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THE POTENTIAL VALUE OF BLOCKCHAIN FOR USE IN HIGHER EDUCATION

by

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DECLARATION

I, Selema Tebogo Molopa, declare that the contents of this PhD thesis represent my unaided work and that the PhD thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my opinions, not necessarily those of the Cape Peninsula University of Technology.

Additionally, I declare that I have used ChatGPT, Scite.ai, SciSpace, and Gemini to enhance the quality and efficiency of my thesis writing. These tools were employed to assist in various stages of the writing process, including research, citation management, drafting, editing, and language refinement. The use of AI tools was guided throughout by ethical standards (Katrina G Claw et al., 2018), ensuring that the integrity of the research was maintained.

To ensure that I use these tools effectively and responsibly, I have invested considerable effort into learning about AI technologies, specifically their application in academic writing and research. This effort is reflected in my contribution to academic literature, particularly in my article “AI and Systematic Literature Reviews: Advancing Academic Research with Emerging Technologies” (Molopa & Cronjé, 2024). In this publication, I discuss the potential of AI to transform the systematic literature review process, particularly by automating repetitive tasks and improving research efficiency. The paper also emphasises the ethical considerations and responsibilities researchers must adopt when integrating AI into their work. The article is available here. The article was a byproduct of my participation in the NWU Artificial Intelligence Symposium 2023.

It is important to note that the adoption of AI tools in academic writing is not limited to English-speaking countries. According to recent data from Visual Capitalist, ChatGPT is increasingly used in second-language English-speaking countries, which comprise a significant portion of its top 20 users (Lu & Smith, 2024). This trend highlights the global significance of AI in supporting academic writing and research, particularly in overcoming language barriers and enhancing accessibility for non-native English speakers. This highlights the inclusive nature of AI tools, facilitating a more equitable academic landscape.

I also incorporated advanced AI-powered research assistants such as Scite.ai, which helps in managing and analysing academic citations by offering smart citation recommendations; SciSpace, an innovative tool for exploring and summarising research papers; and Gemini, which supports various aspects of academic writing by providing contextual suggestions and improving the flow of ideas. These AI platforms, in addition to ChatGPT, have contributed significantly to the efficiency and accuracy of my research work, enabling me to streamline the writing process while ensuring academic rigour.

The use of AI in academic research has been supported by recent studies demonstrating its positive impact on writing efficiency, accuracy, and accessibility. Research suggests that AI-powered tools can enhance cognitive load reduction in writing tasks (Williams, 2023), assist with second-language learning and proficiency (Wang & Vasquez, 2022), and improve the overall quality of scholarly work. Furthermore, ethical guidelines For AI use in research have been outlined by scholars such as (Bender et al., 2021) to ensure transparency and accountability in integrating AI into academic workflows.

Furthermore, I have attached my proposal, which was submitted before the advent of Large Language Models (i.e. ChatGPT), which forms the foundation of this thesis and can be accessed here.

In conclusion, the use of AI tools in my thesis writing was undertaken with careful consideration of ethical and academic standards. These tools were employed to support, rather than replace, the original intellectual effort invested in my research. Where applicable, AI-assisted outputs were reviewed and revised, and the origin of the ideas was sourced and appropriately cited, ensuring full transparency and integrity in the writing process.

	29 July 2025
Signed	**Date**

ABSTRACT

This study investigates the potential of blockchain technology in democratising the value chain in HEIs, unfolding both theoretical and practical challenges in stakeholder participation, governance, and transparency. Essentially, it aims to study the relationship between Blockchain Adoption Drivers with activities and expectations of various actors in the higher education value chain to offer inclusive and decentralised higher education institutional models. In this context, the study attempts to critique existing limitations of the centralised HE systems and proposes a Blockchain Adoption Model for Higher Education for the implementation of alternative and more participative governance structures through blockchain.

To this effect, the study chose mixed methods as its overall research design, underpinned by critical realism. In the first phase, peer-reviewed literature was subjected to computational content analysis and software such as VOSviewer was used to generate quantitative insights into the patterns of blockchain adoption and actor roles in higher education. Lastly, in the second phase, focus groups composed of students, academic staff, administrators, and external stakeholders employed Participatory Action Research (PAR) methods. The focus groups utilised interactive activities, public voting, and digital tools to capture qualitative data on actor perceptions, blockchain applications, and adoption drivers. The grounded theory approach was applied to synthesise these data streams into a coherent conceptual model.

The findings reveal several critical results: (1) Currently, students and institutional administrators prevail in the discourse and practices of blockchain in HE, while capture by the under presence of faculty, alumni, and regulatory bodies; (2) Key adoption drivers considered include decentralisation, transparency, co-creation of value, and data security; (3) There is a mismatch between blockchain's technical affordances and its pedagogical uses, primarily generated by uneven actor participation. The validated Blockchain Adoption Drivers Model provides an exhaustive mapping of blockchain capabilities against HE actor needs and activities.

The study concludes that HE blockchain adoption is viable and transformative but requires a participatory model to engage all actors in the realisation of a digital democracy. If blockchain is inserted into the critical nodes of the HE value chain, accreditation, learning records, research dissemination, and community engagement, institutions can overcome the current limitations of governance and value distribution. Such a shift from centralised control to decentralised and co-governed ecosystems is feasible and necessary for fostering sustainable innovation in the sector.

The contribution of the study lies in empirically validating the Blockchain Adoption Model for Higher Education it proposed, integrating theoretical, technical, and participatory components. It constitutes a framework for institutions wishing to responsibly and inclusively implement blockchain technologies. Additionally, this research advances understanding of how emerging technologies can enable democratic transformation of education, thereby making it a valuable reference for policymakers, researchers, and institutional leaders.

Keywords: Blockchain adoption, Participatory Governance, Decentralisation, Higher Education, digital democracy.

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To my beloved wife, **Blessing Molopa**, you have been my unwavering rock and partner. Thank you for your endless love, patience, and strength. You took on extra responsibilities and provided emotional support so I could dedicate the time and focus needed for this work. Your belief in me and your valuable advice have carried me through every challenge, and this achievement is as much yours as it is mine.

To my children, thank you for your incredible patience and understanding during this journey. You sacrificed time with me and supported me in ways you may not yet realise.

To both my mothers and my late father, thank you for believing in my dreams. Your unwavering faith in me has been a pillar of strength.

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To everyone who walked this journey with me, I offer my deepest gratitude. This achievement is as much yours as it is mine.

DEDICATION

This thesis is lovingly dedicated to my grandmother, **Welheminah Matale Mkasi**, whose wisdom, support, and unconditional love have been a constant source of inspiration; my mother, **Tsakani Patiance Molopa**, for your unwavering belief in me and endless encouragement; my late father, **Bernard Mamatšheu Molopa**, who was not only my greatest cheerleader but also the one who planted the seeds of perseverance and the value of education in my heart; my mother-in-law, **Maria Mlangeni**, for your steadfast love, warm care, and for always lending an ear to listen to all my stories about this journey; my children, **Matome Bohlale Molopa, Nobuhle Mlangeni, Lethabo Pulana Molopa, Bonolo Mmatšatši Molopa, and Buthu Thato Molopa**, for your incredible patience, understanding, and for being my reason to strive for excellence; and most importantly, to **Blessing Molopa**, my beloved wife, whose unwavering love, strength, and encouragement have been my anchor throughout this journey. Most importantly, thanks to Bo Malatjie (Noko), Banarene, Gheghana, Magoveni, and the Most High Yashua.

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GLOSSARY

Terms/Acronyms/Abbreviations	Definition/Explanation
COR	Conservation of Resources
DAO	Decentralised Autonomous Organisation
dApps	decentralised application
DeFi	Decentralised Finance
DLT	Distributed Ledger Technology
GDPR	General Data Protection Regulation
POPIA	Protection of Personal Information Act
OECD	Organisation for Economic Cooperation and Development
UTAUT	Unified Theory of Acceptance and Use of Technology
TAM	Technology Acceptance Model
TOE	Technology-Organisation-Environment
FATF	Financial Action Task Force
HEI	Higher Education Institutions
MOOCS	Massive Open Online Course
HE	Higher Education
MCO	Mechanisms Contexts Outcomes
P2P	peer-to-peer
POPIA	Protection of Personal Information Act
OER	Open Educational Resources
PoS	Proof of stake

PoW	Proof of work
PAR	Participatory Action Research
HEFCE	Higher Education Funding Council for England
ACA	Anonymous, Confidential and Auditable

CHAPTER 1 : INTRODUCTION

1.1 Introduction

This study pertains to a PhD program in informatics and responds to Son-Turan (2022:16), who calls for the exploration of the game-changing power of blockchain in business models and value propositions of Higher Education Institutions (HEIs). Blockchain is gaining popularity in Higher Education (HE) (Mikroyannidis et al., 2020). Its decentralised nature offers new solutions to institutional problems, and scholars see blockchain research as a growing field (Bodó et al., 2018; McArthur, 2018; Leible et al., 2019; Ogrutan, 2020; Dinh & al., 2021).

1.2 Background

1.2.1 Defining blockchain and its institutional promise

Blockchain, introduced by Nakamoto (2008) for Bitcoin, is a distributed ledger technology (DLT) that enables secure, tamper-proof transactions without reliance on a single intermediary (Ogrutan, 2020; Lizcano et al., 2019). Through cryptographic protocols and consensus mechanisms, blockchain affords verifiable data integrity and process transparency, addressing long-standing trust and security limitations of centralised information systems (Leible et al., 2019; Dai et al., 2019; Wüst & Gervais, 2018). Beyond its technical architecture, scholars emphasise blockchain's socio-institutional appeal: it can support "digital democracy" by enabling peer-to-peer coordination and participatory decision-making independent of traditional authorities (Kosmarski, 2020; Chen et al., 2018; Xu et al., 2023). Furthermore, Kosmarski (2020: 14) asserts that: "*The appeal of blockchain to industry and academia builds upon the promise to make data reliable, immutable, transparent, and decentralised. However, it is not the data handling but the social appeal of blockchain that has attracted the attention of academia. Principal advantages of blockchain in this perspective, apart from the immutability and verifiability of data, are the guarantee of trust in the trustless environment and successful peer-to-peer interactions without the need for a central governing authority.*" Accordingly, blockchain is both a technology and a philosophy of coordination, inviting adoption frameworks that integrate technical affordances with organisational governance and culture.

1.2.2 Blockchain adoption in higher education

In HE, blockchain discourse often foregrounds features, immutability, smart contracts, and verifiable credentials, yet institutional uptake remains fragmented (Lizcano et al., 2019; Walsh et al., 2021). Early adoptions in finance and supply chains outpaced systematic exploration in HE (Son-Turan, 2022; Loukil et al., 2021), where projects frequently report what was piloted but not why specific features or chain types were selected, nor how choices mapped to pedagogical and governance needs (Chen et al., 2018; Mohammad & Vargas, 2022; Kosmarski, 2020). This results in an affordance-use mismatch and uneven actor participation across initiatives.

This thesis responds by centring Blockchain Adoption Drivers, decentralisation, transparency, co-creation of value, and data security, and systematically mapping them to value-chain activities and actor expectations (students, academic staff, administrators, alumni, regulators, industry, communities). The outcome is a Blockchain Adoption Model for Higher Education that treats adoption as a socio-technical and participatory process rather than a purely technical rollout.

1.2.3 Participatory governance as a design principle

Centralised HE governance structures often under-represent key stakeholders in decisions where institutional value is created and distributed, leading to legitimacy and implementation deficits (Mačiulienė & Skaržauskienė, 2021; Son-Turan, 2022). In this study, participatory governance is an organising design principle, not a post-hoc add-on. Two moves operationalise this principle: (i) computational content analysis establishes a baseline of *discursive participation* in the HE-blockchain literature, revealing dominant and marginalised voices; and (ii) Participatory Action Research (PAR) focus groups, students, academics, administrators, and external stakeholders, surface perceived benefits, risks, and necessary conditions for legitimate adoption. A thematic synthesis then specifies governance mechanisms (e.g., voting, quorum, dispute resolution, role-based permissions, oversight) *co-designed* with those who will use and be governed by them. In short, governance legitimacy is treated as a design variable, with participatory routines embedded where stakes are highest (e.g., credential standards, assessment policies, data-sharing agreements), while automation streamlines routine execution (e.g., issuing/verifying learning records).

1.2.4 Decentralisation: calibrated distribution

For HE contexts bounded by statutory compliance, quality assurance, and ethics, decentralisation must be calibrated. The model distinguishes between: (a) decentralising records (verifiable credentials, research provenance), (b) decentralising rules (smart-contract workflows with human override), and (c) decentralising governance (multistakeholder voting and delegated authority with transparent audit trails). Value materialises where decentralisation addresses concrete frictions: reducing reconciliation across siloed systems; enabling portable, privacy-preserving learning records; tracing accreditation and funding decisions; and recognising broader academic labour (peer review, community-engaged scholarship). Absent participatory governance, however, decentralisation risks re-encoding central power “in cryptographic form”. Hence the coupling of distributed architectures with inclusive decision rights and clear accountability (Leible et al., 2019; Dai et al., 2019; Kosmarski, 2020).

1.2.5 The higher education value chain: challenges and opportunities

HEIs are better conceived as multi-actor value chains than as single organisations. Value is co-produced across admissions, teaching and learning, student support, research and innovation, external partnerships, and community engagement. Centralisation has yielded speed and compliance, but often at the expense of transparency, responsiveness, and shared ownership, manifest in concerns about accreditation consistency, opaque decision-making, and uneven recognition of contributions (Duarte, 2015; Wüst & Gervais, 2018; Son-Turan, 2022). Three intersecting challenges frame the problem:

1. **Participation asymmetries**

   Dominant actors steer agendas while faculty, alumni, regulators, and communities are peripheral, constraining problem definition and solution design.

2. **Governance opacity**

   Critical processes (credit recognition, assessment change, and funding allocation) lack real-time visibility and auditability for affected stakeholders.

3. **Fragmented information ecosystems**

   Disparate systems limit interoperability and verifiability, elevating administrative burden and eroding trust.

A carefully governed blockchain architecture can address these challenges by aligning incentives, increasing traceability, and making value co-creation legible and accountable (Tapscott & Tapscott, 2017a; Walsh et al., 2021; Son-Turan, 2022).

1.2.6 Blockchain vs value chain: the investigated phenomenon

While both blockchain and value-chain theories concern value creation, they differ in coordination logics. Traditional value chains privilege central control to manage procurement, production, and distribution for competitive advantage (Smith &

Fairbrother, 2021; Krippendorff, 2022), but often lack transparency, equitable participation, and robust accountability (Son-Turan, 2022). Blockchain-enabled coordination redistributes verification and decision rights via cryptographic consensus, enabling trustworthy peer-to-peer interaction (Leible et al., 2019; Dai et al., 2019; Chen et al., 2018). Consequently, blockchain can democratise the centralised HE value chain into a more decentralised and inclusive value-creation system aligned with contemporary goals of participatory governance (Molopa & Cronjé, 2024; Son-Turan, 2022).

1.2.7 Digital democracy as normative horizon

This study's normative horizon is digital democracy in HE, a condition where stakeholders have meaningful voice, verifiable visibility into consequential processes, and credible mechanisms to shape outcomes (Kosmarski, 2020). The validated Blockchain Adoption Drivers Model operationalises this horizon at critical nodes:

1. Accreditation and quality assurance: Append-only records of standards alignment, programme changes, external reviews; role-based voting with auditable justifications.
2. Learning records and recognition: Portable, verifiable credentials; recognition of micro-learning and community-engaged work; privacy-preserving verification.
3. Research dissemination and provenance: Timestamped artefacts, contributor attribution, grant-disbursement trails, open-review workflows.
4. Community engagement and partnerships: Transparent tracking of commitments, outcomes, and resource flows; stakeholder voting on priorities within agreed mandates.

Across nodes, the model specifies adoption drivers, actor roles, governance routines, and data/standards requirements, converting democratic principles into implementable design (Tapscott & Tapscott, 2017a; Walsh et al., 2021).

1.3 Problem Statement

HEIS do not benefit from the full value chain as it is not open to value chain actor participation. One of the reasons is that participants do not have the time or willingness to participate actively in voting, discussion, and the daily operations of the organisation (Kosmarski, 2020). Blockchain can change this. In addition, literature shows that blockchain adoption drivers are not fully investigated in diverse contexts such as HE, as outlined by Son-Turan (2022).

Practically, Higher Education Institutions (HEIs) continue to operate within centralised value chain structures (Son-Turan, 2022) that inherently limit broad stakeholder participation in institutional processes and decision-making (Mačiulienė and Skaržauskienė, 2021). This conventional approach often results in a partial and fragmentary engagement with critical challenges, such as sustainable development, academic projects, therefore hindering systemic change. Furthermore, such exclusions distort value creation and undermine the potential for fostering transparency, accountability, and innovation within the higher education ecosystem, as evidenced by issues like inconsistencies, concerns regarding accreditation and oversight, and a loss of trust in HEIs' value propositions (Son-Turan, 2022).

Although blockchain technology, as a decentralised and distributed ledger technology (DLT) (Kosmarski, 2020; Son-Turan, 2022; Naumova et al, 2019; Wüst and Gervais, 2018), offers the promise of verifiable, permanent, and transparent data handling (Wüst and Gervais, 2018). By facilitating peer-to-peer interactions with a central governing body, its integration into higher education business models remains fragmented and unsystematic (Kosmasrski, 2020). It can be concluded that reported blockchain projects in higher education focus on features of the technology, with little evidence of how the blockchain features were selected. Furthermore, insufficient evidence on how the type of blockchain adopted is selected. As a result, the process of adopting blockchain shows little to no democratic approach to adopting blockchain in the value chain. Thus, the adoption models used for blockchain adoption are not true to blockchain as a philosophical endeavour.

Consequently, key stakeholders, including alumni, faculty, industry, and broader communities, are frequently lacking representation or are entirely absent in current HE values chains. This oversight leads to lost opportunities for effective value co-creation among these diverse actors, which is crucial for enhancing quality and democratising governance across the educational landscape (Son-Turan, 2022; Mačiulienė and Skaržauskienė, 2021).

Philosophically, the prevailing models of value generation in higher education are deeply rooted in hierarchical, technocratic logic, which inherently privileges institutional authority and often leads to the marginalisation of the lived experiences, knowledge contributions, and agency of diverse actors (Son-Turan, 2022; Mačiulienė and Skaržauskienė, 2021). This reflects a profound philosophical tension between traditional, centralised systems of control (Wüst and Gervais, 2018; Kosmarski, 2020), and emerging calls for decentralised, participatory epistemologies that align with digital democratic principles (Kosmarski, 2020).

It can therefore be concluded that the advent of blockchain technology, particularly through concepts like Decentralised Autonomous Organisations (DAOs), explicitly aims to radically restructure academic governance to foster open science and transparent decision-making. The onus, therefore, is on how we can rethink the social construction of technology in education, and how blockchain can be ethically and successfully adopted to promote genuine democratic participation as well as equitable value distribution in a knowledge society.

1.4 Aim, questions and objectives

Table 1.1 below outlines the study aim, question, objectives, and the two stages of this study.

1.4.1 Aim of the study

This study aims to demonstrate how Blockchain Adoption Drivers can be used to democratise the HE value chain. This aim sets the foundation for the subsequent research questions and objectives, emphasising the impactful potential of blockchain technology in an educational context.

1.4.2 Research Questions and Objectives

Question 1: What are the Blockchain Adoption Drivers for HE?

This study adapted the Blockchain Adoption Drivers model to democratise the HE value chain through a critical realist approach. This approach looks at Mechanisms, Contexts, and Outcomes (MCO). Each question and corresponding objective are systematically explored, and the aim is validated within the MCO realist framework. Here is how each question relates to Table 1.1:

Research Question 1: How are the Drivers of Blockchain Adoption in Higher Education?

Objective 1: To Characterize the Motives behind adoption of blockchain.

It was needed to comprehend the factors that motivated the adoption of blockchain in HE. The discovery of these drivers led the researcher to establish the enablers or the impediments to implementing blockchain technology in institutions of higher learning. These drivers worked in the institutional, technological and regulatory environment. The identification of these environments was used to determine the best environments that blockchain could be successfully incorporated. This analysis in detail was a good basis upon which blockchain can be integrated into the HE value chain.

Sub-question 1.1: What are the Stakeholders of Blockchain Adoption in Higher Education?

Objective 1.1: To Determine the Actors of the Value Creation in Blockchain.

By determining the stakeholders who participated in the adoption of blockchain, I understood the roles, interests and influence of the stakeholders as facilitators or inhibitors of the technology. These actors worked under different institutional environments and were differently interested in the adoption process influenced by different organisational cultures and policies. Discussing this question provided greater information about the ecosystem and the role played by various interested parties in the value generation in HE.

Sub-question 1. 2 What are the Higher Education Value Chain Activities that are Blockchain-Enabled?

Goal 1.2: To Discover Blockchain activity in the Higher Education Value Chain.

This question has studied particular activities aided by blockchain and evaluated how it can increase the key affordances, including transparency, security, and efficiency. Such activities were incorporated in the current education practice and technologies. The mapping of these activities highlighted the position of blockchain and potential value addition and the general democratisation of the value chain.

Sub-question 1.3: Who Are the Actors in Higher Education Value Chain Value Generation?

Objective 1.3: To Map the Participants in the Value Creation within Higher Education.

The discovery of the extended range of the actors of the chain of values assisted in gaining insight into the different mechanisms of value creation in HE. These actors operated on a broader scale, both academic, administrative and outside. It was possible to map these stakeholders and have an idea of the interaction and influence of blockchain adoption drivers with the HE ecosystem.

Sub-question 1.4: What Higher Education Value Chain Are the Activities?

Objective 1.4. To Map the Institutional Activities in the Higher Education Value Chain.

The detailed knowledge of the operations within the value chain was essential because it could help to recognize the ways in which blockchain may improve the operations. These were activities that existed along with the existing practice and workflow educational processes. Mapping of the same outlined where blockchain might be incorporated in adding value, enhancing efficiency, and facilitating democratisation.

Research Question 2: How the Democratisation of the Higher Education Value Chain was Made possible through Blockchain Adoption Drivers?

The Question 2: When the Drivers of Blockchain Adoption Premated Democratisation in Higher Education?

This question explored how the drivers of blockchain adoption led to democratising the HE value chain. These drivers functioned under specific conditions and contexts that either enabled or hindered democratisation. By identifying these factors, the researcher uncovered best practices, potential barriers, and critical success factors for the effective implementation of blockchain technology.

Sub-question 2.1: What are the Adoption Drivers for the Activities?

Objective 2.1: To Map the Value Chain Actors' Adoption Drivers to the Blockchain Adoption Drivers

Mapping the adoption drivers to specific activities helped understand how blockchain was effectively applied. These drivers operated within the activities and institutions of the value chain. Aligning them ensured that blockchain technology met the needs of value chain actors and functioned optimally.

Sub-question 2.2: What Kind of Blockchain Did the Higher Education Value Chain Need?

Objective 2.2: To Determine the Appropriate Blockchain Solution for Higher Education

This question aimed to identify the specific type of blockchain technology that best suited the needs of the HE value chain. By understanding the unique requirements and challenges of HEIs, the study recommended a blockchain solution that enhanced efficiency, security, and transparency while promoting democratisation across the value chain.

Table 1.1: Aim, Questions and Objectives

This study will show how the Blockchain Adoption Drivers model can be used to democratise the HE value chain.

	Questions		Objectives
1.1.1	Question 1: What are the Blockchain Adoption Drivers for HE?	*1.2.1*	Objective 1: To portray Blockchain Adoption Drivers for HE.
1.1.2	Sub-question 1.1: Who are the HE Blockchain Actors?	*1.2.2*	Sub-objective 1.1: To map the blockchain actors in HE value generation.
1.1.3	Sub-question 1.2: What are the HE blockchain activities on the HE value chain?	*1.2.3*	Sub-objective 1.2: To map the HE blockchain activities on the HE value chain.
1.1.4	Sub-question 1.3: Who are the value chain actors in HE value generation?	*1.2.4*	Sub-objective 1.3: To map the value chain actors in HE value generation.
1.1.5	Sub-question 1.4: What are the HE value chain activities on the HE value chain?	*1.2.5*	Sub-objective 1.4: To map the HE value chain activities on the HE value chain.
1.1.6	Question 2: Under what circumstances do Blockchain Adoption Drivers meet the HE value chain actors' democratisation?	*1.2.6*	Objective 2: To corroborate the circumstances under which blockchain the Blockchain Adoption Drivers drive HE value chain democratisation.
1.1.7	Sub-question 2.1: What adoption drivers are required for the value chain activities?	*1.2.7*	Sub-objective 2.1: To map the value chain actors' adoption drivers to the relevant Blockchain Adoption Drivers.
1.1.8	Sub-question 2.2: What type of blockchain does the HE value chain require?	*1.2.8*	Sub-objective 2.2: To map the type of blockchain required for the HE value chain.

Source: Author's Construct

The questions and objectives in Table 1.1 are coherent and relevant. Each question links to its corresponding objective, so the research is focused and purposeful. The progression from blockchain adoption drivers to actors, activities and necessary conditions for democratisation is a logical approach to the research problem.

1.5 Research gap and study focus

Despite strong theoretical promise in the literature, evidence from HE indicates fragmented, feature-led pilots with limited justification for design choices and insufficient inclusion of underrepresented actors (Son-Turan, 2022; Chen et al., 2018). This study addresses the gap by (i) empirically mapping discourse and actor salience through computational analysis (VOSviewer was used); (ii) eliciting multi-actor requirements and legitimacy conditions via PAR; and (iii) synthesising insights through grounded theory into a Higher Education Blockchain Adoption Drivers Framework. The framework aligns adoption drivers with value-chain activities and decision rights, coupling decentralised architectures with participatory governance to achieve trustworthy, auditable, and inclusive institutional transformation (Naumova et al., 2019; Wüst & Gervais, 2018; Kosmarski, 2020).

1.6 Summary of the Study

1.6.1 Chapter One

The chapter presents the major concepts of the research. It describes the background, research problem, goal, objectives and guiding questions. It also gives the outline of the research and gives a general understanding of how each chapter plays a role in the study.

1.6.2 Chapter Two

In Chapter Two, the literature review is given, which describes the process of implementing new technologies into institutions like blockchain. Rogers (2003) defines technology adoption as the process by which the users receive and start using new innovations. This paper uses the concept in higher education to learn the application of blockchain technology in universities.

The article explored blockchain adoption trends through systematic literature review (SLR) which is described by Kitchenham et al. (2009) as the systematic approach to locating, assessing, and interpreting all the available information on a topic. Section two of this chapter presents the Higher Education Blockchain Adoption Drivers Framework by Molopa and Cronje (2024). The model allows mapping blockchain adoption drivers in higher education and value chain adoption drivers, which leads to the determination of the main drivers of blockchain adoption in higher education settings.

1.6.3 Chapter Three

In Chapter Three, the research design and methods are explained. Data were collected and analysed through a mixed-method approach, which is a conglomeration of both qualitative and quantitative strategies (Creswell and Plano Clark, 2018). The qualitative section used principles of Participatory Action Research (PAR) of which participants were co-creators of knowledge (Reason and Bradbury, 2008).

The data were collected through focus groups, interactive sessions and digital tools like Google Forms. Others who represented other fields of knowledge such as design, government, journalism, information technology, and fashion were also taking part in the open and private voting. This is what made it very inclusive at the same time making the participants of varying degrees of experience express their views freely with the data being reliable and valid.

1.6.4 Chapter Four

Chapter Four will be the discussion of the results of data gathered in the focus groups. The results have been displayed in answer to the research questions to facilitate understanding and conformity.

1.6.5 Chapter Five

Chapter Five combines the results in a way that gives a discussion and conclusion. It contrasts the key blockchain adoption drivers found in the literature and the participants. The relationships were evaluated through the application of a composite scoring method where a variety of scores were bundled together to create one standard score against which they could be compared (Corrente et al., 2025) to determine the relationships between actors, activities, and the type of blockchain used in higher education.

The validated outcomes were further projected onto the Higher Education Blockchain Adoption Drivers Framework (Molopa and Cronje, 2024), which showed that the framework is used.

The study creates and tests a research model that helps institutions map their adoption preparedness, recognise the drivers of adoption that are active in their value chain, and identify the location where blockchain may have the strongest impact on the institution.

1.6.6 Chapter Six

Chapter Six summarises the contributions of the study, its limitations, recommendations and conclusive reflections.

CHAPTER 2 : LITERATURE REVIEW

2.1 Introduction

This chapter establishes its foundation through the adoption of a systematic literature review (SLR) process published by the author of this thesis as a component of the literature review for this PhD study (Molopa & Cronjé, 2024) . This study provides the methodological basis for this literature review. From this process, 27 items were identified that highlight higher education blockchain studies published over the past five years. Additionally, 33 items were collected that specifically address the implementation of value chains in higher education over the past decade. Literature items were sourced from reputable academic databases, including SpringerLink, Web of Science, and Scopus. The detailed process of item selection, including the search strings and inclusion criteria employed, is documented comprehensively in Molopa & Cronjé, (2024).

In Section 1, these items collectively serve to answer this study's research questions, Research Question 1 and Research Question 2, thereby supporting the development of the conceptual framework. The selected literature thus provides both thematic insights and empirical grounding for the study.

Section 2 extends the discussion by examining the core principles of adoption theory as they intersect with blockchain applications in the higher education value chain. This section highlights the participatory nature of adoption and further demonstrates convergence by mapping the interrelationships between the Blockchain Adoption Drivers Model, adoption theory, critical realism as the study's ontological stance, and the guiding research questions.

The author of this thesis published the outcome of the SLR that is used in full in this study. The full details of the publication are:

Molopa, S.T. & Cronjé, J. 2024. Research on Blockchain Adoption in Higher Education: A Systematic Review and Conceptual Model. In Advances in Information and Communication. Springer Science and Business Media Deutschland GmbH: 110–130. https://link.springer.com/book/10.1007/978-3-031-53963-3.

The article in its entirety forms part of this thesis as provided for in Figure 2.1 by the publisher. The link gives the authors the licence to use the full article in this thesis.

