

SOCIAL MEDIA ONLINE PRIVACY IN SOUTH AFRICA: The case for blockchain technology innovation

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ABSTRACT

In today's society, it has become nearly impossible to exist without an online presence on some form of social media platform. These platforms have become an integral part of our daily lives, serving as avenues for maintaining relationships and facilitating connections. However, the extensive use of social media exposes users to various privacy concerns and malicious activities. Furthermore, the generation of vast amounts of personal data on these platforms raises questions about data ownership, control, unauthorized data utilization, and constant user activity tracking.

Over recent years, concerns surrounding privacy, risks, and exposure on social media have escalated, particularly regarding issues such as data ownership, control, unauthorized data usage, and user activity tracking. Social media users have increasingly expressed the view that platforms are making incremental security improvements without fully addressing users' genuine concerns, which may impact their economic models.

This research paper seeks to explore whether blockchain technology can offer a solution to the privacy concerns raised by users of social media platforms. It evaluates the characteristics of blockchain technology in addressing the privacy-related issues associated with traditional social media platforms.

The paper begins by establishing a foundational understanding of blockchain, privacy, and the role of social media platforms in today's society. The research identifies the challenges faced by everyday social media users as part of defining the research problem.

The study investigates whether the most common online privacy concerns related to social media platforms remain pertinent in the current landscape. It then delves into blockchain technology, assessing whether its characteristics introduce additional

value or raise new concerns for social media users if platforms were to transition to blockchain technology.

The research adopts a qualitative empirical approach, conducting interviews with a sample of social media users who are active in white-collar professions and possess some level of technological knowledge, including limited familiarity with blockchain technology.

The findings indicate that the prevailing privacy concerns of users on traditional social media platforms remain highly relevant. When presented with the option of social media platforms built on blockchain technology, users exhibit a positive sentiment and largely perceive it as a means to address their primary concerns regarding data ownership and management. While some limitations and additional concerns emerge, participants express a willingness to migrate to blockchain-based platforms to leverage the benefits offered by this technology.

The study suggests that social media users' dialogue should shift from demanding additional security features on traditional platforms to advocating for the migration of social media platforms to blockchain technology, considering the potential benefits it offers.

KEYWORDS

Blockchain, Social Media, Online Privacy

DECLARATION

I, Edward Philip Beja Abegao Pinto, 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 Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Name: Edward Pinto

Signature:

Signed at Johannesburg

05 June 2023

DEDICATION

To my family, Alexandra, Catia and Gianna Pinto, your support and understanding has been more than I could have asked for. Thank you for providing me the time to complete this research.

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To my wife, Alexandra Pinto, for the understanding, patience, and support throughout this process. Love you.

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ABSTRACT.....	2
KEYWORDS.....	4
DECLARATION	5
DEDICATION	6
ACKNOWLEDGEMENTS.....	7
LIST OF TABLES	10
LIST OF FIGURES	12
ABBREVIATIONS AND ACRONYMS.....	13
1. INTRODUCTION	14
1.1 STATEMENT OF PURPOSE	14
1.2 BACKGROUND OF THE STUDY	14
1.3 RESEARCH PROBLEM	18
1.4 RESEARCH OBJECTIVES	21
1.5 RATIONALE	22
1.6 DELIMITATIONS OF THE STUDY	23
1.7 ASSUMPTIONS	23
1.8 DEFINITION OF TERMS	25
1.9 CHAPTER OUTLINE	26
2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK.....	27
2.1 INTRODUCTION	27
2.2 EXPANDED DEFINITION	27
2.3 ANALYTICAL FRAMEWORK	32
2.4 CONCLUSION OF LITERATURE REVIEW	40
3. RESEARCH METHODOLOGY	43
3.1 RESEARCH DESIGN	43
3.2 RESEARCH METHOD	44
3.3 POPULATION AND SAMPLE	45
3.4 DATA COLLECTION METHOD AND PROCEDURES	47
3.5 THE RESEARCH INSTRUMENT	48
3.6 DATA ANALYSIS STRATEGIES AND INTERPRETATION	51
3.7 CREDIBILITY, TRUSTWORTHINESS AND DEPENDABILITY	52

3.8	ETHICAL CONSIDERATIONS	53
3.9	RESEARCH METHODOLOGY SUMMARY	55
4.	PRESENTATION OF FINDINGS	57
4.1	INTRODUCTION	57
4.2	SOCIAL MEDIA PLATFORMS	57
4.3	PARTICIPANTS SUMMARY	58
4.4	RESEARCH QUESTIONS	60
4.5	THE THEMATIC ANALYSIS OF FINDINGS	61
4.6	FAMILIARITY WITH THE DATA	61
4.7	GENERATION OF INITIAL CODES	66
4.8	FINALISING OF THEMES	75
4.9	CODES PER RESEARCH SUB QUESTION	78
4.10	RESULTS FROM THE ANALYSIS	79
4.11	SUMMARY OF FINDINGS	80
5.	DISCUSSION OF FINDINGS	82
5.1	INTRODUCTION	82
5.2	ARE SOCIAL MEDIA USER’S PRIVACY AND SECURITY CONCERNS STILL VALID?	84
5.3	IS MIGRATING TO BLOCKCHAIN GOING TO ADD ANY ADDITIONAL VALUE TO THE USERS?	91
5.4	IS MIGRATING TO THE BLOCKCHAIN GOING TO ADD ADDITIONAL CONCERNS TO THE USERS?	95
5.5	CONCLUSION	102
6.	CONCLUSIONS, LIMITATIONS & RECOMMENDATIONS	104
6.1	INTRODUCTION	104
6.2	CONCLUSIONS	104
6.3	RECOMMENDATIONS	107
6.4	LIMITATIONS OF THE RESEARCH	108
6.5	SUGGESTIONS FOR FUTURE RESEARCH	109
7.	REFERENCES	111
8.	APPENDIX A – LITERATURE REVIEW	117
9.	APPENDIX B – PARTICIPANT INFORMATION	124
10.	APPENDIX C – INTERVIEW QUESTIONS	126
11.	APPENDIX D – PARTICIPANT CONSENT FORM	135

LIST OF TABLES

Reference	Table Name	Page
List of Tables	List of Tables	12
List of Figures	List of Figures	13
Table 0.1	Abbreviations and Acronyms	14
Table 1.8	Definition of Terms	24
Table 1.9	Chapter Outline	24
Table 4.3.1	Participants Summary	51
Table 4.5.1	Social Media Concerns (Non-Numerical)	55
Table 4.5.2	Social Media Concerns (Numerical)	55
Table 4.5.3	Social Media Highest Concerns (Numerical)	56
Table 4.5.4	Blockchain Challenges (Numerical)	56
Table 4.5.5	Blockchain Benefits (Numerical)	57
Table 4.5.6	Blockchain Limitations (Non-Numerical)	58
Table 4.5.7	Blockchain Limitations (Numerical)	59
Table 4.5.8	Blockchain Most Limitations (Numerical)	59
Table 4.6.1	Participants concerns around social media	60
Table 4.6.2	Blockchain concerns for social media (Non-Numerical)	61
Table 4.6.3	Blockchain benefits for social media (Non-Numerical)	62
Table 4.6.4	Blockchain limitations on Social Media (Non-Numerical)	63
Table 4.6.5	Most Concerning Blockchain Limitations (Non-Numerical)	64
Table 4.6.6	Consolidated View (Non-Numerical)	65

Table 4.7.1	Final Themes	66
Table 4.8.1	Research Sub Questions, Themes, Codes	67
Table 5.1	Research Question, Research Sub Questions, Themes	72
Table 5.2	Social Media Concerns (Numerical)	73

LIST OF FIGURES

Figure	Figure Name	Page
Figure 1	DataReportal. Overview of Global Social	16
Figure 2	DataReportal. World's most-User Social	17
Figure 4.3.1	Social Media Usage Breakdown	51
Figure 4.3.2	Blockchain Knowledge Breakdown	53
Figure 4.3.3	Hours Spent on Social Media a Day	53
Figure 4.6	Thematic Map	66

ABBREVIATIONS AND ACRONYMS

ABBREVIATION	DESCRIPTION
DLT	Distributed Ledger Technology
dApps	Decentralised Application that runs on blockchain
OSN	Online Social Networks is a service offering on the internet facilitating social interaction amongst its users
SMU	Social Media Users of the platform

Table 0.1 Abbreviations and Acronyms

1. INTRODUCTION

1.1 STATEMENT OF PURPOSE

The purpose of this study was to explore the privacy concerns of social media users on traditional social media platforms and assess if blockchain technology in its current form would address these concerns from a user's perspective.

1.2 BACKGROUND OF THE STUDY

Social networking platforms have grown extensively over the last decade and have become an integral part of our daily lives, interconnecting everyone in a single moment. Social media has transformed how we all communicate and interact with one another socially and professionally. Transformation has also influenced how we share information and experiences and how we digest news and events.

Datareportal (2022) reported total of 4.65 billion social media users worldwide as of April 2022, equating to 58.7% of the world's total population, or 9 out of 10 internet users.

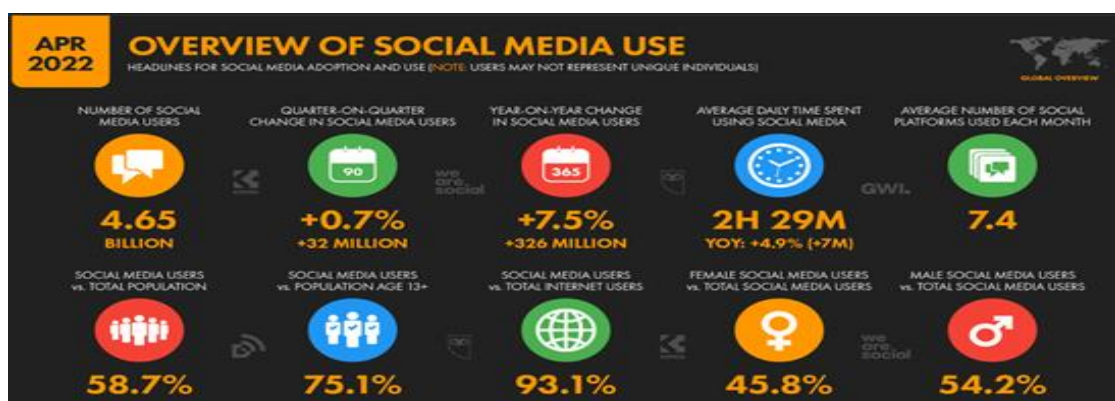


Figure 1. Data Reportal. Overview of Global Social Media Use April 2022, retrieved from: <https://datareportal.com/social-media-users#:~:text=Analysis%20from%20Kepios%20shows%20that,since%20this%20time%20last%20yea>

South Africa has 41.19 million internet users, which grew by 494,000 users between 2021 and 2022. As of January 2022, around 28 million of these internet users are social media users. (Datareportal. 2022)

According to Datareportal (2022), most social network users use social media platforms to keep in touch with family and friends, fill their spare time, read new stories, search for various content, or follow trends. Users use the platforms to share experiences, relationships, and views. With accessibility to social network platforms available on just about most internet-connected digital devices, like mobile phones, tablets, laptops, etc., it makes accessibility available to just about anyone. Some of the more common social media platforms are Facebook, Pinterest, Instagram, and LinkedIn.

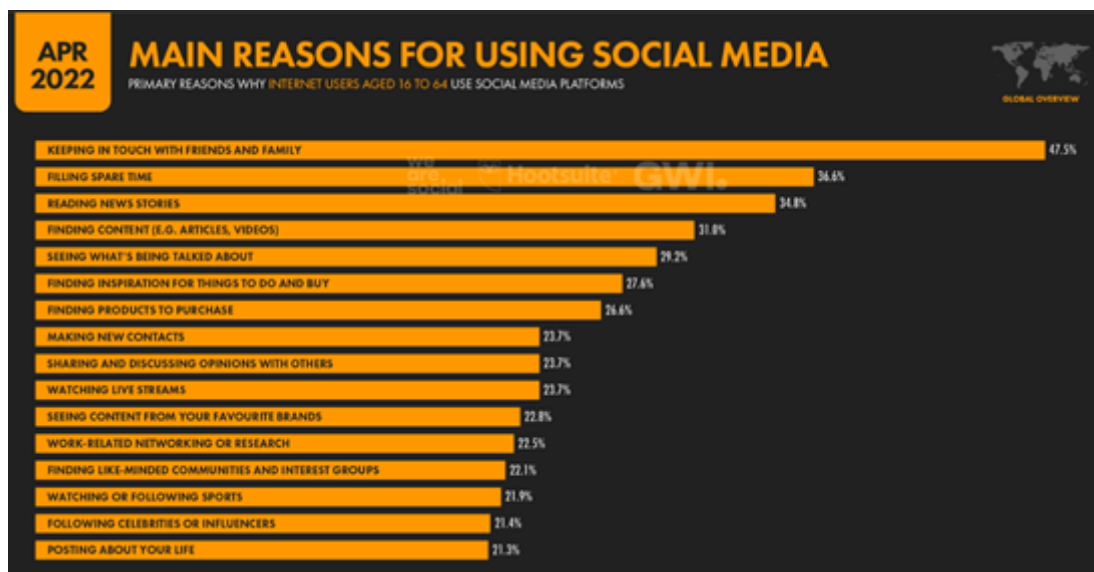


Figure 2 Data Reportal. World's most-User Social Media Platforms April 2022, retrieved from: <https://datareportal.com/social-media-users#:~:text=Analysis%20from%20Kepios%20shows%20that,since%20this%20time%20last%20yea>

These social media platforms have accumulated large amounts of users, sharing freely all forms of data in and amongst themselves, which opens the user base to data mining at unprecedented levels. An enormous community at these platforms' "mercy" allows these platforms to influence, sway and manipulate significant portions of the users in all manners, like advertising, platform rules, moderation of content, associations, etc.

Social network platforms operate primarily on trust, allowing users to share personal information within their peer group or community, with trust placed on the media to safeguard such data. Protecting data is generally outlined in the social network's terms and conditions and privacy policy. A trusting bond must be established and maintained between the users, the platform, and other users for the social network platform to operate effectively. If this trust relationship were to deteriorate, it would negatively impact and possibly be detrimental to the use of the forum.

Social media platform's economic models operate on selling advertising while offering a "free" service to their user base. The user's data is used, manipulated, and transformed to send targeted advertising and other forms of content (If You're Not Paying For It, You Become The Product) (Forbes Business Magazine, 2012), while the platform sells the data to its customers or sells access to specific users based on their profile, demographics, likes, experiences, wishes or even sentiment to the platform's authentic customer base (organisations and enterprises).

The convenience these platforms provide to the users comes with a trade-off, which is only now becoming apparent to the community, which is the potential exposure of personal content and the possible risk associated with having that information exposed. The privacy concerns around traditional social media platforms span multiple layers and sometimes must be more apparent to the user.

As cyber-attacks and breaches are on the rise, we have not only experienced these breaches not only on large enterprises and organisations but also on these platforms. Sometimes, these "hacks" are unknown, or the impact is unbeknown to the user. When they do come out, it impacts the trust relationship between the users and the platforms. It brings to question how security is being addressed from a platform perspective, data, engagement and interaction.

Data mining is a significant contributor to the concerns of the users. Large amounts of information are not only shared but transacted on these platforms, which can be collected and used in manners which is not visible or apparent to the users. Data mining can alter the user's experience on the platforms, like advertising, personalised content, or other uniquely targeted means.

Questions arise as to who owns the data ingested into these platforms and how much control or access the users are allowed or given on these platforms to manage the data relating to their profile.

The complexity of privacy settings on these platforms could be more intuitive and can lead to exposing the user even further to the outside. Users' knowledge of potential leaks, risks and etiquette regarding what one should or should not publicise and post on these platforms is still not entirely understood to the users who might lack the experience and education around security control and assume the media are addressing this issue on their behalf.

Lastly, there is a factor of ethical considerations on these platforms and the lack of firm regulation and controls which govern the overall operations of these platforms.

These grave concerns surrounding social media platforms carry substantial risks to the user community. There is a growing interest in exploring other means of social media platforms and mechanisms, focusing on security, privacy, control, data usage and ownership. Some of the alternatives feature blockchain technology as a possible solution, where its characteristics present a very appealing and viable argument for migrating these platforms.

1.3 RESEARCH PROBLEM

The research problem is multifaceted and comprises several vital elements.

The trust relationship between users and social networks has been shaken over the last few years, with events such as hacking, data breaches, social reengineering, phishing scams, and scandals like the Cambridge Analytica scandal coming to light and progressively worsening. (Hinds et al., 2020). Privacy concerns on social networks have spiked in recent years, with mounting pressure from users requesting more security, privacy, and control over their personal data and reassessing their relationships with social networks.

Three thousand eight hundred data breaches were reported to have occurred globally, compromising 4.1 billion data records in the first two quarters of 2019 (Hinds et al. 2020). Before the COVID-19 pandemic, there was a movement called "#DeleteFacebook", and "#Faceblock" (Hinds et al. 2020), where users were called to leave, delete, or abstain from social media networks due to privacy concerns. When the COVID-19 pandemic hit, social media users were reverting to social networks to establish connections with loved ones and friends (Venegas-Vera et al., 2020).

In Hinds et al. (2020) paper "It Would not Happen to Me", the researchers unpack the Cambridge Analytica scandal and discover that after the scandal, social media network "Facebook" users did not react as expected. Users showed very little concern; they did not change their privacy settings or delete their accounts, which led Hinds et al. (2020) and their team to believe that the users have a false understanding of the psychological manipulation they are prone to because of access to their data.

The researcher aims to explore privacy concerns on traditional social media platforms and answer whether migrating to a blockchain-based platform can offer users some

comfort around better user privacy and control. This study looks to explore the valuable insights of social media users, their sentiment around the privacy issues on traditional social media and their thoughts around the benefits and limitations of blockchain in its current form and its possible application on social media.

According to Aljohani et al. (2017), researching social media users and their use of privacy settings on respective platforms revealed that users disclose a large amount of personal information on these platforms, and the amount of personal information disclosed varies between platforms, gender, education, and age. The researchers also determined that many user's "friend requests" are automatically accepted because of a desire to be a part of a larger community and collect friend requests that one would never really know or meet. Social media users rarely harden up their privacy settings on the platform, thus leaving or assuming the privacy settings will be managed and hardened by the platforms themselves.

The traditional social media privacy concerns are well established and known by the user and the platforms. The primary concerns are data usage and ownership, user risks and exposure. Social media networks need to be faster to adopt such measures. Those social media networks that have implemented some measures speak to some privacy settings that are switched off by default or are unknown or misunderstood by the user base. These features provide the users who do use them with a false sense of security. According to Spinelli (2010), industry self-regulation could be more effective and give users the privacy protection they deserve. A rapid evolution of privacy laws to cater to social networks within cyberspace is needed.

Blockchain technology is believed to be the answer by many, including Jayson Tan (2021), founder of Torum (the world's first social media platform designed to connect cryptocurrency users), to address social network privacy concerns. This is now called "Social FI" (social media on the blockchain combined with finance).

Blockchain promises to address social media privacy concerns by eliminating data scams, uninformed algorithm changes, and unnecessary content censorship (Nasdaq, 2021), coupled with decentralised management, ownership by the community, and the introduction of tokenisation. (The process of converting an asset or ownership rights to a unique unit.) Nasdaq (2021).

Blockchain technology has limitations and concerns, including a lack of awareness, limited technical talent, immutability, key management, scalability, and the consensus mechanism. (Javapoint, 2022), which is somewhat hampering its early adoption into the mainstream. Other limitations are around usability and, compatibility and integration with existing platforms.

Grover et al. (2019) defined blockchain as having penetrated all industries, but implementation of blockchain technology within the industry is still in its infancy. Blockchain communities have been working hard to solve blockchain limitations, with various complex solutions, frameworks, and models being proposed to address each concern in several published papers.

The user adoption, understanding and acceptance of blockchain technology is still a challenge, and this has restricted the willingness of the community to push for a migration to blockchain-based social media platforms. The technical aspect of migrating these platforms poses a severe challenge, and the feasibility of this move needs to be economically viable for these platforms, or the pressure from the community needs to be at such a level that these platforms are forced to migrate, but this has yet to transpire.

The regulations around social media platforms and blockchain technology are still evolving and need to consider ethical considerations, which also comprise legal considerations not only on the traditional platforms but also on blockchain-based

platforms. Investing in this platform currently, as the rules are still being defined, is risky despite the possible benefits of such a transition.

