts were interviewed. The interviews were then analysed using cognitive maps, with composite cognitive maps to present the key themes from the interviews.

The research objective was divided/broken down into eight achievable objectives. These eight smaller objectives are discussed in detail in the previous chapter indicating the achievement of the objectives of this report.

The study cannot be regarded as definitive. The research was exploratory in nature and designed to aid accumulative learning and uncover some of the issues around Blockchain adoption to support financial inclusion. As such it serves to lay a foundation for further study.

6.5 Conclusion

The mainstream adoption of Blockchain is still some way off, there will still be some failures and consolidations along the way but Blockchain can offer businesses and governments a powerful infrastructure that can be attained at very low cost. Blockchain as an idea and way of working is about to arrive in an impactful way.

People from all industries want to be part of this conversation and we are already seeing some basic groundwork being laid from lessons learnt in earlier POCs and experiments. Companies and governments will eventually get there through concerted efforts among CIOs, IT practitioners, IT vendors and software developers.

South Africa, as a developing country, faces challenges with a rife corruption that has infiltrated day to day practices and is becoming deeply entrenched in most practices in society. This corruption is most pronounced but not limited to the government, which faces other issues around land redistribution and land titles. The South African society is also one of the most unequal societies in the world.

Trust, is a social resource that is all too often in short supply especially for the government, and the trust element of Blockchain would play well into sustainable development plans designed to **end poverty**, **protect our planet** and **ensure a life of prosperity** for all. Blockchain has great potential and it will make an impact on and bring value to transactions that require trust.

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APPENDIX

Appendix 1: Letter of Introduction





13 January 2017

Dear Sir/Madam

I am currently undertaking research for the partial fulfilment of the requirements for the Master of Business Administration (MBA) through the Wits Business School.

My research concerns the potential impact and social good that could come out of the adoption of Blockchain technology by the main financial institutes in South Africa especially. This could greatly improve financial inclusion of, the traditionally underprivileged and unbanked, citizens of the country allowing them to participate formally in our economy. As you are most likely aware when people can participate in the financial system they are better able to start and expand their businesses, invest in their children's education and absorb financial shocks.

As a technology subject matter expert who is either directly/ indirectly involved in some undertakings that might be looking into this technology, your views on this subject would be of significant value to this study. May I request an opportunity to ask you a few questions around this subject as a way of getting your views? The discussion will not take longer than an hour. I am planning to visit your offices on the month of March subject to your availability.

All information will be treated in the strictest confidence, and your name will not be published on any section of the research report.

If you wish to receive a copy of the main findings of this research, please indicate so during our discussion so that I can make necessary arrangements.

Lastly, I would like to request your permission to use a recording device during our conversation. This will help me to ensure that I capture the entire conversation accurately and get the full benefit of your input.

Thank you for your participation in this study.

Yours sincerely

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Nobby M. Mabale

Appendix 2: Interview Questions

The following questions will be used as guide to the interview:

1) What is the nature of **your business** and how does your business achieve that?
2) What is your **understanding of Blockchain** technology?
3) Views on its **potential application**, especially in the Financial Services Industry?
4) **Market**: Are you considering the impact that Blockchain technology could have on the market you operate in?
5) Do you think your firm is doing enough research and looking into BlockChain?
6) How do you/would you quantify this level of involvement?
7) **Use Cases**: Given its potential breadth of impact, what use cases/business cases are you focusing on at the moment?
8) **Challenges**: What have been some of the challenges you and your teams have come across in working with BlockChain?
9) **Co**-operation: Is co-operation with other organisation important?
10) **Mobile Penetration Rates and Financial Inclusion**: Any prerequisites for BlockChain adoption that you foresee?
11) **Social Impact**: What is the most important social impact you foresee Blockchain having if any?