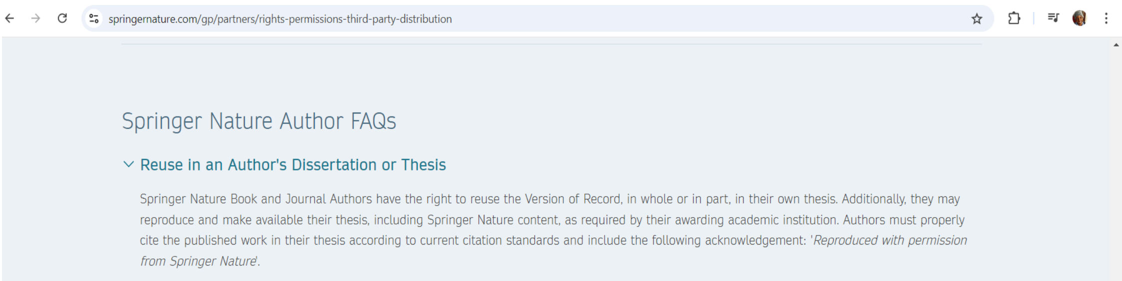

Figure 2.1: Springer Nature: Reuse in an Author's Dissertation or Thesis: Snapshot from the website

Source: Springer Nature (2024)

2.2 Section 1: Research Questions – Literature Findings (Molopa & Cronjé, 2024).

This section draws from the 27 literature items of Delgado-Von-Eitzen (2021), as adapted and applied by Molopa & Cronjé (2024: 111). The researcher uses the Antcon system to identify the Actors and activities of the higher education blockchain and value chain from the data items retrieved from the SLR process accessed in this link.

2.2.1 Research Question 1: What are the HE blockchain adoption drivers?

Research question 1 is extracted from the 27 SLR items retrieved from different databases. In this regard, the AntConc computational content analysis was used to determine the higher education Blockchain actors and their activities. Furthermore, Value Chain actors and their activities are deduced (Smith, 2022).

2.2.2 Sub-Question 1.1 & 1.2 Literature: Blockchain Actors in Higher Education.

As blockchain evolves into a reality, it becomes clear how this technology will continue to disrupt higher learning institutions. From its cryptocurrency background, blockchain offers a secure, transparent, and decentralised method of recording and managing educational data, which could transform institutions. Nevertheless, to grasp this potential clearly, one has to define who the major protagonists are within this emerging environment and what they do. These questions will be addressed in this section, although the main sub-questions that will be answered include Sub-Question 1.1, Who, and Sub-Question 1.2: What do they do within the context of Higher Education?

Studies published over the past few years embrace the role that universities, enrolled learners, executives, and other HEIs players like accreditation agencies and employers play in the blockchain HEIs system (Capetillo et al., 2022; Guo *et al*., 2021; Turkanović *et al.*, 2018). Such changes, which could be made possible by the application of blockchain, have been pointed out in the following studies: Analysing these actors' functions and relations is essential for prescribing in which ways blockchain could potentially impact higher education in the future years, including serving as a guiding framework for academicians and practitioners.

2.2.2.1 Higher Education Blockchain Actors

The emergence of blockchain technology has disrupted numerous sectors, including higher education. Various stakeholders with distinctive perspectives combine efforts to examine and exploit blockchain's transformational power in learning domains.

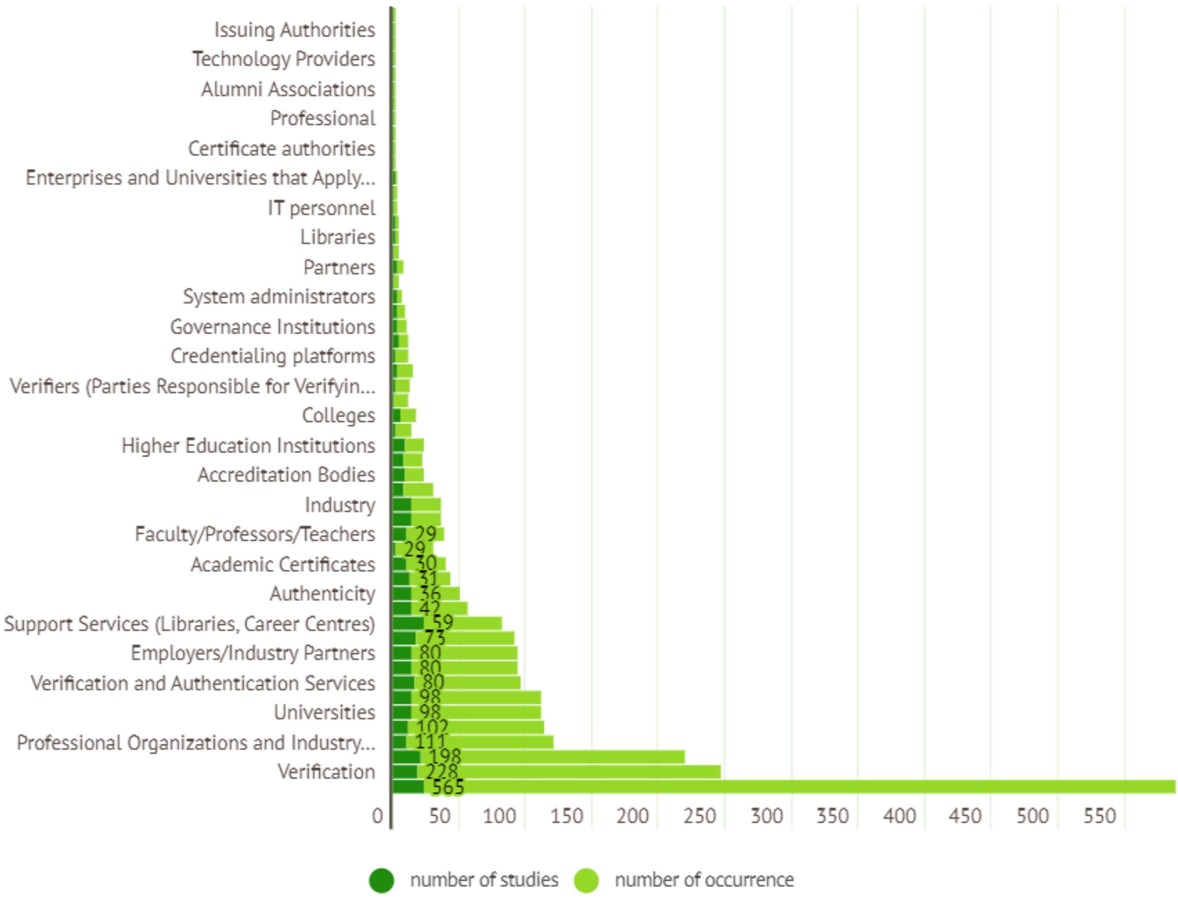

Figure 2.2: Higher Education Blockchain Actors Scale of Occurrence

This phenomenon represents a shift not just in terms of conventional patterns for teaching but also invites various entities whose joint efforts can increase the use and incorporation of blockchains.

This trend is acknowledged by educational institutions that play a leading role in this process. They understand that it is important to simplify procedures, improve safety, and confront issues such as degree fraud, managerial ineffectiveness, and the unavailability of schooling for all. Universities and colleges devote time to research, engage with suppliers of technology and test blockchain solutions to create more efficient and clear learning environments (Chen et al., 2023).

A new breed of blockchain users is arising from higher education. These students aspire to get secure and verifiable digital qualifications that honestly portray their skill sets and accomplishments. In addition, they require personalised learning experiences that suit their distinct requirements and ambitions; they want to have more control and ownership over their own educational information (Chen et al., 2018; Grech & Camilleri, 2019). Not only do these platforms influence how education will be conducted in future, but they also help usher in a new era of educational empowerment (Turkanović *et al*., 2018).

To put it another way, students, who are the end consumers of these innovations, are increasingly asking for secure and verifiable digital diplomas which truly exhibit what they can do and what they have achieved. They long for a learning experience tailored to their needs and dreams, desiring more ownership of their educational information. As stated by the World Economic Forum (2020), this insatiable demand is fuelled by the development of blockchain-based platforms that give learners portable credentials they can trust and personalised learning paths.

Moreover, faculty members and researchers also embrace blockchain technology to augment their work. Using an unchangeable ledger from blockchain technology, researchers have created academic records resistant to manipulation, tracked the origin of research data throughout time, and stimulated interinstitutional and interdisciplinary cooperation. Additionally, Grech and Camilleri (2019) assert that it is possible that “blockchain could transform research” because it promotes trust by way of securing the integrity of data or materials, makes it easily accessible, thereby ensuring accountability among researchers, and makes everything clear in terms of information sharing among researchers (Grech & Camilleri, 2019). In addition, the emergence of new teaching-learning practices that capitalise on blockchain could reshape how students acquire knowledge and interact with learning materials altogether (Huang et al., 2021).

Universities, professional bodies, and certification providers are searching for solutions based on blockchain that will simplify the process of issuing and verifying credentials. This lessens the administrative load and allows students to have digital certificates that can be verified and shared with prospective employers or educational institutions. This move towards digital credentials, as proposed by MIT Technology Review (2022), is transforming our understanding of academic success.

Table 2.1: Blockchain Actor Activities

#	Blockchain Actors Ecosystem	Activities
1	Educational Institutions (Chen, G., Xu, B., Lu, M., & Chen, N. S., 2023; World Economic Forum., 2020).	Universities, colleges, and other educational providers exploring blockchain solutions.
2	Students (Chen, G., Xu, B., Lu, M., & Chen, N. S., 2023; World Economic Forum., 2020).	Learners who demand secure, verifiable credentials and personalised learning experiences.
3	Faculty and Researchers (Grech, A., & Camilleri, A. F., 2019; Huang, Y., Lu, Y., Wang, N., & Zhu, H., 2021).	Educators and researchers leveraging blockchain for academic records, research data provenance, and collaboration.
4	Credential Issuers (MIT Technology Review., 2022).	Organisations issuing academic credentials are exploring blockchain-based verification solutions.
5	Employers (IBM., 2021).	Companies and organisations seeking to verify credentials and assess candidate qualifications using blockchain.
6	Technology Providers (Sony Global Education., 2018)	Companies developing and delivering blockchain solutions for the education sector.
7	Investors and Philanthropists (World Bank., 2018)	Individuals and organisations funding blockchain research and development in education
8	Policymakers and Regulators (Organisation for Economic Co-operation and Development (OECD)., 2019)	Government bodies are creating supportive regulatory environments for blockchain adoption in education

#	Blockchain Actors Ecosystem	Activities
9	Miners/Validators (Fisch, E., 2019; Buterin, V., 2022).	Responsible for creating new blocks on the blockchain through Proof of Work (PoW) or Proof of Stake (PoS) mechanisms.
10	Nodes (Zheng, 2017)	The foundation of the blockchain network, maintaining ledgers and validating transactions.
11	Developers (Werner, Perez, D & Gudgeon, , 2019; Atzei, Bartoletti & Cimoli, 2017)	Innovators creating blockchain protocols, decentralised applications (dApps), and smart contracts
12	Users (Huckle, Bhattacharya, White & Beloff, 2016)	Individuals and organisations use blockchain for various purposes.
13	Exchanges (Fan, Xiao & Wang, 2023; Gandal, Hamrick, Moore & Oberman, 2018)	Platforms facilitating the exchange of cryptocurrencies
14	Wallet Providers (Karame, G. O., Androulaki, E., & Capkun, S, 2012, May)	Services offering secure storage solutions for cryptocurrencies.
15	Blockchain Communities (Nakamoto, S., 2008)	Groups promoting and advocating for blockchain adoption and education.
16	dApp Enthusiasts: Advocates of Decentralisation	Individuals who adopt the decentralised nature of blockchain
17	Passive Beneficiaries: Indirect Users of Blockchain	Individuals indirectly benefit from blockchain technology without even realising it

#	Blockchain Actors Ecosystem	Activities
18	Expanding User Base: Businesses, Governments, and Non-Profits	Organisations increasingly exploring the potential of blockchain technology to streamline their operations
19	Credential issuers, Professional bodies, and certification providers.	Institutions exploring blockchain-based solutions to streamline the issuance and verification of credentials

Source: Author's Construct

2.2.2.2 dApp Enthusiasts: Advocates of Decentralisation.

Another significant group of users are dApp enthusiasts, individuals who involve the decentralised nature of blockchain to interact with applications that operate outside the control of any single entity. People are attracted by the opportunities of applying blockchain-based applications for handling various operations, including decentralised finance (DeFi), supply chain management, and other purposes (Chen et al., 2022; Schär, 2021). It is ultimately important to improve their interaction with dApps and drive increased demand for decentralised applications (Tasatanattakool & Techapanupreeda, 2018).

2.2.2.3 Passive Beneficiaries: Indirect Users of Blockchain

In addition to these players, millions of users who do not even know, are served by blockchain services daily. They are the passive receivers who get profit from the distributed ledgers, the buyers who interact with the goods and services provided by organisations using the blockchain supply chain, or the patients who use the blockchain-based health systems for storing their records (Kuo et al., 2017; Casini & Roccetti, 2020). The above experiences, as fleeting as they are, give a pointer to how this blockchain technology will revolutionise efficiency, reduce the incidence of fraud and enhance the levels of transparency and security in the real world Kshetri, 2018).

2.2.2.4 Expanding User Base: Businesses, Governments, and Non-Profits

As the maturation of the blockchain ecosystem is on the horizon, so is the growth and possible segregation of the users. New classes of users, including business enterprises, governmental agencies, and non-profit organisations, are also looking at the possibilities of how the application of blockchain can transform them, how it can make them more efficient, effective, and transparent, and develop new opportunities of value. The adoption of blockchain solutions by their organisations will not only push the technology to the mainstream but also foster hard innovation and meaningful co-production for all users (Zarandi et al., 2022; Treiblmaier et al., 2021).

Employers also appreciate using credentials as a talent acquisition tool through blockchain verification. They can help these credential issuers and educational institutions receive and validate academic records and learner skills more easily, thus offering a more efficient talent pipeline and a better-quality labour force, and thus, the increased deployment of blockchain credentialing by employers as supported by IBM (2021).

Each of the identified issues can be solved by adopting specific technological solutions provided by technology providers experienced in the use of blockchain in education. Development of blockchain infrastructures, platforms, and tools is essential for supporting educational institutions in implementing and scaling blockchain initiatives. Given the prospect of blockchain in education, possible technological vendors in the future blockchain market are identified; for instance, Sony Global Education (2018).

Due to the ability of blockchain to revolutionarily improve the learning landscape, make education available to all, and eventually make the educational process more equal or even fair, investors and philanthropists are willing to fund research, development and or implementation in this field. Their funding drives the speed of advancement and guarantees that those utilising blockchain technology are equally learning, regardless of the standard of living. For example, according to El Koshiry et al (2023), blockchain can catalyse change in education financing, opening new opportunities for populations with limited access to funding.

Blockchain is a new form of technology, and the challenges stated above are within the focus of the policymakers and the regulators as they work hard to frame regulatory policies that would encourage innovation in the application of this technology to advance the human learning purpose while simultaneously promoting the protection of the rights of the learners and the defence of educational data. These activities are desirable to prevent the reckless application of blockchain technology in education and set the legal base for its proper usage, so regulatory frameworks require the consideration of innovation, learning protection and educational system integrity, which the Organisation for Economic Co-operation and Development OECD (2022) stressed.

2.2.3 Sub-Question 1.3 & 1.4 Literature: Value Chain Actors and Activities in Higher Education, Emerging Value Chain for Educational Model Context

King and Erickson (2020) posited another insightful model for analysis, which is the "Emerging Value Chain for Educational Publishing," as suggested by Xuemei and Martin (2013). The model helps identify actors and their interrelation in generating and distributing educational content. Nevertheless, critical evaluation leads to the identification of the strengths and the weaknesses in this framework, and as such, reflection in critical appreciation of the consequences of this framework for higher education institutions (HEIs) is deemed appropriate.

2.2.3.1 Creation & Selection

During this first stage, the main focus is on educational content, qualitatively defining topic selection, and defining subject matter experts. Teacher educators, curriculum developers, and authors are responsible for content relevance and quality, as confirmed by Sánchez-Gómez et al. (2022) and Czerniewicz et al. (2021). Still, this model does not capture the possible input from students who can also assess the relevance and interest of learning materials to add value to the model (Ahn *et al.*, 2022). Cobo *et al*. (2019) propose that incorporating students when developing and choosing the content can improve the value proposition of the content and make it relevant to the learners.

2.2.3.2 Development & Access

IT professionals, educational technology experts and librarians participate in developing and enhancing education modalities and resources as identified by (Czerniewicz et al., 2021) roles. This phase is really important to deliver content that is accessible and easily interactive for the user. However, the role of additional participants may be added, for instance, instructional designers to check whether the necessary educational materials are maximally properly developed and oriented towards achieving learning objectives (Sun & Liu, 2023; Al-Azawei *et al.*, 2017). Furthermore, the use of blockchain technology has the potential to improve the security and the verifiability of education credential documents, about which there are issues with credential fraud (Capetillo et al., 2022)

2.2.3.3 Aggregation

It is the role of content managers and educational consultants to gather and incorporate content for the market and institutions, as noted by King and Erickson in their 2020 publication. This phase requires synthesis, though it embodies compendialisation whereby contents from different sources are collected and customised to fit particular audiences. However, the model does not consider the educational publishers who act more often as collectors and distributors of educational content. Thompson (2019) says that marketing knowledge, distribution experience, and skills in IP can bring significant value to the process.

2.2.3.4 Search & Discovery

In this phase, particular attention is paid to the issue of how to make educational content more recognisable with the help of the marketing staff and web developers. However, there is no significant focus on the role of libraries and library professionals in the given model, though they are experts in collecting, organising, and disseminating educational literature for students and professors (Cobo *et al*., 2019). AI Applications can enhance search and discovery through filters created for learners' preferences and learning styles (Ahn *et al*., 2022; Zawacki-Richter *et al*., 2019).

2.2.3.5 Authority & Relevance Fulfilment

For this purpose, the academic reviewers and the quality assurance teams are responsible for the authority, relevance, and educational standards of the content. This phase is critical in providing the basic safety and effectiveness of the issued materials in the educational processes. Nevertheless, it is noted that the same model could benefit from the implementation of a continuous feedback loop that would facilitate the assessment of the effectiveness of the content depending on the inputs received from the users, as well as depending on the current trends in educational changes (Al-Azawei *et al*., 2017); Czerniewicz et al., 2021).

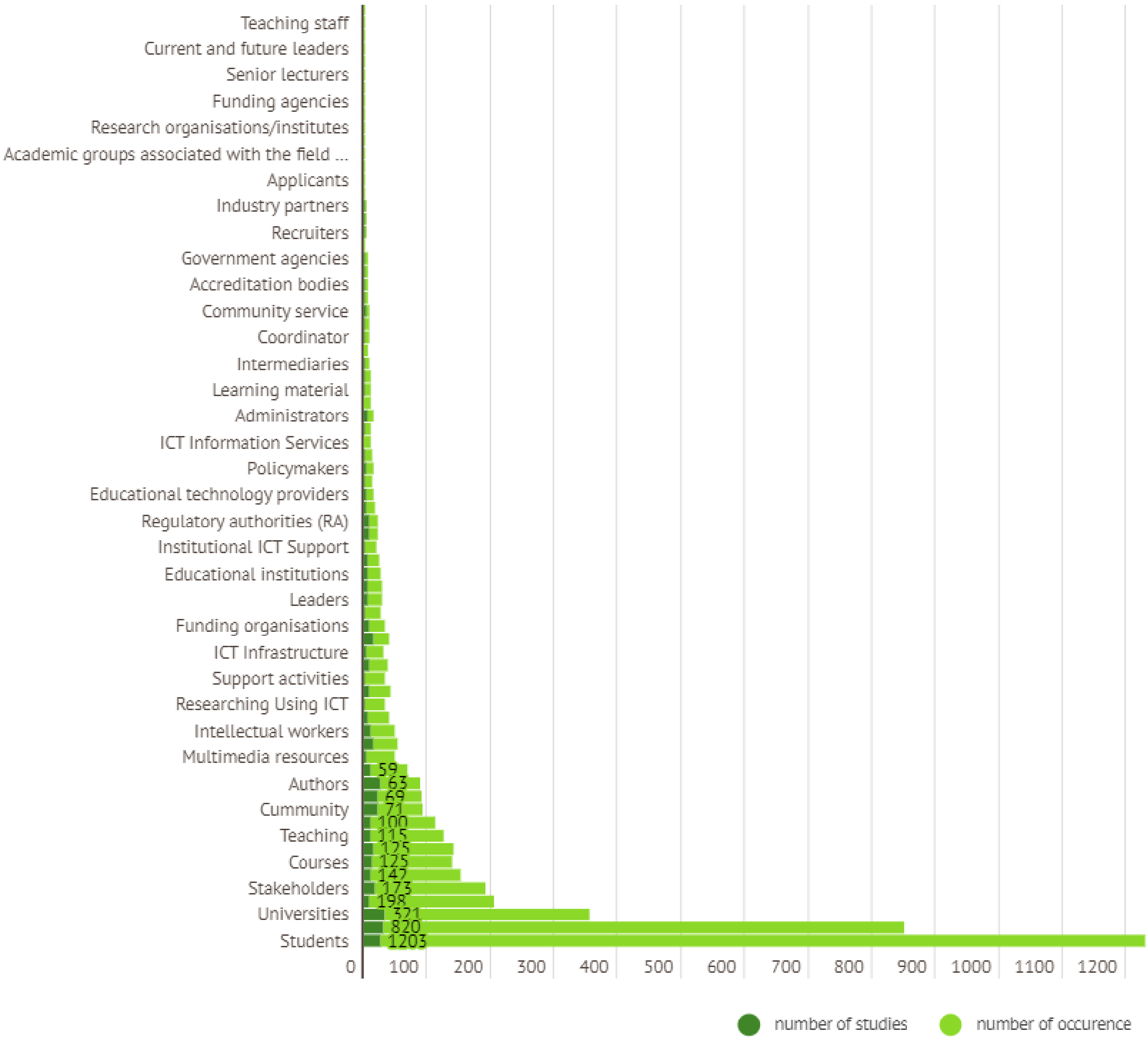

Figure 2.3: Higher Education Value Chain Actors Scale of Occurrence

2.2.3.6 Secondary Support Services

The model considers secondary support services like top management, human resources and technology management personnel. The above services are crucial for the smooth running of educational institutions and complement the basic educational process. Nevertheless, the model could include other essential stakeholders, for example, alumni, who can speak about the reputation and the efficiency of the educational activity of the institution (Sánchez-Gómez *et al.*, 2020).

2.2.3.7 Primary Support Services

This category includes several diverse activities directly related to core educational services. These activity areas are technology management, networking/relationship management, content development/management, procurement management, author support, and academic institution administration. However, in designing the model, it does not attempt to analyse in detail the functional responsibilities of the actors within each activity. Following the work of Thompson (2019), it might be interesting to get more nuanced with these roles and investigate how such activities create value within HEIs.

Using the “Emerging Value Chain for Educational Publishing” model, the research proposes a clear identification of actors whose activities are important for producing and distributing knowledge. Nevertheless, the analysis shows that more research should be done, and suggestions should be made to fine-tune and expand them to qualify as useful frameworks in the current and complex environment of higher education. The inclusion of student views expands the concept. It includes instructional designers, educational publishers, libraries, Artificial Intelligence, feedback journey and other stakeholders, making the model more nuanced and fully dressed for the higher education value creation map in Molopa and Conje (2024).

2.2.3.8 Legislation as an actor (philosophical paradigm and blockchain)

University statutes may proscribe specific activities, but it is important to understand that the make-up of the higher education value chain can be considerably different depending on parameters like size, geographical location, mission, and strategic direction of the institution. Such a variation depicts the flexibility that educational institutions have to conform to various operations and strategies due to objectives and environmental factors. An appreciation of these changes is essential for comprehending dynamics in the higher education sector based on understanding how various components will function to support the educational process and, ultimately, the benefit of institutional success. There are several well-known actors across the value chain in higher education.

As mentioned by Ahn *et al*. in 2022, the customer or the core recipient of the value and the service, namely the students, are at the centre of the value delivery process and central to the whole value chain exercise; their needs and educational outcomes are the ultimate focus. Professors and instructors play an important role in disseminating knowledge and designing the curriculum, as noted by Daniel in 2020. Employees from clerks to technicians are responsible for running the institution, according to Clegg & Rowland, who published their work in 2020.

Producers define the goals and oversee the allocation of the resources as postulated by De Wit *et al*. in 2022. They also come in handy in fundraising for the school’s projects and identifying industries, a role which was explained by Lauret and Miozzo in a 2021 publication. As noted by Bougroug *et al*., government and funding policy affect funding and policy. Bougroug *et al*., in 2020, illustrated that employers matter to end-users through the skills of the graduates, as highlighted by Trowler in 2023. Combined, these actors comprise the educational ecosystem and contribute to its performance.

2.2.3.9 A Dynamic Collaboration

The focal reason the concept of the higher education value chain is dependent is the need to foster proper relations among the many stakeholders involved. Knowledge-based societies, from students to employers, have diverse self-interests and preferences. Therefore, building consensus on the mission and vision of the institution will facilitate higher value creation in this environment (Clegg & Rowland, 2020).

The higher education environment is dynamic; therefore, the value chain composition may also change in the future. For instance, the shift towards online learning has led to such new actors as educational technology vendors and online course developers (Capetillo et al., 2022). HEIs must consider the possibility of the emergence of new stakeholders and their involvement in value-creation activity (De Wit *et al*., 2022).

Encouraging the primary and secondary stakeholders to engage in critical dialogues on their places and contributions to the supply chain, HEIs will facilitate a vibrant, sustainable learning environment (Daniel, 2020). This makes possible the constant enhancement of the value chain through critical reflection and the evaluation of the necessary improvements and changes in collaboration and communication modes (Trowler, 2023). Such an approach may contribute to the formulation of new learning models, positive student performance, and the overall creation of value for the providers and consumers (Ahn *et al*., 2022).

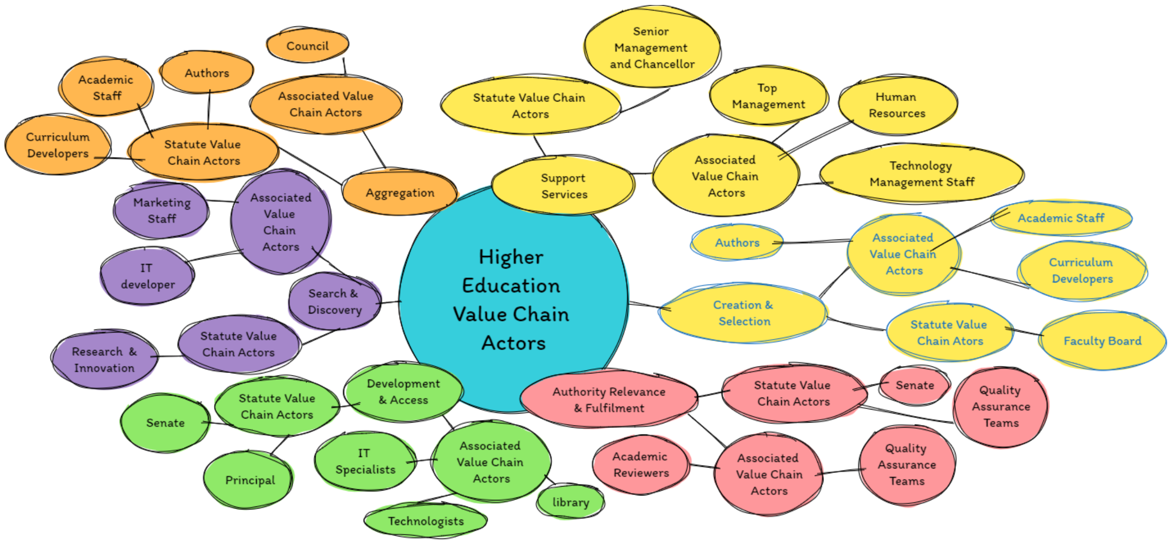

Figure 2.4: Higher Education Value Chain Actors

2.2.4 Research Question 2: Under what circumstances will blockchain be adopted in higher education? (Molopa & Cronjé, 2024)

The systematic literature review by Molopa & Cronjé, (2024) follows a VOSviewer content analysis method (Krippendorff, 2022; Vaismoradi et al., 2013; Van Eck & Waltman, 2007; Van Eck, n.d.; Walker, 2022). A VOSviewer content analysis software is used to identify the occurrences, linkages, relevance, and importance of the text corpus. VOSviewer uses large text and mathematical calculations to identify themes, eliminating references and nouns irrelevant to the subject (Wang & Tian, 2008) The network builder displays data from a central point and cascades according to clusters and linkages (Walker, 2022).

After identifying the drivers of blockchain and the value chain in higher education, a potential adoption model is developed through a thematic analysis process (Trainor & Bundon, 2021b).

2.2.5 Sub-Question 2.1 – Literature: What are the key drivers for adoption? (Molopa & Cronjé, 2024).

2.2.5.1 Critical Drivers for Blockchain Adoption in Higher Education

The analysis revealed seven key drivers that strongly associated "proof" with "higher education," indicating their high frequency and significant relevance (Table 2.2). These drivers are crucial for blockchain adoption within higher education. Figure 2.6. Among them, "enhancement" exhibited the weakest linkage to the other drivers.

This study supports the notion that "use" is a primary driver of blockchain adoption in higher education, aligning with established theories within the adoption literature Loukil *et al.*, 2019). In Figure 2.6, "use" is interconnected with "trust" and "blockchain applications," while "trust" is further linked to "transparency" and "blockchain applications." Notably, "proof," "use," and "trust" are positioned differently from "blockchain applications" and "enhancement" on the left side of "use" in Figure 2.6. This suggests that integrating "proof," "use," and "trust" with "use" might reduce the overall occurrence of "use." Conversely, integrating "blockchain applications" and "enhancement" could increase the relevance of "use" by boosting both its frequency and significance within Table 2.2.

Figure 2.6 provides a visual representation of the interconnections between critical drivers for blockchain adoption in higher education. Notably, these drivers lacked a direct connection to stakeholders, despite arguments by Loukil *et al*. (2019) that identified stakeholder benefits as key drivers of adoption, as highlighted in Figure 2.5. Specifically, Loukil *et al*. (2019), in Figure 2.5, found that enhancing accountability and transparency accounted for 51% of the total benefits identified in their systematic literature review.