The user community are awakening to the understanding that the responsibility is shared between the platforms and users, and both share the burden, responsibility and accountability for any risk brought about in and around the platform. Users' expectations concerning control and ownership may not align with what blockchain can offer. They may be too much responsibility for the user to bear, and they might settle for a similar model that the traditional social media platforms offer.

Users continue using various social media networks despite pressure for improved privacy and security. This results from a need for an immediate alternative to socially interact online in a way that social media networks facilitate.

Ultimately, this research problem outlines an intertwined connection between existing and new technology, current and potential concerns and risks. It exposes the desires versus the needs of users on these platforms. The researcher seeks to provide insights for users, researchers, social media platforms and all those interrelated around this evolving landscape and the need for greater security.

Are the social media users' privacy and security concerns still valid, and will migrating to the blockchain add any additional value to the users or create additional concerns around privacy?

1.4 RESEARCH OBJECTIVES

The primary objective of this research paper was to explore whether blockchain technology can address some of the online privacy concerns on some of the popular traditional social media platforms from a user's perspective.

From the objective mentioned above, the following sub-objectives emerged:

- Sub-Objective 1: identify and validate the shortcomings of online social media privacy.
- Sub-Objective 2: Explore the benefits of blockchain in relation to the identified shortcomings.
- Sub-Objective 3: Explore potential blockchain challenges or concerns in relation to online privacy.

1.5 RATIONALE

According to Droesch (2019), in his research focused on the Cambridge Analytica scandal relating to privacy, he believed at the time that users were knowingly and happily sacrificing privacy for convenience, but his research showed a shift in user behaviour patterns where users were no longer happy to sacrifice privacy for convenience.

The movement before the COVID-19 pandemic around users threatening to leave social media due to privacy concerns has subsided, and because of the COVID-19 pandemic, usage of social media platforms has drastically increased. Datareportal (2022). This is because the users needed to establish and maintain relationships during the COVID-19 pandemic and the implemented lockdowns.

The current state of privacy concerns relating to social media is constantly in flux. As we shift towards a more blockchain-based platform, we need to realign and re-evaluate if those concerns on traditional social media platforms are still valid in their current form. Will the blockchain's benefits and characteristics address them, or will blockchain reintroduce new privacy concerns that have not been explored in their entirety?

This study is significant as several projects, research projects, and initiatives are underway, looking at new or enhanced blockchain frameworks, encryption models, and algorithms to address some of the blockchain's shortfalls and limitations. This research established a revised list of concerns about traditional and blockchain social media platforms and their relationship to privacy from a user's perspective and understanding.

1.6 DELIMITATIONS OF THE STUDY

- The study was based on privacy concerns raised by social media users, irrespective of where they were based.
- The study was based on the current known benefits of blockchain relating to privacy.
- The study was based on the current limitations of blockchain technology relating to privacy.
- The study compared the user's privacy concerns against the characteristics of the blockchain to see where each concern could be addressed.
- The study compared the user's privacy concerns against the proposed solutions to address blockchain limitations to see if they addressed the privacy concerns of social media users.

1.7 ASSUMPTIONS

The following assumptions were made regarding this study:

1. Privacy concerns vary substantially based on demographic variables like age, race, and religion.

2. Social media experience and knowledge, use of various platforms, and familiarity with privacy features or functionality might have varied substantially based on demographic variables like age, race, and religion.
3. Not all social media user participants were familiar with blockchain technology and thus required further explanation to gain a better understanding before questioning could have taken place.
4. As blockchain is mainly theoretical and has yet to become mainstream, most participants could not draw from experience. Thus, questions were based on theoretical knowledge and understanding of what they had heard, read, or understood.

1.8 DEFINITION OF TERMS

Terms	Definitions
Blockchain	A decentralised distributed ledger technology in a peer-to-peer architecture operating on a consensus mechanism
Social Media	An online platform used by the users to establish and maintain relationships and social networks with other users or networks who share similar interests or experiences.
Privacy	An individual's right to own, be aware of and have a say in the use of his private data and information in relation to other parties

Table 1.8 Definition of Terms

1.9 CHAPTER OUTLINE

Item	Title	Description
Chapter 1	Overview	Purpose of the study, context, research problem, objectives, the significance of the study
Chapter 2	Literature review & theoretical framework	Privacy concerns around social media, and how blockchain proposes to solve the concerns
Chapter 3	Research Methodology	Research methodology, research design, population, sampling, validity and reliability, data collection instruments, limitations, and ethical considerations
Chapter 4	Results	Results obtained from the survey
Chapter 5	Discussions and understanding of research results	
Chapter 6	Conclusion and recommendations	

Table 1.9 Chapter Outline

2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 INTRODUCTION

This chapter aims to review prior studies conducted on privacy concerns relating to social media and gain an understanding of blockchain technology and how it attempts to solve these concerns.

This chapter was arranged in the following sequence: The definitions section will review the definitions of the three keywords: blockchain, social media, and online privacy. The subsequent section will review past studies or literature reviews related to online privacy on social media, social media on blockchain, privacy concerns on social media, and how blockchain attempts to solve them. We examined communication management theory (CPM) and blockchain theory in the last section.

2.2 EXPANDED DEFINITION

2.2.1 BLOCKCHAIN

Blockchain, a distributed ledger technology (DLT) defined by Bernabe et al. (2019), provides an immutable, verifiable digital ledger in a decentralised model. This digital ledger allows for the movability of digital assets between ledgers in a decentralised manner while ensuring its creditability and validity, divorced of any centralised third-party entities during the transaction. Blockchain is enabling the self-sovereign identity (SSI) model to evolve due to some of its challenges. The SSI model would allow blockchain users to take anonymous control of their digital identity, including all personal data, transactions and other information on the blockchain.

The blockchain provides a peer-to-peer architecture that distributes and duplicates data, making it unassailable across the entire network. (Freni et al., 2020). Blockchain can be divided into permissioned blockchain, which is permission-based and allows access based on authorised access to the blockchain and works as consensus nodes, and permissionless blockchain, which is open to all. (Peng et al., 2020).

Sherman et al. (2018) defined blockchain as a "distributed ledger" where mutually distrustful remote parties can reach a consensus on the ledger's state via the use of nodes, which make up a system. The blockchain comprises several cryptographically linked blocks, forming an immutable ledger. Through various nodes in the network, the ledger can be appended. The blocks are managed by an access and control policy, which manages the various access levels on the blockchain. A consensus policy sets the valid and invalid block states and addresses misalignment or conflicts.

Sherman et al. (2018) expand on the blockchain by introducing the concept of a "smart contract. This smart contract allows for agreements between terms-based parties to be processed automatically and autonomously based on conditional statements defined in the contract.

Guidi (2021) referred to blockchain technology as one of the most promising and revolutionary technologies which can bring about significant disruption. Blockchain is predominantly a peer-to-peer (p2p) network consisting of consecutive blocks of transactions called chains. It is a record of transactions in a decentralised and distributed digital ledger. The network comprises several nodes that hold an exact copy of the ledger, with several characteristics: distributed digital ledger, decentralised architecture, consensus mechanism and mining, innovative contract platform, immutability, authentication ability, and lastly, distributed node computational functionality.

Guidi (2021) identifies four categories of blockchain: public, permissionless and accessible to all (trustless); private, which by design is a closed network system managed and controlled by a group, which allows and denies access to the specified blockchain. Hybrid, a combination of private and public, shares some characteristics with both. Lastly, a consortium blockchain, more of a federated chain, shares similar traits with a hybrid blockchain but is entirely private regarding access. It is managed by a consortium and is considered a permissioned blockchain.

Although blockchain technology promises to be revolutionary and address a lot of digital problems at hand, it has been slow to adopt and expand, mainly due to its complexity, usability, the capital requirements to establish a network, skilled human resource constraints, and last, blockchain is not without limitations or disadvantages, and there is an aweigh up decision which hast to be taken against its characteristics which arguably might require far more initial effort and finances to get off the ground.

Many frameworks have been proposed to address particular use cases, enhance specific characteristics, or even address some limitations. These will be touched on briefly in the paper, but a dynamic ecosystem still has yet to settle down and define a baseline.

2.2.2 SOCIAL MEDIA

Tokyo Online Media Entertainment first used the phrase "social media" in 1994, relating to their application "Matisse". It has become a platform where individuals, businesses, and users can interact interactively and in real time. (Aichner et al. 2020). Various social media platforms exist, providing anonymous and non-anonymous interaction, the opportunity to be a part of a community or social group, and the ability to share and create content. (Murimi. 2019). Social Media are online platforms that facilitate users to engage, create, share, communicate, and even recently interact via virtual reality. Their use is extensive and varied. Historically, it was a place to

communicate and share ideas, but it has become far more than that; it is about networking, socialising, and keeping current, and some have even made careers out of this.

Social media describes many different platforms, including blogs, social networks, forums, photo-sharing sites, video sharing, social gaming, and virtual worlds. The diverse platforms touch on most aspects of online interaction. (Aichner et al. 2020). Social media has become an integral part of our daily lives. We utilise these platforms to satisfy our social needs and desires, share personal information, thoughts, photos, or experiences with the community, and source information. It is becoming one of the most common and dominant ways humans communicate. (Guidi. 2021).

Freni et al. (2020) explain that a social media platform's purpose is ultimately to foster connections between users of the platform and to connect individuals who share similar ideas and thoughts. The major platforms are Facebook, Instagram, Twitter, LinkedIn, Pinterest, and Snapchat, to name a few. Social Media platforms have and are still transforming how we engage with one another. It is no longer based on text; we have voice, video, and virtual reality. Businesses depend primarily on social media to communicate and interact with their market.

Social Media also has flaws; some bad actors use the platforms for malicious and devious intent, from spreading fake news to stalking and even hacking and theft, to name a few. Social media organisations have evolved substantially in a concise space into data ingestion-type organisations that hold massive amounts of personal information. Concerns around data management, control and ownership are an ever-growing concern. As we progress into the future, these privacy concerns will keep growing, calls for enhanced security will be enforced, and the risk of being on these platforms will increase as well as we introduce virtual and augmented reality and artificial intelligence into our social media platforms.

However, the future is not all doom and gloom; more innovative ways of managing content are being developed, like ephemeral content, which is short-lived, or blockchain integration to leverage off the security characteristics it has to offer, and even increased regulation is being introduced to the estate. Globalisation will continue to expand with the assistance of social media platforms, bringing diverse cultures and different perspectives closer together and possibly uniting the world.

2.2.3 ONLINE PRIVACY

Haro-Olmo et al. (2020) define privacy as "the right of the individual to know how his or her data will be treated to achieve the purpose for which it was collected, especially in its relationship with third parties". Privacy can also be applied to online data, not only those that one knowingly provides but also those that third parties unknowingly source. Online privacy is securing sensitive and private data while ensuring that the service provided to the users is not impacted by the security measures implemented. (Zhang et al., 2021).

Haro-Olmo et al.'s (2020) research identified a strong relationship between anonymization and privacy in blockchain. Zhang et al. (2019) classified the requirements for privacy within a blockchain as needing the following: integrity of the transactions; consistency of the ledger across institutions; availability of the system and data; prevention of double spending; confidentiality of transactions; anonymity of the users identity; and lastly, un-like ability of transactions.

Strahilevitz (2009) argues that our privacy expectations are more defined by whom and with whom we share data. If information is shared with a larger community or a few individuals, does that mean the data is private? Even if information is shared by 1 or 2 individuals, by the sheer nature of human interaction, it is not expected that that information will be relayed to other individuals, possibly not in its original form or intention.

Whoever is connected to the internet is, in theory, online. Placing information, irrespective of what it is, on social media platforms, which is a public community, already places that data out of one's control.

Strahilevitz (2009) drew a close relationship between privacy and control. (Petronio, 2002) defined control as more a precondition of privacy. With control, we can manage privacy, but the task becomes more challenging without it. Strahilevitz (2009) stated that most privacy theories could be split between privacy as control and privacy with control. Tavani (2007) thought that privacy and control serve two different functions and thus should see as separate. However, when applying this to social media platforms, it becomes evident that it takes more work to separate the 2, especially as platforms pass some of the burdens of managing one's account and, thus, privacy to the user.

Nissenbaum (2010) stated, "We have a right to privacy, but it is neither a right to control personal information nor a right to restrict access to this information". Privacy should instead be repackaged as value, and that value is quantifiable based on one's perception.

2.3 ANALYTICAL FRAMEWORK

2.3.1 COMMUNICATION PRIVACY MANAGEMENT THEORY (CPM)

The Communication Privacy Management Theory (CPM), called Communication Boundary Management, is grounded in empirical research. Initially developed by Sandra Petronio in 1991, the theory looks at humans' process when deciding what private, sensitive, and personal information to expose to the public domain (social and online) or maintain private.

Petronia (1991) proposed that individuals establish privacy boundaries with various parties that govern their willingness to share limits. The boundaries are based on the perceived cost and benefit of exposing or keeping the information private. A rule-based system ensures that accessibility is maintained and is in line with the individuals' limits. These rule-based systems are, in theory, "negotiated" between the two parties. Once the individual has agreed to share information, the information becomes shared between both parties. This co-ownership can potentially expose the individual and carries a level of risk. This risk is constantly weighted between cost and benefit by the individual, which then assists in redefining the boundary, ultimately defining how much, when, to whom, and how the information is guarded or exposed.

Petronia (1991) defined five core principles of communication management theory:

1. Private Information: People believe they own and have a right to control their private information.
2. Private Boundaries: People control their private information using personal privacy rules.
3. Control and Ownership: When others are told about or given access to a person's private information, they become co-owners of that information.
4. Rule-Based Management: Co-owners of private information need to negotiate mutually agreeable privacy rules.
5. Privacy Management: When co-owners of private information don't effectively negotiate and follow mutually held privacy rules, boundary turbulence is the likely result.

The Communication Management Theory defines three rules on which it is dependent (Petronia, 1991):

1. People control their privacy boundaries, which include "revealing or concealing personally or collectively".

2. For information that is shared with two or more people, boundaries are coordinated.
3. Once disclosure occurs, groups create collective management that must be coordinated.

There have been several additions to the theory by other researchers, each further elaborating on various definitions and applications of the theory. The underlying core is that the theory is rule-based ("the need to act on principles rather than consequences that cannot necessarily be predicted") and not law-based ("prescribe a set of rules on how to behave with predicted consequences") and establishes a baseline for accessibility to information and privacy thereof by the individual.

2.3.2 THEORIES OF PRIVACY

In his research paper on social network theory, Strahilevitz (2009) presents a methodology designed to aid legal professionals in identifying privacy breaches within social networks. His empirical insights shed light on the dynamics of sharing information within social communities.

Strahilevitz (2009) asserts that information shared among close-knit community members may not remain private in the long term, as it tends to become known to the broader community over time. Moreover, he emphasizes the role of trust and mutual understanding in such relationships. When individuals share private information with those they are familiar with, there is an inherent expectation of trust and confidentiality. Breaching this trust can lead to severed relationships. Conversely, individuals rely on their anonymity when sharing information with unknown individuals, assuming that the connection will not circle back to them, thus minimizing the perceived risk. This distinction influences how people engage on social networks and the extent to which they expose themselves based on the potential repercussions of information dissemination.

Strahilevitz (2009) identifies three key ways in which these interactions influence individual behaviour based on one's familiarity with the recipient:

- **Tone Setting:** The relationship between the sender and the recipient influences how private information is conveyed. The recipient may interpret and convey the information based on the dynamics of their relationship.
- **Privacy Intimacy:** The level of intimacy within a relationship serves as a determinant of whether information is considered private. More intimate information is likely perceived as private and not meant for sharing.
- **Risk Assessment:** Individuals assess the potential risks associated with information exposure. They consider the likelihood of the information becoming public and its potential harm or negative impact on them.

Strahilevitz's (2009) research contributes to our understanding of how the dynamics of relationships and the nature of shared information influence the behaviour of individuals within social networks, particularly in terms of privacy and the expectations of confidentiality.

2.3.3 THE EVOLUTION OF BLOCKCHAIN

To understand the blockchain theory is to understand its history, what motivated the various contributors to evolve it to what it is today, and what drives their motivation to enhance it further?

David Lee Chaum initially proposed the blockchain concept in his 1982 doctoral dissertation titled "Systems Established, Maintained, and Trusted by Mutually Suspicious Groups. He proposed a protocol for the structure and foundation of blockchain, which he called a vault system. He describes a distributed system where mutually suspicious groups would build, maintain, and provide trust in the system. The system would be public yet provide private transactional computations, ensuring individual privacy. (Chaum. 1977)

Since then, blockchain has been evolving throughout the years, with many additions to the original framework. In 1991, Haber and Stornetta introduced cryptography into the blockchain theory, which prevented altering timestamps on the ledger and improved efficiency by including certificates. Satoshi Nakamoto's name is well known. He founded the cryptocurrency Bitcoin in 2008 when he introduced a method to timestamp blocks within the blockchain without requiring consent from the nodes on the network. Satoshi also introduced a new method for summing up new blocks on the chain, which was then placed on a public ledger called Bitcoin. (Petronio. 1991)

The blockchain theory is a peer-to-peer decentralised distributed ledger on a network that is publicly available, and its driving motivation is to provide for transactions in a trustful manner without third-party intervention and to solve the existing centralised systems in a decentralised manner. At its core, Blockchain needs to incorporate several defined characteristics to ensure security and privacy. Firstly, well-defined protocols for commitment are required to ensure that transactions are committed wholly and promptly to the blockchain. Consensus ensures all copies across the blockchain (chains) are updated and consistent; Security ensures every aspect of the chain is not compromised and tamper-proof; and privacy and authenticity remain intact and secured (Mohanta et al., 2019).

According to Mohanta et al. (2019), blockchain is still a very demanding research field and is ever-evolving and changing as new applications are found. It needs to be faster to adopt, complete to operate, expensive to deploy and has limited resources who understand the technology. Blockchain is here to stay, and despite its limitations and restrictions, it is a far better alternative than what we currently have. Its applications are far-reaching, potentially touching every one of our lives.

2.3.4 PRIOR STUDIES

This section reviews prior studies about how blockchain technology has the potential to influence social media by examining several papers addressing the blockchain, social media networks, and privacy.

I. **BLOCKCHAIN**

Chen et al. (2018) published a paper titled "Towards Trusted Social networks with blockchain technology" (2018), where they investigate how blockchain can address the spread of fake information and rumours on social networks utilising blockchain technology using virtual credits. Their study demonstrated a reduction in the spread of rumours utilising their model.

II. **BLOCKCHAIN AND SOCIAL MEDIA**

Freni et al. (2020), in their paper titled "Fixing social media with the Blockchain" (2020), investigated how the introduction of blockchain technology is reshaping social media. Their paper emphasised that blockchain is bringing the social media user back into the spotlight because of its benefits, including transparency, value redistribution, ownership awareness, decentralisation, decentralisation of data, and censorship resistance. The research also discusses how the tokenisation model within the blockchain will transform how value is perceived. The study states that on-chain and off-chain social media platforms have some cross-pollination characteristics, but it is still too early to see which characteristics will prevail and stay on.

Guidi (2021) has published several papers about blockchain and social media. "An Overview of Blockchain Social Media from a Technical Point of View" (2021) unpacks the current social media trend. It explores the two essential characteristics social media platforms should adopt on blockchain: scalability and transaction fees. Guidi (2021) ends by stating that the current blockchain model is not a good fit for social media but proposes some changes to Ethereum that might address the limitations and concerns.

Guidi (2020) published a paper, "When the Blockchain Meets Online Social Network," where she discusses the various mail and service features that some social media platforms on the blockchain offer and outlines some limitations like visibility and privacy

issues. Guidi (2021) ends by proposing some enhancements to the framework, focusing on placing the users at the centre of the platform as opposed to the content.

In her work titled "Managing Social Contents in Decentralised Online Social Networks: A Survey," she examines the results of a survey about the challenges online social platforms have on blockchain, like data management and availability, information diffusion, and privacy concerns. Guidi's (2021) findings reflect that blockchain is a better option for social media platforms, but having a decentralised decentralised network would require a different approach to managing data. It proposes some solutions to group management, e.g., third-party integration and mobile access, to name a few.

Li et al. (2019), in their research paper, performed an empirical analysis on a blockchain social media platform called Steemit. The analysis was about how the platform operated under a decentralised model and how its incentive crypto-reward system operated. It also assessed if the model was efficient and effective, as suggested. The research paper uncovered that although the reward system was operating as expected, a large portion of the rewards (16%) were being moved to what seemed like bots (an autonomous program online that can interact with systems or users) on the network. Furthermore, the analysis of the decentralised network revealed that it was at a lower level than expected, potentially ruling out the DPOS (delegated proof of stake) consensus protocol for this type of blockchain use. The research ultimately exposed that even if a social media platform is on the blockchain, it is still susceptible to misuse.