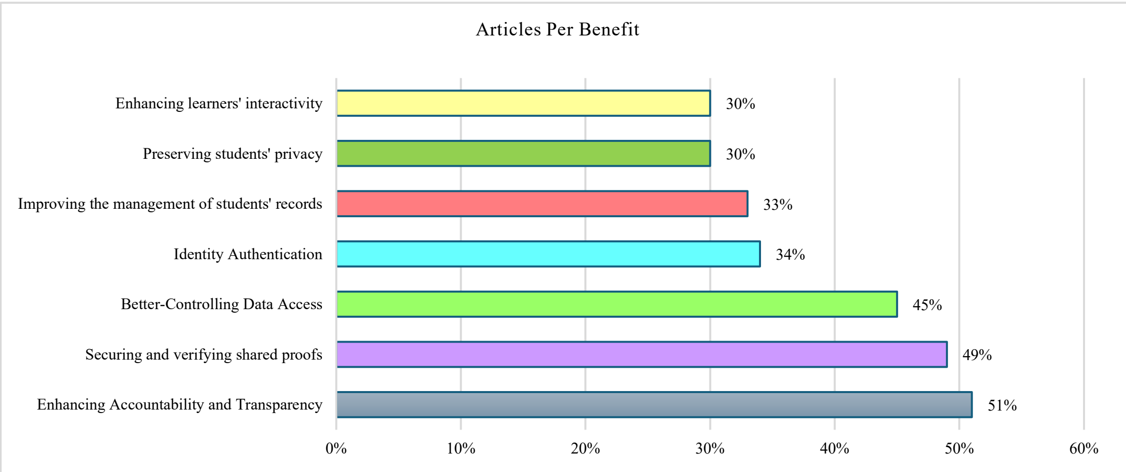

Figure 2.5: Blockchain adoption percentage analysed per benefit

Source: Loukil et al. (2021)

This study's results directly linked trust, use, blockchain applications, transparency, and enhancement to proof and higher education. Both "proof" and "higher education" exhibited high relevance and frequency in the left and right halves of Figure 2.6, respectively, indicating clusters of blockchain and value chain concentration.

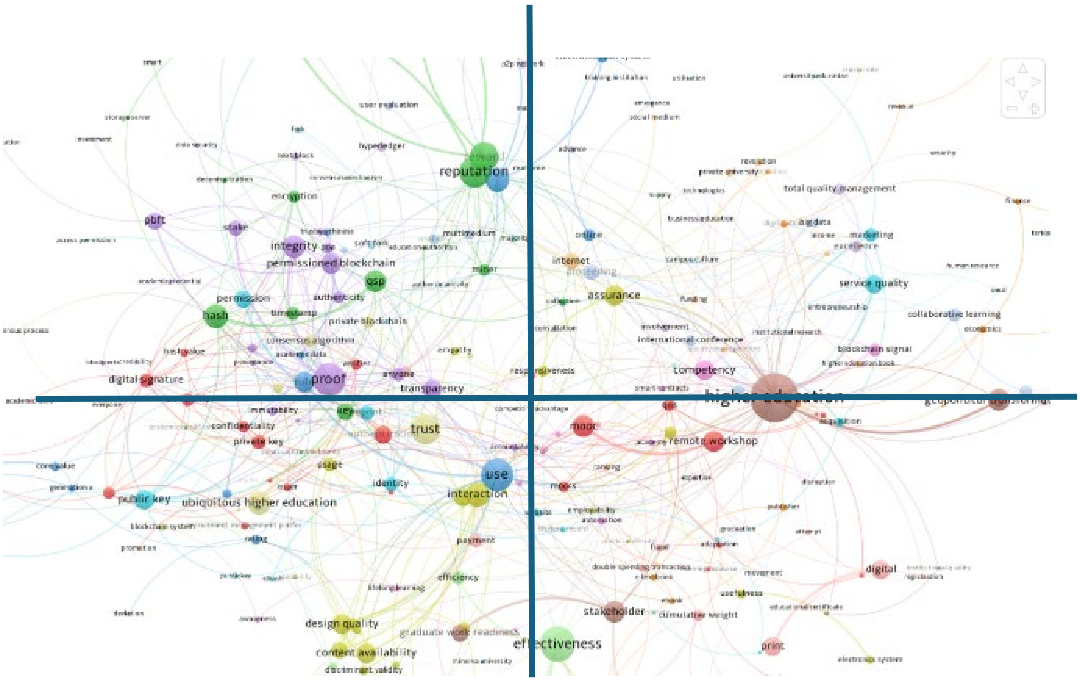

Figure 2.6: Higher Education Blockchain and Value Chain Driver Network

Source: Molopa & Cronjé, 2024

Alammary et al. (2019) proposed several potential benefits of blockchain for higher education, including "enhancing accountability and transparency, securing and verifying shared proof, better control of data access, identity authentication, improving the management of students' *records, preserving students' privacy, and enhancing learners' interactivity".*

Table 2.2: Driver Element Occurrence, Total link strength, Links and Relevance

#	Driver Element	Occurrence	Total link strength	Links	Relevance
1	Higher education	664	193	54	0.45
2	Use	468	94	48	0.37

3	Trust	169	80	18	0.50
4	Proof	117	94	18	0.58
5	Blockchain application	16	5	5	0.78
6	Transparency	118	35	19	2.17
7	Enhancement	19	3	3	0.9

Source: Author's Construct

In Table 2.2 data presents a network analysis focused on key concepts related to a particular topic, likely within the Scope of higher education. "Higher Education" emerges as the most central and frequently occurring concept, appearing 664 times with 54 links and a total link strength of 193. Despite its prominence, it has a moderate relevance score of 0.45, indicating that while important, it may not be as critical in specific contexts. The concept of "Use" is also significant, with 468 occurrences and 48 links, though it has a lower total link strength of 94 and a relevance score of 0.37, suggesting that it is essential but somewhat less central than higher education.

"Trust" is moderately represented with 169 occurrences and 18 links, yet it holds a higher relevance score of 0.50, underscoring its importance in the network. "Proof," with 117 occurrences and 18 links, has a slightly higher relevance score of 0.58, indicating its critical role in certain areas of the network. Although "Blockchain Application" appears only 16 times with five links, it has the highest relevance score of 0.78, pointing to its substantial importance where it does appear. Similarly, "Transparency" is mentioned 118 times with 19 links, but it stands out with the highest relevance score of 2.17, making it exceptionally critical in its context. Lastly, "Enhancement" is the least represented concept, with only 19 occurrences and three links, yet it has a relevance score of 0.9, suggesting that it holds significant importance in a specific context within the network.

While "Higher Education" and "Use" are the most central concepts, "Blockchain Application," "Transparency," and "Enhancement" are highly relevant in their particular areas, with "Transparency" being especially critical despite its lower frequency.

2.2.5.2 Drive Network Description

This Y-axis provides the overarching themes or driving forces within the dataset. These themes encompass various aspects such as trust, proof, blockchain application, transparency, enhancement, and use.

1. **Occurrence**
   This column represents the frequency of occurrence of each theme within the dataset. For instance, "Higher education" appears most frequently, with 664 occurrences, indicating it is a prevalent topic within the dataset. This unsurprisingly dominates the data, reflecting the overall focus on blockchain's potential impact on this sector. “Use” follows after higher education most frequently, with 468 occurrences. This highlights the emphasis on the practical applications of blockchain technology within higher education.
2. **Total Link Strength.**
   Total link strength measures the cumulative strength of connections or associations between elements within each theme. It signifies the interconnectedness and depth of discussion related to each theme. For example, "Transparency" has a link strength of 35, indicating considerable discussion and interconnectedness within this theme.
3. **Links**
   The number of links represents the count of specific connections or associations within each theme. It quantifies the degree of interrelation or reference to other concepts or topics. For instance, "Higher education" has 54 links, suggesting a significant interconnectedness with other concepts discussed in the dataset.
4. **Relevance**
   Co-relevance shows how each theme is related to all the others and the whole dataset regarding the level of importance or relevance. It can be measured based on how related they are to the main theme under study, how often they are cited in the work being done or the extent to which main issues are addressed. For instance, a term such as ‘Transparency’ has achieved the highest relevance score of 2.17, making the term a complete relevance score and its importance within the data set which shows its importance in developing an enhanced degree of trust and accountability into the applications of blockchain in higher learning institutions and even in discussions revolving around blockchain and higher education. Blockchain skills offer an initial and unchangeable record-keeping, agreeing with the results from (Azmi *et al.*,

2022) and (Tiwari and Bhatt, 2021). This is a favourable view because of the capability of blockchain to establish integrated, secure, and easily verifiable record-keeping of certificates as well as information (Datta & Mitra, 2022).

2.2.5.3 The Driver Network To identify efficiency in increasing Occurrence and Relevance of "Use": A Composite Score Approach

The approach used to identify the most important driver network, whereby the driver network simultaneously reflects the occurrence and relevance of Table 2.2 "Use" with higher efficiency than other networks, is described. After that, an occurrence relevance rating is derived for each driver network, and an overall score for each is computed as a sum of these ratings, allowing for comparison between them.

This makes the composite score method a strong comparison model since it considers the existence of the driver network and its applicability. Additionally, when used to transform the scores to a standard value, it provides a relative comparison of the performances of the various networks and grants a weighted performance based on their significance fraction (Corrente et al., 2025; Nardo et al., 2005).

In this method:

Recurrence refers to the extent that a specific driver network is present in a given data work.

Relevance expresses the level of relationship of the driver network with the target variable.

Total link strength quantifies the connectivity of a driver network within the dataset by summing up the strengths of a network's links.

The composite score is calculated as the product of occurrence and relevance divided by total link strength:

$CS = Occurrence \times Relevance Total\ link\ s$

CS=Total link strengthOccurrence × Relevance

This score yields a measure that accounts for the communication intensity of the driver network and the openness of the target variable to change. Higher composite scores indicate stronger potential for impact.

Composite scores are commonly used in various fields for multidimensional assessments and comparisons. They enable decision-makers to prioritise effective drivers and allocate resources efficiently based on their potential impact.

To calculate this, first, we define the composite score (CS) for each driver network as identified in Table 2.2.

CS= $\frac{Occurrence \times Relevance}{Total\ link\ strength}$

Then, we will calculate the composite score for each driver network.

$CS_{Use} = \frac{468 \times 0.3794}{94} = 1.83$

$CS_{Trust} = \frac{169 \times 0.5080}{80} = 1.06$

$CS_{Proof} = \frac{117 \times 0.5894}{94} = 0.72$

$CS_{Transparency} = \frac{118 \times 2.17}{35} = 7.32$

$CS_{Blockchain} = \frac{16 \times 0.78}{5} = 2.58$

$CS_{Enhancement} = \frac{19 \times 0.90}{3} = 5.70$

The driver element network scan increases the occurrence and relevance of "Use" efficiently compared to other drivers. The driver with the highest composite score of 7.32 is **Transparency.**

Transparency has a high relevance score and a relatively high occurrence score compared to other driver networks, making it the most effective driver network for increasing the occurrence and relevance of "Use" in this scenario.

2.2.6 Sub-Question 2.2 – Literature: Types of Blockchains Required by Higher Education Institutions

Table 2.3: Literature Type of Blockchain

#	Type of Blockchain	Relevance	Occurrences	Total link Strength
1	Permissioned	0.68	54	40
2	Private	0.75	42	13
3	Public	0.77	43	11
4	Permissionless	0.67	15	3

Source: Author's Construct

2.3 Higher education context on blockchain vs. value chain (Molopa & Cronjé, 2024)

2.3.1 Higher education value chain: A quantitative paradox

Through the computational content analysis process of the literature in this study, where the occurrence of words was used to determine the importance and interconnectedness, which in turn determined the relevance, the HE value chain actors, activities, and potential blockchain drivers were identified. This section draws conclusions from the 33 value chain in higher education literature items incorporated in the introduction through Molopa & Cronjé (2024). This process was developed to identify where different actors contribute through their activities in the value chain. As a result, the actors as stakeholders in the value chain will show the contribution to value creation, which often does not represent decision-making.

For example, there is a significant disparity in the representation of stakeholders, highlighting the need for a decentralised, transparent, and accountable governance process. Moreover, the number of students represented in a council compared to the number of academic staff, administrative staff, and management staff reveals significant imbalances that may result in misrepresentation. Especially, when the authors of studies on the blockchain adoption in HE use the term "management" more frequently than any other stakeholders. Consequently, stakeholders elected to represent the broader community may not have the time or benefit of consulting with constituencies when conditions of negotiations change during a meeting, potentially leading to unconsulted decisions being made. The paradox is therefore, to prolong decision-making for adequate consultation, on the one hand, and to represent council membership according to the population's decisions, which will tilt the power dynamics and potentially undermine accountability in governance. This is further exacerbated when the committees are found to be inconsistent in applying long-standing policies. The HE value chain is a complex ecosystem with many stakeholders, each playing important roles in shaping the educational experience, research, innovation, and policy decisions (Vergani, 2024).

2.3.2 Literature findings of the study at a glance

2.3.2.1 The central role of students and faculty: a quantitative dominance

This study's quantitative content analysis of the occurrences of both blockchain and value chain actors in HE within academic literature shows a clear dominance of students and faculty being central to HE. These two groups account for about 65% of all mentions, which are central to the educational process. The National Student Clearinghouse Research Centre data also supports this trend, stating that there is consistent enrollment growth and increasing emphasis on student success metrics (Causey *et al*., 2023). However, a qualitative analysis shows a more sophisticated picture. While students are the main beneficiaries of education, their influence on institutional decision-making is limited. While faculty members are responsible for knowledge dissemination and research, their autonomy is being constrained by administrative pressures (Altbach *et al*., 2021).

2.3.2.2 The Growing Influence of External Stakeholders: A Paradigm Shift

The data shows a significant increase in the influence of external stakeholders within HE, especially employers and policymakers (The World Economic Forum, 2020). Furthermore, mentions of employers in HE have increased by 20% since 2019, reflecting the growing demand for graduates with specific skills and knowledge. Furthermore, the future of jobs also highlights the need for HEIs to align curricula to industry needs. Policymakers account for a 15% increase in occurrences, showing the growing scrutiny and regulation of HE (The World Economic Forum, 2020). The OECD (2022), In their Education at a Glance Report, they illustrate a trend of increasing government intervention in areas such as tuition fees and quality assurance.

2.3.3 Literature contributing factors to the HE context

2.3.3.1 The Underrepresentation of Alumni and Community: Missed Opportunities

Despite their potential impact, alumni associations and community members are underrepresented in the HE discourses, accounting for only 5% of mentions. This is a missed opportunity, as research shows alumni can play a crucial role in fundraising, mentorship and advocacy (Smith & Fairbrother, 2021). Community engagement can also enhance the social impact and relevance of HEIs (Jones, 2017).

2.3.3.2 The Rise of Educational Technology Providers: A Disruptive Force

The emergence of educational technology providers as major players, with 10% of occurrences, reflects the impact of technology on HE. The COVID-19 pandemic accelerated the adoption of online learning modalities, resulting in a growing demand for educational software and platforms (Swart *et al*., 2022). However, there are concerns about the quality and equity of online education (Czerniewicz *et al*., 2021).

2.3.3.3 Non-Participation and Its Implications: A Data Gap

Figure 2.2 was developed by creating a mind map that incorporates actors from the value chain in higher education literature studies and higher education blockchain studies to identify the actors common to both areas of literature, as introduced through Molopa & Cronjé (2024). Thus, identifying the non-participation of funding agencies and research organisations in HE within the academic literature, as shown in the data, reveals a data gap, as illustrated in Figure 2.7. They are important in supporting research and innovation, but are often overlooked in discussions among HE stakeholders.

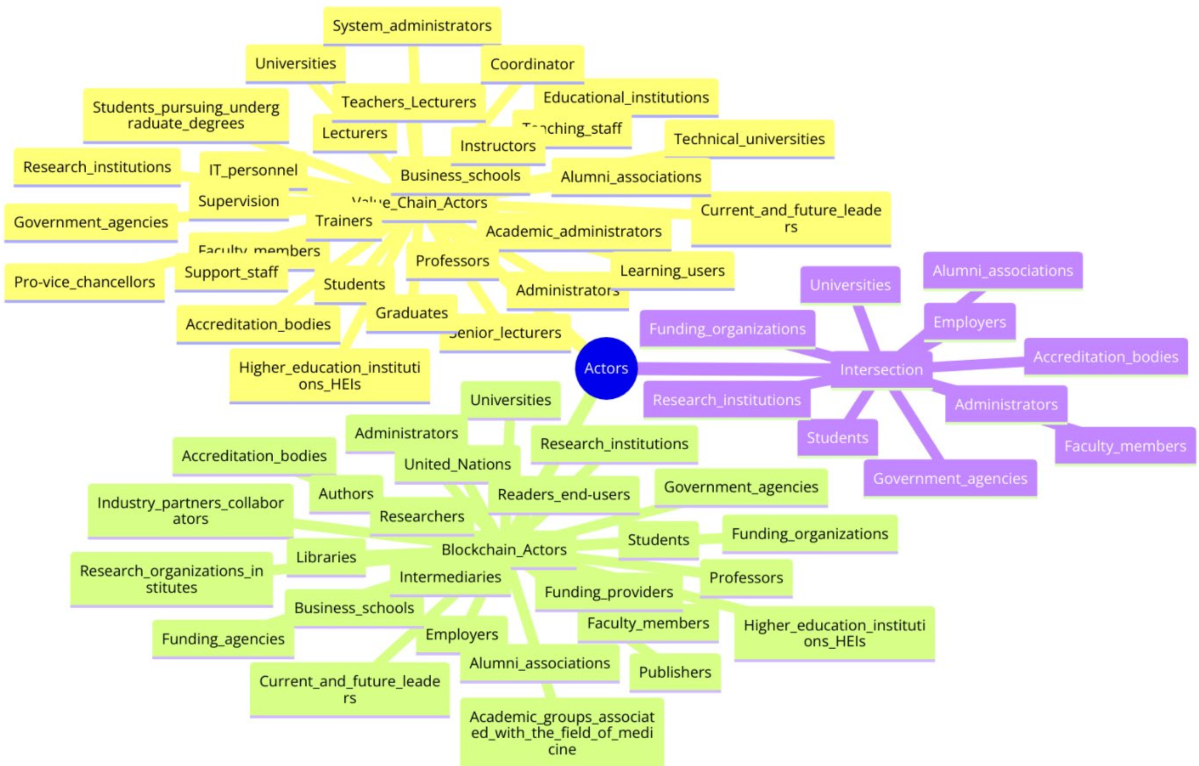

Figure 2.7 Summary of HE Blockchain, Value Chain and legislation actors intersecting

Source: Author's Construct

2.3.4 Blockchain adoption in HE: Actor participation perspective

The integration of blockchain technology into HE has garnered significant attention in recent years, promising to revolutionise processes such as credential verification, transcript management, and secure data storage (Archa Erica *et al.*, 2024). This section draws conclusions from the 27 blockchain in higher education literature items incorporated in the introduction through Molopa & Cronjé (2024). This thesis critically examines the participation of various actors within the HE blockchain ecosystem, utilising the generated and provided statistics alongside insights from industry, government, academic journals, and reports between 2019 and the present.

2.3.4.1 The Central Role of Institutions and Students

The collected data highlights the central role of institutions and students in blockchain adoption within HE. Institutions, encompassing universities, colleges, and HE establishments, account for 14.5% of the total occurrences, indicating a strong institutional drive towards blockchain integration. Similarly, learners, including students, represent 20.8% of occurrences, highlighting their significant stake in this technological shift.

This aligns with the academic literature. Universities like MIT and Stanford have been at the forefront of blockchain initiatives, creating platforms for issuing digital credentials and diplomas (Sharples & Domingue, 2016). Student-led projects like the “Learning is Earning” initiative at the University of Nicosia show the growing interest of learners in using blockchain for educational purposes (Swan, 2017).

However, a counterargument emerges when student engagement is considered. While some students are actively involved in blockchain projects and research, the majority are passive recipients of institutional decisions (Kosmarski, 2020). This raises questions of equity and inclusion in blockchain adoption as students may have different levels of awareness and access to these technologies.

2.3.4.2 The Underrepresentation of Key Stakeholders: Implications for Governance and Adoption

Despite the potential of blockchain to change HE, the data shows that some actors are underrepresented. Faculty/professors/teachers directly involved in teaching and learning account for only 5.5% of mentions. This means there is a gap between institutional initiatives and the daily practices of educators. Accreditation bodies responsible for quality standards account for only 2.9% of mentions, so how will blockchain fit into existing accreditation frameworks?

As a result, this underrepresentation has broader implications for governance and adoption. Moreover, blockchain initiatives may not have the pedagogical and regulatory support for acceptance and effectiveness without faculty and accreditation bodies.

2.3.4.3 The Prominence of Technical and Administrative Actors: Balancing Innovation and Implementation

This study's quantitative content analysis reveals that technical and administrative actors predominate in the blockchain landscape. Verification and authentication services required for blockchain credentials integrity account for 15.4% of mentions. Institutions, including technical staff and administrators, account for 38.2% of mentions, making them key to building and maintaining the blockchain infrastructure. It is understandable, given the complexity of the technology and its integration with existing systems, but at the same time, there is a need to balance technological innovation with pedagogical considerations. Therefore, overemphasis on technical implementation in literature and research for blockchain adoption in HE may overshadow the opportunity of the 'use' of this technology required for faculty training, curriculum development and student support services needed for blockchain adoption to be successful.

2.3.4.4 The Limited Engagement of Industry and Government: A Missed Opportunity

The study's quantitative content analysis shows the limited engagement of industry and government in the HE blockchain landscape. Industry partners, despite the potential of blockchain to bridge the gap between academia and the workforce, account for only 15.4% of mentions. While government/regulatory bodies are responsible for the legal frameworks and standards, they account for only 5.9% of mentions.

It can be concluded that the industry could help develop blockchain solutions that solve workforce needs, and the government could provide the regulatory framework and scale.

2.4 Section 2: Higher Education Blockchain Adoption Drivers Conceptual Framework

In this section, the Higher Education Blockchain Adoption Drivers Conceptual Framework is described in detail. First, the adoption theories are discussed to outline the need for a blockchain-specific adoption model. Second, the higher education value chain framework is discussed in the context of its relevance in the development of the conceptual framework. Third, the critical realist philosophical posture of the study is used to demonstrate how the questions of this study connect with the adoption theory and the elements of both the Blockchain Adoption Drivers Model and Value Chain (Higher Education Blockchain Adoption Driver Conceptual Framework), consequently demonstrating how this study is designed.

2.4.1 Technology adoption theory background

The history of cultural ideas concerning the diffusion of innovations is quite an inspiring story that covers more than 100 years. Furthermore, it is characterised by outstanding theoretical articles that have affected the definition of mnemonic practices and the diffusion of novelties in society. The timeline of the Adoption Theory below outlines this. At the same time, key moments in the history of and the people who have left indelible imprints in the field of adoption theory are captured in Figure 2.8 below.

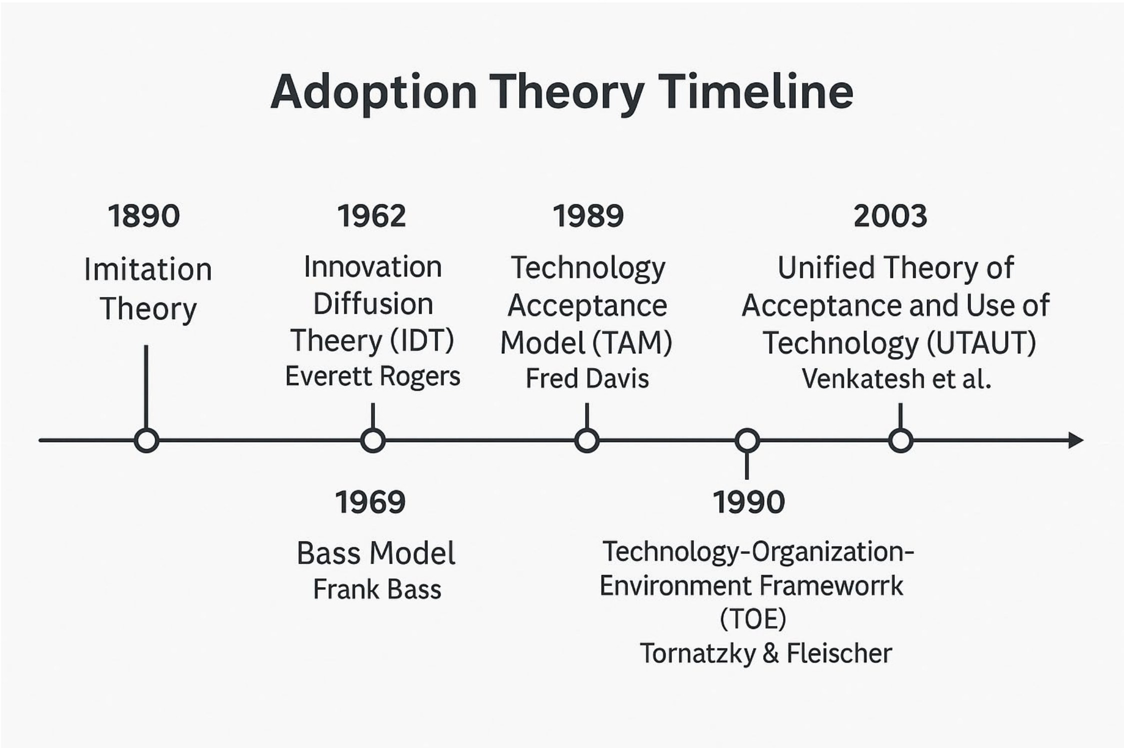

Figure 2.8: Adoption Theory Timeline

Source: Author's Construct

In the late 19th century, Gabriel Tarde's Imitation Theory (Tarde, 1890) laid the groundwork for understanding the diffusion process. Tarde's introduction of the S-shaped curve, representing the gradual, then accelerating, and finally, plateauing adoption rate, remains a cornerstone of diffusion models to this day. His emphasis on social imitation as a driving force in the spread of innovations foreshadowed the importance of social networks and influence in later theories.

In 1943, Ryan and Gross's empirical study on hybrid corn seed adoption (Ryan & Gross, 1943) provided concrete evidence for the S-curve model. They highlighted the role of interpersonal communication and opinion leaders in the diffusion process. This study was a significant milestone, transitioning diffusion research from theoretical speculation to empirical validation.

Everett Rogers' seminal work, "Diffusion of Innovations" (1962), marked a turning point in the field. Rogers expanded on Tarde's ideas, refined the S-curve model, and introduced the five categories of adopters (innovators, early adopters, early majority, late majority, and laggards). His emphasis on communication channels and the concept of diffusion networks provided a more detailed understanding of how innovations spread through various social systems (Rogers, 1962).

The Bass Model, developed by Frank Bass in 1969, brought a quantitative dimension to diffusion research. By incorporating both innovators and imitators into a mathematical model, Bass enabled the forecasting of new product adoption rates, a tool that has proved invaluable in marketing and business strategy (Bass, 1969).

As the field evolved, the emphasis shifted from the technical aspects to the psychological and social factors affecting the adoption decision. Fred Davis, in his work done in 1989, addressed perceived usefulness and ease of use as key factors influencing acceptance of technologies (Davis, 1989a). The Technology Acceptance Model (TAM) is used to analyse user behaviour and has been widely adopted in information system research.

The Technology-Organisation-Environment (TOE) framework, developed by Tornatzky & Fleischer (1990), identifies three critical contexts that influence the adoption of technology within organisations: the technological context, the organisational context, and the environmental context. Applying this framework allows organisations to use the step-by-step approach to assess the factors that may influence their technology adoption, considering their internal resources, the nature of the technology and the external circumstances as defined by Tornatzky and Fleischer (1990).

Last, in 2003, Venkatesh *et al*.'s Unified Theory of Acceptance and Use of Technology (UTAUT) consolidated other models and theories into a single framework (Davis, 1989; Venkatesh *et al*., 2003; Venkatesh *et al*., 2016). The major benefits of using UTAUT include the fact that it includes factors such as perceived performance expectancy, perceived effort expectancy, social influence and facilitating condition, which gives a fuller picture of the forces that come into play as people adopt new technologies.

According to this timeline, it is understood that the diffusion of innovations has developed from the process of social imitation and extends to incorporating the individual's perception, influence from other individuals, and organisational contextual and technological characteristics of the innovation. In Table 2.4, every theorist has offered their own vision, making the picture as comprehensive as possible. It is imperative to ensure this wonderful history continues to be documented and research is conducted further in diffusion to meet the challenges and exploit its prospects brought about by innovations in today's confusing world.

Table 2.4: Adoption Theory Overview

Adoption Theory	**Time Period**	**Theorist(s)**	**Key Contribution**	**Significance**	**Reference**
Imitation Theory	1890	Gabriel Tarde	Introduced the concept of the S-shaped curve of adoption and emphasised the role of social imitation in the spread of innovations.	Laid the groundwork for understanding the diffusion process.	Tarde, G. (1890). *Les Lois de l'Imitation*. Félix Alcan.
Hybrid Corn Seed Study	1943	Ryan, B., & Gross, N.	Conducted an empirical study on the diffusion of hybrid seed corn, providing evidence for the S-curve model and highlighting the role of opinion leaders.	Provided concrete evidence for diffusion theory and emphasised the importance of interpersonal communication.	Ryan, B., & Gross, N. (1943). The diffusion of hybrid seed corn in two Iowa communities. *Rural Sociology*, *8*(1), 15-24.
Diffusion of Innovations Theory	1962	Rogers, E. M.	Published "Diffusion of Innovations," expanding on Tarde's ideas and introducing the five categories of adopters.	Introduced the concept of diffusion networks and emphasised the importance of communication channels in the adoption process.	Rogers, E. M. (1962). *Diffusion of Innovations*. Free Press of Glencoe.
Bass Model	1969	Bass, F. M.	Developed the Bass Model, a mathematical model to forecast the adoption of new products, integrating innovators and imitators.	Widely used in marketing to predict the adoption rate of new technologies and products.	Bass, F. M. (1969). A new product growth for model consumer durables. *Management Science*, *15*(5), 215-227.
Technology Acceptance Model (TAM)	1989	Davis, F. D.	Developed the Technology Acceptance Model (TAM), focusing on perceived usefulness and ease of use as determinants of technology acceptance.	Became a foundational model for understanding technology adoption in various contexts.	Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information

Adoption Theory	Time Period	Theorist(s)	Key Contribution	Significance	Reference
					technology. *MIS Quarterly*, *13*(3), 319-340.
Technology-Organization-Environment (TOE) Framework	1990	Tornatzky, L. G., & Fleischer, M.	The TOE framework identifies and categorises the technological, organisational, and environmental contexts that influence the adoption of technology within organisations.	A comprehensive structure that accounts for multiple dimensions of the adoption process, the TOE framework helps organisations systematically analyse and understand the factors affecting their technology adoption decisions.	Publication: Tornatzky, L. G., & Fleischer, M. (1990). *The processes of technological innovation*. Lexington Books.
Unified Theory of Acceptance and Use of Technology (UTAUT)	2003	Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D.	Proposed the Unified Theory of Acceptance and Use of Technology (UTAUT), integrating multiple models of technology acceptance into a unified view.	Widely used in research on information systems and technology adoption, providing a comprehensive framework for understanding technology acceptance.	Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425-478.