Ciriello et al. (2018) published "The Paradoxical Effects of Blockchain Technology on Social Networking Practices." The paper examines social networking practices and the constraints around them by looking into a social media platform on blockchain called Steam. The authors identify captivity, abundance and scarcity, and peace and war as

the paradoxical effects of blockchain. The author proposes some possible solutions to address the paradoxical effects.

III. **BLOCKCHAIN AND ONLINE PRIVACY**

Jiang et al. (2019) published a paper in 2019 titled "A blockchain-based decentralised online social network", where they unpacked the security concerns around a centralised social media platform and proposed a decentralised model that took the best of current and traditional networks and merged them with the decentralised model. The researchers discussed how the decentralised model addressed the centralised model's concerns, especially privacy and trust concerns.

"Privacy preservation in permissionless blockchain: A survey" by Peng et al. (2020) analysed the various characteristics of permissionless blockchain and possible privacy threats. The findings expose that an adequate level of privacy is difficult to implement due to the nature of blockchain transparency and decentralised characteristics and further outline the potential threats if the privacy issues on the blockchain still need to be addressed.

"Blockchain from the perspective of privacy and anonymisation: A systematic literature review", published by Haro-Olmo et al. (2020), unpacked the relationship between privacy and anonymisation on the blockchain. The research exposed several limitations around blockchain use in terms of the ability to trace transactions on the blockchain, which exposed users' privacy, as well as the extensive computational network and power the blockchain required to operate, including the cost to run the network. The research also discussed the issue of immutability on the blockchain, which is one of the blockers of mass adoption. Lastly, the researchers proposed that global legislation should be investigated around privacy and anonymity on the blockchain.

IV. **BLOCKCHAIN, SOCIAL MEDIA & PRIVACY**

"Enhanced Security on Social Networks with IoT-Based Blockchain Hierarchical Structures with Markov Chain" was published by Moradi et al. (2022). This study investigates security concerns around privacy, confidentiality, data integrity, and confidentiality on social media networks. The authors then introduce a theoretical process called Markov, a new method of encryption that should assist in enhancing and securing the blockchain.

Zhang et al. (2020) proposed a privacy-preserving framework for the blockchain to be used on social media platforms that would look at securing sensitive data in their paper titled "A novel blockchain-based privacy-preserving framework for online social networks" in 2020. The research unpacked their proposed framework, which looks at a more secure, convenient, and efficient data sharing, retrieving, and accessing model coupled with smart contracts for a more reliable and confidential experience.

Chakravorty & Rong (2017) proposed a user-centric approach to social media platforms, allowing the users to own their own identity (identity management) on the blockchain, taking advantage of the characteristics of decentralisation, anonymity, traceability, and censorship. The researcher's framework utilised encryption keys and personal certificate authority management to ensure the privacy of the information on the platform. The researcher concluded that a user-centric blockchain framework on a social media platform would be a step closer to ensuring ownership, anonymity, tractability, and privacy.

2.4 CONCLUSION OF LITERATURE REVIEW

Blockchain technology, a decentralised ledger framework, with its anonymity and suitability characteristics, has academia and industry showing tremendous interest in

its potential application and use. So far, we seem to have only managed to scrape the surface of its application in cryptocurrency and financial, health care, legal, IOT, government, and power grip uses (Mohanta et al., 2019).

As revolutionary as it seems, this technology has several challenges that still need to be addressed before it becomes widely adopted. The literature reviews demonstrate that a large population is attempting to resolve these challenges, with several proposed frameworks, encryptions, and algorithms put forward, each looking at addressing one or more of the current limitations of blockchain.

When we focus on social media and its potential application on the blockchain, Guidi (2021) reminds us that a relook of the social media platform business models will be required with drastic changes, specifically looking at the revenue stream and compensation (reward) model. More important is to understand the concerns of the user base on traditional social media platforms and determine if their concerns are addressed in current blockchains or which features should be further developed before moving over to blockchain social networks.

The literature reviews highlight the persistent user data privacy concerns within traditional social media platforms and the potential for blockchain technology to play a prominent role in solving these concerns.

When examining the literature and publications, we understand why the user base has someone who lost the trust of the platforms because of their privacy concerns around social media platforms. These are well understood and articulated, specifically related to data breaches, unauthorised data sharing, unethical data handling practices, and data misuse.

Blockchain presents itself as a viable solution to address social media privacy concerns. The reviews highlight the possibilities and endless potential of social media

networks on blockchain technology, including revolutionising the commercialisation and economics of social media platforms. The architecture and frameworks presented in the literature review present various models which can be adapted and applied to a different use cases. These frameworks are not limited to those specified reviews. However, they are in abundance and are in a constant state of evolution and adaptability as blockchain technology evolves and adoption becomes mainstream.

The fundamental core features of blockchain, including enhanced cryptographic security, heightened transparency, and the decentralised ledger model, can provide almost immediate improvement and address the social media user's privacy concerns, providing the known hurdles are mitigated or reduced.

3. RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

The researcher expected to extract in-depth data about the research problem due to its exploratory nature and thus opted to use an empirical approach in the qualitative research study. As blockchain technology is still in its infant stages when it comes to adoption into social media, the practicality and application of the combination of blockchain with social media platforms is minimal. However, there is some theoretical research available on the topic.

The approach leans to be flexible and adaptable, intending to research the problem, specifically where minimal knowledge or information is available. This approach assists in gaining a more in-depth understanding of the topic by using interviews, which allows for the gathering of richer descriptive data and sentiment while allowing the participants to express their views openly.

The empirical approach allows the researcher to explore complex topics and deep dive into the meaning whilst using tools and methods like content analysis, coding and thematic analysis to make sense of the information gathered. It also provides a blend of theoretical and observations when reviewing the data. In the empirical approach, it is vital that other researchers can replicate the research. This was essential during the research as social media on blockchain is a relatively new topic with limited precedent set.

The research used the methodological framework, as outlined by the empirical approach, to collect and analyse data from the participants off semi-structured questions to understand the participant's experiences and sentiments in answering the research question. This ensured richer data was collected by leveraging the

participant's experiences, understanding and nuances and gaining a deeper understanding of what influences the user's perception of the research problem. It allowed for the research problem to evolve during the study and adapt to the themes that emerged.

The researcher not only aims to provide insights into the participant's data but also to be able to interpret the data into meaningful themes and trends. The selection of the qualitative empirical research design compliments the research problem. It affirms that it is a suitable choice because it would be exploratory and vital to understand the participants' viewpoints.

3.2 RESEARCH METHOD

Qualitative empirical research is underpinned by a synthesis of philosophical foundations that guide the research methodology, data collection, participant selection, and approach to gain a deeper understanding and interpretation of participant feedback and input. This approach inherently lends itself to an exploratory framework, employing a question-based model, open discussions, and interviews to extract profound insights into participants' motivations, experiences, and sentiments on the topic under investigation.

Several philosophical foundations served as cornerstones for this research study:

- Made use of constructivism, the research delved into participants' experiences and perceptions, recognizing their role in shaping understanding, interpretations, and worldviews concerning the research topic.
- The study leveraged phenomenology to explore the emotional and experiential aspects of participants' journeys, formulating comprehensive responses to research questions.

- Pragmatism was employed to tap into participants' practical problem-solving abilities when confronted with the challenges associated with social media and the considerations surrounding adopting blockchain technology.
- Naturalism was utilized to ground participants' responses in real-world experiences and interactions, enriching the context of their answers.
- Inductive reasoning guided the drawing conclusions based on participant interactions, which gradually evolved into thematic insights.
- The critical theory lens was employed to unpack power dynamics, challenges, social interactions, and inequalities, comprehensively examining the research context.

This research aimed not to offer definitive answers to the research problem but to contribute additional insights and perspectives that can inform future research endeavours in this evolving and relatively new domain. While privacy concerns in social media networks have been a longstanding issue, integrating social media networks with blockchain technology is a recent development. Limited information was available regarding whether blockchain addresses current social media privacy concerns from the users' perspective.

3.3 POPULATION AND SAMPLE

3.3.1 POPULATION

The researcher used his global professional network of technology-savvy white-collar workers for this research.

3.3.2 SAMPLE AND SAMPLING METHOD

In this study, the sample was sourced from the researcher's professional network, mainly LinkedIn and WhatsApp, where participants were white-collar workers who were technology savvy and active social media users.

Since blockchain technology is new and still unknown to the broader population, the researcher provided links to YouTube videos to be viewed before the interview by the participants to provide an overview of blockchain.

- Blockchain in 7 Minutes: <https://www.youtube.com/watch?v=yubzJw0uiE4>
- Blockchains: How can they be used:
https://www.youtube.com/watch?v=aQWfINQuP_o
- Why are social media platforms exploring blockchain technology?
<https://www.youtube.com/watch?v=7zvphwuyphk>

Braun & Clarke (2013) recommended that qualitative studies require a minimum sample size of at least 12 to reach data saturation. A sample of 13 participants was then deemed sufficient. The number of participants selected was primarily attributed to the research method used. The time required for interviews with each participant. The availability of the participants. The time is required to extract and analyse the data captured from the participants and formulate the research paper in the allocated time.

The sampling methods used were convenience sampling, purposive sampling, and snowball sampling.

The researcher belongs to several WhatsApp crypto groups where the community discuss news items relating to crypto and blockchain. The researcher took comfort that individuals in the WhatsApp groups would have good experience with social media

platforms and a good understanding of blockchain technology. This provided the researcher with a potential convenient population to source sample participants.

The researcher used purposive sampling by sourcing participants from his professional network, using mainly LinkedIn, where he had professional relationships or associations. It ensured that the participants were from a white-collar office environment, with some level of education, specifically around technology, and could quickly understand the basics of blockchain technology. Sourcing participants from the researcher's LinkedIn profile provided some level of comfort that the participant had experience with social media. The combination of both ensured that a richer and more in-depth discussion around the research questions could be had with the participants.

The researcher used snowball sampling by requesting the participants acquired from the purposive and convenient sampling for further recommendations and referrals of additional participants into the research. The researcher assumed that having the participants undergo the research questions and interview, the participants would be able to refer worthy referrals who could provide adequate input into the research.

3.4 DATA COLLECTION METHOD AND PROCEDURES

Due to the expected globally dispersed location of the potential participants, it was anticipated that virtually held interviews would take place via MS Teams, allowing recording and transcription.

The researcher contacted Identified participants and asked if they would be willing to participate in the research around blockchain, privacy, and social media. A brief overview of the research was provided to the participant before requesting their answer. The consent form was sent to them if the participant was willing to participate.

Once the consent form was received back and signed by the participant or returned by e-mail with consent (due to a lack of printer facilities), the interviewer scheduled a session with those participants in advance by their availability, accompanied by some guiding questions that the participants could review prior to the interview to ensure they were comfortable answering them.

A pilot interview with a selected participant took place prior to commencing with the rest of the participants. It was to ensure any gaps or challenges were picked up and addressed before proceeding with the rest of the interviews.

The interview lasted up to an hour with each participant. After the interview, the interviewer asked the participant if he or she was willing to recommend another participant within their network who is an active social media user, has some knowledge of blockchain, and is technology savvy.

The interview was semi-structured, with open-ended questions for the participants that allowed for further discussions or explanations around the topic (blockchain, privacy, and social media). The interview was recorded, transcribed, and converted to data.

3.5 THE RESEARCH INSTRUMENT

The interview questions were semi-structured to cater for open discussion and, if required, further explanation or elaboration. The questions were based on the three research objectives as outlined in Section 1.4.

Sub-Objective 1: identify and validate the online social media privacy shortcomings:

Question 1: Traditional online social media has several privacy concerns. Some of the concerns are listed below. Rate each of the items below in order of concern to you on social media platforms and elaborate why?

Question 2: Out of the top 3 highest concerns you mentioned above, do you do anything from your end to prevent, address, or mitigate that risk, and if so, what do you do?

Sub-Objective 2: Explore the benefits of blockchain in relation to the identified shortcomings.

Question 3: Blockchain technology comes with several benefits, as defined below. Are there any characteristics below that you view as a potential challenge or concern for a social media user like yourself, and if so, why?

1. Distributed Ledger: Information is spread across various nodes on the blockchain network, ensuring accessibility and availability while making it hard for hackers to gain access to the data.
2. Enhanced Security: Records are immutable, so they cannot be altered, and they are encrypted end-to-end preventing unauthorized activity and fraud. Data can be anonymized, thus removing any personal data and implementing permission-based access.
3. Greater Transparency: visibility across the entire network is the same irrespective of which node you are viewing the data from, provided you have access to the data. The data is time and date stamped, and a full history of the transaction is available.
4. Instant Traceability: an audit trail of a record is stored, linked, and available to the record on the blockchain at every node.
5. Increased efficiency and speed by providing a digital platform for storing workflow processes, documentation, full transactional details, and records.

Ensuring the records are available on time, anywhere on the blockchain, thus eliminating duplication.

6. Automation: with the use of smart contracts on the blockchain, workflows and transactions can be automated with pre-specified conditions defined before the next steps are taken, eliminating the requirement for 3rd party validators or human intervention.
7. Other: Participant to share details

Question 4: Looking at the blockchain characteristics (benefits) above, which characteristics do you think would benefit you the most as a social media user, and why?

Sub-Objective 3: Explore potential blockchain challenges in relation to online privacy.

Question 5: Blockchain technology comes with several limitations, as defined below. Some of the limitations are listed below. Rate each of the items below in order of concern to you on social media platforms and elaborate why.

Use the following rating as a guide: (1) unimportant; (2) slightly important; (3) moderately important; (4) important; (5) very important

1. lack of awareness: the application of blockchain is still being determined and has not yet gone mainstream.
2. Limited technical talent—a lack of adequate developers might hinder secured code and secured applications.
3. immutable: inability to modify any records, including deleted records
4. Key management: security of one's private keys for the blockchain
5. Scalability: the potential to contribute to poor performance due to the consensus mechanism requiring each node to verify each transaction Once

the blockchain begins to grow, more nodes are added, which will further prolong the time taken to reach consensus.

6. consensus mechanism: time taken to reach consensus by all nodes on the blockchain
7. Other: Participant to share details

Question 6: From the blockchain limitations above or others Are there any that would be so concerning that you would think twice about migrating off the traditional social media network to a blockchain social media network?

3.6 DATA ANALYSIS STRATEGIES AND INTERPRETATION

“A thematic analysis approach” by Maguire & Delahunt (2017) was used to analyse the results. The following steps were followed.

- a. Becoming familiar with the data
- b. Generate initial codes
- c. Search for themes
- d. Review themes
- e. Define themes
- f. Write-up

Once the interview concluded, the interviewer transcribed, classified and then coded using descriptive coding.

Becoming familiar with the following rating as a guide: (1) unimportant; (2) slightly important; (3) moderately important; (4) important; (5) very important

1. Data Mining: Use of one's private information for advertising, sales, marketing, or other purposes of which one is not aware or consents
2. Phishing Attack: Attempt to gain access to one's account, personal information, banking details, etc. via an illegitimate source imitating a legitimate source
3. Botnet Attack: social media automated accounts used to post and follow social accounts for malicious use
4. Malware sharing installing or using compromised software to infiltrate one's account or device
5. Account hacking or impersonation: use the trust one has built up with the followers to further spread their attack.
6. Stalking and harassment: vulnerable to physical or cyber-attacks via sharing personal or private information
7. Other: Participant to share details

3.7 CREDIBILITY, TRUSTWORTHINESS AND DEPENDABILITY

Quality assurance specifically in qualitative exploratory empirical research is vital to ensure creditability, trustworthiness and dependability. By following a systematic approach one can ensure that quality assurance is applied correctly.

The steps to following or a systematic quality assurance approach for qualitative empirical research are as follows:

- Select a clear methodology and research design, this includes defining how data will be collected, stored and retrieved, and the motivation for using the methodology
- Ensure your records are safe, and in tacked referencing all your encounters, video or audio recordings, consent forms, emails and other interactions. It helps

to obtain the participants sign off on the data once extracted pertaining to his interview for verification.

- Leverage off various tools and techniques to four eye confirm your work to ensure non bias or complete transparency and no influence.
- Coding, categorising, identifying themes all should be well documented with an audit trail so that you can unpack how you reached a certain conclusion.
- Correctly reference and cite the participants in your research to ensure no harm done and credit is given where its due.
- Ensure the ethical guidelines are adhered to, and when in doubt ask for permission.
- Ongoing supervision of the research and researcher by the supervisor should be conducted until the research had concluded.
- Use the use of interview guides would ensure data collection was homogenous and consistent throughout the research.

By following these steps one can be confident that the research paper will carry credibility and trustworthiness.

3.8 ETHICAL CONSIDERATIONS

Ethical considerations of extremely important under qualitative empirical research, especially when conducting interviews with participants. The researcher needs to factor in the participants, before, during and after the interview to ensure the research and the researcher has upheld the ethical principles, which ensures the rights of the participants, and their privacy is maintained.

The following considerations were considered for this research

- **Transparency:** The purpose of the study was clearly explained to the participants prior to commencing the interview (as provided in a cover letter on the interview invite). This included the research methodology which would be used, the interview would be conducted, and how the data would be collected, stored, used and disposed of (intent of the data). Contact details in the event further queries or concerns were raised.
- **Informed Consent:** The participant was informed that they had the right to withdraw from the study at any time. Consent was requested from the participant prior to commencing the interview to allow the interview to be recorded and the data to be used for the purpose of the research as defined above.
- **Do no harm:** The researcher took steps to minimize any potential risk or harm which might befall the participant. This spanned across physical, emotional or psychological, specifically whilst conducting the interview with the participant. Ensuring the virtual space and manner of which the interview was conducted was as required.
- **Ethical Clearance:** The researcher waited until the ethical clearance had been provided by the university before commencing with data collection.
- **Plagiarism:** A plagiarism declaration form was signed in accordance with WITS ethics requirements.
- **Fair Treatment:** The interview was conducted in a systematic manner to ensure consistent data collection across all participants was gathered with fairness and without discrimination. The participants were provided with all the time required to understand the question and provide their feedback without pressure.
- **Privacy:** The right to privacy was upheld. The researcher avoided asking intrusive questions which might expose or make the participant feel uncomfortable, including ensuring the location where the interview and the participant held the virtual interview as private, and the participant was comfortable to proceed.
- **Respect for Autonomy:** The participants were informed that their identity will remain anonymous, and a number will be used, but responses to the interview

questions, demographic details, and job title will be reflected in the research. Also, that they were free to express their views freely without fear.

- **Beneficence:** The researcher attempted to limit his interaction with the participant during questioning to reduce bias, coaching and allow the participant all the time required to fully express their views, and to ensure the participant would somewhat benefit from the interview in allowing the participant to proceed without interruption, or respond with further elaboration or clarification as and when requested or needed.
- **Debriefing:** Verification and confirmation of the accuracy and completeness of the data collected was verified with the participant, during and after the interview. Recordings were performed and transcribed by MSTeams and payback verification and correction by the researcher for each recording. The participants provided with the opportunity to ask additional questions about the interview and questions to ensure they had an understanding and were able to answer the questions to the best of their ability.
- **Data Handling:** All records relating to the research including any communication with the participant, signed consent forms, recordings and transcripts have been filed and stored safely.

By the researcher sticking to the above ethical considerations, the researcher is confident that the rights of the participant and ethical confidence was upheld.

3.9 RESEARCH METHODOLOGY SUMMARY

A summary of the research methodology designed is as follows:

- **Research design and method:** empirical qualitative technique
- **Population and sampling:** convenient, purposive, and snowball sampling
- **Data collection:** interviews

- Data analysis: thematic analysis process
- Validity and reliability: semi-structured interview questions and data analysis

4. PRESENTATION OF FINDINGS

4.1 INTRODUCTION

Feedback from the qualitative research conducted is presented in this section. A brief outline of the participants is provided, and thereafter, a review using the thematic qualitative approach of the participant's responses grouped and categorised into identified themes is performed.

4.2 SOCIAL MEDIA PLATFORMS

A social media platform is an interactive online platform that allows for human interaction, distribution, and creation of content, including images, audio, videos, thoughts, commentary, and other means of human expression. The mechanism and scope of this expression are defined by the various platforms in use.