Source: Author’s Construct

Based on the adoption theories outlined above in Table 2.4, the emergent core ideas of adoption theory revolve around three main themes:

- User requirements
- Technology capability
- Technology usage

These subjects are fundamental in determining the pathways by which ideas find a ready market for adoption.

User requirements are part of the requirements that highlight the needs, expectations and desires of any potential user of a given system. Thus, the rule of critical success is that only those innovations that help solve the recipients' problems or respond to their needs can be implemented. Some of these consist of perceived usefulness, ease of use, and compatibility with current practices or systems. Anecdotal evidence suggests that user needs must be addressed for technology to be effectively implemented in learning settings. For example, Khan and Emara (2018), Pal and Vanijja (2020), and Pérez *et al*. (2023) have reported that if the new educational technologies are in harmony with the expected user behaviour and actual practices, they are more likely to be adopted and used appropriately. In addition, perceived usefulness and ease of use constitute two of the main determinants of users' acceptance of the new system (Hoque *et al*., 2022).

Technology capability addresses the aspects of the applied technology that have to do with the specific characteristics of the innovation. Therefore, there is a need to ensure that the technology can bring that and meet the needs of the users. This entails aspects such as sophistication, capability, which trumps current morphological solutions and flexibility of use. To a large extent, the use of educational technologies can be effective if the technologies can deliver benefits that are superior or more pronounced than conventional approaches and if the technologies are easy to use and easy to test (Lin *et al*., 2019; Alshammari 2023). For instance, Lin *et al*. (2019) established that the fusion of augmented reality and big data in academic contexts improved learning outcomes with different approaches to engaging learners (Lin *et al*. 2019). However, according to Benevides *et al*. (2016), complexity can also be a constraint to adoption if it is not controlled (Benevides *et al*., 2016).

Technology adoption focuses on the pattern in which the innovation is adopted and applied in the life or work of the user. The concept of technology adoption is not just the decision; it is the first step in accepting the technology and sustaining it within a larger social or organisational framework. This encompasses aspects such as perceived benefits, perceived socio-compatible pressure, and a permissive context that supports technology utilisation. The two external factors that have been identified and supported in various studies to influence sustained usage of educational technologies include the visibility of benefits and social influence by other end-users' perceptions. Furthermore, the issue of perceiving sustained technology use conditions, including its availability and training, is critical to creating enabling conditions (Adedoja, 2016).

Hearing the users' needs, perceiving technological possibilities, and seeing how technology will be used in a teaching environment is compulsory for the successful implementation of technology-enhanced learning. These dimensions, if addressed, will help educational institutions adjust the application of technology and how it improves on the user requirements.

2.4.2 Adoption theory: blockchain context

The scholarly pursuit of unpacking adoption mechanisms within the blockchain technology domain has grown exponentially. In some ways, it does illuminate a path to a thorough understanding and how to implement this understanding strategically in those other sectors. Following the scholarly rigour, many scholars, such as Leible et al. 2019), J. Sydow et al. 2020), A. Sydow et al. 2020), Beck & Müller-Bloch (2017), and Avital (2018), observe that there is a wide gap towards the development of theoretical models of guiding blockchain integration. Moreover, the identification pertains to an upcoming research niche and stresses the prerequisite of frameworks to encompass the multiphase stage of blockchain use.

2.4.2.1 Examination of TAM and IDT in blockchain adoption

The Technology Acceptance Model (TAM) and Innovation Diffusion Theory (IDT) are the keystone models in technology adoption research, enabling researchers to better understand how new technologies diffuse not only in medical science but also in industries spanning many fields (Lin & Lu, 2021). Based on the constructs of perceived usefulness and the innovation diffusion processes, these models provide a solid theoretical basis for exploring the complex phenomenon of advanced technology adoption, especially the adoption of blockchain. Several studies have shown that the integration of TAM with other models is imperative to achieve higher explanatory power in explaining technology acceptance (Pandey & Chawla, 2018; Gangwar *et al*., 2014).

2.4.2.2 Integrating TAM and IDT in blockchain adoption

A sophisticated analytical framework is then established by combining the Technology Adoption Model (TAM) and Innovation Diffusion Theory (IDT) to analyse factors which propel the use of blockchain at both the individual and societal levels. (Karamchandani *et al*., 2020) Identify six specific dimensions pertinent to supply chain management that are relevant to the interplay of these two models: An examination of the impact of varying product mix and configuration options on customer relationships, information quality, service quality, supply unpredictability, mass customisation, and delivery dependability. Integrating the supply chain into the Bitcoin blockchain sheds light on numerous applications of blockchain technology, especially in expanding customs transparency, efficiency and trust (Makhubu & Budree, 2019). Moreover, various studies outlined the complementarity of TAM and IDT in analysing technology adoption behaviours (Awa *et al*., 2015; Gu *et al*., 2019).

2.4.2.3 Integrating TAM and TOE in blockchain adoption

The Technology Acceptance Model (TAM) is integrated with the Technology Organisation Environment (TOE) framework to advance the analysis of blockchain adoption. TAM takes the user-centric view, whereas the TOE framework considers the technological, organisational, and environmental contexts that affect technology adoption decisions. This combined approach enables a greater scope for the factors contributing to blockchain adoption, such as organisational readiness, technological infrastructure and external environmental pressures. The synthesis of these models can give researchers a more complete understanding of how blockchain is implemented and the impact of blockchain on different industries (Rodríguez-Hoyos *et al*., 2021).

2.4.2.4 Blockchain Adoption Driver's Model (BADM)

It is worth noting that the information technology models for blockchain adoption tend to be restricted to technology and personal users. On the other hand, institutional culture considerations and user demands, as well as group needs, are integrated into the philosophy of blockchain customers in its adoption (Koens et al., 2020). In this study, we will explore the more general requirements at institutions intending to implement adapted technologies based on blockchain (Warkentin & Orgeron, 2020; Frizzo-Barker et al., 2020).

2.4.2.5 Blockchain adoption technical drivers

Figure 2.9 shows that the model employs scenario-based technical requirements (Storing state, Multiple writers, cannot use Trusted Third Party (TTP), Writer's unknown, Writers untrusted and public verifiability).

Furthermore, the Scenario Properties Decision Flow Chart outlines a decision-making process to determine if a blockchain solution is appropriate and, if so, which type to use. Here is a breakdown of the flow chat step by step:

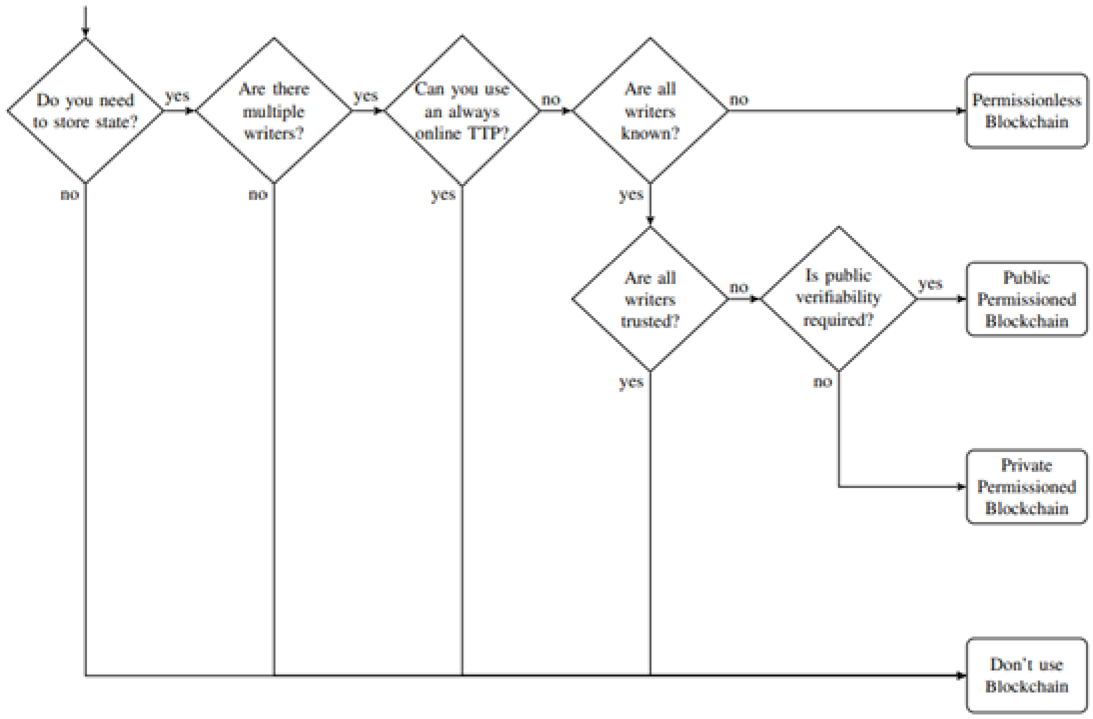

Figure 2.9: Scenario properties decision flow chart.

(Koens et al., 2020) present the scenarios as:

"Do you need to store the state?"

If the answer is no, there is no need to use a blockchain.

If the answer is yes, proceed to the next decision.

"Are there multiple writers?"

If there is only one writer, there is no need for a blockchain, as the single entity can manage data on its own.

If there are multiple writers, move to the next step.

"Can you use an always-online trusted third party (TTP)?"

A yes answer means one can rely on this third party to manage interactions between the writers, so a blockchain is not necessary.

If the answer is no (one cannot rely on a trusted third party), proceed.

"Are all writers known?"

If the writers are not known, this scenario suggests a Permissionless Blockchain, where anyone can join without needing permission, making it suitable for open, decentralised systems like Bitcoin or Ethereum.

If the writers are known, proceed to the next step.

"Are all writers trusted?"

If the writers are not trusted, one needs a Public Permissioned Blockchain. In this case, the writers are known but not fully trusted, requiring some public verification (like Hyperledger).

If the writers are trusted, proceed to the next decision.

"Is public verifiability required?"

If public verifiability is required, one should opt for a Public Permissioned Blockchain, as it allows known parties to interact but still maintains a level of transparency.

The system can use a Private Permissioned Blockchain if public verifiability is not required. This type of blockchain restricts access to a few trusted, known participants and does not require public oversight.

If none of these conditions fit, and one does not require state storage or multiple writers, the recommendation is not to use blockchain.

This flowchart helped participants evaluate if blockchain is necessary for their use case and suggested an appropriate blockchain model based on the trust and interaction requirements of the system. The core decision factors include:

- Number of Writers - This requires numerous participants, often called miners, who share an interest in confirming whether the data stored is correct; thus, this system relies on a consensus which maintains its integrity.

- Is there a Trusted Third Party? - A trusted third party (TTP) serves as a centralised authority responsible for overseeing updates and modifications of data. If a TTP exists, access to data may be regulated.
- Are All Writers Known? -This question queries whether all persons contributing to the network have been verified and are known.
- Are they reliable authors? – This has to do with the faith participants have in them and whether they will likely commit any deeds that are not well. If authors are not trustworthy, there is also room for wicked conduct. Public verifiability of the state determines whether the public can access and verify the data to enhance transparency and accountability.

The model on these features suggests four possible remedies:

1. Open source blockchain – Allows all people to join and see the information without prohibiting any person from writing into this ledger.
2. Purposes of public permissioned blockchains – Only a few people have writing rights to this type of blockchain, while anyone can read its information.
3. Private permissioned blockchains – Certain individuals hold writing and reading rights in such a way that they limit entry to their conversations.
4. Do not use blockchain – This proposal is made if better options are available, for instance, when not many trusted authors exist or when needing a non-existent, entrusted party.

2.4.2.6 Blockchain adoption non-technical drivers

To include non-technical requirements that drive the adoption of the blockchain, the blockchain adoption model outlines blockchain philosophical beliefs, network effects, economic incentives, and breaking the gridlock (Koens et al., 2020a).

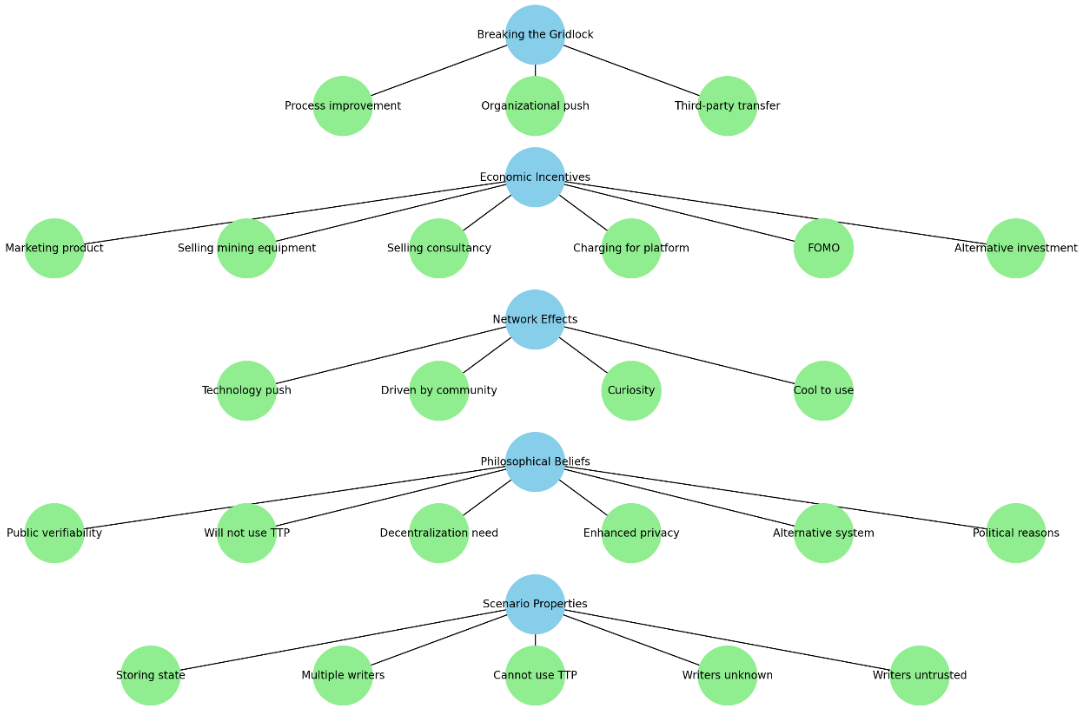

Figure 2.10: Blockchain adoption: non-technical drivers

Source: Adapted from (Koens *et al*., 2020)

Koens et al., (2020) integrate the technical drivers in Figure 2.8 with the non-technical drivers named:

Non-technical blockchain adoption drivers:

- **Philosophical Beliefs**: These factors emphasise the use of blockchain based on the ideological positions of the participants involved.
- **Network Effects**: This aspect suggests that existing blockchain users can influence new users to adopt this technology.
- **Economic Incentives**: These motivators are tied to the financial benefits or avoiding financial losses that might accrue to any party involved in the scenario.
- **Breaking the Gridlock**: Even if blockchain is the least optimal technical choice for certain applications, it might help eliminate organisational hurdles, encouraging collaboration. Additionally, having a third party manage the technology could further promote cooperation, especially when specific technical expertise is lacking within some organisations.

This model helps to study the blockchain uptake. Furthermore, a better understanding of what is needed instead of testing present features can be achieved by BADM (Koens *et al*., 2020). The model encompasses technical and non-technical components, making it possible for realism research efforts (as described in chapter 3 below).

Therefore, the adoption theories in this study will be evaluated within a critical realist perspective whereby entities, powers and systems are interplayed with each other, and no phenomenon exists in isolation from its surroundings as no outcome is determined by anything else. Additionally, a blockchain inquiry will explore a phenomenon created to allow massive groups to participate.

Chatterjee *et al*. (2021) test adoption theories in IT primarily individually, and group adoption theories are largely unexamined. They, therefore, propose that organisations and teams should include IT adoption in looking at other fields of study that can positively influence IT learning via new research breakthroughs or innovations. Therefore, we concluded that we are looking at blockchain from a realist perspective in higher education.

In this section, the Blockchain Adoption Drivers Model (BADM) is deployed as a theoretical foundation to critically research blockchain adoption (Koens *et al*., 2020a). Instead of being constant, this model lays a solid foundation that provides a holistic understanding of the parameters that impact the adoption of blockchain technologies in different situations. It does not measure only the current features but also the features that are most needed to satisfy specific use cases.

In particular, this is due to the inclusive structure of the BADM, which incorporates technical and nontechnical factors. The combination of the twin focus provides a more complete and realistic understanding of blockchain adoption, which follows the principles of critical realism. This thesis will then acknowledge the complex interplay between material reality and subjective/subjectifying perception, which may affect technology adoption. Consequently, the model is developed to allow for a multifaceted exploration of the technical capabilities and other socio-economic and philosophical questions (Koens *et al*., 2020a), thereby enriching the model both analytically and critically.

2.4.3 Higher education value chain models: a participatory pursuit.

Romanovskyi *et al*. (2020) show that the value chain concept is an impactful lens to assess how higher education institutions (HEIs) deliver and create value. Accordingly, everyone cannot agree on a single global model (Usmi *et al*., 2024). Rather, several frameworks developed to address different needs and contexts within HEIs exist internationally (Chen *et al*., 2023).

2.4.3.1 Understanding participation and strategic planning in higher education

Two different frameworks are used to understand education at higher levels: the Chain-of-Response (COR) model and value chain analysis.

However, despite being first proposed by Cross in 1981, the COR Model remains one of the key models to use when investigating student decisions concerning higher education with regard to widening participation efforts (Ottesen *et al*., 2022). It throws a useful light on the psychological, sociological and environmental factors that influence their choices, thus unravelling the intricacies of widening access, massification and diversity in tertiary sectors. Widening Participation (originally a HEFCE (Higher Education Funding Council for England) term) refers to a broad range of initiatives designed to increase access to universities for groups that do not meet its representation targets (Marginson, 2019). Under the massification Macgregor (2014) discussed, there has been a rapid increase in the number of people enrolling in universities and colleges.

Additionally, diversity pertains to offering a wide composition of students from different racial, ethnic and economic backgrounds, as stated by (Trowler & Trowler, 2010) and (Halbesleben *et al*., 2014), extended the use of this COR model outside the U.S context, this is made possible by applying a European setting to gauge how students determine their options thereby making it very relevant when coming up with strategies aimed at internationalization and inclusivity in higher education institutions Therefore, it serves to demonstrate the potential for applying this model as a basis for forming solutions to deal with the widening of accessibility and diversity in the colleges and universities all over the world.

Value Chain Analysis, from business management, is employed in strategic planning in Higher Education Institutions (HEIs). This approach to a detailed examination of internal resources and capabilities will enable HEIs to be able to identify areas of improvement that will create a competitive advantage, as highlighted by (Dagen and Fink-Hafner 2019) (De Wit 2023), They explains how HEIs can apply value chain analysis to redesign service delivery and get strategic positioning in the turbulent educational sector. In this way, by concentrating on operations at the HEI core, such as teaching, research and student services, HEI can identify their strengths and weaknesses and develop their unique programs and services in parallel with the needs of the market as well as future educational trends (De Wit, 2023; Dagen & Finkhaefner, 2019; Schuld, 2022). It is, therefore, a strategic approach which ensures both long-term prosperity and enhances the operational efficiency of these institutions.

Although the COR model deals with lower educational drivers, it is still concerned with societal and ecological impacts, where chain analysis is based on the strategies employed by HEIs considered as a dimension of strategic management. While the models may emphasise different things, they are both helpful for understanding higher education as complex. COR strategy increases participation in various areas and underrepresented areas, utilising strategies based on the COR model. In contrast, the value chain analysis serves as a blueprint for HEIs to follow to realise improved utilisation of resources and institutional growth as a function of the changing educational requirements. Hence, the value chain theory is adopted as a second theoretical framework for this study, upon which a model for higher education built around blockchain is introduced.

2.4.3.2 Customer focus and operational efficiency

As per Li & Li (2020), the customer-centred value chain framework insists on perceiving how the demands of consumers are considered at any stage of value creation. To develop how higher learning organisations could offer significant customer experiences at every point in the lifelong education program continuum, Choi et al. (2019) have employed customer journey mapping in conjunction with value chain analysis. Furthermore, Vitug (2023) also considers re-engineering the higher education value chain through a customer-centred view that is interested in identifying and fixing students' perspective inefficiencies. In this manner, this position departs from those models commending the internal functions of the organisation or its efficiency.

2.4.3.3 Leading the charge: executive and strategic vision

The model of the value chain is an industry which provides services, such as the model of higher education (Indrawati *et al*., 2024). The value chain concept can work as a strategic tool for colleges and universities, which identify areas for improvement and use technology to address the identified problems (Rowlands & Kautz, 2022). What is powerful about this model is how it addresses operational inefficiencies.

2.4.3.4 A complete framework integrating technology into higher education

Zhang (2023) presents a comprehensive framework encompassing many actors and activities along the value chain, highlighting the central importance of technology for improving higher education. This shifts the content to become a personalised learning service, in line with the current technology trends and educational pedagogy. Similarly, (Sun & Liu, 2023) have a similar opinion, but they are more focused on linking blockchain technology with other actors and actions in higher education. This model is very important, as it has a broad aspect and covers many problems and possibilities in dynamic higher education.

These represent the richness and variety of perspectives on higher education value chain literature. However, it should be mentioned that none of the models give a complete analysis since they are restricted. However, what HEI is the “best” fit for always depends on the context, strategic objectives, or the audience being served. Later, other research could look at a more complex or hybridised approach using evidence from several current frameworks. Figures 2.11 also describe the higher education model for publishing (Tian & Martin, 2013).

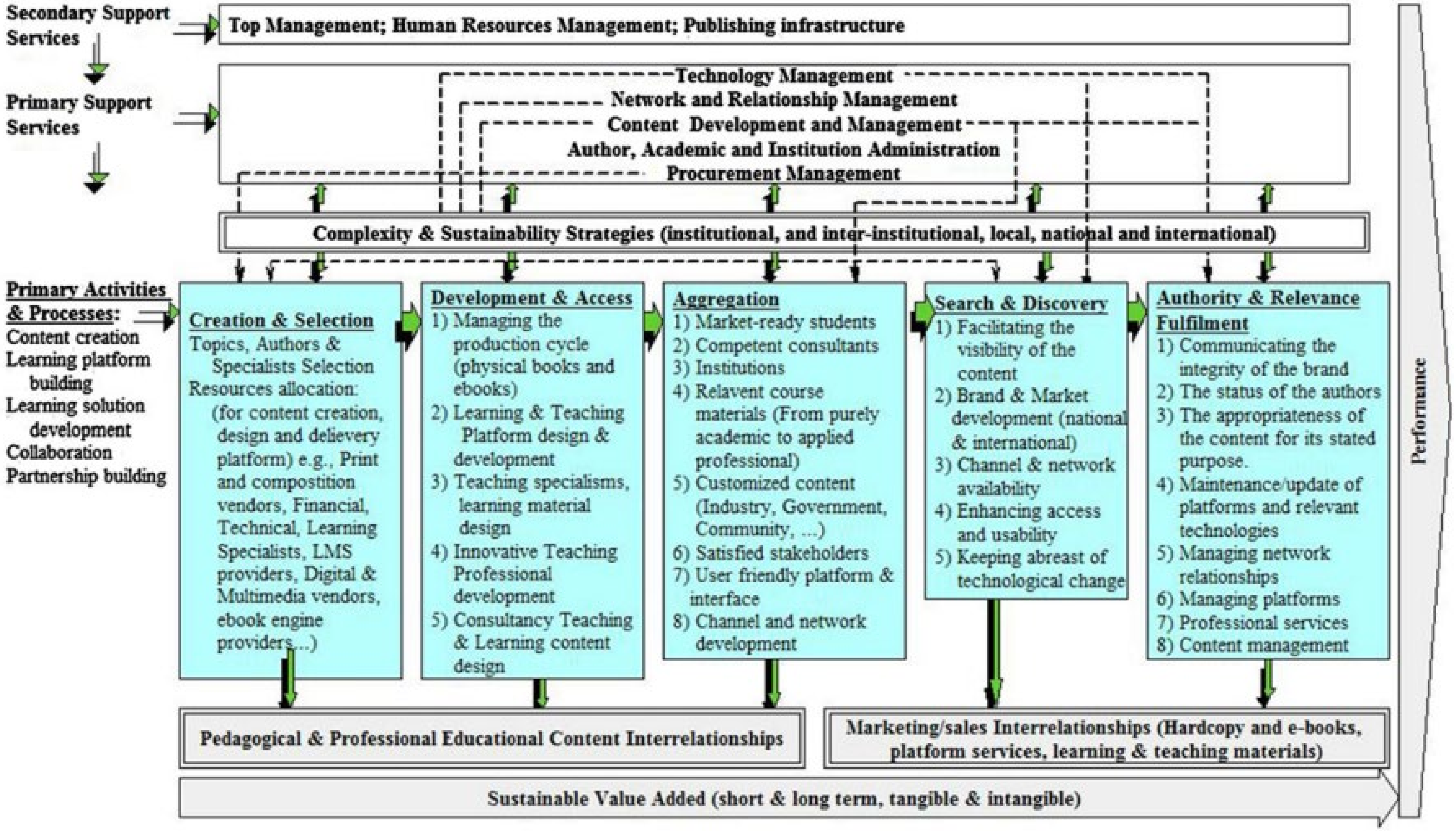

Figure 2.11: Emerging Value Chain for Educational Publishing

Source: Tian & Martin (2013)

The value chain concept has many strata that examine how higher education institutions make positive value. Each model displays specific features that make it fit for a particular purpose, and its range varies depending on learner participation choices (Cross, 1981). Similarly, it establishes a strategic position De Wit, 2023) or enhances operational productivity (Rowlands & Kautz, 2022), leading to them highlighting at all times the instrumental aspects of strategic management, stakeholder engagement, and technological integration in tackling complexities associated with higher education.

Xuemei Tian and Bill Martin's (2013) "Emerging Value Chain for Educational Publishing" catches attention due to its inclusive and forward-looking approach, as depicted in Figure 2.11. It recognises the dynamism of higher education in general, especially the increasing technological influence (Capetillo et al., 2022). Various actors and activities within the value chain are involved such that tech is not only seen as a delivery mechanism. Arguably, it is also a force that transforms educational services altogether (Zhang, 2023) which conforms with current trends in pedagogy that call for more personalised learning experiences (Choi et al., 2023).

As much as these model selections might depict the diversity within the value chain in universities, no one model can capture all the intricacies of various institutions. The "best" type depends on a particular higher education institution's (HEI) unique context, strategic priorities and target audience (Neave & Pinson, 2019). For example, the COR model developed by Dr. Stevan E. Hobfoll may be most useful to an institution focusing on widening access (Hou & Tao, 2023). At the same time, such an approach may not work for a school whose mission is to offer personalised learning experiences as initially proposed by K.P Cross, which is a means of differentiating itself from competitors; Aslanian (1983) would support this assertion.

The concept of value chains serves as an important toolkit for understanding and optimising value generation in state colleges and universities. By critically engaging with different models and recognising their limitations, HEIs can make informed decisions concerning strategic management, stakeholder engagement and technology integration. Consequently, they are positioned to create and provide value for their students in today's rapidly changing landscape of higher education.

2.4.4 The convergence of the study philosophy, theory, conceptual framework, and Questions.

Table 2.5 presents the conceptual framework underpinning this study, which links blockchain adoption drivers with the HE value chain, drawing on the model proposed in the introduction of this study. In the context of this study, the framework is drawn to demonstrate the dynamic relationship between the higher education blockchain adoption drivers model features, realist lenses, and this study's research questions.

Research Question 1, "What are the Blockchain Adoption Drivers for Higher Education?" is addressed through the identification and classification of two key categories of drivers:

Technical Drivers: These include blockchain's core functionalities such as immutability, decentralisation, data security, and compatibility with existing digital infrastructure.

Non-Technical Drivers: These consist of organisational culture, regulatory readiness, stakeholder awareness, institutional trust, perceived usefulness, and alignment with educational objectives.

These drivers help determine the motivations and barriers influencing blockchain adoption across different HE contexts. The conceptual framework positions these drivers in relation to institutional goals and stakeholder needs, helping to explain variations in adoption patterns.

By integrating both research questions, the framework provides a comprehensive understanding of how blockchain adoption drivers operate and under what conditions they align with the goals of democratising higher education.

Research Question 2 "Under what circumstances do Blockchain Adoption Drivers meet the Higher Education value chain actors' democratisation?" guides the core analysis. This question investigates how blockchain adoption enables or hinders democratisation among key value chain actors such as students, academic staff, administrators, funders, and employers. The framework analyses whether and how blockchain adoption facilitates equitable access to information, decentralised decision-making, and improved accountability across HE processes such as credentialing, research dissemination, teaching, and administration.

The adoption drivers are mapped onto the value chain to assess how technological and institutional contexts create opportunities or limitations for democratisation. These interactions are assessed through a critical realist lens, which considers:

Contexts: Institutional and policy environments and user needs that shape adoption.

Mechanisms: Underlying causal processes, including stakeholder motivations and systemic constraints.

Outcomes: The degree to which adoption transforms existing power structures and enhances inclusivity and transparency in higher education.

The table demonstrates that the contexts + Mechanisms = outcomes. Thus, this study shows how it employs the higher education blockchain adoption model and the application of the critical realist philosophical paradigm.

Table 2.5: Blockchain adoption drivers' model for higher education: a conceptual model

Philosophical Paradigm						**Mechanisms**					**Outcome**
	Research Questions					**What are the Blockchain Adoption Drivers for Higher Education?** Sub-RQ1.1 and Sub-RQ1.2: Who are the blockchain and value chain actors? Sub-RQ1.3 and Sub-RQ1.4: What are the higher education blockchain and value chain activities?					
		Conceptual Framework				**Higher Education Value Chain**					
			Use			**User Requirements.**					
				BADM & Value Chain		**Value generation**					
						Creation Selection	**Development & Access**	**Aggregation**	**Search Discovery**	**Authority Relevance Fulfilment**	**Performance**
Contexts	**Under what circumstances do Blockchain Adoption Drivers meet the Higher Education value chain actors' democratisation?** Sub-RQ2.1: What are the critical drivers for Blockchain adoption in Higher Education? Sub-RQ2.2: When can the drivers drive adoption? Sub-RQ2.3: What type of blockchains do higher education institutions require?	**Blockchain Adoption Driver Model**	**Technology Capabilities.**	**Technical Drivers**	Store state						
					Number of writers						
					Trusted Third Party						
					Writer Known?						
					Writers Trusted?						
					Public Verifiability?						
			Technology Usage.	**Non-Technical Drivers**	**Philosophical Beliefs**						
					Network Effects						
					Economic Incentives						
					Breaking the Gridlock						

Source: Adapted from Molopa & Cronjé (2024)

2.5 Conclusion

In the introduction of this chapter, the need for a blockchain-specific adoption model is identified through an SLR. At the same time, the Higher Education Blockchain Adoption Drivers conceptual framework is established through a computational content analysis process.

In Section 1, the items collected from the SLR are analysed to identify RQ1 actors and activities (blockchain and value chain) and RQ2 key drivers and types of blockchain.

Additionally, in Section 2, the core principles from the adoption theory in the context of blockchain and the value chain model are discussed to establish its participatory pursuit. Finally, section 2 demonstrates the convergence through mapping the relationship between the Blockchain Adoption Drivers Model Conceptual Framework, the Adoption Theory, the Critical Realism ontology, and this Study's Questions in Table 2.5. This provides a graphical representation of the design of this study's research process. Moreover, this table provides a visual representation of the chain connections of the fundamental concepts underpinning the study, thus providing a concrete view of how the conceptual framework will be evaluated conceptually.

In summary, Chapter 2 has used literature to identify the need for an adoption model and has used literature to establish the conceptual framework in preparation for the testing of the model.

CHAPTER 3 : RESEARCH METHODOLOGY

3.1 Introduction

The primary factor that shaped the design choices in this chapter was the Research Onion, which is a multi-layered system of the research design as suggested by Saunders et al. (2009). The design of the study had the backbone of Research Onion as was discussed in Sections 3.2 to 3.6. Next, section 3.7 introduces the research methodology of the research where it indicates the location of the research, the approach of the research, research methods, and the considerations of validity and reliability with the tools and techniques utilized. The main goal of the study is to examine the use of blockchain technology in institutions of higher learning. This model actually provide a systematic road map on the management of the various strata of the research process.

One must meet a philosophical layer, and Critical realism is an ontologic realism, an epistemologic constructivist stance, thus is the most suitable to analyze blockchain technology. In such a way, relying on this approach of the philosophy, the researcher can not only observe the potential of the blockchain in the real world but also emphasize and otherwise interpret its outcomes which can be addressed to various stakeholders (Bhaskar, 1975; Archer, 1995). The discovery of the concealed generative process and context is among the best benefits and leads to the understanding of the objective efficiency of blockchain technology and the subjective opinion of the user. Therefore, a combination of these views may be extremely complex and difficult operations; in many times they need methodologically demanding approaches.

In the approach layer, Retroductive Approach implies attempting to discover the possible existence of certain structures or mechanisms solely based on the observed phenomena. Critical Realism supports this method and allows developing the hypothesis about the latent generative forces of the blockchain adoption in higher education (Sayer, 1992). Although there are situations when this method may become rather dramatic and require the quality of the preliminary observations, it does not weaken in forming powerful annotated models.

The data in the form of qualitative information will be gathered in the strategy layer through focus group shapes of the participants; this is because the approach adopted will be capable of identifying and expressing the minds of the people including their perceptions and risk-taking regarding the Blockchain Technology. This makes it possible to have elaborate discussions with members, elaborating on specific features that would otherwise not be easily expounded by the respondent; however, it poses a problem of group influence in that the respondent is likely to be biased by other members' answers.

At the choices layer, a mixed-methods approach is employed, integrating qualitative research methods, such as questionnaires and surveys, with quantitative techniques, including statistical data analysis, to achieve a comprehensive understanding of blockchain adoption. This mixed-methods research design combines depth and breadth, enabling the collection of both qualitative and quantitative data. Such an approach is particularly advantageous as it ensures the validity and reliability of the findings through cross-verification, while also being resource-efficient, as small sample sizes alone often fail to yield generalizable insights (Creswell & Plano Clark, 2018a). However, it is important to note that this approach can be both time-intensive and costly, as it requires the application of diverse data collection methods for qualitative and quantitative analysis.

The cross-sectional type involves gathering data at a particular time in a bid to take a look at the current trend of blockchain in higher learning institutions. This method is real, practical, and strong for the prevalence search of the present tendencies and regularities, yet it is unable to find the temporal shifts and the consecutive consequences (Bryman, 2012).

Regarding methodologies and approaches, data collection employs focus groups for qualitative information gathering and focus group protocol (Table 3.6) for quantitative and qualitative data (Krueger & Casey, 2002). There are common methods to engage in data analysis, which include Thematic and Content Analysis methods for qualitative data and Statistical analysis methods for quantitative data (Braun *et al*., 2021; Nowell *et al*., 2017; O'Leary, 2017; Creswell & Creswell, 2018). Thematic and content analysis yield contextual understanding and details, while statistics permit the measurement of patterns and associations (Braun & Clarke, 2006; Neuendorf, 2016; Field, 2013). However, qualitative analysis is interpretive and may demand substantial time, while quantitative analysis may oversimplify phenomena if not carried out well.

Superimposing the research onion on the investigation into blockchain adoption in HE with Critical Realism provides a clear and strong framework. This approach involves both quantitative and qualitative research in a way that gives considerable insights into factors for adoption. This paper concludes that researchers must be aware of the various issues and constraints inherent to each layer of the research onion to conduct thorough and sound research.

3.2 Philosophy

3.2.1 Ontology: Critical Realism

Thus, critical realism is promising for providing a strong ontological background to the investigations of blockchain adoption in higher education. This framework assumes a layered world of appearance, existence, and essence as observed, occurred, and operatively existing (Bhaskar, 1975). These kinds of differentiation are paramount to explaining blockchain because researchers can disentangle more superficial effects, such as better administrative effectiveness, from the underlying, frequently latent processes that these effects represent, such as decentralisation and increased transparency. The essence and causal power of blockchain technology in higher education can be seen as emergent, starting with outcomes such as greater data security and better credentialing. These powers engage with existing formations consistently in educational institutions and may alter them (Vincent & O'Mahoney, 2018).

3.2.2 Epistemology: Constructivist Epistemology within Critical Realism

The epistemological position of critical realism affirms the nature of reality but agrees that knowing reality is even influenced by social or cultural relations (Vincent & O'Mahoney, 2018). This epistemological perspective is conducive to understanding how blockchain technology is adopted within the HE context, given that different populations of the community (students, teachers, managers) might have different perceptions about the positive and negative sides of the innovation. This implies that the study of blockchain adoption should embrace the insiders' subjectivities and rhetorical positions. Survey questionnaires can estimate the proportion of the population supporting the idea of blockchain's application across a given industry, while focus groups can give deeper insights into how this utility is perceived and what some of the implementation difficulties are (Sayer, 1992).

3.2.3 Axiology: Ethical and Value Considerations

There is also axiology in critical realism describing the values and ethical part of the research (Wynn & Williams, 2012; Shrestha & Sharma, 2024). This is done in regard to the following areas where the application of blockchain technology is being considered in higher education: ethics, self-identity of blockchain adoption in higher education and values and outcomes self-assessment. For instance, while using blockchain resolves issues with the implementation of educational technologies by ensuring transparent records which are possibly fair in realising the relevant democratic values to all without discrimination. However, there may be certain ethical concerns that researchers need to bear in mind, including probable privacy violations and paradigms that may leave out those who are not fully conversant with technology. Despite recognising that there are different value positions possible within critical realism, by subscribing to the critical realist philosophical orientation, scholars are meaningfully encouraged to reflect on the values they hold personally and the values of the research participants while being very upfront about the values inherent in chosen research questions and methods (Vincent & O'Mahoney, 2018).

3.2.4 Mechanisms, Contexts, and Outcomes in Blockchain Adoption

In seeking to understand and explain the mechanisms behind empirical and actual events, critical realism is primarily interested in causal explanations—moving from the what to the why. This perspective challenges researchers, policymakers, and managers to develop deep understandings of their worlds, moving away from simplistic regression analyses that might show implementing X 'causes' Y and towards understanding why different contexts, conditions, and aspects of X could cause Y. The key to this inquiry is the 'mechanism', and the events it produces, but the mechanism in an open system cannot be isolated from its context. Hence, (Tilley & Pawson, 1997) equation: Mechanism + Context = Outcome (Tilley & Pawson, 1997).

Table 3.1: Critical Realist lenses

#	Analysis	Methods	Description	Margin
1	Entity	Contexts	Higher education Blockchain & Value Chain Actors	Value
2	Systems	Mechanisms	Blockchain technical and non-technical & Value chain activities	
3	Powers	Outcomes	Requirement	

Source: Author's Construct

One of the primary goals of effective research is to improve the modelbuilding process for the future. Evidence is gathered utilising a methodological pluralist approach in which multiple views are investigated at a minimum, using a variety of data collection approaches (Kazi, 2003). This evidence may provide information on the model's usefulness, accuracy, and impact on other mechanisms and contexts; however, this is a by-product (Kazi, 2003; Kazi, 2000; Kazi, 2011). The primary goal of this evaluation is to enhance the program in terms of content and targeting to improve the theory, improve the assessment, and strengthen the mix of data collection approaches in a never-ending cycle of progress (Kazi et al., 2002).

3.2.4.1 Mechanism

This refers to how the properties of one or more entities affect those of others. For example, in the context of blockchain adoption, the mechanism could be the technology's ability to securely and transparently record transactions.

3.2.4.1 Context

This involves the conditions for an entity's causal mechanisms to be triggered. In higher education, the context could include institutional policies, stakeholder readiness, and technological infrastructure (Fleetwood, 2005).

3.2.4.2 Outcomes

These are the empirical manifestations produced by causal mechanisms triggered in a given context. For blockchain adoption, outcomes might include enhanced data security, improved credential verification, and increased transparency.

The role of context means that, unlike the image promoted by positivists, there are no clear, simple, or easy answers in the social world (Fleetwood & Hesketh, 2010). For example, we might find that low-waged service workers in a call centre can be happy when they work on quality services, have high levels of discretion in their jobs, and positively identify with the values of their work (Jenkins & Delbridge, 2014). The mechanisms that manifested here concern the relational identifications of the workers with the values of their employer and their work. However, Jenkins and Delbridge also clarify that the context of this mechanism was a labour market with limited choice and a family-owned, small, and successful business. Thus, the identified mechanisms may produce different outcomes in different contexts or even within the same company at different times.

Summarily, ontology, epistemology, and axiology of critical realism provide a comprehensive framework for investigating blockchain adoption in higher education. The stratified ontology is useful in establishing other latent factors, and the constructivist epistemology is useful in establishing a more holistic view of stakeholders' impressions. The axiological dimension guarantees that ethical concerns are essential to the research. Furthermore, applying critical realism to mechanisms, contexts, and outcomes can substantially improve the scopes and methodological quality of blockchain adoption research and improve practical recommendations for higher education institutions.

3.2.5 Research approach

In critical realism, retribution implies that the mechanism being considered, if it existed, would explain the occurrence of the phenomena (Vincent & O'Mahoney, 2018). This approach endeavoured to discover what the world must have looked like for the observed entities to be as they were and not otherwise (Sayer, 1992). Scholarly retroduction in the context of studying the adoption of blockchain in higher education meant first spotting the emergent patterns across and through time and spaces and then posing the 'what if' questions that help one uncover commonly masked causal relations.

For example, the following was noted: (1) that some of the used blockchains were considerably more effective than others, and (2) that depending on the educational environment, that is, where IT is well-developed (for example, in universities). This suggested other causal processes affecting the observed mechanism, such as institutional support and stakeholder readiness. The variance in blockchain adoption outcomes was better explained by understanding these relationships.

A choice to either develop new theoretical resources or draw on existing ones occurred to build better explanations of the interconnections between strata. For example, comparative analysis showed that those institutions that could align blockchain adoption with their strategic goals were more successful. This led to a new theory connecting organisational outcomes with broader educational contexts. Alternatively, considering the nature of opportunity structures within higher education can explain why some institutions were more inclined to adopt blockchain technology than others. Thus, new lines are drawn between the operation of a mechanism and the context(s) within which it resides. The observation identified the value chain as a context for higher education institutions to build a blockchain adoption framework.

Retroduction, therefore, embraced theoretical eclecticism, where various theories are used based on the value they brought when offering 'theoretical' interpretations of the numerous factors that shaped what was observed in the study (Vincent & O'Mahoney, 2018). Abstraction and retroduction could also engage with other viewpoints to construct theorising in a discipline. This entailed examining theories for first-level contradictions, then second-level contradictions, tensions between the theories, and re-framing the tensions in critical realist concepts (Edwards *et al*., 2014).

Critical realism as a method of understanding blockchain adoption in higher education helped see both the technical and social aspects of using this technology. Ontology, epistemology, and axiology of critical realism helped the study remain multi-dimensional and ethical in nature. Using formal concepts as the theoretical framework and applying retroduction to understand mechanisms, contexts, and outcomes, the authors enriched the research epistemology and improved the development of strategies for the proper and fair adoption of blockchain solutions.

3.2.6 Research Strategy

The research method for this study combines computational content analysis, grounded theory, and Focus groups to accomplish both quantitative and qualitative analysis to examine the acceptance of blockchain within the value chain of higher education (Kuhlman *et al*., 2020). This research strategy offers a systematic knowledge acquisition, which is supported by data, as well as the generation of theory elaborated by analysing the stakeholders' experiences.

3.2.7 Computational Content Analysis

The quantitative aspect of this research is supported by the computational content analysis that forms the basis of the calculations of this research. Adopting VOSviewer allows the study to critically mine a large selection of literature and identify patterns, driver themes, and co-occurrences related to adopting blockchain and value chain processes in higher education. By visualising a network of terms and relations, the critical factors driving the implementation of blockchain can be better understood. Using this method, the subject matter is analysed extensively and devoid of biased results, as the results presented are generated through a computational method rather than human intervention (Kuzior & Sira, 2022).

Another benefit is scalability—the approach of ACA allows for the completion of many analyses when investigating the increasing flow of literature on blockchain in higher education. The analysis based on the method helps unveil major adoption drivers that might be overlooked when focusing on traditional forms of analysis, such as patterns and trends of the identified driver themes and their connections (Basarir-Ozel *et al*., 2022). Furthermore, this approach augments the established tendency in the methodological approach that makes use of the computational tools for data search and analysis, as well as provides stringent and open data analysis solutions that can be efficiently replicated (Kuzior & Sira, 2022).

3.2.8 Grounded Theory

The study uses grounded theory methodology combined with computational analysis to build a conceptual framework derived from focus group data. Grounded theory is appropriate for this study because it involves developing theory from scratch and using data collection and analysis, which are cyclical and almost simultaneous, in order to arrive at findings that are rooted in data. It is important to apply this approach when studying blockchain adoption because it enables the researchers to examine new occurrences for which there can be no theories initially.

Its advantage is that it is highly contextual, and its categorisation offers a way to build context-sensitive and responsive theories from raw data (Khan, 2014), as demonstrated in the development of a conceptual framework. Drawing from the objectives of this study, grounded theory is employed to explore how blockchain technology can be adopted into higher education institutions and how this new technology can change the traditional value chain models. As an objective form of analysis concentrated upon identified actions, relationships and the spiralling processes occurring within focus groups, grounded theory assists in the creation of a verified theoretical model which captures the nature of institutional practice and stakeholder perceptions (Maher *et al*., 2018).

3.2.9 Focus Groups

The primary method used for collecting the qualitative data is focus groups for which various stakeholders, education administrators, faculty, IT personnel and other individuals and organisations involved in decision-making in higher institutions of learning share their views, experiences, and expectations towards the adoption of blockchain technology. Focus group discussions are fruitful and engaging due to the nature of the medium, which responds to the subject matter in a practical and policy-oriented way, providing a view into the implementation issues and potential effector institutions. These discussions focus on the driver elements derived from the computational content analysis of the text data such that the qualitative information collected corresponds to the quantitative analysis.

Another strength of focus groups is that the generation of knowledge is coproduced, a concept that accords with the nature of blockchain technology, which is democratic and decentralised (Trainor & Bundon, 2021). Because discussions are collaborative, the research informs participants' understanding of how blockchain might transform institutions. It is crucial to use the data from focus groups to elaborate the grounded theory because it supplies the contexts that cannot be explained using computing technologies (Walsh *et al*., 2021).

3.2.10 Reflection on Methodology

The integrated approach using computational content analysis, method of grounded theory and focus groups results in a methodological approach which is both quantitative and qualitative in nature and complementary in its strengths. Quantitative content analysis demands the precision and scalability that is needed to sift through the large literature on blockchain and higher learning, and GT ensures that the theories developed are very much anchored in the data collected. On the other hand, focus groups are a novel form of interaction and substantive input on the part of larger groups of people in the sample, since the study can get a closer look at how the direct stakeholders in the implementation of blockchain technologies experience different processes and events.

Using this mixed method approach, the research is able to deliver one composite answer on how blockchain can be best implemented in the higher education value chain. The results of the study are accurate and can also be used in practice because the computational analysis was combined with qualitative observations based on focus groups. The strategy also reveals important insights about why blockchain is implemented and where it can be utilised beneficially in higher education institutions, which the proposed implementation framework would address.

3.3 Research Method Choice

3.3.1 Mixed Method Approach with Corroboration

This research utilises qualitative and quantitative methods to explore blockchain technology adoption in the value chain of higher education while using one technique to confirm findings obtained from the other. Thus, through the method of corroboration, the study intends to increase the validity of the findings based on the synthesis of the findings rooted in diverse methods to provide a more valid picture of the redefining potential of blockchain in the context of higher education institutions.

3.3.2 Mixed Method Strategy

3.3.2.1 Concurrent Transformative Approach

A concurrent, transformative mixed-method approach was used to allow the data collection from both the qualitative and the quantitative sources while following the distinct theoretical framework recommended by Venkatesh et al. (2003). This approach is suitable for the current study because blockchain has the capability to revolutionise conventional top-bottom organisational models in higher learning institutions, as noted by Alavi and Hąbek (2016). Thus, the study explores state-of-the-art blockchain adoption and aims to identify the prospects of changing directions. A major advantage of any concurrent design is the collection of data necessary to use methods to support each other and ensure that the conclusions drawn are credible (Creswell & Plano Clark 2018b). It makes it possible for the quantitative results to be harmonised with the qualitative results in presenting a coordinated view of how blockchain can redesign the value chain of higher education.

3.3.3 Mixed Method Design and Choice

In the proposed method, corroboration is integrated as a main design principle, applied simultaneously alongside two different data analysis approaches computational content analysis and participatory focus groups (De Brún, 2020). This design makes it possible to complement the findings from each method to give a comprehensive look at the effect of blockchain.

3.3.3.1 Quantitative Computational Content Analysis through VOSviewer

The quantitative part of the research used computational content analysis, which is suitable for large text data, using VOSviewer. The literature on blockchain and value chain in higher education included 27 and 33 studies, respectively, which were reviewed to specify the terms, patterns, and connections between the drivers of blockchain adoption. The text mining functionality in VOSviewer allowed for the building of connection network maps of these concepts, and some of these terms and concepts are indeed significant in the blockchain and value chain domain (Van Eck & Waltman, 2011b). Subsequently, focus group data was used to validate the identified computational patterns as it would effectively ensure that the patterns identified have a bearing on current real-world experiences.

3.3.3.2 Content extraction: higher education blockchain and value chain actors

The researcher identifies actors through a content analysis process. The premium version of SciSpace found at www.Typeset.io is used to deduce the names from the adapted items. Then, a verification process was engaged by first navigating the links generated in the extracted Table from the library of papers adapted from Molopa & Cronjé (2024) linked here. Then, the items were converted into PDF documents and uploaded to the AntConc concordance research desktop application. The list of actors was manually searched from the AntConc. Hallucinated actors were identified and excluded from the list. The results are outlined in Chapter 4, and the process is shared in the Excel spreadsheet Grouped Higher Education Actors.

AntConc is a widely used corpus analysis software developed by Dr. Laurence Anthony, particularly known for its application in corpus linguistics and text analysis. Although AntConc is not typically "rated" by research institutions in the traditional sense, it enjoys a strong reputation in the academic community. Furthermore, the software is frequently cited in numerous scholarly papers and research studies across various disciplines, including linguistics, language education, and digital humanities (Zhang, 2023).

AntConc Copus Software

AntConc's reputation is largely derived from its widespread adoption in academic research, ease of use, and the extensive features it provides for analysing text corpora. AntConc is used widely in corpus-based research, and many reputable research institutions and universities from around the world have adopted AntConc in their research methodologies for corpus-based studies. The above utility of this utility is seen in a significant number of publications indicating or relying on AntConc for text analysis (Louw & Louw, 2021; McEnery & Hardie, 2012; Hardie, 2014).

So, if you want an evaluation or review from a research institution, it's not going to be there in a fashion that you would see something reviewed for commercial software. However, the frequent citations and usage of AntConc in academic research are evidence of its credibility (Brezina, 2018).

SciSpace AI

SciSpace is an AI-based tool for simplifying the understanding of academic research papers and is well known for its ability to demystify complex scientific concepts. This is especially useful to students, professionals and researchers who may not understand scientific jargon. Many reputed research institutions and platforms have discussed and reviewed SciSpace, a useful academic tool.

For instance, as a case in point, Scispase was written up in a study published in TechRxiv, which refers to how SciSpace aids you in doing an efficient literature review and spotting gaps in existing research. The research shows that the tool can greatly simplify the research process when there are huge academic paper collections to work with (Jain *et al*., 2023). As another example, SciSpace has platform features such as "The Effortless Academic" discussing their AI features like a "CoPilot" tool, which lets users interactively work with research papers as part of a research workflow (Ilya Shabanov, 2024).

The AI review websites also highly recommend using SciSpace because of its user-friendly interface and practical features that are best suited for students and professionals. Critiques around this indicate that although SciSpace is great at reducing a scientific paper's complexity, it is not that good at handling more specialised or highly complex papers (AI Hungry, 2024). Also, SciSpace is deemed a useful tool for any participant in academic research.

3.3.3.3 Qualitative Participatory Focus Group

Altogether, participatory focus groups were used with the quantitative data analysis, with the target participants being administrators, faculty, and IT professionals in higher education. These focus groups gave qualitative data, which gave them a look at the practicalities and possibilities of applying blockchain in various dimensions. The participatory approach provided the means through which stakeholders could reflect on how blockchain could affect certain activities or roles within value chain activities and, therefore, build upon the results generated through the computational analysis (Trainor & Bundon, 2021). The experiences and perceptions elicited during the interviews were also triangulated with quantitative findings to ensure that the developing blockchain adoption model includes theoretical support from qualitative data.

3.3.4 Participatory Focus Group Reflection

Thus, while using the participatory focus-group method to elicit learners' engagements more proactively, this study offers a richer and more emancipative examination of blockchain's potential to revolutionise the higher education value chain. The quantitative results described the main drivers and activities associated with blockchain based on the surveys, and the focus groups provided richer data by explaining the results based on the respondents' experiences. The extensive realist, through the participatory focus group approach, enabled the confirmation of the above datasets, providing a more informative view of the institutional processes that can be supported by blockchain.

Corroboration made it possible to establish that discoveries made were consistent across the various approaches employed in the study. According to the results provided by the VOSviewer software, the decentralization of the work of the decision-making system, the enhancement of transparency and cooperation among the networks integrated into Blockchain are accepted in the shared network diagrams. This was referred to by the respondents in the focus group discussions. This consistency of information sources indicated the complementary nature of blockchain and value chain operations in higher education and, consequently, offered an empirically validated roadmap of how blockchain can be deployed, which can be taken into account by institutions at the moment (Delgado-Von Eitzen et.al., 2021).

With the help of corroboration this paper will develop a wide-ranging framework of the prospects of application blockchain usage in HEIs, thus, increasing the search of the progressive development of HEIs, based on transparency and collaboration. In comparison and triangulation of the qualitative and quantitative findings, the study makes sure that the image is not incomplete lacking the details about the theoretical and practical mistakes and successes regarding the application of blockchain in the academic colleges.

With the corroboration concept, the combination of the qualitative and quantitative information was carried out and this ensured that the use of blockchain in the higher education value chain would be effectively and accurately analyzed. Quantitative computing content analysis and qualitative participatory focus group combined helped to ensure that the results that are generated in this research are triangulated using various sources of data. This high unsureness to imitate results approach contributed to the theoretical findings and allowed to bring it into more realistic applications. The institutions of higher learning are not an exception as they run to abide by the change in technology. This research has presented a solid empirical one in the realm of effective application of blockchain technology in value generation, transparency and other applicable partnerships.

Participatory focus groups are also included in this research not only to enhance the data collection process, but also compliant with the current concept of democracy, co-creation and co-beneficiation that has been emphasized as desirable in recent scholarship

(Trainor & Bundon, 2021). The research process is democratic because the key actors like administrators, faculty and IT persons are directly involved in the research. Participatory focus groups also permit a variety of various voices, and produce results of blockchain adoption due to a collaborative approach rather than a top-down approach. This strategy aligns with the philosophy of inclusivity of governance and collective decision-making than the spirit of blockchain and its decentralised architecture, a goal to democratise institutional actions (Delgado-Von Eitzen et.al., 2021).

The collaborative character of the focus groups reacts to the growing interest in co-creation in the research of higher education where knowledge is created via the dynamic process of interaction between the researchers and the individuals (Trainor and Bundon, 2021). The conducted focus groups offered an in-depth understanding of the contextual knowledge on the practical implementation of blockchain adoption so that the developed models could be valid and that they are being created in accordance with the real needs of institutions. This comes in accordance with the principle, according to which the results of research should be co-constructed by the participants of the research, in order to create a stronger relationship between theory and practice (Walsh et al., 2021)..

Furthermore, taking part in the participatory focus group provides co-beneficiation, which involves such things as equitable benefits for researchers and participants (Delgado-Von Eitzen et al., 2021). The benefits of such discussions are that for the participants they are a chance to sway and inform the directions that their institutions take regarding blockchain and to ensure that any developments in this area will be suited to their particular needs and worries. For the researchers, the heterogeneity in the focus group answers adds weight and significance to the study, resulting in more nuanced and actionable findings. This collaborative spirit in the research is further enhanced by the shared knowledge creation, which is in line with the potential of blockchain in applied value creation in higher education (Vargas et al. 2021).

Participatory focus groups contribute to the values of democracy, co-creation, and co-beneficiation, which are important values to the research process as well as blockchain technologies being investigated by this study. By incorporating these principles into the research design, the research guarantees that the results are collaborative, inclusive, and progresses all stakeholders.

3.4 Predictive calculation Composite score

The activity of the event and significance are multiplied and divided to get a composite score. This implies that the score obtained by this method does not only look into the number of strong drivers that affect the specific variable but also the strength and the higher the composite score the stronger the forecasted effect of the driver network would be. Composite scores attract the use of indispensable tools of multi-dimensional evaluation and comparison worldwide in various sectors with the view of assisting decision-makers to focus on the efficiency of high impact factors and resources appropriately.

The development of composite scores and the application of the latter in decision making has been supported by evidence in various ways compiled by the bodies of research on various fields. The composite scores are usually utilized to combine more than one form of data directly into a single measure that could simplify the decision-making process (Hareesh, 2024). As an example, (Rawat et al., 2022) developed a conceptual model to describe social isolation by proposing a generalized approach to social factor and their influence on consumers: computed a pain composite score in terms of patient-reported outcome measures to assess pain and treatment outcomes (Komann et al., 2021) used in different spheres to make multi-dimensional assessments and comparisons, helping decision-makers to focus on meaningful drivers and allocate resources efficiently based on their possible impact.

However, the definition of composite scores and their importance in decision-making processes is justified by a number of researches in diverse fields. The composite scores are commonly used in the synthesis of multiple data dimensions into one metric used to make better and informed decisions (Hareesh, 2024). As an example, Rawat et al. (2022) offer a conceptual framework of the interpretation of social exclusion and state that a multifaceted approach to the notion of social dynamics and their effects on consumer behaviour is crucial. In their study, Komann et al. (2021) estimated a pain composite score based on the patient-reported outcome measures to measure pain and treatment outcomes. Furthermore, another strategy to include the data on perioperative pain in an overall modelling score was also suggested by Jiang et al. (2022). Such works show that it is possible to apply the scores to different areas with the view of measuring multi-faceted objects in an efficient manner. In the framework of assessment and interventions, the study by Xu et al., (2019) are also recommended as its findings are devoted to interventions in mild cognitive impairment and migraine, respectively. Multi-dimensional frailty scores are applied in the evidence in (Clementi and Garofalo, 2023; Xu et al. 2019) and in the article by Lee et al. (2016). These sources point out the utility of considering several parameters of interest in order to have a comprehensive description of multi-faceted conditions that have the potential to frame and guide interventions.

The overall scores are uniquely useful in supporting multiple aspects of evaluations, comparisons, and decisions in different academic or professional domains. That way, by using composite scores and paying attention to the occurrence and relevance of factors, their assessment and output forecast become comprehensive.

3.5 Time horizon

This cross-sectional research, conducted from 2022 to 2024, systematically examines blockchain's application in higher education while incorporating empirical data from multiple domains. This paper started with a proposal and a pilot study conducted in February 2023. In the subsequent step, SLR was conducted from May to August 2023 to synthesise credible literature data systematically. From this SLR phase, focus group instruments were developed and piloted in early August 2023 using focus groups to understand the stakeholders' views on using blockchain in an Academic setting.

Accordingly, with current literature, this work also employs the benefits of blockchain in increasing the transparency, security and efficiency of data in educational organisations. For instance, Kabashi et al. (2023) have stressed the decentralisation function of the participants in shielding academic and administrative procedures using blockchain; this correlates with the objectives of the present study (Kabashi et al., 2023). Likewise, Toader et al., 2023) point to trust and perceived security for Blockchain in HE, grounding this research on Blockchain's democracy to enhance inclusiveness and performance.

Using the cross-sectional research design meant that blockchain's adoption drivers could be studied closely at one time to understand more deeply the levels of Readiness among the stakeholders and the models of participatory governance. This approach, following IIM frameworks such as in Inayatulloh et al. (2023), suggests that the various stakeholders within the higher education value chain can be decentralised to incorporate more voices into decision-making while the data integrity of records would be improved due to applications of blockchain technology (Inayatulloh et al., 2023).

Information gathered in these phases was processed from September 2023 to February 2024 to enhance the Blockchain Adoption Drivers Model, which the given study proposes as the theoretical framework to investigate blockchain's capabilities in higher education. A summary of the findings based on the SLR will be made during a conference on five April 2024. In its stead, the thesis writing and finalisation will occur between May and November 2024 with a summative of the whole study.