Participants were asked to select which social media platforms they were users of. The following platforms were listed:

- WhatsApp is an instant messaging service for text, images, voice, and videos that has expanded into VoIP services, community groups, and stores.
- Instagram is a photo and video sharing service that caters to commentary within selective groups.
- Pinterest is a platform allowing you to pin pictures relating to a certain topic or aspect of your personal life or business.
- Facebook is a content sharing platform that allows for photos, updates, general news, and interactions to take place on its platform, allowing families and friends to keep in touch and a marketing platform for organizations.

- LinkedIn: A platform catered largely for the professional engagements of social networking, from individual to organizational profiling and interaction
- Other: This was to cater for other social media platforms that do not fall under the above five common platforms in use.
 - Twitter is a platform allowing you to share quick bits of information and photos, build up a following, and see what's trending in various categories.
 - Snapchat is a multimedia instant messaging platform that allows messages and images to be featured for only a limited amount of time.
 - TikTok is a platform allowing for short video clips ranging from a few seconds that are shared with the community, normally related to satire.
 - Rumble is a platform catering to online video content.

4.3 PARTICIPANTS SUMMARY

Thirteen participants were interviewed per the research methodology outlined in Chapter 3. All interviews were conducted over MS Teams. This section reflects background information on the 13 participants. As a result of the agreed confidentiality, the participants are referred to as Participant 1, Participant 2, and Participant X. Only information relevant to the study was captured.

The table below reflects the summary of participant information collected in terms of the social media platforms most frequented by each participant, hours spent on social media, and knowledge of blockchain technology. Note that all participants were social media users, with varying degrees of platform types used and time spent on each platform. Knowledge of blockchain is subjective, based on the participant's assessment of their knowledge and understanding.

Participant	WhatsApp	Instagram	Pinterest	Facebook	LinkedIn	Other	Hours	Knowledge of Blockchain
1	X			X		None	1 – 2	Non
2	X				X	None	1 – 2	Little
3	X	X	X	X	X	Twitter	2 - 4	Lots
4	X	X		X	X	Rumble	2 – 4	Average
5	X	X		X	X	None	4 – 8	Little
6	X	X		X	X	Twitter	2 – 4	Lots
7	X	X			X	None	0 – 1	Lots
8	X	X			X	TikTok	4 – 8	Little
9	X	X	X	X	X	None	1 – 2	Average
10	X	X			X	Twitter Snapchat	0-1	Lots
11	X			X	X	Twitter	2 – 4	Average
12	X	X	X	X	X	N/A	1 – 2	Average
13	X					TikTok	2 – 4	Little

Table 12.3.1 Participants Summary

All the participants are WhatsApp users and thus familiar with instant messaging of various content on an individual and group basis, with familiarity with some limited security features within WhatsApp. Many are Instagram, Facebook, and LinkedIn users, so they have some familiarity with the profiling and security features of these platforms, and some use other less known or utilised platforms with some form of security and profiling features.

On average, the participants utilised social media around 2 to 4 hours a day, providing a sound basis of exposure and usage on the social media platforms.

Regarding blockchain technology, it was a mix of average to no knowledge. It was expected as the technology is still relatively new and has yet to be adopted into the mainstream, but content provided prior to the interview, as well as additional explanation during the interview, would have addressed any concerns relating to limited blockchain technology knowledge for this research.

Although it is not represented in Table 4.3.1, all participants were white-collar workers, with ten males and three females making up the participant list.

4.4 RESEARCH QUESTIONS

The research questions sought to understand the typical social media concerns and if the benefits and limitations of blockchain technology, when applied to social media, translated to comfort or concerns from a user perspective.

Should the narrative of the end user change from applying pressure on the social media platforms to further secure their current platforms to instead applying pressure on the social media platforms to migrate on to blockchain technology?

1. Are the social media user's privacy and security concerns still valid?
2. Is migrating to the blockchain going to add any additional value to the users?
3. Is migrating to the blockchain going to add additional concerns for the users?

4.5 THE THEMATIC ANALYSIS OF FINDINGS

The feedback received was analysed using the thematic analysis process.

The steps followed were, 1. Familiarity with the data, 2. Generation of initial codes, 3. Identification of themes, 4. Reviewing of the themes, 5. Definition of themes, 6. Writing of the report.

4.6 Familiarity with the data

Data was extracted from voice and converted into text for easy analysis. An initial review of the overall dataset allowed an initial impression

The one-on-one interview data collected was formatted into summarised text snippets. The ratings were identified, enumerated and then summed to determine which item within the question was rated the highest.

4.6.1 Initial Review: Traditional online social media has several privacy concerns.

Participant	Data Mining	Phishing Attack	Botnet Attack	Malware Sharing	Account Hacking or Impersonation	Stalking & Harassment
1	Very Important	Very Important	Slightly Important	Unimportant	Unimportant	Moderately Important
2	Very Important	Very Important	Very Important	Very Important	Very Important	Very Important
3	Very Important	Moderately Important	Very Important	Moderately Important	Very Important	Important
4	Important	Very Important	Very Important	Important	Very Important	Moderately Important
5	Important	Very Important	Moderately Important	Important	Moderately Important	Important
6	Important	Very Important	Very Important	Very Important	Very Important	Very Important
7	Very Important	Important	Slightly Important	Moderately Important	Very Important	Moderately Important
8	Very Important	Very Important	Very Important	Very Important	Very Important	Very Important
9	Very Important	Very Important	Very Important	Very Important	Very Important	Very Important
10	Very Important	Important	Moderately Important	Very Important	Important	Important
11	Important	Very Important	Moderately Important	Very Important	Important	Important
12	Very Important	Slightly Important	Slightly Important	Important	Moderately Important	Important
13	Important	Very Important	Moderately Important	Very Important	Very Important	Very Important

Table 4.6.1.1 Social Media Concerns (Non-Numerical)

Participant	Data Mining	Phishing Attack	Botnet Attack	Malware Sharing	Account Hacking or Impersonation	Stalking & Harassment
Key	Very Important (5)	Important (4)	Moderately Important (3)	Slightly Important (2)	Unimportant (1)	
1	5	5	2	1	1	3
2	5	5	5	5	5	5
3	5	3	5	3	5	4
4	4	5	5	4	5	3
5	4	5	3	4	3	4
6	4	5	5	5	5	5
7	5	4	2	3	5	3
8	5	5	5	5	5	5
9	5	5	5	5	5	5
10	5	4	3	5	4	4
11	4	5	3	5	4	4
12	5	2	2	4	3	4
13	4	5	3	5	5	5
Sum	60	58	48	54	55	54

Table 4.6.1.2 Social Media Concerns (Numerical)

Overall, participants felt that data mining was the highest concern around social media platforms, followed by phishing attacks, account hacking and impersonation, stalking and harassment, and finally, botnet attacks, which had the lowest concern ratings.

The concern was predominantly focused on the ownership of the data, the consent to mine the data, and the intended use of the data.

4.6.2 Initial Review: Out of the list of concerns you mentioned above, which concerns you the most? Do you do anything from your end to prevent, address, or mitigate that risk, and if so, what do you do?

Participant	Data Mining	Phishing Attack	Botnet Attack	Malware Sharing	Account Hacking & Impersonation	Stalking & Harassment
1		1				
2		1				
3	1					
4			1			
5	1	1				

6	1	1				
7					1	
8			1			
9					1	
10				1		
11	1					
12						1
13			1			
Sum	4	4	3	1	2	1

Table 4.6.3.1 Social Media Highest Concerns (Numerical)

Phishing attacks and data mining received the highest ratings for most concerns around social media, followed by botnet attacks. It was mainly attributed to the financial impact, influence of misinformation, and personal exposure risk that the concern could have. Education, vigilance, and keeping abreast of possible risks were the mitigating actions.

4.6.3 Initial Review: Blockchain technology comes with several benefits, as defined below. Are there any characteristics that you view as a potential challenge or concern for a social media user like yourself, and if so, why?

Participant	Distributed Ledger	Enhanced Security	Greater Transparency	Instant Tractability	Increased efficiency and speed	Automation	Other Regulation
Total	2	3	4	1	2	1	1

Table 4.6.3.2 Blockchain Challenges (Numerical)

Greater transparency, followed by enhanced security, received the most ratings for blockchain technology benefits, which might pose a challenge or concern to social media users. The concerns were mainly about the anonymity and transparency that the technology can provide and how it would be used, as well as the complexity of blockchain and the possible vulnerabilities it can expose when applied.

4.6.4 Initial Review: Looking at the blockchain characteristics (benefits) above, which characteristics do you think would benefit you the most as a social media user, and why?

Participant	Distributed Ledger	Enhanced Security	Greater Transparency	Instant Tractability	Increased efficiency and speed	Automation	Other Regulation
Total	2	7	4	5	1		

Table 4.6.4 Blockchain Benefits (Numerical)

Enhanced security received the highest rating of the characteristics that would benefit social media users, followed by instant tractability, greater transparency, distributed ledgers, and increased efficiency and speed.

4.6.5 Initial Review: Blockchain technology comes with several limitations. Some of the limitations are listed below. Rate each of the items below in order of concern to you on social media platforms and elaborate why?

Participant	Lack of awareness	Limited Technical Talent	Immutable	Key Management	Consensus Mechanism	Scalability	Other
1	Unimportant	Very Important	Important	Moderately important	Slightly Important	Very Important	
2	Slightly Important	Very Important	Slightly Important	Very Important	Very Important	Very Important	Implementation, ease of use
3	Important	Unimportant	Very Important	Very Important	Important	Very Important	
4	Important	Important	Unimportant	Very Important	Very Important	Very Important	
5	Slightly Important	Very Important	Very Important	Important	Moderately Important	Unimportant	
6	Unimportant	Very Important	Very Important	Very Important	Very Important	Very Important	
7	Slightly Important	Very Important	Very Important	Very Important	Important	Very Important	
8	Important	Moderately Important	Important	Important	Very Important	Very Important	
9	Important	Important	Very Important	Very Important	Very Important	Important	
10	Moderately Important	Important	Slightly Important	Very Important	Moderately Important	Moderately Important	
11	Unimportant	Moderately Important	Important	Important	Moderately Important	Important	Architecture
12	Unimportant	Very Important	Important	Very Important	Very Important	Very Important	Environmental Impact

Table 4.6.5.1 Blockchain Limitations (Non-Numerical)

Key	Very Important (5)	Important (4)	Moderately Important (3)	Slightly Important (2)	Unimportant (1)		
Participant	Lack of awareness	Limited Technical Talent	Immutable	Key Management	Consensus Mechanism	Scalability	Other
1	1	5	4	3	2	5	Sharing of information Monetary value
2	2	5	2	5	5	5	Implementation, ease of use
3	4	1	5	5	4	5	
4	4	4	1	5	5	5	
5	2	5	5	4	3	1	
6	1	5	5	5	5	5	
7	2	5	5	5	4	5	
8	4	3	4	4	5	5	
9	4	4	5	5	5	4	
10	3	4	2	5	3	3	
11	1	3	4	4	3	4	Architecture
12	1	5	4	5	5	5	Environmental Impact
SUM	29	49	41	55	49	52	

Table 4.6.5.2 Blockchain Limitations (Numerical)

Key management received the highest rating for the limitations of blockchain, followed by scalability, consensus mechanisms, limited technical talent, immutability, and lastly, a lack of awareness.

4.6.6 Initial Review: – From the blockchain limitations above, or others. Are there any that would be so concerning that you would think twice about migrating off the traditional social media network to a blockchain social media network?

Participant	Lack of awareness	Limited Technical Talent	Immutable	Key Management	Consensus Mechanism	Scalability	Other Environmental	Other Architecture
Total	1	1	2	3	1	3	1	1

Table 4.6.6.1 Blockchain Most Limitations (Numerical)

Key management and scalability received the highest ratings as possible limitations that would make the end user think twice before moving to a blockchain social media platform; after that, immutability followed, followed by lack of awareness, limited technical talent, consensus mechanisms, environmental issues, and architecture.

4.7 GENERATION OF INITIAL CODES

Code generation was performed on each question individually to identify the similarities between the respondent's feedbacks; below are details of the steps taken to generate the initial overall codes and emerging themes. An inductive approach will be taken, where the empirical observations from the interviews and participants' feedback will be examined and simplified so that patterns and commonalities can be identified and then converted into themes for a conclusion on the research.

- **Collect the Data.** Interviews were held with the participants. The interviews were then transcribed.
- **Data Analysis.** The transcriptions were then organised, and answers to the questions were grouped. Questions 1 and 2 were grouped as they relate to social media concerns, while questions 3, 4, 5 and 6 were individually analysed as they relate to different components of a blockchain.
- **Identification of Themes.** There were no pre-identified codes or themes prior to the code generation. A transcript review revealed emerging themes, which were then used for coding. Each respondent's feedback provided was reviewed and summarised into 1 line. Once this was completed, the summarised lines were placed into a table for ease of reference. Each summarised feedback was then reviewed, and the similarities between all the respondents' feedback were colour-coded. Once all the feedback was colour-coded, each similar grouping was reviewed, exposing an emerging theme. All codes from all the questions were merged to provide a holistic view of all the emerging themes. These were then reviewed, and common themes were then identified.
- **Development of Theories.** The researcher has added a brief explanation of the subthemes, resulting under each question and further articulated the themes in detail under the theme section.
- **Reporting the findings.** This will be done in Chapter 5

4.7.1 Question 1 and 2 combined (Social Media Concerns)

Data mining	Phishing Attack	Botnet Attack	Malware Sharing	Account Hacking & Impersonation	Stalking & Harassment	Other
Safeguarding of personal information	Safeguarding of personal information	No financial impact not too concerned	mitigated, own protection in place, awareness and educated	not exposed to this, aware and educated	Safeguarding of personal information	Moderators of users and content
Unsolicited use of private information	potential for financial loss and credit history	Influence and Manipulate content and news.	Financial Loss	Become part of the problem, exposed to other threats, not knowing extent of compromised	Cyber bullying	exposing information about others or you without consent
Advertising has become invasive and intrusive	Educate yourself	hard to determine what's credible and valid over all the noise	how you use social media	hard to separate real accounts , loose access to your own account, information exposed	give away too much information freely and unknowingly	Moderation on the social media platforms, more focus on content to shape the younger generation
noise might be blocking out valid communication	Poor personal controls around data security	Manipulative, control the narrative, overload public with information can change the narrative Misinformation	risk to private information, unknown of original intended use of malware	Exposure, access to trusted network	Education, exposure, & risk. Be conscious & responsible of putting out in public domain	Women are more of a target
You the product, and you need to understand that..	Unsolicited use of private information	know who you are interacting with and need to be authentic, validity of the interactions	Privacy and losing information	gain access to trusted network with ill intentions	expose too much information unknowingly, be consists of what you posting	Terms and conditions of use of data
Exposes and makes you a target	moderators to ensure the safety of your data which you own	Easy to spot them	security, securing personal information, education on personal usage, monitoring from a platform perspective	Identify and proof of self	Putting yourself out there in a public forum	Changing algorithm for a specific purpose, traction, reason, Social Media content manipulation
Educations and keep current to be able to identify these types of attacks	Less at risk as able to identify attempts	Legitimately does away public and individual views	risk and exposure to me personally, Risk & exposure to accounts	Use a mac so less of a concern	You information is out there, and you lose all that history and you can't do anything about it. Its not right	Unsolicited marketing and sales
	people give away too much information freely and unknowingly	Possible risk on identifies and integrating from IoT into social media networks	Ransomware	Financial Risk, identity theft	Young and vulnerable exposure on social issues	Fine print avoids platform accountability
	Always done with malicious intent and no benefit to me	Still requires access to the account before it can function	Access to personal information	So your day-to-day living and everything else we have to basically change everything.	Targeting online and can lead to physical	false information, fake news
	No sharing of passwords or 1 time pins.. Personal information, financial concern	its very personal. you only want to chat with the contacts you know on your account, invasion of personal space	Access to unauthorized information	Possible blast radius, Unauthorized access	Information available in the public forum	Custodians of social media platforms, their influence and use / consumption – have own train of thought, make own mind up, triple check facts from reliable sources, validation, and verification
	Financial implications, just try to use common sense when opening or responding to emails	Self educates, but potential to influence the public with fake news	May unknowingly install software despite my attempts to avoid	Riskier to those who are more exposed to a larger audience	But there is blocking features and you can also secure your account a bit more.	The terms and conditions that non one reads or understands
	Educations and keep current to be able to identify these types of attacks	Question legitimacy and Credibility	get educated, malicious purposes	attack may not always be recognizable	Privacy Settings Loopholes	
	Access to private and personal space and areas	How people digest and interpret information, influential ability to change the narrative	shared responsibility of platform and individual,	Personal experience, Recourse after the fact is not possible	Right to feel safe	
		Validate information using multiple sources to mitigate	Just try to mitigate the risk	Secure Identity, access management and limited data sharing, use anonymous data		

Table 4.7.1.1 Participants concerns of Social Media

The coding above shows 86 open codes derived from social media concerns. We can identify 11 core codes from the duplications and similarities. The following subthemes can be formed:

- Potential for financial loss (Blue)
- Exposing oneself or personal information to the public domain (Green)
- Unsolicited use of private information (Pink)
- Invasive, intrusive, and questionable information (Yellow)
- Education around social media usage (Grey)
- Knowing your audience and community (Navy Blue)
- Social media platform responsibility (Cream)

The uncovered subthemes from the social media concerns are all related to the possible implications and risks associated with social media privacy and security concerns and the expectation to address them. It is no surprise, as the users bear the burden and repercussions of failed security measures and exposure of private content, irrespective of whose fault it is. The risk and expectations associated with social media and privacy concerns go hand in hand, and there potentially lies the gap in understanding which carries the responsibility and accountability to ensure such measures and mitigation actions are in place.

4.7.2 Question 3 Blockchain characteristics which might be challenges or concerns

Greater Transparency	Scalability	Automation	Encryption	Speed and efficiency	General Ledger	Other
Being anonymous allows for individuals to hide behind it while performing bad deeds	Speed, lag, delay in posting ,	Hard to cover all scenarios	Current blockchain Encryption Standards and Algorithms have not been developed protection against quantum computing.	little bit of give and take depending on what you want to achieve on the blockchain. if you want improved efficiency you must prepare to lose a bit of speed	Users access to see more than they currently can	Complexity, implementation
Exposes the social media platforms algorithms and data rules to the user base	Higher speed or higher cost,	Maybe automation opening a gap or vulnerability.	Quantum computing use cases are on the rise and I do not know how the introduction of this new technology will affect blockchain security	dependent on network chosen to run		Going green, ecological
Massaging the content and narrative	Who carries the cost burden					
dependent on network chosen to run						
Users access to see more than they currently can						

Table 4.7.2.1 Blockchain concerns for Social Media (Non-Numerical)

From the coding above, find 17 open codes derived from blockchain concerns for social media questions. We can identify six core codes from the duplications and similarities. The following subthemes can be formed:

- Performance (Green)
- Exposure and Vulnerabilities (Red)
- User Accessibility (Orange)
- Financing (Purple)
- Architecture (Yellow)
- Environmental Impact (Blue)

The subthemes that have been uncovered speak clearly to the challenges surrounding blockchain technology, including impacting the speedy adoption of this technology. These are well understood, and the markets have several initiatives to try and address them. However, it is no surprise that these characteristics would be a concern for social media users, as currently, being a social media user carries minimal financial cost while offering a speedy and seamless user experience.

4.7.3 Question 4 blockchain benefits which might benefit social media

Instant Traceability	Data Ownership	Greater Transparency	Distributed ledger	Enhanced Security	Increased efficiency and speed	Automation
To hold people accountable	Credibility, No tampering, or alterations	no shadow banning, algorithms that determine what you see on your feed are more open	Distributed ledger with ownership of data transferred to the owner which will impact the commercial model they currently operate	Tracing and closing illegal activity	The possible introduction of FinTech services into Social Media platforms will depend of transaction efficiency and speed.	I like the ability of automating business transactions through social media. This will lead to new business opportunities in blockchain
Tracing and closing illegal activity		reduced risk of compromised data	Privacy and control over ones data	Privacy and control over ones data		
Knowing exactly who and what I'm dealing with		Greater transparency will build trust in social media systems. I do not trust social media. Recent use cases of censorship within Twitter and Facebook prove a lack of ethics and transparency in the industry.	your information can't be lost	greater security, reduced risk of compromised data		
Difficulty to decrypt on the blockchain, quickly and easy to detect what happened retrospectively		so transparency gives you traceability and audibility		Records are immutable		
Combat fake news and misinformation				Address most of the social media concerns listed		
validity, verification of accounts and information						

Table 4.7.3.1 Blockchain benefits for Social Media (Non-Numerical)

From the coding above, find 21 open codes derived from blockchain benefits for social media questions. We can identify six core codes from the duplications and similarities. The following subthemes can be formed:

- Accountability and Credibility (Green)
- Know Your Audience (Navy Blue)
- Security (Orange)
- Data Ownership (Grey)
- New Service Offerings (Blue)

Once again, the emerging themes are of no surprise. They outline the existing challenges with the current social media architecture and define the core strengths of blockchain technology. The one surprising item was the subtheme of new service offerings that blockchain technology can bring to the market, which has yet to be explored in detail but shows great potential and promise.