3.6 Research Context

3.6.1 Research Setting

The study was conducted in the field of higher education, where the participants were students and lecturers of the disciplines of design, journalism, informatics, fashion and information technologies as well as senior managers and specialists of the state and commercial sectors. The diversity in the participants strengthened differing opinions of the adoption of Blockchain technology and how it may be applied in higher education.

In terms of this research, the awareness and understanding of blockchain technology for a number of participants were found as very less and they lived up to their expectations. This reflected a wide real-world challenge of deploying any novel and sophisticated technology similar to what blockchain is like in learning environments where the individuals of interest may not even be technically literate. The study obtained the preconceptions of the blockchain from the participants and then it was noticed how their evolution was produced as they passed through the conceptions of the model.

This is a study that was carried out using democratic research methods as blockchain is all about decentralisation, openness and equality (Tapscott & Tapscott, 2017). These principles meant that all the participants, whatever their IT skills and career backgrounds were, were actively involved in creating research knowledge. In this context the present study aimed at using an inclusive approach that involved in the research process all these groups so that no group could dominate the discourse and all would contribute to the findings of the study (Creswell and Plano Clark, 2018a).

This resulted in added variables being linked to the geography of access to technology and other physical infrastructures due to the fact that the survey participants came from the Eastern Cape, Western Cape and Lesotho. This geographical diversity comes out prominently in the beliefs that emerged in the contextual applicability and sustainability of blockchain solutions to various forms of education embedded in Walsh et al. (2021). For example, while the participants were coming from rural areas, explaining the technological barriers, which may not work in urban areas, there's a good chance of the perception of the viability of blockchain in their environment being biased.

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This is a study that was carried out using democratic research methods as blockchain is all about decentralisation, openness and equality (Tapscott & Tapscott, 2017). These principles meant that all the participating people with whatever their IT skills and career background were, were actively involved in the research knowledge creation. In this context the present study aimed at using an inclusive approach that involved in the research process all these groups so that no group could dominate the discourse and all would contribute to the findings of the study (Creswell and Plano Clark, 2018).

This made the result that the added variables were associated with the geography of access to technology and other physical infrastructures as a result of the fact that the survey participants were from Eastern Cape Western Cape and Lesotho. This geographical diversity gets fruitful results in the beliefs arising in the contextual applicability and sustainability of using blockchain solutions in the applicability of different forms of education embedded in Walsh et al. (2021). For example, while the participants were coming from rural areas, explaining the technological barriers, which may not work in urban areas, there's good chance of the perception of the viability of blockchain in their environment being biased.

The research context, involving participants from various disciplines and geographic regions within the higher education environment, facilitated a multi-faceted exploration of blockchain technology. Guided by democratic research protocols and a Participatory Action Research framework, the study allowed for an inclusive, collaborative approach that reflected the complex realities of adopting innovative technologies like blockchain in diverse educational settings.

3.6.2 Study Population

The study population consists of key stakeholders within higher education institutions who possess extensive knowledge of or are actively involved in the deployment and potential integration of blockchain technologies. Respondents were selected based on their organizational roles and their experience in strategic decision-making processes. A total of twenty participants were included in the study, with selection criteria designed to ensure purposive sampling. This approach aimed to engage individuals with a deep understanding of how blockchain technology could influence various dimensions of the higher education system.

Out of the participants, 19 were involved in the focus group activity. The focus group session was carried out on the 3rd and 4th of August, 2023. The participants were selected in such a manner to include participants from the necessary departments within the educational institutions and technological companies and exclude proficiency heads, councils, communities, and executive members as they do not possess the practical involvement in the conceptualisation of the adoption of blockchain in education (Creswell & Creswell, 2018).

Participants were organised into three focus groups, with representation across various fields, ensuring a diverse range of perspectives and insights:

The participants of Focus Group 1 were senior lecturers, ten coordinators who work in education sectors concentrating on media studies, research coordination, and industrial design, and are postgraduates (Table 3.2).

Focus Group 2 included lecturers from media and IT studies, nursing; male professionals in technology and petroleum sectors – an IT manager in cybersecurity and cloud technology and a telecoms architect (Table 3.3).

Participants in Focus Group 3 comprised senior lecturers in public relations and graphic design, government professionals, town planners and governance experts (Table 3.4).

The end result of this careful process of sample selection was a diverse pool of participants whose knowledge of blockchain technology and its implications for the higher learning institution was grounded in practice as well as theory. The reason for selecting participants through purposive sampling was that the study would address practical considerations of how blockchain could be adopted in academia and yield data that has theoretical value (Guest et al., 2017).

3.6.3 Study Sampling

Three focus groups were used in the study: two with seven members each and the third with six members, yielding a total of 19 participants. The reasoning for focus group size/number considered the data saturation stage and the best qualitative analysis strategy, not forgetting the practicality of managing the focus groups where the goal is to gain depth and breadth of understanding. (Creswell & Plano Clark, 2017).

In order to get sufficient specificity of the data harnessed, the method of purposive sampling was employed. This approach made it easy to identify participants who have a predisposition to knowing about value chain processes and blockchain in an academic setting. Purposeful sampling is especially valuable in qualitative research because it is possible to aid researchers in getting in touch with the right people most likely to give direction to the subject under study (Palinkas et al., 2015).

The sampling technique used in the study took two phases of the Extensive Realist sampling technique. The first was computational quantitative content analysis and systematic literature review to generate recurrent themes and select eligible participants (Palinkas et al., 2015). In the second stage the participants were selected on the basis of the results obtained from this study. Since the study was exploratory and based on the cooperation of the participants, a sampling technique was used to ensure that it captured a wide range of participants. Conducting analysis in this way offered advantages to consider the research question of this study in a more systematic and fair manner than the previous pipelined analysis. It was especially compatible with the methodological framework to focus on the broad involvement of stakeholders and the comprehensiveness of data acquisition (Creswell and Creswell, 2018).

3.6.4 Focus Group Participants

3.6.5 Focus Group: Higher Education Focus Groups: A Status-Influence Findings

Focus Group 1 (FG1) participants represent a broad spectrum of actors operating across different levels of the higher education value chain. Thus, by comparing their statuses and the degree of their impact, coherent conclusions are drawn regarding the evaluation of knowledge production, distribution, and application. This analysis enables soliciting a better and holistic understanding of the milliseconds' elements that constitute the educational phenomenon, therefore adding a better and deeper understanding of the nature of academic learning as well as the roles it plays in the advancement of societies.

3.6.6 Focus Group 1: Participants in Higher Education Value Chain

Table 3.2: Focus Group 1 Participants

Participants	***Industry***	***CPUT Student***	***Professional Practice***
FG1S2	Education	N/A	Senior Lecturer Media Studies and Research Coordinator
FG1S3	Education	N/A	Lecturer Media Studies
FG1S4	Education	PhD	Lecturer at College
FG1S5	Education	PhD	Retired Teacher and Lecturer
FG1S6	Education	Masters	Lecturer and WIL Coordinator
FG1S7	Education	PhD	Lecturer of Product and Industrial Design

Source: Author's Construct

When examining the educational value chain, the student from CPUT (designated FG1S2) is, in effect, a consumer of the products offered at this firm. Their evaluation of the relevance of the curriculum and the effectiveness of the teaching methods and coaching, as well as how well-prepared their students are for the job market, plays a vital role in developing the academic course and the teaching Delivery Systems. Despite operating non-transformationally through surveying, student unions, among others, the role benefits in matching graduate competencies to the market expectations.

The Senior Lecturer and Research Coordinator (FG1S3) holds a cross-over role, enabling them to act as a bridge between the teaching and research functions of the university. This person can also add value to the educational process by introducing evidence-based knowledge to the curriculum and the student population, promoting a culture of inquiry, and seeking funding sources for research that can stimulate the improvement of knowledge delivery processes.

The direct influence comes from the cadre of lecturers who provide instructions and are involved in the curricula designs (FG1S4, FG1S6, FG1S7). PhD and Masters are the postgraduate qualifications that they pursue. The specialised knowledge they possess as scholars may in some way determine the range and content of academic programs. FG1S6 Working as a coordinator of Work-Integrated Learning (WIL), therefore, means being an active participant in connecting theory with practice to enhance employment opportunities for graduates in the labour market. The first focus group participant is a retired educator and lecturer, for this is a source of retrospective oral history that is invaluable in charting the advancement of the educational value chain. Many are experienced in contributing to discussions involving changes to curricula or the manner of delivering instruction, yet the extension of their influence on current practices may be limited.

3.6.7 Focus Group 2: Participants in Higher Education Value Chain

Table 3.3: Focus Group 2 Participants

Participants	*Industry*	*CPUT Student*	*Professional Practice*
FG2S2	Technology	PhD	Telecoms Technology Architect and Cyber Security and Cloud Technology
FG2S3	Education	N/A	Lecturer (Social Studies, Media Studies, Communication Studies)
FG2S4	Education	N/A	Lecturer BTech Nursing
FG2S5	Petroleum	Masters	IT Manager for IT Service Management Operations
FG2S6	Education	N/A	Lecturer
FG2S7	Education	N/A	Lecturer IT
FG2S8	Education	N/A	Media Studies Department (Teaches Media and Media Law)

Source: Author’s Construct

On comparing the identified stakeholders in Focus Group 1 (FG1) and Focus Group 2 (FG2), the latter covers a wide range of higher education value chains. These factors in and of themselves necessitate a closer look at the current state of each of them and the degree to which they may revolutionise the system. Knowledge of the interactions among these entities could be useful for identifying key performance improvement strategies of the value chain.

3.6.8 Focus Group 2 Participants and their Influence

At the Cape Peninsula University of Technology, the client is the students, most especially those within the FG2S2 cohort since they directly benefit from the Academic offerings at the institution. Students' stances on the transferability of the academic program, including employment opportunities in particular areas of technology like telecommunication, cybersecurity and cloud computing, are crucial for the fine-tuning of the program. This can ensure that graduates have competencies that match the market's needs. Likewise, the Telecoms Technology Architect of the same cohort provides another rich external perspective. For this reason, their expertise in cybersecurity and cloud-based technologies plays a major role in curriculum improvement, identifying missed opportunities in meeting industry needs and academic delivery, and creating partnership prospects to advance the program and introduce specialised guest speakers. The two departments of social sciences and nursing learning facilitators of FG2S3 and FG2S4 have a crucial role in moulding soft skills, including critical thinking skills and good communication. These are common skills globally and are valued in different working professions. Fidelity Group’s contribution to the Bachelor of Technology in Nursing program is an investment in the healthcare talent pool. Known as FG2S5, the IT Manager represents the target employer for the university’s graduates, particularly in IT. From the authors’ point of view, their opinion on how the acquired knowledge is useful in the real world is a valuable addition to curriculum development to address the employers’ requirements and identify potential gaps in the training programs needed for students. The lecturers of the FG2S6, FG2S7, and FG2S8 courses, like the FG1 lecturers, use their classroom practices and curricula in the ways mentioned below. Their specialised knowledge in areas that are especially relevant in new disciplines, such as Media Studies, Information Technologies and Education, points to a market-oriented skills and knowledge profile. Although media law is taught in other classes as part of broader communication courses, the focus that FG2S8 has on media law can be considered relevant, especially because of the dynamic, growing nature of the media environment.

3.6.9 Focus Group 3 Participants in Higher Education Value Chain

Table 3.4: Focus Group 3 Participants

Participants	Industry	CPUT Student	Role
	N/A	N/A	Student
FG3S2	Government	Masters	Town Planner
FG3S3	Education	PhD	Senior Lecturer Graphic Design
FG3S4	Education	PhD	Lecturer
FG3S5	N/A	Masters	N/A
FG3S6	Government	Masters	Governance (Parliament)
FG3S7	Education	Masters	Lecturer Public Relations

Source: Author's Construct

FG3 brings together a diverse group of participants from different tiers of the higher education ecosystem cluster. The Town Planner (FG3S2) is identified in the governmental sphere, who uses their town planning knowledge to enhance curriculum in related fields, including geography and architecture. This expertise can help align academic institutions with governmental developmental goals to create applicable learning via internship or project-based educational models. The FG3S3 Responsible post of Senior Lecturer in Graphic Design naturally locates this professional at the heart of curriculum delivery and, hence, at the commanding heights of forming education outcomes considered relevant or valuable by students. Studying from a critical realist stance encourages questions about whether organisational structures, workloads or resources, for instance, foreclose the use of innovative teaching practices. The Lecturer (FG3S4) is responsible for imparting knowledge and competencies characterised by critical realism. This paper questions the extent to which institutional structures, such as evaluative paradigms, support effective skill development. The participant from an Unidentified Industry (FG3S5), currently in the process of obtaining a master's degree, could be a valuable addition to specific segments of the value chain due to his/her specialised knowledge. The governmental regulations that have a bearing on higher education are perceived by the Governance Official (FG3S6) from the governmental domain of the university. Their expertise in governance is paramount in shaping discussions on aspects such as financial modelling, accreditation and co-alignment of governmental goals and aspirations to the learning curriculum. Finally, the Public Relations Lecturer (FG3S7) focuses on developing communicative skills, which is perceived as the production output. An onerous critical realist critique would, therefore, question if actual 'educationally embodied' student–teacher relations, such as S:T ratios or pedagogic techniques, for that matter, are 'capable' of enhancing these competencies within the context of higher learning effectively.

3.6.10 Student and Professional Composition Across Focus Groups

Here is a breakdown of student and professional participation across the focus groups, along with percentages:

Table 3.5: Population Distribution

Focus Group	Students Only	Students & Professionals	Professionals Only	Total
FG1	1 (16.7%)	N/A	5 (83.3%)	6
FG2	1 (14.3%)	N/A	6 (85.7%)	7
FG3	1 (14.3%)	1 (14.3%)	4 (57.1%)	6
Total	3 (15%)	1 (5%)	15 (75%)	19

Source: Author's Construct

The composition of the focus groups from Table 3.5 above reflects a multifaceted assembly, thereby enhancing the discourse surrounding the higher education value chain in manifold ways. Within these groups, 15% of the participants are students, who are the primary beneficiaries of educational offerings. Their firsthand experiences yield critical perspectives on the efficacy of the curriculum, the pertinence of academic programs to prospective professional endeavours, and the availability of skill enhancement prospects. Specifically, students from CPUT embody the end-users of educational services, offering discerning viewpoints on the practicality of programs, the applicability of the curriculum to future vocational requirements, and the prospects for employability post-graduation. Their participation guarantees that the focus groups give due consideration to the ambitions and necessities of impending graduates.

Professionals represent seventy-five per cent of the focus group; thus, the input of practical-oriented specialists concerned with the essential demands of the occupations and the skills that graduates should possess. They evaluate the current curriculum in motivating graduates in the labour market and identify areas for collaboration between academic institutions and the industrial sector, such as internships and special seminars. The possibility of involving practitioners from various sectors, such as the government, technology, information technology, and public relations, has made it possible to have a comprehensive discussion that relates theoretical teaching with real practice in the practice field. Their knowledge is used in developing curricular structures that will help make graduates competent professionals in their respective fields.

A smaller percentage of 5% of the focus group comprises students and working professionals; hence, they have a unique perspective on the transition from academic to professional life. They explain how academic theories relate to their work practice and map out the challenges facing graduates in the labour market. This view remains of a good deal of value, especially due to its role in connecting theoretical education with practical occupations.

The combined pool of educators, advanced scholars, emeriti faculty and industry professionals bring years of experience and knowledge. Such a heterogeneous assembly encourages conversations informed by various perspectives derived from different points of cross-sections at one’s academic and career journeys. This interrelated process of mastering the material enriches the training and produces an effective knowledge sharing that allows for creating an elaborate understanding of ecosystems on theoretical and practical aspects of professional growth.

3.6.11 Overall Influence on the Value Chain

The collective contributions of this assembly, encompassing students, governmental bodies, educational experts, and, where applicable, an employer (identified as FG3S5), are instrumental in shaping the discourse on various pivotal aspects. These include the structuring of academic curricula, the formulation of governmental strategies, the enhancement of graduate employability, and the overarching efficacy of the tertiary education infrastructure. By integrating diverse viewpoints, this group can potentially drive meaningful advancements in the educational sector, thereby impacting the value chain significantly.

3.6.11.1 Rationale for Focus Group Size

A focus group size of seven members was selected to balance two important considerations:

Depth of discussion: smaller focus groups, typically between six and eight participants, encourage more detailed and personal contributions from each member. With seven participants, there are many opportunities for everyone to share their perspectives, and the facilitator can manage the discussion effectively, ensuring all voices are heard without it becoming chaotic (Guest et al., 2017).

Group dynamics: Having a moderate group size helps foster an interactive environment where participants can build on each other's ideas, enhancing the richness of the data. Larger groups often risk creating a setting where only a few dominate the conversation, while smaller groups may limit the diversity of views shared. A group of seven balances these dynamics, allowing for diverse input while maintaining manageability (Krueger & Casey, 2015).

3.6.11.2 Rationale for the Number of Focus Groups

The logistical considerations along with the need for data saturation directed the decision to conduct three focus groups. Three focus groups were held, and there were no new themes emerging from the data, which indicated saturation was achieved. Saturation- the collection of data is considered finished when conduct of new focus groups/interviews will not likely reveal new themes or knowledge (Fusch & Ness, 2015). As the themes determined in the three focus groups were similar to those determined in the literature, it was concluded that further focus groups were not needed. In line with this, other studies have indicated that between two and three focus groups is often enough to reach saturation, particularly in studies that are populated by relatively homogenous participant groups (Guest et al., 2017).

Moreover, the use of three focus groups proved adequate and sufficient for comparative analysis while ensuring that the study proves feasible in terms of time and resources. By testing multiple populations, the researcher can see if there are differences or similarities in the respondents' opinions and assure a strong validity of emerging themes. This method provides a greater degree of reliability in the findings, in that they are not based on the views of one group of people, but rather provide an overall consensus of the population at large (Morgan, 2018).

3.6.12 Research Setting Reflection

The study's sampling strategy and focus group design were carefully chosen to maximise the richness of the data while ensuring practicality. The study successfully reached data saturation by selecting knowledgeable participants through purposive sampling and conducting three focus groups with seven members each. The focus group size and number were informed by both empirical research on qualitative methods and the specific needs of this study, ensuring the data collected provided a robust understanding of blockchain adoption drivers in higher education without redundancy.

3.7 Research methods used for data collection.

Figure 3.1 shows the data collection map, which outlines the chosen research methods and how they impacted quantitative and qualitative data collection.

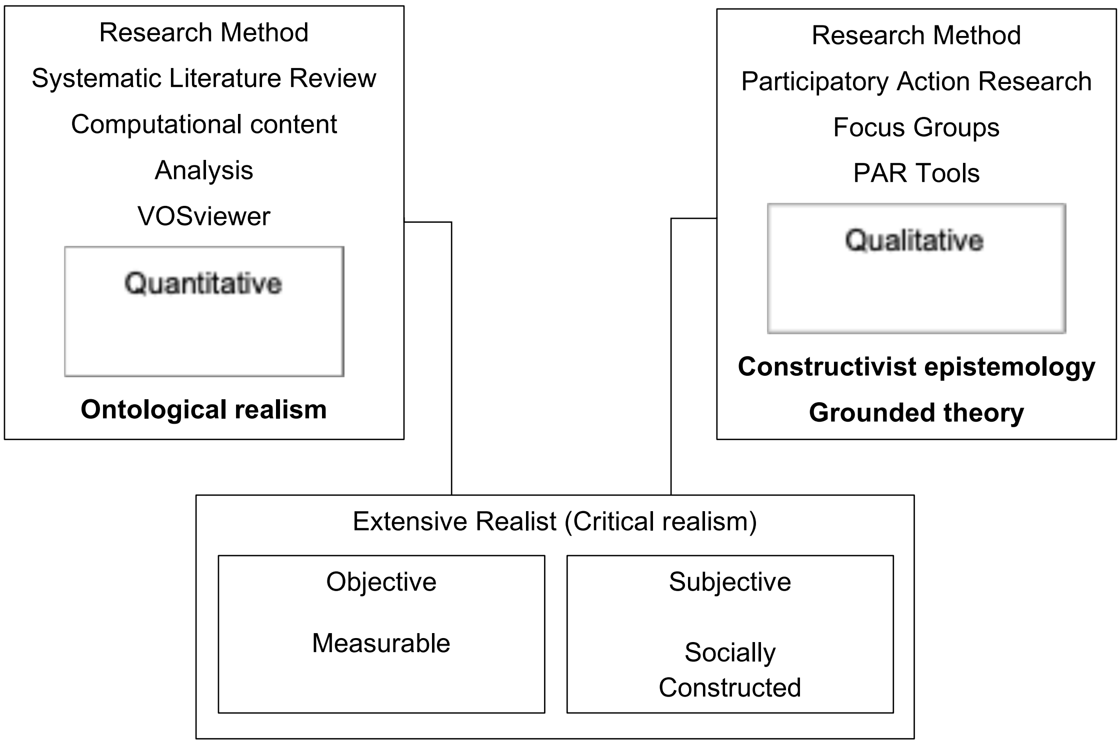


Figure 3.1: Research methods for data collection process

Source: Author's Construct

3.8 Systematic Literature Review

3.8.1 Quantitative content analysis

A list of studies from a recent systematic literature review focused on blockchain applications in higher education (Delgado-Von Eitzen et al., 2021) is adapted, as it is relevant to the research investigation in exploring blockchain drivers from blockchain applications in higher education (Trainor & Bundon, 2021). On the other hand, a systematic literature review process (Figure 3.2) is adapted to examine higher education, value chain and value-driven activities.

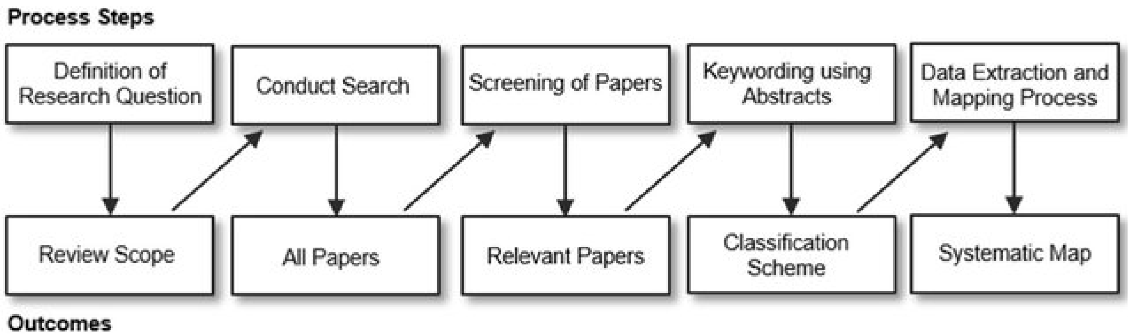


Figure 3.2: A systematic guide to literature review development.

Source: Petersen *et al.* (2008)

3.8.1.1 Computational content analysis

A VOSviewer content analysis software is used to identify the occurrences, linkages, relevance, and importance of the text corpus. VOSviewer uses large text and mathematical calculations to identify themes, eliminating references and nouns irrelevant to the subject (Wang & Tian, 2008). The network builder displays data from a central point and cascades according to clusters and linkages (Walker, 2022).

3.8.1.2 Focus group workshop protocol

Participatory focus groups were deemed suitable for this study to achieve an in-depth focus on causal mechanisms, contextual factors, and their various interactions (Slocum, 2003; Jagosh et al., 2014; Stein & Barron, 2017) by consolidating information from a diversity of sources to merge action and reflection, theory and practice (Brydon-miller et al., 2003) in elucidating the observed Higher Education Value Chain Blockchain outcomes demonstrated in Table 3.6 column: objectives furthermore, summarised the two-staged extensive critical realist Participatory Action Research process (Stein & Barron, 2017).

Corroborative evidence was collected through mixed methods, designated as the Higher Education Blockchain causal mechanisms, contextual factors, and their various interactions. Combining qualitative and quantitative methods created varied data sets for in-depth explanations (Stein & Barron, 2017) for this all-encompassing research. Furthermore, the method reinforced the research findings (Venkatesh & Brown, 2016), thereby informing the limited comprehensive literature on the subject. Corroboration supported the assessment of measurement, sampling, and procedural bias (Wynn & Williams, 2012).

3.8.1.3 Instruments

In this section, the instruments are intended to facilitate data collection and ensure both group engagement and individual representation; interactive and digital tools were employed during the study. The following tools were instrumental in gathering both qualitative and quantitative data.

3.8.1.3.1 VOSviewer

VOSviewer is a specialised software tool used for constructing and visualising bibliometric networks, enabling researchers to analyse large-scale scientific data. Developed by (van Eck & Waltman, 2010), it facilitates the examination of relationships such as co-authorship, keyword co-occurrence, and citation networks, helping to uncover research themes and influential works. The software employs a clustering algorithm that groups related items based on co-occurrence and uses a distance-based visualisation to reflect the strength of connections. This approach provides a deeper understanding of scientific domains by visualising structural patterns and relationships. VOSviewer's impact lies in its ability to encourage researchers to critically analyse and redefine the intellectual landscape of their fields, revealing both existing structures and emerging trends (N J van Eck & Waltman, 2010).

In this study, the software was used for content analysis, where the items retrieved from scientific databases were integrated as a single corpus content document. The content was analysed focusing on the co-occurrence, relevance, and network relationship of words rather than the bibliometric.

3.8.1.3.2 Flip Chart for Interactive Sessions

The flip chart was used during interactive sessions, allowing participants to engage visually with the study topics. It was particularly effective in conducting public voting on the key elements of the study, such as actors, actor activities, and types of blockchain (technical drivers). Votes were recorded on the flip chart, and points were allocated based on the number of votes received for each item, as indicated in Figure 3.3. This tool enabled participants to interact directly with the research process and visually see how their contributions shaped the discussions and outcomes (Krueger & Casey, 2015).

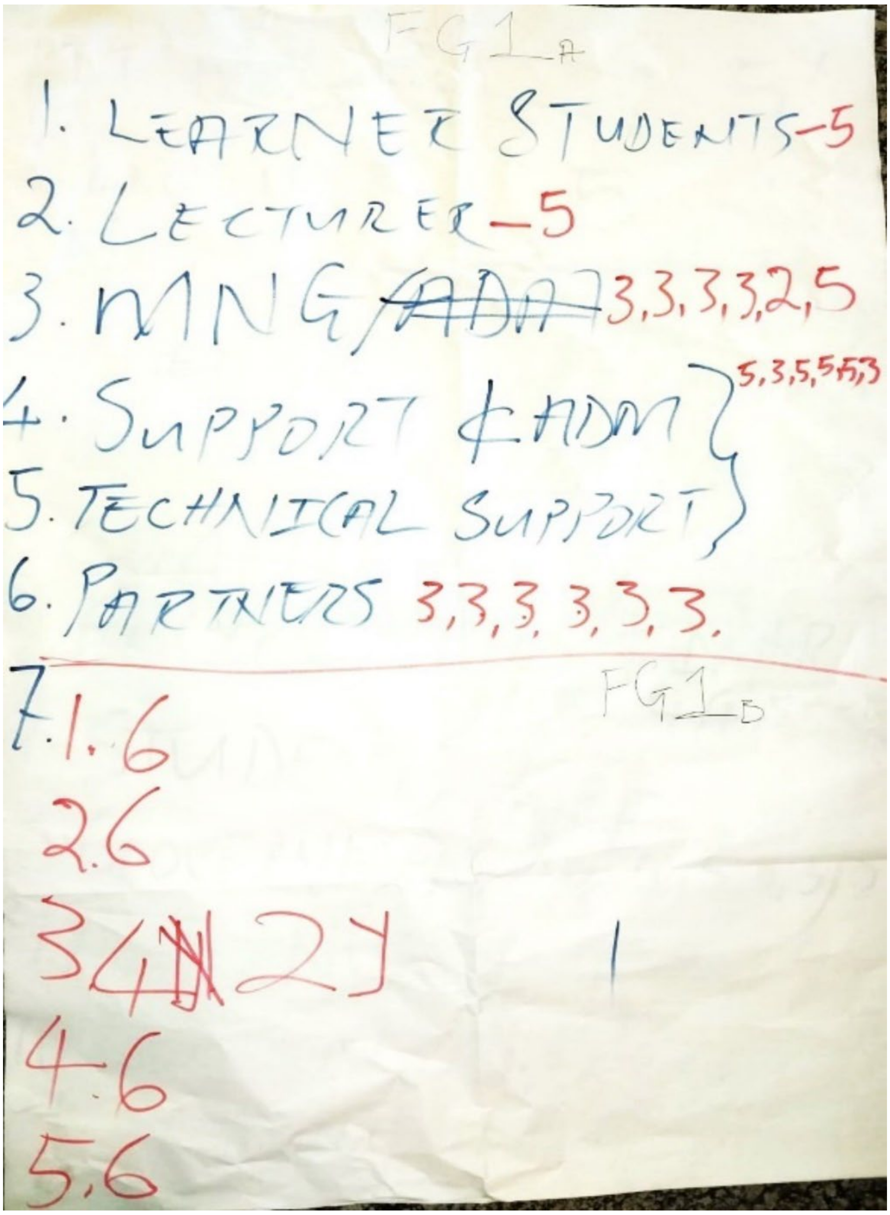


Figure 3.3: Flip chart voting activity for Focus Group 1

3.8.1.3.3 Google Forms for Secret Voting

In order to provide the respondents with confidentiality and motivate them to share honest opinions, secret voting (providing, of course, confidentiality) about the philosophical beliefs (non-technical drivers) was used and it is possible to access it here. This approach enabled the participants to give out their opinions on the more subjective issues privately, hence giving everyone an opportunity to voice their contribution to the research process. Individual representation using Google Forms was a means of giving a structured approach through which the participants could communicate with the researcher one-on-one but anonymously (Creswell and Plano Clark, 2018).

These aids were part of the study, as they offered a balanced method of data collection since they encouraged community participation in the process of gaining information via interactive sessions and a personal reflection in the voting conducted privately. Collaborative decision-making was supported by using a flip chart, whereas Google Forms served to make sure that the respondents had no reservations about sharing their personal opinions that contributed to the overall validity and inclusiveness of the study (Fusch and Ness, 2015).

3.8.1.4 Form of the focus group protocol.

In this research, the focus group protocol was also designed in a way that the data collection process was structured, ethical and easy for the participants. The protocol provided critical aspects to establish an open and respectful atmosphere that could allow the participants to have meaningful interactions with each other and provide insights meaningful to the adoption of blockchain in higher education. Ethical considerations were raised in the beginning, and the participants had an elaborate briefing on the purposes of the study, objectives, and the voluntary participation. This was supported by the fact that the consent of each participant was informed, and signed site permission (which was available here) was obtained, in accordance with the best practices of conducting ethical research (Krueger and Casey, 2014; Creswell and Creswell, 2018).

The subjects were informed of the purpose of the study, giving the researcher the needed background that acts as a guide in how the research takes into consideration the input of the subjects. Ethics of confidentiality and privacy were also a major attribute of the protocol, and they assured individual responses would be anonymous and data reported in aggregate to protect the identity of the research participants which is very important in preserving trust and the comfort of participants when conducting sensitive research is involved (Brydon-miller et al., 2003; Fusch and Ness, 2015).

The questions of questions that were intended to be used in the focus group were tailored on the variation of the Participatory Focus Group Protocol, which was aimed at facilitating a natural and progressive flow. The given structure included some steps: preliminary introductions, the time of individual contemplation, tutored guidelines, a specific period of discussions, and a closing feedback presentation as presented in Table 3.6 a column in the section How the study is conducted? The design is consistent with the existing guidelines, supporting and motivating the participants to become open (Wong et al., 2014). During the session, constant feedback was invited so that their reflections could be reflected during the time to augment the validity of the study and provide insights could come out based on the experiences of participants (Guest et al., 2017). This protocol created a balance in this structured direction and permissive discovery of the research, a stimulated, ethical, and receptive study.

3.8.1.5 Focus group

Planned discussions and participatory activities among the small group of stakeholders were facilitated by a researcher to identify how the contextual circumstances of actors and programs may be impacted by the drivers (Pawson & Manzano-Santaella, 2012) and further confirm the existing theories and the researcher's thoughts (Kumer & Urbanc, 2020:9) on Higher Education Blockchain implementation. The focus group approach is cost-effective and may be conducted online (Slocum, 2003), making it most suitable for maintaining social distancing regulations.

Table 3.6: Summary of the Extensive Critical Realist PAR research process.

The study aims to demonstrate the potential use of the Blockchain Technology Adoption Drivers model to democratise the higher education value chain.

	Questions		***Objectives***	***Focus Group Activities***	***Instrument***	***How it was conducted***
3.2.1	**Question 1**: What are the Blockchain Adoption Drivers for higher education?	**3.3.1**	**Objective 1:** To portray Blockchain Adoption Drivers for higher education.			
3.2.1.2	**Sub-question 1.1:** Who are the Blockchain actors in higher education value generation?	**3.3.1.2**	**Sub-objective 1.1:** To map the blockchain actors in higher education value generation.	Literature was used to identify the blockchain actors. The participants in the pilot demonstrated limited knowledge of blockchain, while they showed an understanding of the principles and elements of blockchain.	Table 2.1: Higher education blockchain actors. Preference ranking	Discussion Voting (determine hierarchies)
3.2.1.1	**Sub-question 1.2:** What are the higher education blockchain activities on the higher education value generation?	**3.3.1.1**	**Sub-objective 1.2:** To map the higher education blockchain activities on the higher education value generation.	Literature was used to identify the activities of blockchain. The participants in the pilot demonstrated limited knowledge of blockchain while they understood the principles and elements of blockchain.	Table 2.2: University Blockchain and Their Activities Preference ranking	Discussion
3.2.1.2	**Sub-question 1.3:** Who are the value chain actors in higher education value generation?	**3.3.1.2**	**Sub-objective 1.3:** To map the value chain actors in higher education value generation.	Participants individually identify and compile a list of value chain actors in higher education. In a discussion group, participants identify value chain actors on the value chain Table 2.1 and categorise them into main actors and supporting actors. In a discussion group, participants map value chain actors on Table 2.3 and categorise them into main actors and supporting actors	Table 2.3: Higher education value chain actors. Preference ranking	Discussion Voting (determine hierarchies)
3.2.1.1	**Sub-question 1.4:** What are the higher education value chain activities on the higher education value chain?	**3.3.1.1**	**Sub-objective 1.4:** To map the higher education value chain activities on the higher education value chain.	Participants individually identify **what is the value that they expect from public universities.** Participants identify and map literature identified value chain activities that generate value on the **value chain activities and categorise them into main activities and supporting activities. Figure 3.6 shows how the activities are identified from literature.** In a discussion group, participants map value chain activities and their linkages in the value generation on the value chain Table 4.1 and categorise them into main activities and supporting activities.	Table 5.4: University Value Chain Activities Preference ranking	Discussion Voting (determine hierarchies)
3.2.2	**Question 2:** Under what circumstances do	**3.3.2**	**Objective 2:** To corroborate the			

The study aims to demonstrate the potential use of the Blockchain Technology Adoption Drivers model to democratise the higher education value chain.

	Questions		***Objectives***	***Focus Group Activities***	***Instrument***	***How it was conducted***
	Blockchain Adoption Drivers meet the higher education value chain actors' democratisation?		circumstances under which Blockchain Adoption Drivers drive higher education value chain democratisation.			
3.2.2.1.	**Sub-question 2.1:** What adoption drivers are required for the value chain activities?	**3.3.2.1**	**Sub-objective 2.1:** To map the value chain actors' adoption drivers to the relevant Blockchain Adoption Drivers.	Participants, individually and in groups, identify blockchain drivers and map value chain activities on the public university blockchain value chain drivers Table 5.4. Are there technical property drivers at any stage of the value chain? Are Philosophical beliefs drivers at any stage of the value chain? Is the Network effect an important element at any stage of the value chain? Are economic incentives a driver at any stage of the value chain? Are there gridlocks in the value chain stages that need to be broken?	Higher Education Blockchain Value Chain Table	Discussion (individuals in the focus group used an electronic questionnaire)
3.2.2.3	**Sub-question 2.2:** What type of blockchain does the higher education value chain require?	**3.3.2.3**	**Sub-objective 2.2:** To map the type of blockchain required for the higher education value chain.	Participants individually follow the Blockchain decision flow chart in Figure 4.2. Do you need a store state? Are there multiple writers (value chain actors)? Can you always use a trusted third party? Are all writers known? Are all writers trusted? Are all writers verifiable? Discussion on deciding the group type of Blockchain	Blockchain decision chart in Figure 2.9	Discussion Voting (decisions on the flow chart) Consistent with literature)

Source: Author’s Construct.

3.8.1.6 Pre-testing of the instrument and Pilot Study

Pilot studies' goal in this research was to assess the viability and utility of the instruments used in the context of operationalising blockchain adoption motivators within the HE value chain. As claimed by Hertzog (2008), piloting research instruments is a technique commonly used to enhance study validity with reference to some general ideas qualifying potential problems that may be experienced when engaging in full-scale data collection exercises. As a result, this pilot study was conducted with faculty members, postgraduate students, management and lecturers from various fields of study, including Design, Educational Technology, Media Studies, Journalism and the private sector, which gave a cross-sectional representation of the study instruments.

The purpose of the pilot was to facilitate respondent participants to nominate and order the positional significance of the key actors in the higher education value chain, consistent with the latter's concern with stakeholder mapping for improving the comprehension of value chain dynamics (Porter, 1985; Freeman, 2010), as the starting point for developing strategy. Prospective value chain actors were obtained from a preliminary search of the literature. Lyon *et al*., 2013 and participants were asked to crosscheck the accuracy of the list and to propose any missing actors where necessary. Using participants to check the research instruments is consistent with the recommended instrument development process and enhances context appropriateness (Creswell, 2014).

The two types of activities used in the focus groups were pairwise ranking and voting for actor hierarchies and decision flow charts to make choices regarding relevant blockchain requirements. This study suggests that participation improves both the level of engagement and the quantity and quality of the data by including the participants in important decision-making processes (Arnstein, 1969). At the conceptual level, participants used the Venn diagram to categorise the actors as suggested but to prioritise them, they recommended voting, as it was found that when stakeholders are involved in participatory ranking, then there is often more clarity on roles and hierarchies as well as the relative preference among them (Chambers, 1994).

Of major concern mentioned in the piloted part was the generally low level of the participants' awareness of blockchain. This lack of prior knowledge required a brief orientation on what blockchain is per protocols suggested in the literature to increase engagement with technology-related data (Rogers, 2003:249). It was then possible to catch non-technical aspects of blockchain adoption from the participants and discuss and rank them individually, avoiding common bias that may prevail in group decision-making as noted by (Krueger & Casey 2014).

These observations from the pilot study were useful in modifying the main study's methodological design. Drawing from the participant feedback, the research design of the study was changed to ensure the provision of a brief introduction to blockchain at the onset of the subsequent focus group sessions; changes to the nature of the prompts used the transition towards more directed ranking instruments. Such modifications correspond to the recommendations of methods where research instruments or devices should be improved progressively for understanding or relevance (Van Teijlingen & Hundley, 2001). The pilot session took slightly more than one hour and thirty minutes but was important in refining the focus group procedures for the main study.

When analysing the pilot, responses were qualitatively coded and quantitatively converted into numbers, as outlined here. Following a mixed methods approach to handling data enabled the use of qualitative data and numbers, which is recommended in mixed methods research (Creswell & Plano Clark, 2011). The pilot, conducted August 2, 2023, was important in fine-tuning the study instruments and research methodology, which escalated the credibility and accuracy of the next data collection steps.

3.8.1.7 Procedures followed in administering of instruments.

In administering the instruments for this study, a reflective and structured approach was taken, following the systematic guide to literature review development outlined by Petersen et al. (2009). This was achieved by stating the problem the study sought to address, the study objectives and the research questions. These steps set a context for how the research would be shaped and executed and raised the understanding of how this investigation and the next step fit into the overall discourse among academics.

Central to this investigation was focusing on two key domains in higher education: blockchain and the value chain. Both areas were systematically searched to determine which articles and trends should be included. The studies incorporated in this research were particularly relevant as they were identified in a recent systematic literature review on blockchain applications in higher education by Delgado-Von Eitzen *et al*. (2021). This prior research formed the foundation for exploring the factors encouraging blockchain use in higher education settings (Trainor & Bundon, 2021).

To complement the study, a systematic literature review process, as depicted below in Figure 3.4, was conducted to analyse value driver activities in the value chain of higher education. Such a dual-focused approach presented the opportunity to fully understand how the blockchain technology engages with the traditionally understood value-creation processes within higher education settings. These structured review processes are incorporated and modified into the study to provide a reflective discussion of the organisational roles of blockchain in academic settings and the enablers that enable the occurrence of the roles. The logical approach used in this paper establishes methodological foundations and prescribes the path for identifying integration points between blockchain and the value proposition in higher education settings.

3.9 Validity and Reliability

The reliability and validity of this study are high because predefined themes have been extracted systematically from both the blockchain and the value chain approaches. These themes were chosen after a review of the literature in which they fit both theoretical perspectives and current reality; content validity was maintained, and all important aspects of blockchain adoption in higher education were included. The blockchain themes were Scenario Properties, Philosophical Beliefs, Network Effect, and Economic Incentives, while the value chain has considered how these elements of blockchain affect some of the processes and actors in the higher learning environment.

The systematic literature review (SLR) and focus groups with these predefined themes provide construct validity since the themes are well-developed drivers of blockchain adoption like trust, transparency and proof (Capetillo et al., 2022; Lizcano *et al*., 2019). The fact that these various data sources are coalescing around seminal themes reduces the impact of bias and increases the internal reliability of the results. Furthermore, using computational content analysis to analyse the relevant literature also ensures that the themes were found systematically and unbiased, contributing to inter-rater reliability (Prinz *et al*., 2020).

In addition, the validated focus group discussion scripts where participants discussed ideas related to the same blockchain and value chain themes enhance test re-test reliability. It also enhances the possibility of getting consistent results across the participants, and it is applicable regardless of whether students or managers (Guo *et al*., 2021). Using these predefined themes in the literature review and focus group discussions allows the study to be highly reliable and valid in identifying the direction for blockchain adoption in higher education.

3.10 Data analysis

3.10.1 Computational content analysis: RQ1-quantitative data analysis

The data analysis process involved organisation, data reduction through summarisation and categorisation, and the identification and linking of patterns and themes (Figure 3.6). To address RQ1.1 to RQ1.4, SciSpace was utilised to generate a list of actors and their associated activities. The results were exported into an Excel document (Figure 3.5), which facilitated the sorting of data and the compilation of a comprehensive list of actors and their respective activities. Additionally, AntConc (Figure 3.4), a freely available corpus analysis toolkit, was employed to conduct concordance and text analysis, enabling the identification of key occurrences within the dataset. The list was entered into the Infogram to create the graphs used in Chapter 4, RQ1.1 and RQ1.3.

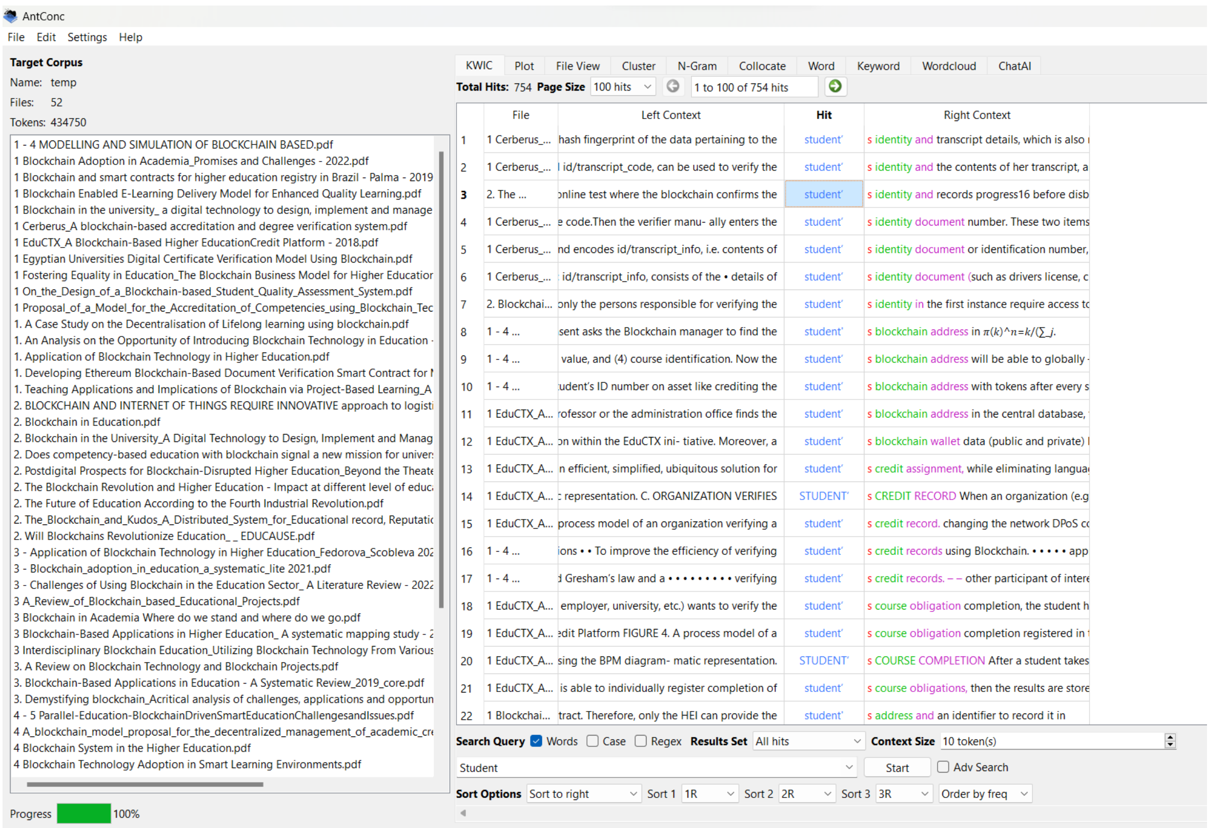
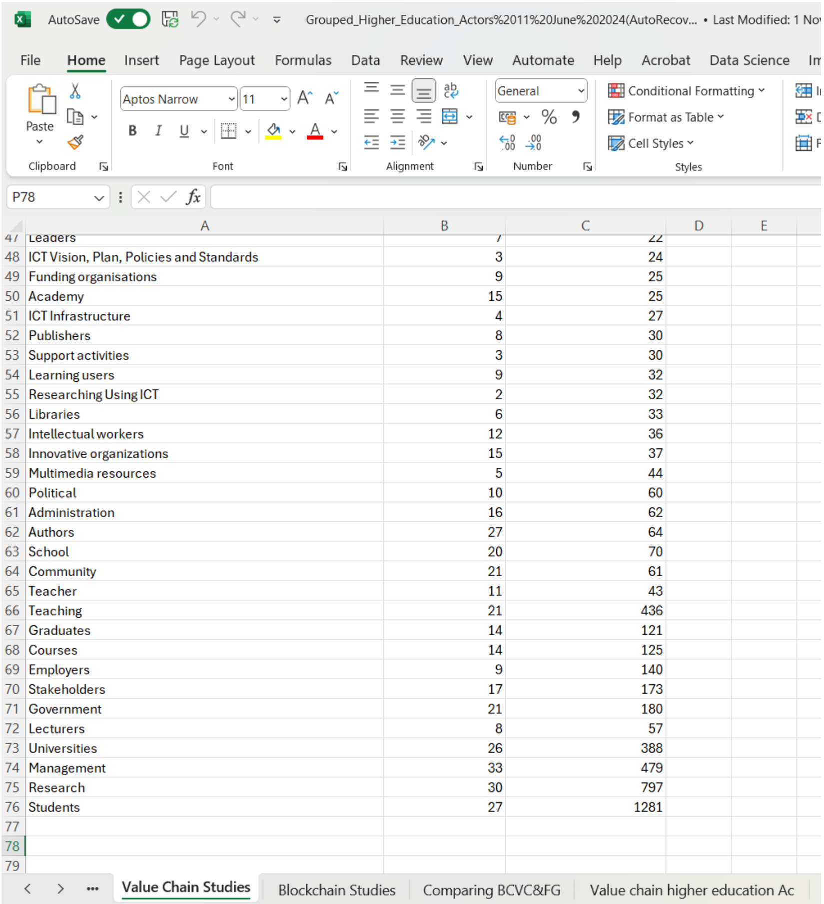


Figure 3.4: Higher education blockchain AntConc occurrence terms generator

The occurrences of the actors were stored in an Excel spreadsheet, exemplified in Figure 3.5 below.



	A	B	C
47	Leaders	7	22
48	ICT Vision, Plan, Policies and Standards	3	24
49	Funding organisations	9	25
50	Academy	15	25
51	ICT Infrastructure	4	27
52	Publishers	8	30
53	Support activities	3	30
54	Learning users	9	32
55	Researching Using ICT	2	32
56	Libraries	6	33
57	Intellectual workers	12	36
58	Innovative organizations	15	37
59	Multimedia resources	5	44
60	Political	10	60
61	Administration	16	62
62	Authors	27	64
63	School	20	70
64	Community	21	61
65	Teacher	11	43
66	Teaching	21	436
67	Graduates	14	121
68	Courses	14	125
69	Employers	9	140
70	Stakeholders	17	173
71	Government	21	180
72	Lecturers	8	57
73	Universities	26	388
74	Management	33	479
75	Research	30	797
76	Students	27	1281

Figure 3.5: Higher education value chain actor occurrences

The items from the SLR were inserted in Scispace “What are the value chain actors?” and “What are value chain activities?” Figure 3.6, inserted as columns. The questions were tested for the effectiveness of AI data extraction. For instance, the question would be inserted with higher education, and to evaluate the best prompt results (Molopa, 2024). Furthermore, the actor list was extracted and compared to previously manually extracted results, and the AI results were more comprehensive and can be repeatable and consistent. Additionally, Scispace provides links that act as references that allow the researcher to verify the efficacy of the data extraction, as depicted in Figure 3.5, with the small blue arrows next to the results of the column directly under the inserted question (Molopa, 2024).

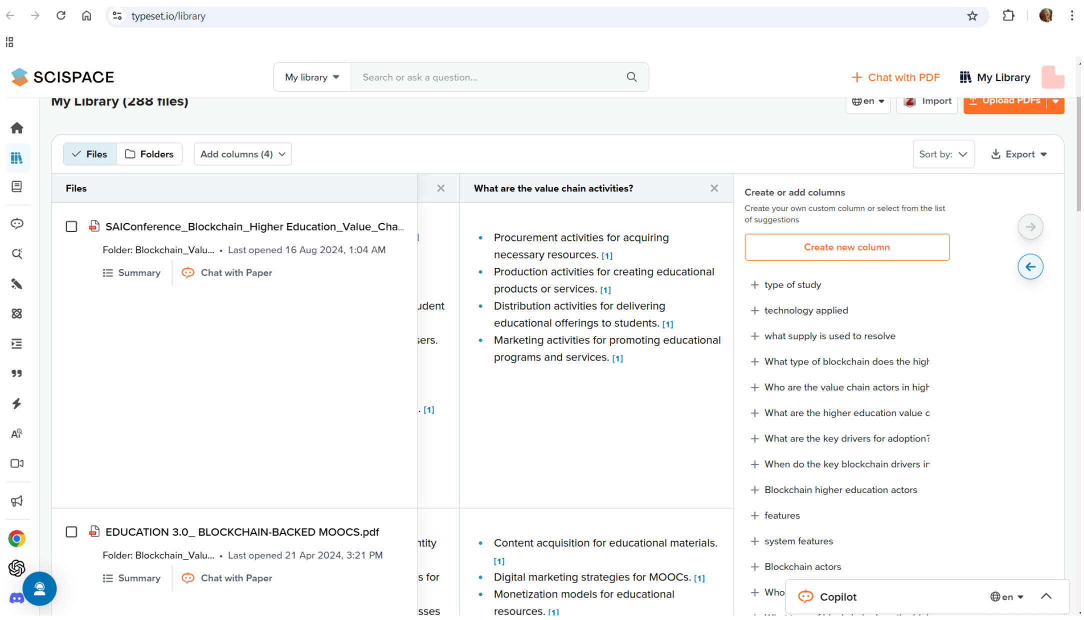


Figure 3.6: Higher Education Blockchain actor activities

Source: Author's Construct

3.10.2 Computational content analysis: RQ1.1-literature-quantitative data analysis

Considering Krippendorff K's (Krippendorff, 2022) content analysis theory, computational software converts a body of text into representations that get closer to addressing a researcher's query because it incorporates a theory of meaning or a model of how texts are utilised in a particular context. Here, he draws distinctions between methods that rely on coding/dictionaries, statistics-based associations, semantic networks, and memes (Krippendorff, 2022).

In this regard, the VOSviewer content analysis process is described in detail. VOSviewer is a network visualisation tool that can analyse infeasible literature at its speed and scale using manual methods or legacy software tools (van Eck & Waltman, 2010). The tool also has text mining capabilities to construct network maps of occurring keywords, importance, linkages, and relevance of data sourced from abstracts and bodies of research resources, articles, books, and conference papers. The author used VOSviewer network visual analysis to facilitate the content analysis process of the 27 higher education blockchain studies and the 33 higher education value chain studies.

The system only uploads plain text files. The create button was selected once the file was ready to upload, and option 3 ("create data based on the text") was established, as illustrated in Figure 3.6.

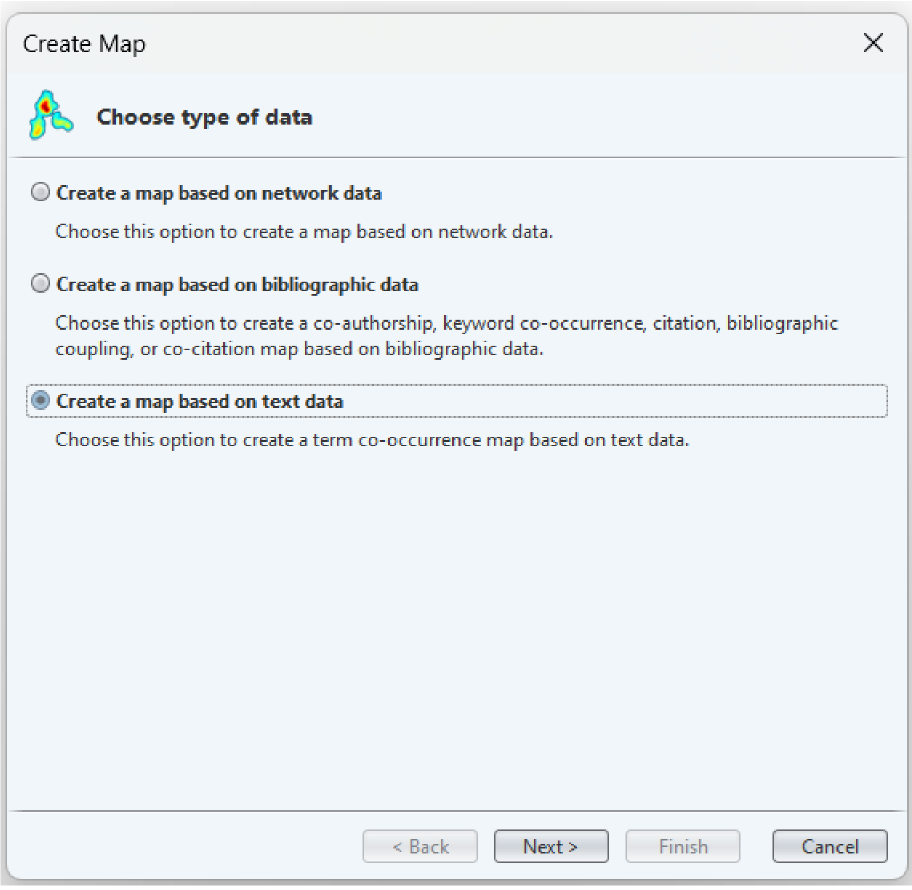


Figure 3.7: Higher Education Blockchain and Value Chain Driver Network: Choose type of data

In the next "create a map" popup window, the first option, "Read data from a VOSviewer datafile," was selected. Figure 3.7 demonstrates the selection.

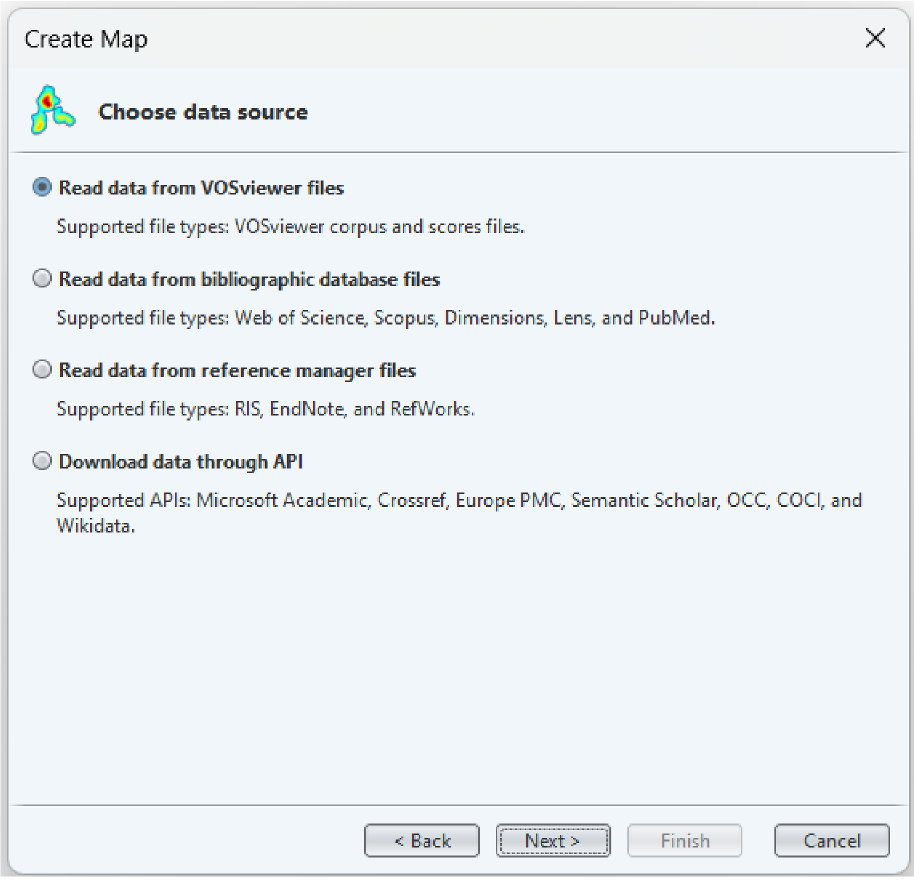


Figure 3.8: Higher Education Blockchain and Value Chain Driver Network: Choose data source

The next "create a map" window in Figures 3.8 allows uploading a "VOSviewer corpus file." After the merged file was located and uploaded, two checkboxes with the names "ignore structured abstract labels" and "ignore copyright statement" were checked. Additionally, "Select File" was selected from the first drop-down menu.

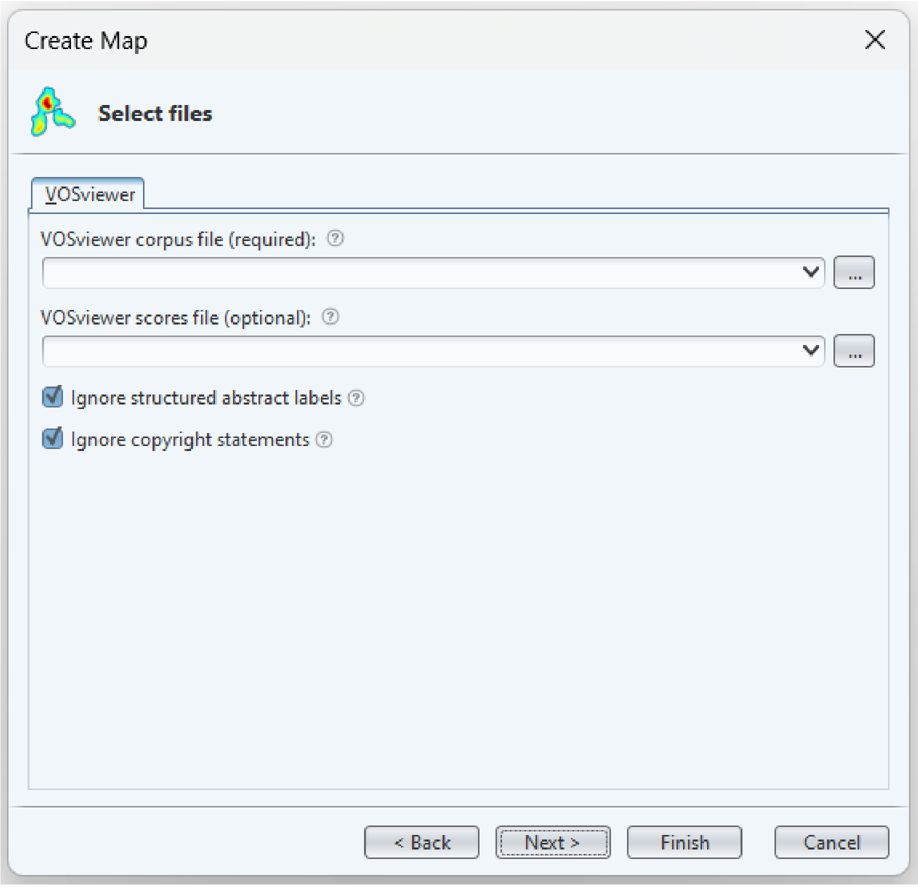


Figure 3.9: Higher Education Blockchain and Value Chain Driver Network: Choose select file

The next window illustrated in Figure 3.9 "create a map" popup window, the first drop-down menu of the "Choose Counting Method" and "full counting" were selected (Figure 3.10).