4.7.4 Question 5 blockchain limitations concerns

Lack of awareness	Limited Technical Talent	Immutable	Key Management	Consensus Mechanism	Scalability	Other
Need to educate the public	Ability to upgrade and maintain the system	Ability to remove content, accidents or missed threads	Complexity around setting up and managing the key	Slow would cause a problem	Theory of constraints	Sharing of information – Monetary value
Users don't need to know the inner workings of blockchain,	How would u implemented effective solutions	history should remain intact, but ability to update new version	all about security	needs to work well, and not impact performance	performance is important	implementation and ease of use
Education and understanding of the technology is needed	There are enough software engineers, blockchain is just another software framework	core principles of blockchain is around immutability of a record	Complexity of Key Management to non tech savvy users	Time taken to post a message transaction limits per second type of consensus mechanism used	Performance Risk related, lower risk might require lower confirmation while high risk might require a more thorough vetting process	How blockchain social media platforms is currently being advertised and marketed
Needs trust to be built	Possibly bad stigma around blockchain limiting engineers entering the community	But an option should be available to touch a record or post in the past	the current process is too confusing around keys, very important to get it right and make it easier.. very hard to store the keys, and lost access to accounts and ledgers on the blockchain.	hinder the adoption on to the blockchain for social media, as a result of lag, and potential cost implications for the social media platform, as well as on costing to the end users	Scaling will only work with how efficient the network will work, speaks to the consensus mechanism	Shared blockchain to mitigate the current limitations and reduce cost of running a blockchain
unaware of benefits but aware of dangers	not enough real work commercials to monetize the skill	Instills trust in the platform as the records are untampered with	Control who owns the consent, find better ways to own the key	Credibility to the transaction / record	Economies of scale in blockchain is non-existent, re quantities of scale, due to no real value vs potential value	Architecture
Just keep up to date of what they doing but its just a tool	high risk for developers to move over	Holds people to a higher standard	Security	And more important around what type of blockchain to be used which will define the speed	Do the long-term benefits out way the disadvantage	Environmental impact Potential cost of running on blockchain based platform
People won't know they using blockchain	Speaks to getting quicker there and early adoption	Audit and traceability purposes	Securing your information correctly, but simply but with the core principle the same	Proof of work effective	Scalability will be built into the blockchain of choice more the quicker the blockchain is, the less secure it is.	
People kind of know it exists but don't care or don't need to care how it works	Blockchain has a perception of a Ponzi scheme, there is enough skills just the wanting to make the conversion is not there	Information security	People don't want to use something that is finite they enjoy options and alternatives and backups	User experience impact	scalability limitations opened up some vulnerabilities which was then exploited	
About peoples current interest in the technology, when it becomes mainstream it will improve	not interested in pursuing that path personally	cornerstone of blockchain	lack of understanding of key management , might scare away the general user base	Trust in the network	User experience needs to be figured out, deciding factor for adoption	
Due to unknown regulatory requirements	Opportunities to draw the talent	version control should limit risk / limitation financial and economic implications to immutable record	Maintain cryptography good	just take longer than expected depending on the traffic	it depends on the business case	
Testing into blockchain underway	Support model around resourcing	Integrity	Lack of understanding of key management	Depend on the use case of the platform	Ability to scale up and improve	
Unimportant	Reusable code Lack of interest not talent	Prevent data manipulation	would probably have to put something in front of that, thus making it easier for the user to authenticate	Possible exposed to hacking while waiting	so very important that they get that right, or they not going to then succeed	
Adaptable	Develop correctly	Correcting data	Complexity	Dependent on infrastructure in play	Exposing when reaching limitations	
As long as the user can do what they want	It will sort itself out on its own as demand grows	Private information and control thereof to do with what you want	Basis of blockchain speaks to ownership		Design and architecture	

Table 4.7.4.1 Blockchain limitations on Social Media (Non-Numerical)

From the coding above, find 89 open codes derived from the blockchain limitations on social media questions. We can identify eight core codes from the duplications and similarities. The following subthemes can be formed:

- Education (Purple)
- Confidence and Trust (Yellow)
- Architecture (Orange)
- Security and Regulation (Red)
- Skills and Resourcing (Copper)
- Credibility (Brown)
- Vulnerability and Exposure
- Complexity (Green)

Once again, the subthemes emerging are predictable. These are limitations which are well-known within the blockchain technology realm. This limitation speaks to a technology still in its infant stages and has yet to be formally defined and frameworks into a universally agreed structure. Although these are concerning on blockchain, one has to question if they are covered in the traditional social media platforms or are exposed and the users accept due to no alternative.

4.7.5 Question 6 blockchain limitations, most concerning

Scalability	Environmental, Speed, Usage	Immutability	Key management	Consensus mechanism	Scalability	Limited technical resources	None	Lack of awareness	Accountability	Architecture
Don't want it to be too slow	Environmental impact	moderating content	complex process	time for post to go live	transaction per second constraints	confidence of the platform being built correctly	The limitations are not challenges for social media, but actually are good for it	The lack of regulatory requirements will prove to be a problem in future to both social media users and companies. I'm concerned about regulation affecting:	deformation, children protection, social media held accountable	Design of blockchain, usability, experience, integration, features and benefits
Speed of Transition		Don't want things to be on social media platforms permanently, indefinitely	Key Management, and time taken, scalability and consensus due to time, dash boarding – over all status, simplify		Be able to onboard the early adopters with speed and cater for the populous as they climb on board		.. at the moment it doesn't seem to be a big issue, we kind of just accept it right		Focus on validation of the user	ease of migration
			Lost keys and unable to recover							

Table 4.7.5.1 Most Concerning Blockchain Limitations (Non-Numerical)

From the coding above, find 19 open codes derived from the most concerning blockchain limitations questions. We can identify core codes from the duplications and similarities. The following subthemes can be formed:

- Architecture (Navy Blue)
- Performance (Light Green)
- Regulation and governance (Yellow)
- Data ownership (Blue)
- Complexity (Orange)
- Opportunity (Purple)
- Confidence and credibility (Green)

The most concerning limitations by the participants are really around the architecture of blockchain and how it is architected, impacting its performance and overall functionalities. These are pressing concerns and are evident when looking at all the frameworks that have been released and are in the pipeline around how blockchain technology should be architected, operated and performed. With vast, varied views around this, one can understand how this is a significant concern. Surprisingly, the

privacy and security issues, which are of primary concern for social media users, do not feature here.

4.7.6 Groupings of subthemes

Groupings of all codes were placed into a single table for analysis. Duplications and similarities were consolidated. Resulting in 27 codes grouped into four categories:

- social media concerns
- blockchain concerns for social media
- blockchain benefits for social media
- blockchain limitations.

Social Media Concerns	Blockchain concerns for Social Media	Blockchain Benefits for Social Media	Blockchain Limitations
Potential for Financial Loss	Anomaly concerns both from being anonymous and traceability	Greater Accountability	Lack of awareness and understanding of blockchain
Exposing oneself or personal information to the public domain	New vulnerabilities might be exposed	Greater Credibility	Limited draw for technical resources to move to blockchain
Unsolicited use of private information	Performance issues	Greater Trust & Transparency	Trust around blockchain needs to be established
Invasive, Intrusive & questionable information	Environmental concerns	Privacy and Control over one's data	Vulnerability's exposed through limitations
Education around Social Media usage	Complexity and Architecture	Immutability	Key management complexity
Know your audience / community		New Business Opportunities	Performance issues can hinder adoption
Social Media platform responsibility			Data & record management
			Environmental impact
			Regulation and governance

Table 4.7.6.1 Consolidated View (Non-Numerical)

4.8 FINALISING OF THEMES

From the consolidated coding, categories, and subthemes, we were then able to derive the themes. The Themes were color-coded for easily reference to the questions

Blockchain Benefits for social media	Blockchain Limitations
Blockchain concerns for social media	Social Media Concerns

Environmental	Environmental concerns
	Environmental impact
Architecture	Complexity and Architecture
	Key management complexity
	Performance issues
	Immutability
	Key management complexity
	Performance issues can hinder adoption
Risk and Exposure	Potential for Financial Loss
	Exposing oneself or personal information to the public domain
	Unsolicited use of private information
	Invasive, Intrusive & questionable information
	Anonymity concerns both from being anonymous and tracability
	New vulnerabilities might be exposed
Knowledge and Education	Vulnerabilities exposed through limitations
	Education around Social Media usage
	Know your audience / community
	Lack of awareness and understanding of blockchain
	Limited draw for technical resources to move to blockchain
Regulatory and Governance	Trust around blockchain needs to be established
	Social Media platform responsibility
	Regulation and governance
	Data & record management
	Greater Accountability
	Greater Creditability
Entrepreneurship	Greater Trust & Transparency
	Privacy and Control over ones data
	New Business Opportunities

Table 4.8.1 Final Themes

The final identified themes are:

- (1) **Environmental** – The environmental topic has gotten much traction recently, mainly because of climate warming and a drive to get off fossil fuels and resort to

renewable energy. Green energy and sustainability product and solutions are increasingly being publicised, and traction and pressure is from the community to utilise eco-friendly product and services. Blockchain technology historically had a lousy persona for not being energy efficient. However, much work is going in to make it more energy efficient and change that perception for the community.

- (2) **Architecture:** Architecture is fundamental to the design and operations of any technology product or service. It defines the resilience, capability, vulnerability and potential of a product or service and can be the ultimate make or break. Architecture also defines the complexity of the solution, which ultimately defines the support and resources available to progress that solution further.
- (3) **Risk and exposure:** Security is no longer virtual or physically isolated. The two are intertwined and are tools for each other. Social Media platforms, by virtual their users' interactions, hold massive potential for significant risk and exposure to the users. With any new solution, this is one of the first items to weigh in on any decision. It speaks to security, accessibility, ownership and control but is also subjected to volatility, possibly in the markets or related to perception.
- (4) **Knowledge and Education:** One only knows what one knows and rarely knows the full extent of what one does not know. In this digital era, knowledge and education is no longer an option but a necessity. If we do not keep abreast of current trends and shifts, we may be very exposed and not know how to make an informed decision. Platforms are finding various ways to pass some of the burden of operations onto the user base, and if one is not informed, one might fall victim. Blockchain technology is by no means stopping, and if we skill up in it, we may be able to use and benefit from its characteristics or mitigate its limitations.
- (5) **Regulatory and Governance:** Without rules, there is chaos. Both social media platforms and blockchain technology are in constant motion regarding regulation and governance. Authorities at very levels are defining and redefining the rules

around social media platforms and blockchain technology as it evolves. Blockchain has somewhat transformed to cater for community-type governance, and similar models are coming through on social media platforms.

- (6) **Entrepreneurship:** There is always an opportunity to create with new and evolving technology. We have seen it with social media users, who have been able to commercialise their presence on various platforms. Blockchain technology also has the potential to unlock a new industry with new solutions.

A thematic map was compiled out of the themes reflecting the relationships and interdependencies.

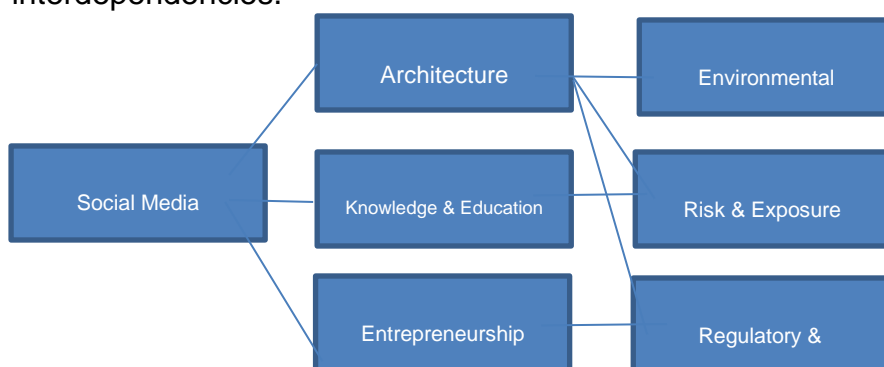


Figure 4.6 Thematic Map

4.9 CODES PER RESEARCH SUB QUESTION

From the consolidated coding, categories, and subthemes, we were then able to derive the themes. The final identified themes are (1) environmental, (2) architecture, (3) risk and exposure, (4) knowledge and education, (5) regulatory and governance, and lastly, (6) entrepreneurship.

Research Sub Questions	Theme	Codes
Are the social media user's privacy and security concerns still valid?	Risk & Exposure Knowledge & Education Regulatory & Governance	(1) Potential financial loss (2) Exposing oneself or personal information to the public domain, (3) Unsolicited use of private information (4) Invasive, intrusive and questionable information (5) Education around social media usage, (6) know your audience & community (7) Social media platform responsibility
Is migrating to the blockchain going to add any additional value to the users?	Architecture Regulatory & Governance Entrepreneurship	(1) Accountability & Credibility (2) Know your Audience (3) Security (4) Data Ownership (5) New Service Offering
Is migrating to the blockchain going to add additional concerns to the users?	Environmental Architecture Risk & Exposure Knowledge & Education Regulatory & Governance	(1) Education (2) Confidence & Credibility (3) Governance & Regulation (4) Architecture (5) Vulnerability & Exposure (6) Resourcing & Skills (7) Ownership

Table 12.9.1 Codes per research sub questions

4.10 RESULTS FROM THE ANALYSIS

4.10.1 Question 1

Are the social media user's privacy and security concerns still valid?

The research instrument provided a list of the most common social media concerns and asked the participants to rate them and provide context about their ratings. The consolidated ratings provided a view of the most concerning items among the participants. The analysis exposed seven sub-themes around the concerns of social media users: (1) potential for financial loss; (2) exposing oneself or personal information to the public domain; (3) unsolicited use of private information; (4) invasive, intrusive, and questionable information; (5) education around social media usage; (6) knowing your audience and community; and lastly, (7) social media platform responsibility.

4.10.2 Question 2

Is migrating to the blockchain going to add any additional value to the users?

The research instrument provided a list of the most common benefits of blockchain technology and asked the participants to rate them and provide context. The consolidated ratings provided a view of the features that would provide the most benefit from the viewpoint of the participants. The analysis exposed five sub-themes: (1) accountability and credibility, (2) knowing your audience, (3) security, (4) data ownership, and (5) new service offerings.

4.10.3 Question 3

Is migrating to the blockchain going to add additional concerns to the users?

The research instrument provided a list of the most common limitations of blockchain technology and asked the participants to rate them and provide context. The consolidated ratings provided a view of the users most concerning blockchain limitations. The analysis exposed seven sub-themes: (1) education, (2) confidence and credibility, (3) governance and regulation, (4) architecture, (5) vulnerability and exposure, (6) resourcing and skills, and (7) ownership.

4.11 SUMMARY OF FINDINGS

Social media usage has become a part of our daily lives, intertwined with our routines, interactions, and social behaviour. Despite the concerns around traditional social media platforms, users continue to use them with partial knowledge and acceptance of their limitations and flaws.

Blockchain technology comes with several known benefits and limitations. Although the benefit solves some of the concerns of traditional social media users, it does bring about several limitations and possibly new ones. The biggest hurdles blockchain might face while trying to win over traditional social media users are education, architectural framework, and regulation.

Privacy and Security are significant concerns for anyone online, especially those on shared platforms. Accountability and responsibility need to be clearly defined, and the users need to be educated to understand the full implications of their usage.

Regulations and governance are still being refined, whilst new products and services are being added to the platforms. Without an alternative, the users are left wanting but continue to use.

Blockchain technology is an emerging innovative technology that promises to solve many of the issues social media users are experiencing. However, it also might introduce some challenges, specifically around its core characteristics, which make it secure.

The themes derived from participants' feedback are not surprising and are well-known and understood. These themes apply to both blockchain and social media regarding pros and cons. At first glance, concessions might have to take place for social media users to make that transmission to blockchain-based social media platforms, as by solving some challenges on the social media side, new challenges are introduced on the blockchain side.

Further analysis of the responses in Chapter 5 will unpack if the participants are willing to make those concessions and make the migration.

5. DISCUSSION OF FINDINGS

5.1 INTRODUCTION

In this chapter, we analyse the results of the research outlined in Chapter 4 and unpack the themes per research sub question, ultimately attempting to answer the research question.

Research Question	Research Sub Questions	Theme	Codes
Should the narrative of the end user change from applying pressure on the social media platforms to further secure their current platforms, or rather apply pressure on the social media platforms to migrate on to blockchain technology	Are the social media user's privacy and security concerns still valid?	Risk & Exposure Knowledge & Education Regulatory & Governance	(1) Potential financial loss (2) Exposing oneself or personal information to the public domain, (3) Unsolicited use of private information (4) Invasive, intrusive, and questionable information (5) education around social media usage, (6) know your audience & community (7) Social media platform responsibility
	Is migrating to the blockchain going to add any additional value to the users?	Architecture Regulatory & Governance Entrepreneurship	(1) Accountability & Credibility (2) Know your Audience (3) Security (4) Data Ownership (5) New Service Offering
	Is migrating to the blockchain going to add additional concerns to the users ?	Environmental Architecture Risk & Exposure	(1) Education (2) Confidence & Credibility (3) Governance & Regulation (4) Architecture (5) Vulnerability & Exposure

		Knowledge & Education Regulatory & Governance	(6) Resourcing & Skills (7) Ownership
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Table 5.1.1 Research Question, Research Sub Questions, Themes and Codes

5.2 ARE SOCIAL MEDIA USER’S PRIVACY AND SECURITY CONCERNS STILL VALID?

A lot has been done on social media platforms to implement or, at the very least, provide enhanced security and privacy measures.

The movement among social media users to get off social media platforms due to privacy concerns, according to Slawson & Heimans (2018), has remained relatively high.

Are the privacy and security concerns around traditional social media platforms still valid? We examine the responses in detail and unpack the themes shared by the participants to see if the privacy concerns are still valid.

Participant	Data Mining	Phishing Attack	Botnet Attack	Malware Sharing	Account Hacking or Impersonation	Stalking & Harassment
Key	Very Important (5)	Important (4)	Moderately Important (3)	Slightly Important (2)	Unimportant (1)	
1	5	5	2	1	1	3
2	5	5	5	5	5	5
3	5	3	5	3	5	4
4	4	5	5	4	5	3
5	4	5	3	4	3	4
6	4	5	5	5	5	5
7	5	4	2	3	5	3
8	5	5	5	5	5	5
9	5	5	5	5	5	5
10	5	4	3	5	4	4
11	4	5	3	5	4	4
12	5	2	2	4	3	4
13	4	5	3	5	5	5
Sum	60	58	48	54	55	54

Table 5.2.1 Social Media Concerns (Numerical)

Examining the heat map of the responses received by the participants in relation to the most common social media concern, we identify data mining as having the most concerning rating overall. Guidi (2021) mentioned that data management is critical and

will be a key motivator for the migration to blockchain. Most privacy concerns do require some form of data collection and management to activate the threat.

5.2.1 Risk and Exposure

Risk and exposure were two themes that emerged from the responses about the current and common privacy concerns around traditional social media. It is no surprise, as these platforms not only provide a facility for users to interact with each other socially but also accumulate vast amounts of information and place any user in the public domain at various degrees of exposure, which poses several potential risks, especially when it comes to data breaches, as described by the participants.

Financial loss or potential thereof is always top of mind in any action, transaction, interaction, and more online. Unsurprisingly, it has emerged as one of the more robust themes around social media privacy concerns. As stated by Participant 13, social media privacy breaches are always done with malicious intent, and no real benefit is derived due to the impact on the social media user. Participant 4 shared similar views, stating that if the perpetrator can gain access to one's profile, they intend to steal one's data, and there is a good chance they will source information to gain access to one's bank accounts or steal money in other ways via one's profile. Participant 5 was concerned about the financial risk and possible impact because of the privacy concerns. His main issue was around something other than what one, as a user, was aware of, but more around what one was unaware of, which he did not know. It was not only specific to direct financial risk, but there needed to be more concern about identifying theft and its implications.

Most, if not all, of the social media privacy concerns that were discussed in the interviews have some underlying financial motivation. Data is quickly becoming the currency of the internet, and any data loss can be interpreted as some form of financial loss. As we continue to use social media, more and more of our footprints are left on the platforms and in the public domain. "Be conscious and responsible for what you put out in the public domain" "Participant 4". This information can be harvested, and a

profile built around one can provide valuable personal and private information that, as Participant 13 stated, can be used to employ information against the user to manipulate or steal.

Harvesting all this information online in the public domain provides an abundance of information that can be used for all sorts of activities. As Participant 5 stated, the constant bombardment of these unsolicited advertising and marketing engagements creates an abundance of noise, which might end up inadvertently blocking valid information. Not only does it distract and overwhelm, but it is also full of misinformation and questionable or unverified content. These interactions may have some form of malicious intent in the background, which one, as the user, is unaware of, or even possibly some form of manipulation or even focus on controlling the narrative and headlines, as speculated by Participant 8.

Unsolicited or unapproved interactions on social media platforms pose a significant risk, as one is unaware of the identity and intentions of that interaction. However, they are also intrusive into one's personal and private space.

Freni et al. (2020) stated that traditional social media networks currently own and have complete control of all data on their platform and can decide what is made visible and what is not. It ultimately impacts freedom of expression on the platforms and allows the platforms to control the narrative.

It is a crucial and expected theme to unfold from this research. Social media has become integrated into our daily lives. The lines between what is private and what is in the public domain need to be clearly defined as data ownership and control. Hacking and other malicious actions on social media are on the rise and are very advanced and intertwine across various platforms and into our physical lives. We all hold the risk when going online. Privacy, hacking, defamation and bullying, inappropriate content, phishing and other scamming, as well as the constant bombardment of information and news and data, some of our unsolicited, and some intentions are not amicable and pose a severe threat of manipulation and curating one's thoughts and ideas to a specific narrative.

On the current platform, there are some mitigation actions that one can take and were mentioned by several participants. Privacy settings can be adjusted, such as educating oneself, content moderation, upskilling in cyber security at home whilst online, legal compliance with the platform usage policy, and practising good digital hygiene. Social Media platforms offer significant benefits to us as social creatures, but they also come with inherent risks that require a certain level of awareness, responsibility and vigilance.

5.2.2 Knowledge and Education

Social media is a minefield of hurdles and traps that must be navigated correctly each time a new interaction is initiated. These minefields are filled with malicious intent, unauthentic actors, and insecure interactions.

Identifying unsavoury actors on the platform or activities related to potentially malicious intent, or even exercising caution on any request for personal information, is becoming more challenging by the day as the tactics used are maturing and evolving. Adapting as platforms become more secure and users become more skilled and educated, being on social media platforms without being technology-conscious or skilled in the possible risks is now optional. However, users are constantly being made victims and taken advantage of continuously.

Most participants felt users shared the burden of ensuring their safety on social media platforms. They thought the onus was on the user to ensure they are knowledgeable enough to understand the risks and know what information is acceptable in the public domain and should not be posted. Participant 5 mentioned that this is an ongoing process of constantly reading and becoming familiar with the risks on the platforms and online. Participant 12 believes that ensuring one is educated enough to avoid infiltration consciously is necessary. Participant 13 also shared a similar sentiment.

Educating oneself on interacting safely on social media is essential, but there are other necessities. As Participant 11 said, the broader and farther reaching one's audience or connections are on social media, the higher the risk of exposure one possibly has.

Participant 6 also stated that one needs to be aware of and know who one's audience is and whom one is interacting with and ensure authenticity before engaging further.

Participant 4 had the view that social media platforms should instead use their platforms for education purposes, especially for younger users, and moderate the content based on age, adopting a Chinese model where content is allocated to the user based on age and focused on upskilling and educating as opposed to social purposes.

Social media platforms also offer an excellent opportunity to access learning resources and material in and around the social media platform and in all other topics. Social media users should rely on something other than the platform to educate the user. They should look to other sources, informal blogs, webinars, and articles to ensure they get the best knowledge and information to make informative decisions. Much of the exposure and risk on social media platforms is attributed to the user's need for awareness or carefree actions. Digital hygiene is essential and should be applied in all interactions. The user should be responsible for ensuring they are familiar with this hygiene process. Nowadays, education and knowledge transfer occur in informal sessions, mainly on social media platforms. Users need to take the initiative and understand that as a user, there is a responsibility on them to upskill and be familiar with the best practices and ways of work to ensure their safety and that of others on the network.

5.2.3 Regulatory & Governance

The consensus from all participants is that there needs to be more regulatory and governance policies around social media, as these are hard to enforce but manage as well. Platforms and user bases span the world, among various cultures, beliefs, standards, and laws.

Some participants felt the users shared responsibility for the risk and exposure on social media platforms. As a result of how users use social media, "Participant 4", people give away far too much information on social media, "Participant 3", and then

a lack of understanding and knowing who their audience is or whom they are interacting with "Participant 6". It places some of the responsibility on the users of the platform.

The participants also felt that the platform shared some responsibility for addressing and mitigating privacy concerns. Participant 2 states that the platforms should take accountability or even responsibility for moderating their platforms, ensuring no illegal activities occur, and providing some validation to each user. Furthermore, Participant 2 felt that the platforms are the custodians of the data on behalf of the users and thus should ensure its security and safety at all costs; furthermore, they should moderate the platform and ensure there are measures to prevent illegal activities. Participant 11 shares similar views, stating that the platforms should have some control to provide validation and security checks and balances.

Participant 4 felt the responsibility for the data was shared between the platform and the user. Functionality around security controls and measures was the platform's responsibility, while the user had to be accountable for activating or enabling them. Participant 4 also felt that the platforms would do the bare minimum as required by law or legislation, but not what is required, which is doing the right thing to mitigate the risk.

Bernabe et al. (2019) stated that we have entered a significant data era, undermining users' privacy. Multiple sources of systems and interconnected IOT devices are flowing into a magnitude of data lakes and repositories, thus making access to data far too convenient and accessible.

Some regulatory and governance measures have been defined and applied to social media platforms. However, there is a debate about whether it is sufficient and covers all the critical aspects, especially since the landscape is highly dynamic. There are some considerations also to take note of listed below. Social media platforms operate globally; no central regulator or governance body can enforce the measures globally. Laws change from province to province, country to country. There is no global set standard which defines how these platforms should operate. Content moderation is

extremely sensitive and cannot appease all, and there is a fine line between freedom of speech and possibly breaking the law in some way or form.

Social Media platforms do not share their decision-making processes or algorithms as it is considered their IP, so there needs to be more transparency and accountability with this view. The debate around who owns the data once it is stored on the platform is still ongoing, coupled with who controls the data. Some measures like POPI have been applied, but this is not worldwide, and moderating it is daunting. Some governments and even regulatory bodies require visibility into these data sets, which might compromise privacy. These social media networks' power in framing a narrative for their population requires some independent oversight, but this may come at a cost.

The regulatory and governance landscape of social media is in a state of constant change and is becoming more and more complex. The network expands and integrates and becomes part of our daily lives. There are efforts to put some form of framework in place, but it is difficult to ensure that users have privacy, safety and security while still having freedom of speech.

5.2.4 Summary

Reviewing the feedback the participants received about the typical privacy concerns on traditional social media, it is evident that the concerns are still very valid. Although the users have learned to live with and accept the concerns while utilizing social media platforms, it still poses a risk and threat, which they are very aware of. Although social media companies have taken steps to enhance security and privacy on their platforms, which should mitigate the risk and exposure, the challenges persist, and ultimately, the responsibility is shared between the user, the platform and the regulators. T

he users must keep abreast of their rights on these platforms and the various options to protect their data, understand good data and online hygiene practices and apply them. This problem is not going away, and all signs point out that it is continuing to expand, so users should remain vigilant and safeguard their online presence at all costs.

5.3 IS MIGRATING TO BLOCKCHAIN GOING TO ADD ANY ADDITIONAL VALUE TO THE USERS?

5.3.1 *Architecture*

Architecture is everything; a poorly designed system will contribute immensely to its poor performance, exposure, vulnerabilities, and lack of confidence in the platform. A well-designed architecture system instills confidence and allows innovative solutions and ideas to bear fruit. Immutability is one of the main characteristics of blockchain technology, which ensures that all interactions are protected by end-to-end encryption. At the same time, every activity is irreversibly stored in the blockchain.

Some participants see immutability on social media platforms as a double-edged sword. As stated by Participant 6, immutability is twofold: first, one cannot lose any information on the blockchain, but one cannot undo what was said. We have all said and done things online that we deleted and regretted with immutability in its current form that will not be possible.

Participants 4 and 7 felt that immutability instills trust in the platform as the records are untampered with and would also place an additional level of responsibility, accountability, and caution on users for their posts on social media, which might address some of the human interaction concerns and risks of social media like harassment and overall better self-regulation on the platform.

Participants 5 and 8 shared similar thoughts and felt that immutability would enhance and expose an audit trail, telling a story of events and allowing for more accurate recollections and accounts of what has transpired, possibly addressing fake news and similar uncreditable content.

Immutability in its current form, although it provides for better record-keeping, could be improved in terms of having a permanent record of that transaction.

Participant 8 stated that although the record is permanent, it does not necessarily have to be public and can be controlled via version control. They allow the latest version to be visible while allowing an audit trail of the historical versions or records via access control.

Guidi (2021) stated that immutability offers trustable, reliable, and verifiable data from a blockchain perspective. Immutability is a unique and core characteristic of blockchain. Sherman et al. (2018) elaborate on the immutable characteristic that it is ledger-specific and ultimately provides for an auditable and creditable record and account of events.

The blockchain architecture, especially around its core characteristics, addresses the privacy and security concerns of the user base, not only around data control but also transparency, which would address the accountability aspect of social media, where platforms would then need to step up. The decentralised architecture can distribute decision-making, moderation and other activities so that it is no longer up to the platform to define but more a community-based decision. However, the architecture is complex, and performance is not at the level of the traditional blockchain platforms, significantly if one leverages the consensus mechanism. Immutability, which is seen as one of its core features, might not be ideal for a social media platform use case.

Migrating to a blockchain-based social media platform undoubtedly has several substantial benefits for the user, especially around privacy and security. However, the scalability, regulatory and complexity challenges underlining the technology's core architecture need to be addressed so that migration and adoption can be seamless.

5.3.2 Regulatory & Governance

Accountability, traceability, creditability, and transparency are shared sentiments across participants regarding blockchain's benefits to the social media arena. Participant 1 stated that the most significant benefit would be that there would be instant traceability to hold people accountable.

Participant 2 felt it would allow platforms to take responsibility and vet and moderate the platform better to ensure no illegal or malicious activities were occurring. Participant 5 shared a similar sentiment with participants 6 and 9, stating that traceability bundled with a distributed ledger would allow better transparency while providing enhanced security and efficiencies.

Participant 12 felt that the fine print in terms and conditions allows the platforms to hide in the small print and thus not be fully transparent. Participant 12 felt that blockchain would create a better structure to regulate the platforms while allowing transparency, and Participant 11 felt that transparency would allow for better traceability and auditability.

Participant 13 felt that traceability would bring about better validity and verifications of accounts and information sources, which could assist in addressing fake news and information and malicious accounts.

Dagher et al. (2020), 1985, as cited in Zhang et al. (2020), stated that the benefits brought by blockchain are decentralization, tamper resistance, anonymity, traceability, and public verification, to name a few.

Blockchain technology is complex, and central regulation and governance have yet to be defined and implemented. It might be challenging to adhere to or meet regulatory requirements around data management due to its core characteristics. Blockchain offers accountability, traceability, transparency and creditability, which is a big step up from the current social media platforms. The challenge is whether the social media platforms will be willing to give or allow these features into their platforms.

5.3.3 Entrepreneurship

With any new technology, there is potential for new business development, new industries, and opportunities for entrepreneurship. Participant 9 felt that automating transactions through social media would lead to new business opportunities on the blockchain.

Participant 4 thinks that moving social media onto a blockchain can open a whole new world and new ways of doing things, which would then influence how commercials are run on social media, ultimately handing over the power back to the user regarding managing their presence.

Basel (2020) acknowledged that blockchain was still in its infancy. However, looking ahead, with integration, intelligent contracts, and consensus protocols, new ways could be developed to deliver business processes which social media platforms could adopt.

As a new technology entrant, the potential of blockchain technology in the world has yet to be entirely determined, but what we do know is that it has the potential to create enormous opportunities for new business development in areas like decentralised finance, tokenisation of assets, or interactions or even gamification, intelligent contracts and tracking, identification and verification services, and even NFT's that we saw a significant spike in a few years ago. Blockchain has massive potential to open the industry to new business forms and allow entrepreneurs new opportunities to explore.

5.3.4 Summary

Reviewing the feedback from the participants on whether blockchain technology can add benefit and additional value to social media platforms based on its common characteristics, we see that there is a consensus that blockchain would add value, especially around data ownership and management, and this would address some of the concerns around social media on the traditional platform.

The real question is whether the value it adds outweighs the limitations or challenges it brings. Either way, the user must accept and make some concessions if they migrate over. It will specifically be about its benefits, which involve better data control and transparency and user incentives against scalability, regulatory compliance and possibly an unpleasant and complete interaction.

5.4 IS MIGRATING TO THE BLOCKCHAIN GOING TO ADD ADDITIONAL CONCERNS TO THE USERS?

5.4.1 *Environmental*

Participants 2 and 12 shared concerns about the environmental and ecological impact that running a blockchain social media platform would have. These concerns are related predominantly to the consensus node infrastructure required to be deployed. This infrastructure consumes enormous power, which has indirect implications for the environment due to the power production methods used and the noise pollution that the nodes generate.

Freni et al. (2020), when addressing some drawbacks of blockchain technologies as they would be applied to social media, also mentioned that they would require a high environmental footprint.

5.4.2 *Architecture*

Crypto private key management is one of the unique characteristics of blockchain architecture, providing enhanced security. However, key management is complex in its current state and is seen by some as a deterrent to the technology, especially if one needs to be upskilled in key management, storage, and retrieval.

Chakravorty & Rong (2017) stated that as blockchain grows, key management issues could significantly impact security and performance, depending on how they unfold and get addressed.

Participants 3, 8, and 10 all shared similar concerns about the complexity of key management on blockchain and how it would work with social media, especially for non-tech-savvy users.

Participant 4 stated that the current process is too confusing, but it is essential to get it right, and it needs to be made, as it is tough to store keys, easy to lose them, and even harder to recover them.

Participant 1 was more concerned about how one would go about setting up keys correctly. Participant 10 also had concerns about how one would be able to retrieve lost keys and thought that performance issues could hinder adoption.

Participant 11 was more concerned about the overall architecture selection, as several models could be selected. Participant 11 thought that that would be the deciding factor around the overall limitations and benefits, especially around whether users will carry the cost or own their data, and ultimately determine the performance and usability of the platform.

Social media platforms require instant responses and posting. Any delay or performance issues encountered will hinder adoption and ultimately lead to the platform's demise.

Participant 2 stated that for the platform to work well, it must work fast, and the performance from an end-user experience perspective will determine the platform's adoption. Scalability and consensus mechanisms were listed as possible contributors to poor performance on social media platforms while running on blockchain. Participant 2 also mentioned that the migration process from a traditional platform to a blockchain platform needs to be seamless and not weighted down.

Participant 3 suggested that users might be willing to wait a few minutes for a financial transaction to process but need more patience for any lag on social media. The platforms need to operate almost immediately. Participants 3, 5, 8, and 10 shared the same concern around scalability, as most blockchains have significant transactions per second constraints and how quickly they can scale up to compensate for the increased transactions per minute without hindering performance.

Participant 3 suspects that social media will likely require an even higher rate of transactions per second and is not confident that, in its current state, blockchain will

be able to handle the load. Participant 5 felt that a minor wait in time might not be so problematic for the user as the benefits of added security outweigh the delay penalty.

Participant 5 felt that determining the blockchain network would be vital for the social media platform, as a poor selection would have performance implications for the platform.

Participant 8 also felt that the consensus mechanism built into blockchain would prolong the time taken to reach consensus on a social media platform and would need to be much improved to speed up the consensus process. Otherwise, performance would be impacted.

Basel et al. (2020) discussed the challenges faced by platforms dependent on various real-time data exchange scenarios, like social media platforms, which require high performance that is difficult to achieve using blockchain and suggested that this must be part of the future work lined up in blockchain. Basel (2020) further highlighted a social media blockchain platform's possible high computational and interoperation costs.

Pal et al. (2019) recommended that incorporating IoT systems into blockchain could develop a more refined and simplified business process with a lower operational cost and higher efficiency.

5.4.3 Risk & Exposure

Any new technology will always have gaps, vulnerabilities, and areas requiring further attention. The question remains if these areas of concern and the exposure they subject the users to are manageable and acceptable to the user community while the platform addresses the improvements.

Participants 1 and 9 felt that having a blockchain provides enhanced security via anonymizing the ledger's data, allowing backdoor actors to hide behind this feature. Participant 9 went further and stated that the current encryption standards and algorithms have not yet been developed to protect "quantum-safe" computing, and

there is uncertainty as to how this new technology might affect or impact blockchain's enhanced security features.

Participants 12 and 7 were concerned with scalability limitations in the current state of blockchain and how that might introduce new vulnerabilities into the environment when reaching limitations and thresholds that hackers could exploit. Participant 6 suggested that introducing automation might open gaps or cause additional vulnerabilities. Participant 12 looked at the complexity of blockchain as a doorway to exposing vulnerabilities and gaps.

Participant 5 felt that traceability, considered one of the benefits of blockchain, would be concerning. Participant 5 felt that traceability might expose too much information on the blockchain and allow users to see more than they should.

Bernabe (2019) touched on the new quantum computing technology and stated that some proof-of-work algorithms and signatures are at risk. Bernabe (2019) stated that some mitigating actions could be adopted on the blockchain; for example, hashes should not be stored on-chain without a previous randomization process. In addition, some blockchain research solutions and platforms are currently utilizing crypto-algorithms resistant to quantum computing.

Basel et al. (2020) identified challenges with blockchain's anonymization of transactions while exposing risks of traceability relating to identifying those involved in those transactions. Basel (2020) recommended that possible selective disclosure of private information or even de-anonymization should be made available on the blockchain.

5.4.4 Knowledge & Education

With any introduction to new technology, there is a period where upskilling will take place. It does not happen all at once within a community but is generally driven by necessity. There is immense risk in not knowing what one does not know while

accessing a platform or functionality that allows one to operate without the required skills or understanding.

Skilled technical resourcing in new technology is always a challenge. Those who move early on into new technology do so out of passion and belief in the technology and are generally relatively skilled, but only a few. The mainstream resources are focused on chasing the money, and this only comes over time once the new technology hits the mainstream world.

Participants 11, 13, and 8 all shared the same sentiment. They felt that the public needed to be up to speed on blockchain, which should not impact their usage. The user needs to know how to use the system but does not need to know how it operates and functions under the hood. The participants also felt that as blockchain becomes mainstream over time, many more people will upskill and become familiar with the technology. However, they did feel that understanding the benefits of blockchain might hinder and slow the adoption of the technology in the public space.

Participant 4 stated that the need for more awareness around blockchain technology is generational. The older generation needs to understand and trust the new technology. Participant 4 was also concerned that the constant scandals around blockchain, specifically crypto, are negatively influencing blockchain technology and making it harder to gain traction. This results in people focusing on the dangers of blockchain due to crypto scandals without understanding or grasping the potential benefits of blockchain and divorcing crypto from blockchain technology.

Participants 4 and 5 stated that there might be more real-world commercial opportunities in the industry around blockchain to monetize the skill, which results in a high risk for developers to move from traditional development to blockchain development. Participant 4 felt that the current blockchain developer community comprised inexperienced and novice developers, as there was yet to be a draw for skilled and experienced developers.

Participants 1 and 2 were concerned that the limited technical skill resources in the blockchain space would cause complications delays, and expose vulnerabilities on

social media platforms. Participant 11 felt that the lack of technical resources in the blockchain realm is not related to a shortage of skill but rather a lack of interest in or fear of the new technology, the blockchain chain. Salaries might not be as high within the blockchain career space, and there might still be some scepticism around whether there is a future for a developer focusing on the blockchain if it has yet to hit the mainstream.

Freni et al. (2020) stated that blockchain, as a new technology component, has some hard work ahead of it to gain the trust of ordinary and uneducated users and ultimately kick off the network effects and ensure a smooth and flawless user experience. However, Freni et al. (2020) still believe a radical transformation is on the horizon in how people use social networks.

Abu-elezz et al. (2020) stated that there needs to be more technically skilled professionals within the blockchain space with the required capabilities to implement thriving blockchain ecosystems. If this gap is not addressed, it could ultimately lead to disastrous consequences.

5.4.5 Regulation and governance

Participant 6 stated that blockchain was designed to be decentralised, which means there is no regulation, giving the technology the freedom to do what one wants, to whom one wants, and when one wants. If we bring regulation to the blockchain, we would go against its core value of decentralisation. So, on the one hand, regulation is needed, but on the other hand, it goes against the principles of decentralisation.

Participant 9 felt that there needed to be more regulatory requirements, which will become a problem in the future for both social media users and organisations. The concerns were around online defamation, children's protection on social media, social media not being held accountable, and blockchain.

Participant 12 raised concerns that the blockchain space lacks regulation and regulatory understanding, which exposes it to vulnerabilities and abuse. Participant 12

also stated that, with no regulation around blockchain, the user base will have no recourse if the data is leaked in the unlikely event of a breach.

Basel et al. (2020) stated that it is evident that there is a requirement for global legislation on privacy and anonymity. It is in consideration of the growth of data and the need to make it more secure and confidential. Basel et al. (2020) stated that more secure mechanisms should be provided with guarantees of privacy and anonymity because of the characteristics of blockchain, e.g., the right to be forgotten due to immutability. It is hard to adapt immutability to the General Data Protection Regulation, an EU regulation law around privacy and data protection within the EU and European Economic Area.

Freni et al. (2020) raised a concern that the current blockchain ledger immutability characteristic relating to user data, specifically around the user's right to be forgotten and how personal data should be handled, is currently incompatible with the DGPR (General Data Protection Regulation) and does not comply with the regulation in its current form.

Regulation is a critical component of any new technology or market. It defines the rules and guidelines required to protect the rights and safety of citizens while ensuring the adequate and reliable delivery of services or goods. Without it, the market becomes a free-for-all, with no baseline of generally acceptable practices. Regulation also brings confidence and authenticity to the technology and provides a safety net for its users and consumers. It is a vital and critical component that is much needed in the blockchain space and on social media platforms.

5.4.6 Summary

Reviewing the participant's feedback about the known blockchain limitations has reflected some issues with the core characteristics of blockchain, like immutability and critical management, and other issues expected with new technology, like scalability, regulation, education and steep learning curve. Users might also not be accustomed to a non-centralised platform where the user's experience, interaction, and

responsibility might differ substantially. Education about possible cryptocurrencies must be had, as many blockchains use this economic model to transact financially. Although security is one of the core benefits of blockchain, it can also be challenging, especially regarding one's private keys, transparency and immutable records. We have discussed blockchain's performance and scalability issues, which might also change how users interact with the platform. Blockchains currently have a significant energy footprint. Although the participants listed these as issues, they were willing to accept them to benefit from the other core characteristics.

Education and communication are vital when transitioning and can assist substantially in making that migration painless and address some of these concerns.

5.5 CONCLUSION

This section examined the participant's responses to current social media concerns on the traditional platform. We further examined, from a social media end user's perspective, what the benefits and concerns around running social media on blockchain technology would be from their point of view, based on some of the characteristics of blockchain.

There is strong consensus and shared concern from all participants over data ownership and management in social media. In its current form and commercial model, blockchain causes much concern around privacy among social media users. As we move into the significant data era and integrate more IoT devices, couple more systems together, and leverage standardized metadata, it will be critical to understand the roles and responsibilities of the platform vs. the user base regarding data ownership and management.

Blockchain technology is still relatively new, with very few active use cases. Some of its core and fundamental characteristics address the participants' concerns, while others present new concerns to the user base.

Overall, the participants felt that the limitations and concerns needed to be revised and detrimental enough to prevent them from migrating to the blockchain, and they felt that the benefit of the migration far outweighed the consequences of not migrating.

6. CONCLUSIONS, LIMITATIONS & RECOMMENDATIONS

6.1 INTRODUCTION

This final chapter will present the conclusions of this research document, providing recommendations and suggestions for possible future research.

The study intended to understand if the narrative of the end user should change from applying pressure on the social media platforms to further secure their current platforms to instead applying pressure on the social media platforms to migrate to blockchain technology.

It was unpacked by answering three questions. Suppose the end-user privacy and security concerns around traditional social media platforms were still valid. If migrating to the blockchain would add any additional value to the users, and lastly, if migrating to the blockchain would add any additional concerns.

6.2 CONCLUSIONS

6.2.1 Are the social media user's privacy and security concerns still valid?

Guidi (2021) states that the business model for social media platforms is designed to provide a free service to the users to grow the user base while harvesting and storing the data on the platform for the platform's ownership and use as they see fit. This data is generally used to grow the platform's profits via sales and marketing, advertising, or other data-related services. These activities, usage, and data publication are the primary causes of the risk and exposure concerns.

The participant feedback relating to the three themes (Risk and Exposure, Knowledge and Education, Regulatory and Governance) revolves around data management and the appropriate knowledge, use, processing, storage, security, and application thereof.

In the current traditional social media model, the data is ultimately managed and owned by the platform, with minimal control given to the user.

The privacy and security concerns around traditional social media are still relevant despite the continued use by the users of the various social media platforms and the incremental security and feature enhancements made to the platform by its custodians.

The shift into the significant data era, where large amounts of data are being generated, consumed, and stored daily, especially on social media platforms, has elevated the concern and risk of how all this data will be managed and ultimately owned.

6.2.2 Is migrating to the blockchain going to add any additional value to the users?

Zhang et al. (2021) stated that sensitive and private data needs to be secured, but the measures used in securing the data should not impact or hinder the user in any way or form.

This section looked at the characteristics of blockchain and how they would apply to social media. In the eyes of the participants, it was assessed if there would be any added value. The benefits mentioned by the participants all addressed various types of bad human behaviour and the impact thereof, as well as looking to some form of self-regulation, which the blockchain characteristics provide.

It also reflected a desire by the participants to own and manage their data, and they felt that the benefits and core characteristics of blockchain on social media would assist with this despite any drawbacks or limitations that might be introduced.

6.2.3 Is migrating to the blockchain going to add additional concerns to the users?

Freni et al. (2020), while discussing current open issues relating to blockchain, stated that blockchain can bring positive disruptive potential to the market. However, there

are still known open issues that need to be solved to ensure the adoption of this technology is without complications.

There are always concerns, risks, and unknowns in any transition to or onboarding onto a new technology stack. The measure of success is understanding the limitations, gaining a firm grasp of areas of improvement and possible challenges, and, where possible, implementing workarounds and pipeline solutions to address, mitigate, or remediate them.

The limitations and challenges of blockchain technology are well-defined and understood, mainly from a theoretical perspective. There is a paradoxical effect where some of the fundamental and core characteristics of blockchain, which make it secure and appealing, are somewhat seen as limitations and possible causes for concern from social media users' perspectives.

Some challenges and limitations, like the lack of regulation and governance around blockchain technology, are expected as the technology is still relatively new with little real-world application. However, the concern Freni et al. (2020) raised concerning the right to be forgotten is not to be taken lightly.

Similar concerns were also raised for social media, blockchain technology, traditional education, and user behaviour, which might not be solved by technology but rather by other means.

The question is: do the limitations and concerns raised around social media on blockchain outweigh the concerns raised for social media on the traditional platform, or do they add complexity and cause concern that the risk or effort is too significant to migrate over from a user's perspective?

6.3 RECOMMENDATIONS

6.3.1 Regulation and Governance

Regulation around social media needs to be firmed up, especially the components around data management and ownership. Not only does the regulation need to be strengthened, but governance within the social media platforms also needs to be enforced and, if possible, auditable by the user to identify what data is collected and where it is stored, shared, and used.

Blockchain technology is here to stay; it is only a matter of time before traditional systems and processes migrate to the various blockchains. Regulation, laws, and governance still need to be improved around this technology and be firmed up extensively and interwoven into social media regulations.

6.3.2 Education

There is a need to educate and upskill social media users not only about the potential threats they are exposed to and how to mitigate and navigate around them but also about the concept of personal data ownership and understanding who one audience is that one is providing information to (knowingly or unknowingly) in the form of posts, images, emoji, or videos. There is an opportunity for social media platforms to run programs to educate their user base and provide them with the skill set to prevent or detect these threats on their platforms.

There is also a need to educate and upskill social media users around blockchain technology and its benefits and limitations. Unfortunately, we cannot leave this to the social media platforms, so other initiatives and programs potentially initiated by the blockchain community should be kicked off. At the very least, it should provide the users with visibility into an alternative solution instead of being at the mercy of the platforms around what measures they are willing to implement.

6.3.3 Data Ownership and Management

Data ownership and management are significant concerns within social media and around our digital footprint on the internet and other digital platforms. Self-sovereign identifier (SSI) looks promising and can solve many data management concerns. A blockchain taxonomy that would allow for the integration of multiple blockchains also looks promising. Integrating SSI and blockchain taxonomy into social media platforms can turn the tables and finally provide the user base with control and management of their personal information.

6.3.4 Narrative of social media users

The participant's collective sentiment was to be unhappy with how social media platforms operate in terms of mitigating various threats and using their data. Conversely, the participants showed optimism about blockchain's capabilities and characteristics and how it could address some of their concerns about traditional social media. However, the concerns regarding the limitations and shortcomings of blockchain were not blockers for the participants' transition to a blockchain-based social media platform.

The researcher recommends that the narrative of social media users be altered towards applying pressure on social media platforms not to keep securing the traditional platforms but rather to migrate over to a blockchain-based social media platform.

6.4 LIMITATIONS OF THE RESEARCH

The limitations of the research paper are outlined below:

- The participation sample size was limited to a fraction of the total social media user population.

- Identifying and sourcing the commitment of the required participants from the defined sample for the interviews once the research had commenced due to year-end and work commitments from the participants.
- Identifying participants who had some form of knowledge of blockchain technology
- Time constraints within the allocated research project time frame as set by the university
- As a result of hosting the interview virtually via MS Teams or similar applications, body language and expressions by the participant were only sometimes picked up.
- Challenges relating to connectivity, load shedding, or other related technology challenges interrupt or prolong the interview and impact the participant.

6.5 SUGGESTIONS FOR FUTURE RESEARCH

The following areas have been identified for possible further research:

- When conducting the research and interviewing the participants, the researcher identified that there might be common trends and themes depending on the participants. Further in-depth research with a greater sample size, including analysing the responses per demographics (i.e., sex, race, and age), might yield interesting results relating to privacy concerns on social media platforms and an appetite for blockchain technology integration into social media.
- One of blockchain's core benefits is its secure algorithms. Quantum computing is on the brink of inception. Investigating the possibility of quantum-resistant ledges to be used within social media and the possible benefits and limitations of such a feature would be interesting to see if the feedback from the participants would change.
- Personal privacy and ownership and control of one's personal information are two of the biggest concerns around social media. Self-Sovereign Identifier (SSI)

might be one possible solution by integrating it with blockchain and social media. Research into the possible options and complexities around SSI-compatible social media integration is suggested.

- There are several blockchains in existence. Each offers varying degrees of features and capabilities. Social media platforms may utilize different blockchains, while the personal profile information of an individual using different social media platforms might be the same. The blockchain taxonomy provides a mechanism to integrate the various blockchains. Research is suggested into the possibility of having a shared profile under the control and ownership of the user, possibly via SSI, to be implemented by the various blockchains that the social media platforms would use via blockchain taxonomy.

7. REFERENCES

Aljohani, M., Nisbet, A. and Blincoe, K. (n.d.). A survey of social media users privacy settings & information disclosure. Retrieved from ;
https://kblincoe.github.io/publications/2016_SECAU_Social_Media.pdf

Mohanta, B.K., Jena, D., Panda, S.S. and Sobhanayak, S. (2019). Blockchain technology: A survey on applications and security privacy Challenges. Internet of Things. Retrieved from:
<https://www.sciencedirect.com/science/article/abs/pii/S2542660518300702>

Braun V, Clarke V. (Mis). (2015) conceptualising themes, thematic analysis, and other problems with Fugard and Potts' sample-size tool for thematic analysis. Retrieved from: <https://www.tandfonline.com/doi/abs/10.1080/13645579.2016.1195588>

Cambridge Analytica and Facebook: (2018) The Scandal and the Fallout So Far Published 2018) Nicholas Confessore Year: 2018 Container: The New York Times. Retrieved from: <https://www.nytimes.com/2018/04/04/us/politics/cambridge-analytica-scandal-fallout.html?searchResultPosition=1>

Chaum. L. David (1982). Dissertation. Computer Systems Established, Maintained and Trusted by Mutually Suspicious Groups. Retrieved from: https://chaum.com/wp-content/uploads/2022/02/chaum_dissertation.pdf

Chakravorty, A., Rong, C. (2017). UShare. User controlled social media based on blockchain. Retrieved from. <https://doi.org/10.1145/3022227.3022325>

Chen. Yiz, Li. Quanlai, Wang. Hao (2018). Towards trusted social networks with blockchain technology. Retrieved from: <https://arxiv.org/pdf/1801.02796.pdf>

Creswell, J. (2014). Research Design (4th Edition). United States of America: SAGE Publications Inc.

Datareportal.com (2022). Digital 2022: Global overview report. Retrieved from <https://datareportal.com/reports/digital-2022-global-overview-report>

Droesch, B. (2019). How Social Media Users Have—and Have Not—Responded to Privacy Concerns. EMarketer. Retrieved from: <https://www.emarketer.com/content/how-social-media-users-have-and-have-not-responded-to-privacy-concerns>

Emerging Technologies in Computing: Theory, Practice, and Advance, Pramod Kumar, Anuradha Tomar, R.Sharmila. A Chapman & Hall Book. 2022. PG 80

Forbes.com (2012). If you're not paying for it, you become the product. Retrieved from: <https://www.forbes.com/sites/marketshare/2012/03/05/if-youre-not-paying-for-it-you-become-the-product/?sh=1fb831d25d6e>

Freni, P, Ferro, E, Ceci, G (2020). Fixing Social Media with the Blockchain. Retrieved from: <https://helios-h2020.eu/wp-content/uploads/2020/09/Freni-et-al.-Fixing-Social-Media-with-the-Blockchain.pdf>

Guidi, Barbra (2018). Managing Social contents in Decentralized online social Retrieved from: <https://0-www-sciencedirect-com.innopac.wits.ac.za/science/article/pii/S2468696418300132>

Guidi, Barbra (2020). When Blockchain meets online social networks. Retrieved From: <https://0-www-sciencedirect-com.innopac.wits.ac.za/science/article/pii/S1574119220300195?via%3Dihub>

Guidi, Barbra, Michienzi, Andre. (2021). The decentralization of social media though the blockchain technology Retrieved from: https://dl.acm.org/doi/pdf/10.1145/3462741.3466680?casa_token=RXDWQ3GagScAAAAA:k7GEY5W9_dOJdxDrQaANsH4eFnjtEsDM5v52NHgJPMmtXwFSzkQoOeCAhFR00ZREfuMEVr4SeXj61kY

Guidi, Barbra (2021). An overview of blockchain online social media from the technical point of view. Retrieved from :
https://www.researchgate.net/publication/355505018_An_Overview_of_Blockchain_Online_Social_Media_from_the_Technical_Point_of_View

Global Social Media Statistics - DataReportal – Global Digital Insights (2022). Retrieved from: <https://datareportal.com/social-media-users#:~:text=Analysis%20from%20Kepios%20shows%20that,since%20this%20time%20last%20yea>

Preeti Grover, Purva, Kar. K. Arpan. (2019). Diffusion of blockchain technology. Insights from academic literature and social media analytics. Retrieved from:
https://www.researchgate.net/profile/Purva-Grover-3/publication/334309552_Diffusion_of_blockchain_technology_Insights_from_academic_literature_and_social_media_analytics/links/5ddcdc6ba6fdccdb44657441/Diffusion-of-blockchain-technology-Insights-from-academic-literature-and-social-media-analytics.pdf

Hisseine, M. A., Chen, D., & Yang, X. (2022). The Application of Blockchain in Social Media: A Systematic Literature Review. Applied Sciences, 12(13), 6567. Retrieved from: <https://doi.org/10.3390/app12136567>

Javapoint (2022). Limitations of Blockchain Technology. Retrieved from
<https://www.javatpoint.com/limitation-of-blockchain-technology#:~:text=Blockchain%20like%20bitcoin%20has%20consensus,the%20other%20institutions%20are%20doing.>

Koohang, A., Paliszkiwicz, J., & Goluchowski, J. (2018). Social media privacy concerns: trusting beliefs Retrieved from:
<https://www.proquest.com/docview/2087525207?accountid=15083&parentSessionId=XAIL1qoWU2G8nQtupukSC8m33C8yA0R37Ubbp51EY84%3D&pq-origsite=summon>

Kuczerawy, Aleksandra., Coudert, Fanny (2017). Privacy Settings in Social Networking Sites: Is It Fair? Retrieved from: <https://hal.inria.fr/hal-01559469/document>

Hinds. J, Williams. E. J. & Joinson. A. N. (2020). "It wouldn't happen to me": Privacy concerns and perspectives following the Cambridge Analytica scandal. *International Journal of Human-Computer Studies*, 143, [102498]. Retrieved from: <https://doi.org/10.1016/j.ijhcs.2020.102498>

Joanne Hinds, Emma J, Williams, Adam N. Joinson, (2020) *International Journal of Human-Computer Studies*. "It wouldn't happen to me": Privacy concerns and perspectives following the Cambridge Analytica Scandal. Retrieved: <https://0-www-sciencedirect-com.innopac.wits.ac.za/science/article/pii/S1071581920301002?via%3Dihub>

Julia Pryce, Renee Spencer, Jill Walsh (2014). *Philosophical Approaches to Qualitative Research*. Retrieved from: https://ecommons.luc.edu/cgi/viewcontent.cgi?article=1109&context=socialwork_facpubs#:~:text=Within%20the%20context%20of%20qualitative,realty%20that%20can%20be%20known.

Li. Chow, Palanisamy. Balaji (2019). *Incentivized Blockchain-based Social Media Platforms: A Case Study of Steemit*. Retrieved from: https://dl.acm.org/doi/pdf/10.1145/3292522.3326041?casa_token=L_bQrejNbVYAAAAA:z6a53ijtqSMrM770GnZFKxAxmom2wcml_dwUREdEbqYMmzmb1UoUebW-BuAU5d_Mq2-dyydkpWXp2WQ

Joshi. P. Archana, Han. Meng, Wang. Yan (2018). *A survey on security and privacy issues of blockchain technology* Retrieved from: <https://www.aims sciences.org/article/id/d27803a2-7ce7-46e8-900d-30001fd4785a>

Rainie, L. (2018, March 27). *Americans' complicated feelings about social media in an era of privacy concerns*. Pew Research Center; Pew Research Center. Retrieved from: <https://www.pewresearch.org/fact-tank/2018/03/27/americans-complicated-feelings-about-social-media-in-an-era-of-privacy-concerns/>

Ritchie, Deanna (2022). *Blockchain Limitations to consider today*. Retrieved from: <https://www.proquest.com/docview/2640051480?parentSessionId=wwbeO386C6KQoN7R5M0lx4NcRc5LjaAbQYXelu36ydu%3D&pqorigsite=summon&accountid=15083>

Sandra Petronio (1991) Communication Boundary Management: A Theoretical Model of Managing Disclosure of Private Information between Marital Couples.

Retrieved from: <https://0-academic-oup-com.innopac.wits.ac.za/ct/article-abstract/1/4/311/4430865?redirectedFrom=fulltext>

StartupFreak. (2012, August 30). 10 revenue models for social media startups.

Startup Freak. *Retrieved from: <https://startupfreak.com/10-revenue-models-for-social-media-startups/>*

Nasdaq (2021). Social Media on the Blockchain (SocialFi) Could Be Key to Mass Adoption (2021) *Retrieved from: <https://www.nasdaq.com/articles/social-media-on-the-blockchain-socialfi-could-be-key-to-mass-adoption>*

Sherman, A. T., Javani, F., Zhang, H., & Golaszewski, E. (2018). On the Origins and Variations of Blockchain Technologies. *IEEE Security & Privacy*, 17(1), 72–77. *Retrieved from: <https://doi.org/10.1109/msec.2019.2893730>*

Shin. Dong-Hee (2010). The effects of trust, security and privacy in social networking: A security-based approach to understand the pattern of adoption.

Retrieved from: <https://0-academic-oup-com.innopac.wits.ac.za/iwc/article/22/5/428/688656>

Spinelli, C. (2010). Social Media: No “Friend” of Personal Privacy. *Retrieved from: <https://www.elon.edu/u/academics/communications/journal/wp-content/uploads/sites/153/2017/06/05SpinelliEJFall10.pdf>*

Strahilevitz.Lior Jacob. (2009). A Social Networks Theory of Privacy.*Retrieved from: <https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?article=5298&context=uclrev>*

Tavani. Herman T. (2007). Philosophical theories of privacy: Implications for an adequate online privacy policy: Retrieved from: <https://philarchive.org/rec/TAVPTO>

Tulane University. (2020). Key social media privacy issues for 2020. Social Media Privacy Issues for 2020: Threats & Risks. (n.d.). Retrieved from:
<https://sopa.tulane.edu/blog/key-social-media-privacy-issues-2020>

Venegas-Vera. Verner, Colbert. B Gates and Lerma. V Edgar (2020). Positive and negative impact of social media in the COVID-19 era. Retrieved from:
<https://www.imrpress.com/journal/RCM/21/4/10.31083/j.rcm.2020.04.195/pdf>

8. APPENDIX A – LITERATURE REVIEW

Table A: Prior studies on Privacy Concerns of social media on the Blockchain (Initial review)

Location	Title	Year	Authors	Purpose of study	Keyword's	Method used (Design, Sample & Place)	Key Findings
Worldwide Italy	Fixing social media with the Blockchain	2020	Pierluigi Freni, Enrico Ferro, Gabriele Ceci	The paper investigates how blockchain is reshaping the social media scene	BlockChain Social Media	Qualitative (Exploratory) – Case study approach	The findings revealed that a paradigm shift is brought in by introduction of blockchain into social media. Bringing the user back to the central focus of social media, and providing transparency, value redistribution, ownership awareness, decentralization of data and censorship resistance. The introduction of tokenization redefines the concept of value which can be traded on the platform. Lastly there is cross pollination between social media platforms of on-chain and off-chain, but its still early days to see which principles (traditional vs blockchain) will permeate into which platforms
Worldwide Italy	An overview of blockchain online social media from the	2021	Barbara Guidi	The aim of the paper is to analyse blockchain online social media from the technical point of view in order to understand the current trend of social	BlockChain Social Media	Qualitative (Exploratory) – Case study approach	The findings revealed that almost all social media platforms based on blockchain are based on Ethereum. Scalability and transaction fees are the 2 most important characteristics to consider when choosing a

	technical point of view			media applications and describe the characteristics which are important in a blockchain based social media platform			blockchain based social media platform. The study emphasized that all current blockchains are not good choices when looking at the social scene, although proposed changes to Ethereum might improve its application on the social scene.
Worldwide Italy	When Blockchain meets Online Social Networks	2020	Barbara Guidi	The aim of this paper is to describe in detail the blockchain based online social media platforms by highlighting the main features and services they offer, but also the common drawbacks of these platforms.	Blockchain Social Media	Qualitative (Exploratory) – Case study approach	The findings revealed the blockchain based online social networks surveyed in this research paper shared a common problem relating to the content visibility and privacy issues. The researcher proposes a new framework which takes into account the role of the user as the centre of the system, instead of the role of the content as in current proposals.
Worldwide Italy	Managing social contents in Decentralized Online Social Networks: A survey	2018	Barbara Guidi	The aim of this paper is to present the results of the survey reflecting the challenges related to blockchain based online social networks and propose solutions taking into account the strategies adopted to manage social data, focusing on the data availability and information diffusion. The survey also presents privacy issues arising from distributed online social networks.	BlockChain Social Media Privacy	Qualitative (Exploratory) – Survey approach	The findings unpack how distributed online social networks prove a better alternative to the traditional online social networks but does note that the decentralization requires specific approaches for social data management. The research outlines techniques to manage social content in a distributed framework but does highlight 3 problems for data management bring data availability, information diffusion and privacy. The researches further unpacks issues around group management, privacy from 3 rd party integration, suggested relation requests and lastly mobile access on DOSN

Worldwide USA	Towards trusted social networks with blockchain technology	2018	Yize Chen, Quanlai Li, Hao Wang	The aim of this paper is to understand how blockchain technology can help limit the spread of rumours, motivate trusted networks and ensure information exchange is secured	Blockchain	Mixed Methodology – Literature review and Case Study	The research investigated the dynamics of rumour dissemination in social networks with and without blockchain-enabled technology. The research introduced a graphical model setup for social media and demonstrated how to incorporate blockchain into peer to peer information exchange utilising virtual credits. The result reflected a reduction in large scale rumour spreading.
Worldwide Iran	Enhancing Security on Social Networks with IoT Based Blockchain Hierarchical Structures with Markov Chain	2022	Masoud Moradi, Masoud Moradkhani, Mohammad Bagher Tavakoli	The research explores security challenges like preserving privacy, confidentiality, accessibility, and data integrity in social networks. The researcher then introduces markov process and transmission to further enhance blockchain security	Privacy Social Media Blockchain	Mixed Methodology – Case Study	The study elaborated on further structural information security improvements which are still required to reduce cumbersome controls and facilitate access to information on the blockchain, and touched on some security issues of blockchain around big data. One proposed solution to address the security concerns is around improving encryption algorithm techniques. The researcher proposed a new method of encryption and blockchain structures, but was theoretical and would require further studies.
Worldwide USA / Denmark	The paradoxical effects of blockchain technology on social networking practices	2018	Raffaele Fabio Ciriello, Roman Beck, Jason Bennett Thatcher	The aim of the study explores how blockchain enables and constraints social networking practices by examining steem, a currently blockchain social network. The researcher identifies and explores the 3 paradoxical effects of block chain social networks	Blockchain Social Media	Qualitative (Exploratory) – Literature review and Case Study	Findings of the research indicate several enabling and constraining characteristics of block chain social networks which present a paradoxical effect on social networking practices. The researcher proposes some coping strategies to address these paradox effects found on Steem. The researcher ends off proposing further studies

				(BSN)– Freedom and Captivity, Abundance and Scarcity and lastly Peace and War			required to look into the ethics underpinning blockchain social networks
Worldwide China	A Blockchain-Based decentralized online social network	2019	Le Jiang, Xinglin Zhang	The aim of the research was to unpack the security concerns around centralised online social networks and propose a distributed online social network framework which integrates the advantages of traditional and distributed online social network	Social Media Security	Mixed Methodology – Empirical, Case Study	The research findings demonstrate by combining smart contracts, the blockchain has been transformed from a trusted server to implement the functionalities that used to be provided by central traditional servers. The researcher demonstrated that blockchain social networks can provide efficient, safe and privacy aware functionalities of authentication, news feed notifications, and friend recommendations. Additionally the users were provided additional encryption to further protect privacy, with additional algorithms based on smart contracts .
Worldwide China	A novel blockchain-based privacy-preserving framework for online social networks	2020	Shiwen Zhang, Tingting Yai, Voundi Joe Arthur Sandor, Tien Hsiung Weng, Wei Liang, Jinshu Su	The aim of the study was to propose a novel blockchain based privacy preserving framework for online social networks called BPP to address the challenge of securing of sensitive data while providing efficient and privacy preserving social network services for the user	Blockchain Social Media Privacy	Mixed Methodology – Empirical, Case Study	This paper unpacks how the proposed novel blockchain based privacy preserving framework enables authorised data queries to enjoy secure, convenient and efficient data sharing, data retrieving and data accessing services in online social networks. Furthermore the proposed framework combines blockchain with public key encryption for additional security. The use of smart contracts provide for a more reliable and confidential keyword search schema with out any verification mechanism. Further investigation is required around the data dynamic update issues for data publishers.

Worldwide Spain	Blockchain from the Perspective of Privacy and Anonymisation: A Systematic Literature Review	2020	Francisco Jose de Haro-Olmo, Angel Jesus Varela-Vaca, Jose Antonio Alvarez Bermejo	The aim of the research was to present the relationship between privacy and anonymisation in blockchain technologies on different fields of application.	Blockchain Privacy	Qualitative – Systematic Literature review	The findings suggest some limitations and future lines of research on issues close to blockchain technology in different fields of application. One of the risks exposed for privacy was the possible traceability of a transaction on the blockchain, another possible limitation would be the high computational and inter-operational costs of running an efficient and effective blockchain. Lastly the right to be forgotten poses a challenge on blockchain, which might further hinder the adoption. Finally, the researcher recommends a move towards a global legislation on privacy and anonymity.
Spain Worldwide	Privacy-Preserving Solutions for blockchain: Review and challenges	2019	Jorge Bernal Bernabe, Jose Luis Canovas Sanchez, José Luis Hernández-Ramos, Rafael Torres Moreno, Antonio Skarmeta	The aim of this research paper is to review the various privacy challenges within blockchain and examines the various privacy preserving options available to address the privacy concerns.	Blockchain Privacy	Systematic review	The finding reviewed the various concerns surrounding privacy-preservation on blockchain, including encompassing transaction link ability, crypto-keys management (e.g. recovery), issues with crypto-privacy resistance to quantum computing, on-chain data, usability interoperability, or compliance with regulations. The researches examined the various current mechanisms to address these concerns, and concluded that there is still a large gap currently in blockchain relating t privacy challenges. Specifically around the users rights to be anonymous, to erase data, or withdraw consent. The researches emphases that more effective crypto privacy algorithms

							are required and focused on complying with privacy regulations around privacy usability and privacy control.
China, Japan, Finland WorldWide	Privacy preservation in permissionless blockchain: a survey	2020	Li Peng, Wei Feng, Zheng Yan, Yafeng Li, Xiaokang Zhou, Shohei Shimizude	The aim of the research was to analyse the specific characteristics of the permissionless blockchain, and outline the potential privacy threats.	Blockchain Privacy	Qualitative (Exploratory) – Case study approach	The findings outlined that through blockchains transparency and decentralised characteristics and nature, it makes it difficult to apply a level of protection on user privacy effectively. The study defined the potential threats to privacy on a permissionless blockchain and identified open issues which still needed to be addressed and further investigated.
Qatar, WorldWide	The benefits and threats of blockchain technology in healthcare: A scoping review	2020	Israa Abu-elezz, Asma Hassan, Anjanarani Nazeemudeen, Mowafa Househ, Alaa Abd-alrazaq	The aim of this research was to explore the work being done to improve patient interoperability within the health care system relating to patient health information and the privacy related issues	Blockchain HealthCare Patient Information	Qualitative (Exploratory) – Case study approach	With all blockchain benefits, which can be used to improve the healthcare data sharing and storing system owing to its decentralisation, immutability, transparency and traceability features. The potential of threats such as security and authorisation issues, interoperability issues and lack of technical skills related to blockchain technology, make the Healthcare organisations hesitant to adopt blockchain technology.
Norway	UShare: user controlled social media based on blockchain	2017	Antorweep Chakravorty, Chunming Rong	The research presented the potential for blockchain based solutions to disrupt the world of social networking	Blockchain, Social Media Network, USHare	Systematic review	The findings unpacked the Social Media Platform called UShare and discussed how its designed to be user centric, which would enable users to control, trace and securely share content. The researcher argued that the platform would support offsite encryption and data mechanisms to share it via the blockchain, as well as how it would be

							decentralization, anonymity, traceability and censorship resistance on the blockchain.
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9. APPENDIX B – PARTICIPANT INFORMATION

Dear Potential Research Participant, My name is Edward Pinto, and I am currently enrolled at Witwatersrand University in Master of Management in the field of Digital Business. As part of the requirements for my degree I am required to submit a research report on a particular topic. The primary objective of my research paper is to explore the extent to which blockchain technology innovation can address the online privacy shortcomings from a user perspective.

Participants in this research will need to be active social media users, technology savvy and minimal understanding of blockchain.

I would like to invite you to participate in my research. In order to participate you will be required to participate in a semi-structured one-on-one interview with the researcher. The broad topic of the interview will be around your privacy concerns within Social Media. The interview will be about one hour and 30 minutes in length. The interviews will be audio recorded with MS Teams and transcribed by the researcher. The audio recordings and transcriptions will be kept in the possession of the researcher encrypted and stored so that only the researcher will have access to. The only other person besides the researcher who will have access to the transcriptions is my supervisor, Dr Tebogo Sethibe.

Direct quotes may be used in the final report but will not be personally identifiable. All data will be kept for a period of 1 years (should publication of the results occur) After this time, all data will be destroyed or deleted. All identifying information will be kept strictly confidential. In the final report (and any subsequent publications) your anonymity will be protected by using a pseudonym such as Participant A, B etc. The identity of all extraneous persons mentioned by you will be kept anonymous through the use of pseudonyms.

Your participation in this research is completely voluntary and you are free to withdraw at any stage prior to submission/publication for any reason. You are also free to abstain from answering any question in the interview that makes you feel uncomfortable.

There will be no reward or sanction as a result of participation in this research.

If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecon-medical@wits.ac.za

If you agree to participate in this research, please complete the consent form attached to this document.

Yours sincerely,

Edward Pinto

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10. APPENDIX C – INTERVIEW QUESTIONS

Social Media Online Privacy: A case for Blockchain Technology Innovation:

Researcher: Edward Pinto

The primary objective of this research paper is to explore the extent to which blockchain technology innovation can address the online privacy shortcomings from a user perspective.

In preparation to the interview, the researcher requests your view the following youtube videos to provide you with a general understanding of blockchain technology

- Blockchain in 7 Minutes:
<https://www.youtube.com/watch?v=yubzJw0uiE4>
- Blockchains: How can they be used:
https://www.youtube.com/watch?v=aQWflNQuP_o
- Why are social media platforms exploring blockchain technology?
<https://www.youtube.com/watch?v=7zvphwuyphk>

The questions which will be put forward during the interview to address the sub objectives as listed below:

- Sub-Objective 1: identify and validate the online social media privacy shortcomings
- Sub-Objective 2: explore the benefits of blockchain in relation to the identified shortcomings.

- Sub-Objective 3: explore potential blockchain challenges in relation to online privacy.

The interview will be semi-structured so feel free to provide any additional context, elaboration or information to your answers during the interview, whilst ensuring you do not divulging any personal, proprietary or secret information relating to the organisation you work for or to yourself. By participating in this interview, you indicate your provision of informed consent in addition to the written consent provided, for the use within this study.

Section A: Participant Details

Participant: _____

Social Media Platforms currently on: WhatsApp Instagram Pinterest
 Facebook LinkedIn Other _____

Hours Spent on social media a day? 0 - 1 1-2 2-4 4-8 8-10 10+

Level of knowledge of Blockchain? Non Little Average Lots Expert

Section B: Interview Questions

Question 1 - Traditional online social media has several privacy concerns. Some of the concerns are listed below. Rate each of the items below in order of concern to you on social media platforms and elaborate why ?

Use the following rating as a guide: (1) Unimportant; (2) Slightly Important; (3) Moderately Important; (4) Important; (5) Very Important

a	<p>Data Mining - Use of one's private information for advertising, sales, marketing, or other purposes which one is not aware of or consent to</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
b	<p>Phishing Attack – Attempt to gain access to one's account, personal information, banking details etc via an illegitimate source imitating to be a legitimate source</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
c	<p>Botnet Attack – social media automated accounts used to post and follow social accounts for malicious use</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>

d	<p>Malware Sharing – Installing or using compromised software to infiltrate one’s account or device</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
e	<p>Account Hacking or Impersonation – Use the trust one has built up with the followers to further spread their attack</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
f	<p>Stalking and Harassment – Vulnerable to physical or cyber-attacks via sharing personal or private information</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>

g	Other – Participant to share detail	(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important
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Question 2 - Out of the list of privacy concerns you mentioned above which concern you the most, do you do anything from your end to prevent, address or mitigate that risk, and if so, what do you do ?

Question 3 – Blockchain technology comes with several benefits, as defined below. Are there any characteristics below that you view as a potential challenge or concern to a social media user like yourself, and if so, why ?

- a. **Distributed Ledger** – Information is spread across various nodes on the blockchain network, ensuring accessibility, availability whilst making it hard for hackers to gain access to the data
- b. **Enhanced Security** – Records are immutable so they cannot be altered and are encrypted end to end preventing unauthorized activity and fraud. Data can be anonymized, thus removing any personal data, and implementing permission-based access.
- c. **Greater Transparency** – visibility across the entire network is the same irrespective of which node you are viewing the data, providing you have access to the data. The data is time and date stamped, and full history of the transaction is available.

- d. **Instant Traceability** – an audit trail of a record is stored, linked and available to the record and available on the blockchain at every node.
- e. **Increased efficiency and speed** – providing a digital platform for storing and workflow processes, documentation, full transactional details, and records. Ensuring the records are available and time, anywhere on the blockchain, thus eliminating duplication
- f. **Automation** – with the use of smart contracts on the blockchain, workflows and transactions can be automated with pre-specified conditions defined before the next steps are taken, eliminating the requirements for 3rd party validators or human intervention.
- g. **Other** - Participant to share detail

Question 4 – Looking at the blockchain characteristics (Benefits) above, which characteristics do you think would benefit you the most as a social media user, and why ?

Question 5 – Blockchain technology comes with several limitations, as defined below. Some of the limitations are listed below. Rate each of the items below in order of concern to you on social media platforms and elaborate why ?

Use the following rating as a guide: (1) Unimportant; (2) Slightly Important; (3) Moderately Important; (4) Important; (5) Very Important

a	<p>lack of awareness – the application of blockchain is still being determined, and has not yet gone mainstream</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
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b	<p>limited technical talent – lack of adequate developers might hinder secured code and secured applications</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
c	<p>immutable – inability to modify any records, including delete records</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
d	<p>key management – security of one’s private keys for the blockchain</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
e	<p>consensus mechanism – time taken to reach consensus by all nodes on the blockchain</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>

f	<p>scalability – potential to contribute to poor performance due to consensus mechanism requiring each node to verify each transaction. Once the blockchain begins to grow, more nodes are added which will further prolong the time taken to reach consensus.</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>
g	<p>Other – Participant to share detail</p>	<p>(1) Unimportant (2) Slightly Important (3) Moderately Important (4) Important (5) Very Important</p>

Question 6 – From the blockchain limitations above, or others, are there any which would be so concerning that you would think twice from migrating off the traditional social media network to a blockchain social media network ?

Regards

Edward Pinto

11. APPENDIX D – PARTICIPANT CONSENT FORM

Participant Consent Form

Social Media Online Privacy: A case for Blockchain Technology Innovation:

Consent to take part in research

- I..... voluntarily agree to participate in this research study.
- I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- I understand that I can withdraw permission to use data from my interview within two weeks after the interview, in which case the material will be deleted.
- I have had the purpose and nature of the study explained to me in writing and I have had the opportunity to ask questions about the study.
- I understand that participation involves answering questions of the level of concern and importance on various privacy concerns around traditional and blockchain social media platforms from my perspective.
- I understand that I will not benefit directly from participating in this research.

- I agree to my interview being audio-recorded.
- I understand that all information I provide for this study will be treated confidentially.
- I understand that in any report on the results of this research my identity will remain anonymous. This will be done by changing my name and disguising any details of my interview which may reveal my identity or the identity of people I speak about.
- I understand that disguised extracts from my interview may be quoted in the research paper titled Social Media Online Privacy: A case for Blockchain Technology Innovation
- I understand that if I inform the researcher that myself or someone else is at risk of harm, they may have to report this to the relevant authorities - they will discuss this with me first but may be required to report with or without my permission.
- I understand that signed consent forms and original audio recordings will be retained securely in possession of the researcher until the exam board confirms the results of this research paper.
- I understand that a transcript of my interview in which all identifying information has been removed will be retained for one year from the date of the exam board.
- I understand that under freedom of information legislation I am entitled to

access the information I have provided at any time while it is in storage as specified above.

- I understand that I am free to contact any of the people involved in the research to seek further clarification and information.

Names, degrees, affiliations and contact details of researchers (and academic supervisors when relevant).

Researcher: Edward Pinto
Supervisor: Dr. Tebogo Sethibe

Signature of participant

Date

I believe the participant is giving informed consent to participate in this study

Signature of researcher

Date