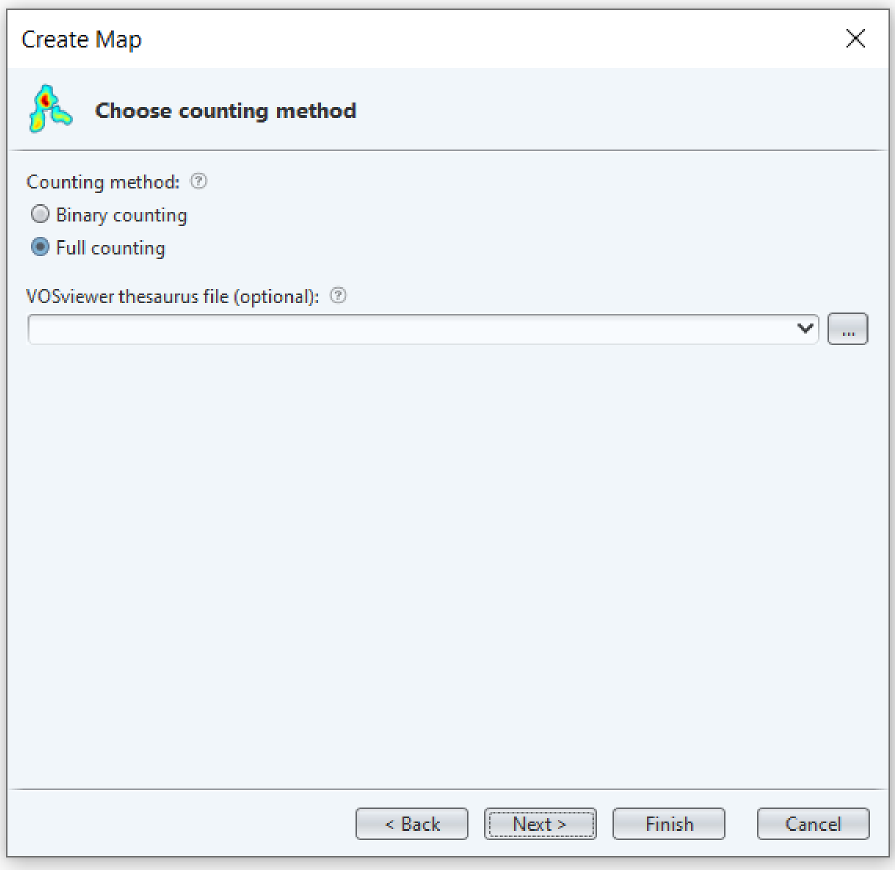


Figure 3.10: Higher Education Blockchain and Value Chain Driver Network: Choose counting method

The literature was merged into one pdf file. The file was converted into text format. The VOSviewer system identified 33440 terms out of all words with an occurrence of 10 (Figure 3.11). The number of times that met the threshold was 1537. The iterations helped the researchers select the occurrence representing the critical terms in the value chain and blockchain phenomenon. The system calculated a relevance score for each of the 1537 terms. Based on the score, the most relevant terms were selected.

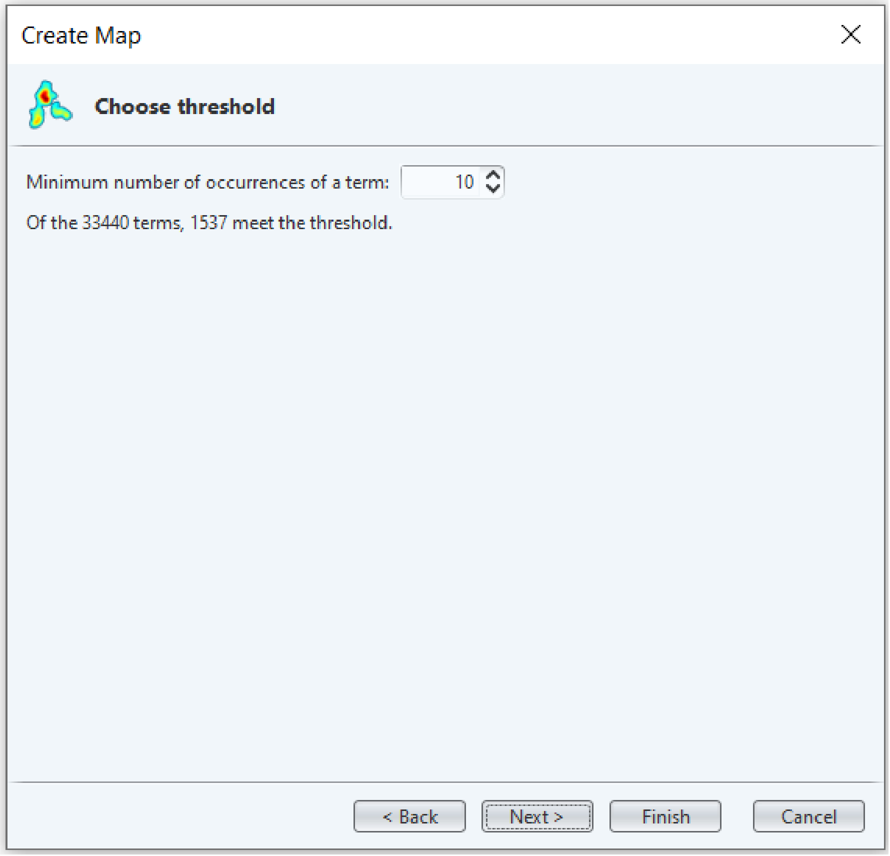


Figure 3.11: Higher Education Blockchain and Value Chain Driver Network: Choose the Threshold

The system defaults to choose the most pertinent terms at 60%. Based on the system default setting, the number of times was set to 922 (Figure 3.12), which the researchers rounded to 1000.

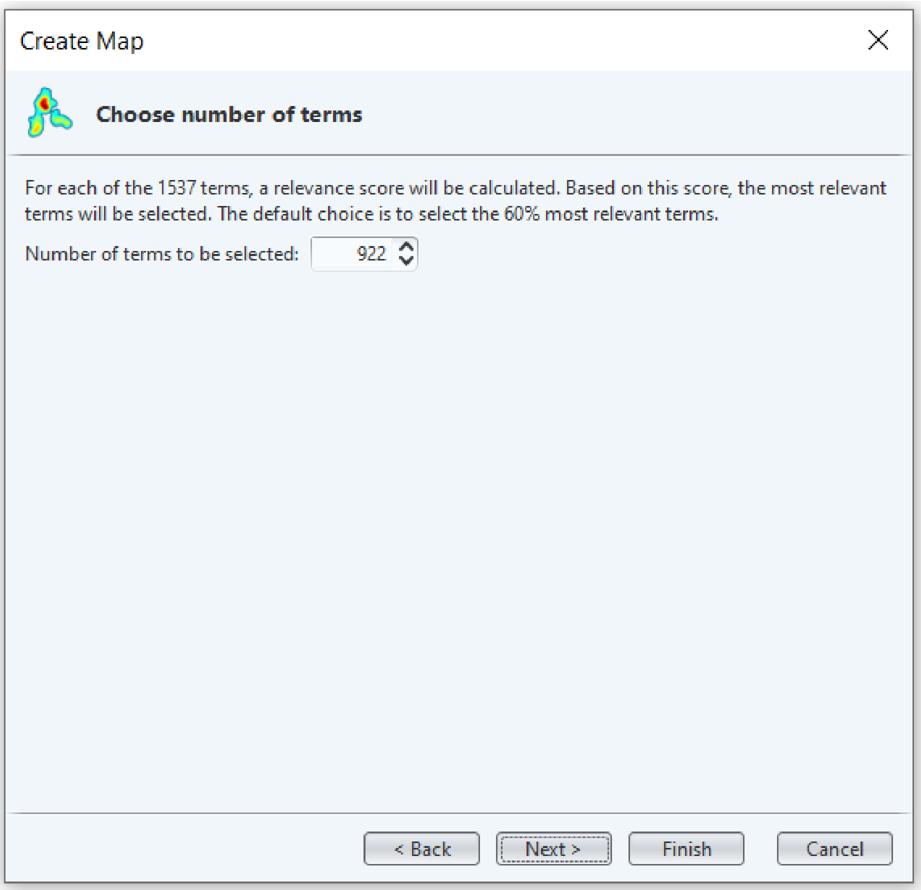
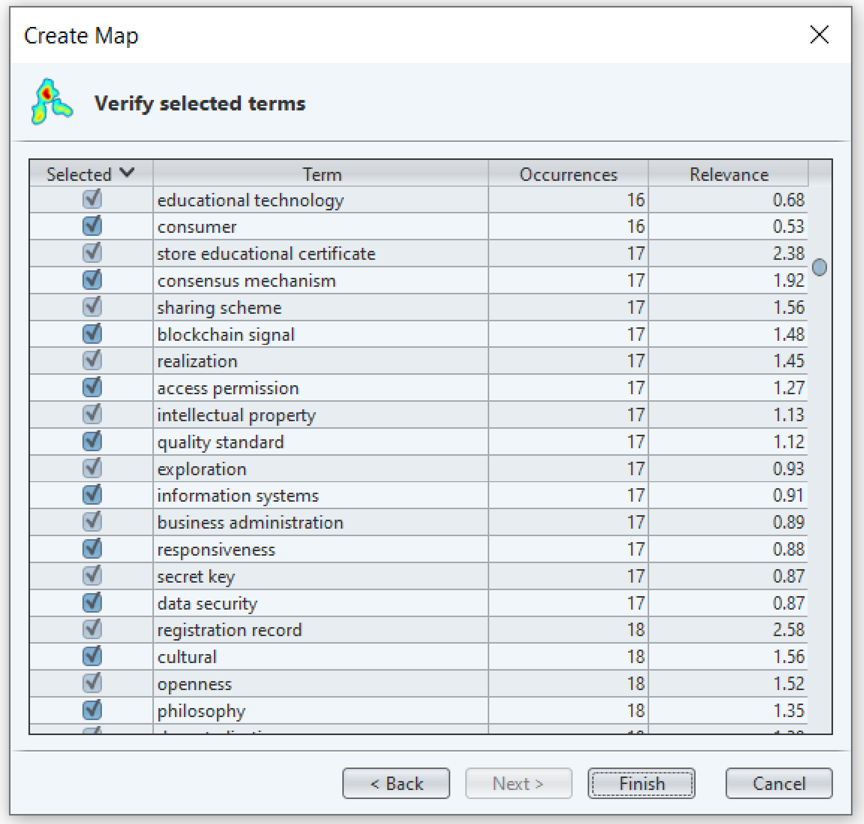


Figure 3.12: Higher Education Blockchain and Value Chain Driver Network: Choose the number of terms.

VOSviewer auto-generates a list of terms identified through a computational content analysis of occurrences, relevance, and linkage strength. Additionally, in this VOSviewer window illustrated in Figure 3.13, the “create a map” popup window, "Verify selected terms", was used to exclude by unchecking terms that least represent the investigation.



Selected	Term	Occurrences	Relevance
✓	educational technology	16	0.68
✓	consumer	16	0.53
✓	store educational certificate	17	2.38
✓	consensus mechanism	17	1.92
✓	sharing scheme	17	1.56
✓	blockchain signal	17	1.48
✓	realization	17	1.45
✓	access permission	17	1.27
✓	intellectual property	17	1.13
✓	quality standard	17	1.12
✓	exploration	17	0.93
✓	information systems	17	0.91
✓	business administration	17	0.89
✓	responsiveness	17	0.88
✓	secret key	17	0.87
✓	data security	17	0.87
✓	registration record	18	2.58
✓	cultural	18	1.56
✓	openness	18	1.52
✓	philosophy	18	1.35

Figure 3.13: Higher Education Blockchain and Value Chain Driver Network: Unselected high Relevance Driver Elements

The researchers verified the list of terms individually and eliminated irrelevant terms before the system produced the interactive driver network. The terms included in the process from the list presented by VOSviewer can be found here.

3.10.3 Computational content analysis: RQ1.2-literature-quantitative data analysis

In Table 2.3, the permissioned blockchain was depicted with the highest number of occurrences among the blockchain types permissioned, public, private, and permissionless in the VOSviewer diagram. The types of blockchains were identified according to their occurrence, relevance, and total link strength.

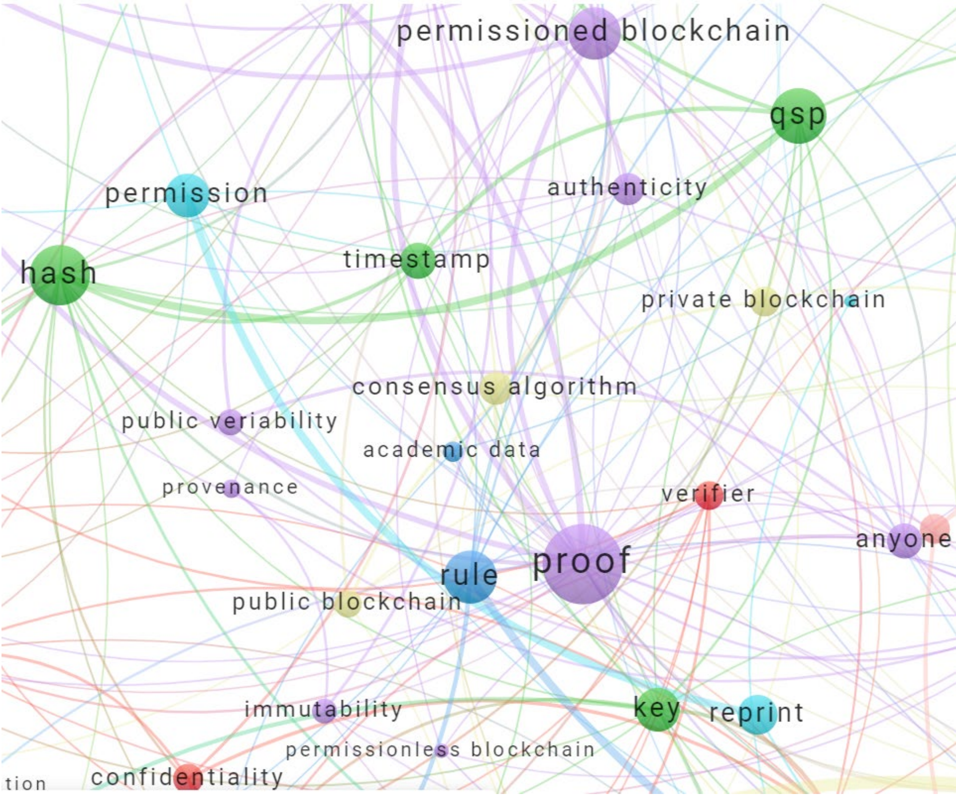


Figure 3.14: Types of Blockchain

Source: Author's Construct

The process includes searching for the types of blockchain using the types of blockchain (Figure 3.14) identified in the type of blockchain decision chat provided by Koens et al. (2020).

3.10.4 Thematic analysis-PAR: RQ2.1-focus-group-qualitative data analysis

During the focus group session, the participants were allowed to discuss the non-technical driver elements of the higher education blockchain model (*Philosophical Beliefs*, *Economic Incentives*, *Breaking the Gridlock*, and *Network Effect)* (Bryson et al., 2020)*.* After discussing each driver element, the participants were allowed to secretly select the driver element of their choice on the Google forms, as shown in Figure 3.15 below (O'Brien et al., 2020).

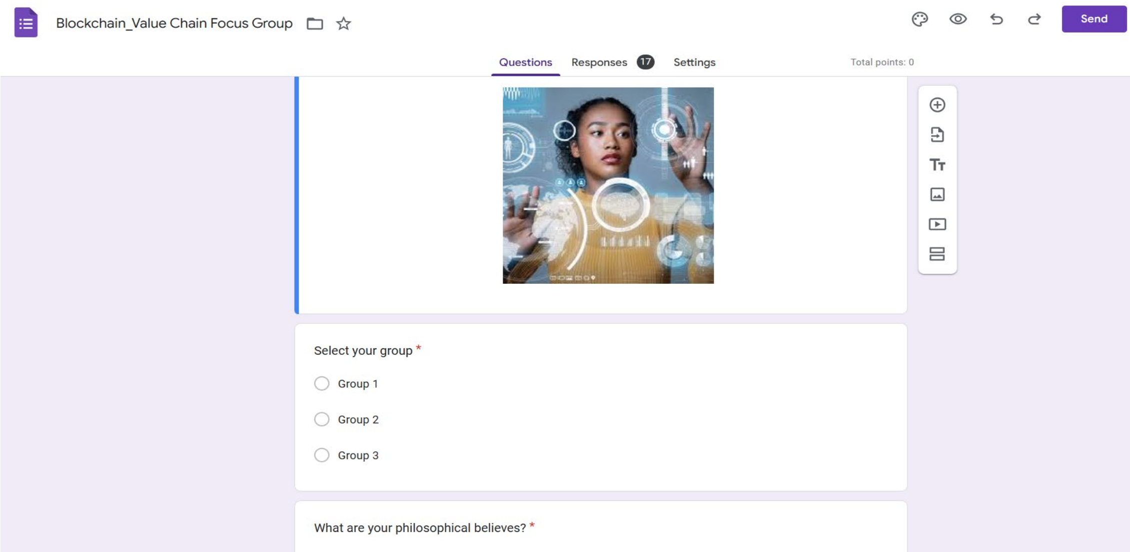


Figure 3.15: Non-technical blockchain driver voting form

Source: Author's Construct

3.10.5 Thematic analysis-PAR: RQ2.2- Focus group-qualitative data analysis.

In selecting the type of blockchain in higher education, the FG1 – 3 discussed the flowchart scenario properties decision flow chart. The facilitator recorded each group's decision on a flip chart, as shown in Figure 3.16 below.

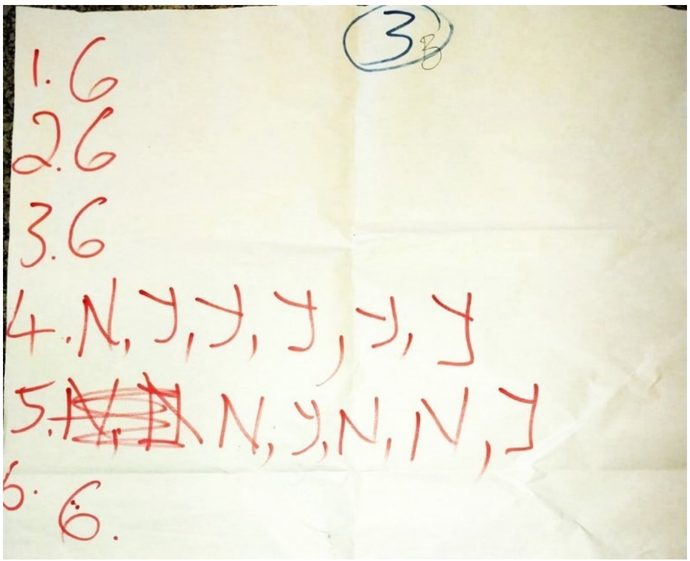


Figure 3.16: focus group 3 - scenario properties decision flow chart group voting results

Source: Author's Construct

3.10.6 Unit of analysis

Consistent with using blockchain to democratise the value chain, Table 3.7 shows that the unit of analysis and unit of observation is the same. This document seeks to collect data from the interactions qualitatively and the decisions of the group participants represented quantitatively in the participatory tools in Tables 3.3, 3.4 and 3.5.

Table 3.7: Units of analysis and units of observation

Research Questions	Unit of Analysis	Data Collection	Unit of Observation
Question 1: What are the Blockchain Adoption Drivers for higher education?	Blockchain enablers of the higher education value chain.	Focus Group (participatory workshop)	Participants (Group)
Question 2: Under what circumstances do Blockchain Adoption Drivers meet the higher education value chain actors' democratisation?	Blockchain enablers Instances of the higher education value chain.	Focus Group (participatory workshop)	Participants (Group)

Source: Author’s Construct

3.11 Ethical considerations

The ethical considerations that informed this research were as follows. CPUT granted permission, which can be considered informed consent to the research study from participants, institutions, or organisations involved. The objectives, methodology and ways of data gathering and reporting were described to the participants and organisations. Due to this, the names of the selected institutions and participants have not been mentioned in this writing to protect their identity. Institutions carried out the focus group for that year, and participants' pseudonyms were used in the study; they were a demographically representative sample. The focus group with the participants were semi-structured, and the individuals had the choice not to participate and could withdraw from the study at any given time.

Moreover, vigorous everyday work-checking minimised such problems as mistakes and oversights in the evaluation process. A recommendation for protecting intellectual property and human dignity was made, and informed consent was obtained before data and findings were released. There was no research misconduct such as data fabrication, falsification or misrepresentation allowed. The appeals for social good and the steer from social harm effectively made people socially responsible. A biased-free approach was adopted in the processing, analysing, and presenting the data.

3.11.1 AI Use Ethical Framework

It is crucial to follow ethical principles guidelines when using different AI tools such as ChatGPT, SciSpace, Scite AI, and Gemini AI. Hence, a framework has been proposed by (Katrina G. Claw et al., 2018) for improving ethical genomic studies among Indigenous communities. This framework emphasises Sovereignty and Research Regulation and provides six core ethical principles that can be integrated into the responsible use of AI in research: reverence, cultural and gender mainstreaming, mutual respect, fair share, openness, empowering, and cultural sensitivity. These principles can be well-synchronised with the ethical principles of AI by maintaining research integrity, inclusion, and responsibility.

The principle of Respect, another key aspect of protecting the participants' privacy, has been implemented with tools such as ChatGPT and Scite AI. It ensured that personal data was not being stored, retaining their integrity after each interaction. In addition, they offered clear citation contexts for the usage of information to eliminate the exploitation or misreporting of information that may infringe on other people's work and effort. This is in accordance with Claw *et al*.'s perspective that honoured all the individuals engaged in research (McKee, 2023).

Equality was illustrated through the implementation of Equity, where datasets for the generative AI models, ChatGPT and Gemini AI were equally represented. These tools ensured that the principles of biased processing were not realised and that the equality of subjects was complied with when working with vulnerable populations (Kuhlman et al., 2020). This commitment to equity and justice is important so that as machine learning and AI inform how research is done, new injustices are not created or deepened.

Transparency is the most comprehensive principle in the accountability of the research being conducted. SciSpace and Scite AI were able to follow this principle of the tool providing precise reports of the data source and citation connection. These actions made it possible to make the research outcomes available for critique and identify and declare any conflicts of interest, thus creating an all-round transparent research setting (Gedrimiene et al., 2023).

According to the suggestions by Katrina G. Claw et al. (2018), Capacity Building drives the idea of strengthening the community through the kind of research promoted herein. Specific to the AI case, Gemini AI technologies let researchers leverage higher-order computational methodologies, thereby strengthening their methodological expertise in code pattern understanding and evaluation. These tools also helped create new skills within the research communities to enhance the positioning and engagement of such communities within the expanding field of AI research (Russell et al., 2022).

Consequently, Cultural Competency involves conducting research that is sensitive to culture and meaningfully interacting with cultural groups. Although the current AI angel-like ChatGPT and Scite AI do not directly interact with cultural groups, they have effective approaches to minimise bias and offer fair representation for diverse research domains. This makes the output culturally relevant in response to the various cultural demographics, especially the Indigenous and other vulnerable groups (Sloane & Zakrzewski, 2022).

Therefore, the framework depicted by Claw and his associates (Katrina G. Claw et al., 2018) harmonises suitably with the exploitation of AI tools in research. AI policies have perennial principles such as respect, equity, reciprocity, transparency, capacity building, and cultural competency that enhance ethical research and stakeholders' respect. Such a connection between AI technology and ethical research frameworks means that the developed AI tools in furthering the research are efficient and ethical in nature and use. However, the rationale and working of the AI tools still need to be transparent, especially in healthcare delivery, where trust and accountability in AI are still key (Jeyaraman et al., 2023). Similarly, trustworthy AI in global health means that algorithmic bias, AI transparency, and equity should be solved (Qin et al., 2023). Over the years, AI systems have found their application in dangerous sectors such as healthcare and justice, requiring much consideration of their bias and fairness (Landers & Behrend, 2022). Mitigating such ethical issues is essential to ensure fairness and accountability in AI systems, especially in areas that can significantly impact people's lives, such as healthcare and education (Jaiswal et al., 2023).

3.12 Evaluation of research methodology

In this regard, the study employs dimensions rooted in the principles of decentralised consensus, trustless system, and democracy inherent in blockchain. These principles are reflected in the study design, which aims to be as open and participatory as blockchain, which implies decentralised stakeholder control (Wright, 2022). Using methodological triangulation within the population and realist sampling context enhances the study's credibility and applies empirical research findings in both qualitative and quantitative manners to develop practical applications (Risius & Spohrer, 2017).

The study adopts a dual framework, which involves the establishment of a conceptual framework to demarcate potential and essential drivers of blockchain in higher learning institutions and a theoretical framework to analyse and enhance the identified factors. The type of conceptual framework used enables the researcher to explore factors underpinning blockchain technology adoption, while the theoretical framework authenticates these concepts to ensure that they are relatable to real-life practices (Ateniese et al., 2019). Using the dual framework strategy makes it possible to understand the implications of blockchain technology and its factors influencing higher education.

The study adopts a cooperative approach in data collection where data from prior literature and focus group studies are used. It also avoids the limitations of being a purely theoretical approach incorporating qualitative data from educational stakeholders. Regarding the methodological framework, this research uses the Participatory Action Research (PAR) (Arnstein, 1969) approach to engage participants in the study process. This method is useful when studying such technologies as blockchain since it engulfs all parties to a given sector to create knowledge together and value their input in capturing details about the drivers and challenges of blockchain adoption (Schlagwein et al., 2019).

Such integration of frameworks, a mix of methods, and PAR fully comply with the Blockchain approach, emphasising democracy and focusing on research. Another important aspect of this research is its methods, which include theoretical and practical frameworks, as well as the application of the Blockchain in higher education.

3.13 Conclusion

Every research journey begins with choices. These choices shape how the study is conducted and how its findings are understood. In this study, investigating blockchain adoption in higher education required a design that could capture both measurable, objective benefits of the technology and the lived, subjective experiences of stakeholders. To guide these decisions, the study followed Saunders et al.'s (2009) Research Onion model, which provides a structured, layered framework for making methodological choices step-by-step (Figure 3.17).

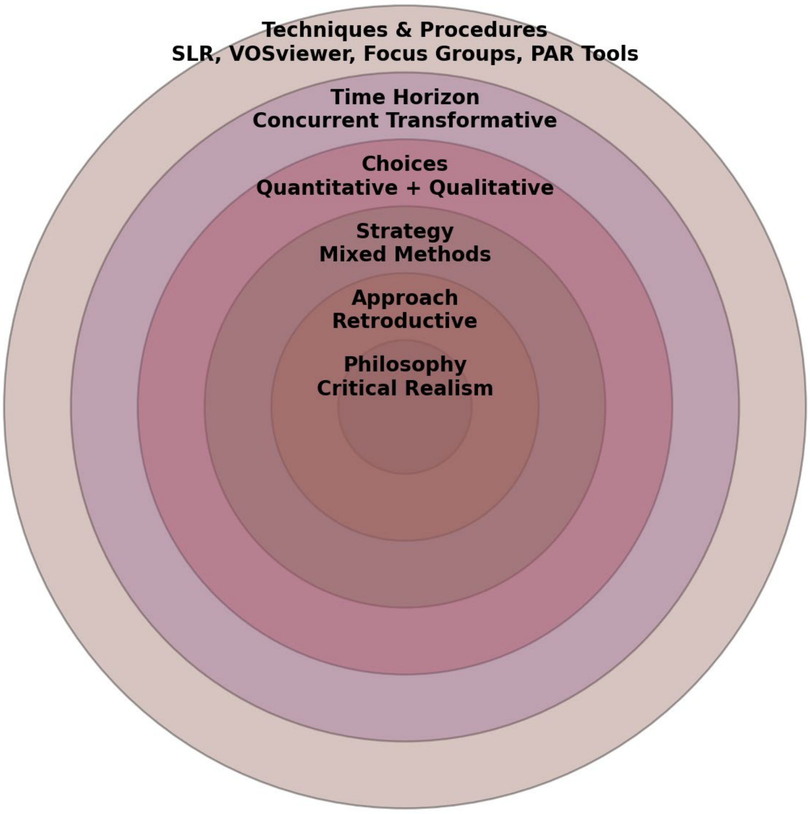


Figure 3.17: Research Onion (Adapted from Saunders et al., 2009)

The study was grounded in Critical Realism. Critical realism is a philosophy of science that assumes reality exists independently of our thoughts, but that our knowledge of it is always partial, socially influenced, and context dependent (Bhaskar, 1975). Put simply, there is a real world “out there,” but we only understand parts of it through our interactions and interpretations.

This philosophy suited the study because blockchain adoption in higher education involves both objective realities (such as efficiency gains or transaction transparency) and subjective interpretations (such as how staff, administrators, and students perceive and experience those benefits). By adopting critical realism, the study was able to hold both perspectives together in a single, coherent framework.

Saunders et al. (2009) describe deduction, induction, and abduction as common research approaches. However, this study adopted retroduction, a logic of inquiry strongly associated with critical realism. Retroduction works by moving backwards from observed patterns to suggest the deeper mechanisms that might explain them (Danermark et al., 2002).

For example, when focus group participants described blockchain as a “trust-building technology,” the study did not stop at describing that perception. It, in turn, posed the following question: What institutional or technological fundamentals could underlie the perception of blockchain in such a manner? The reproduction enabled the study to go beyond the superficial observations to reveal potential causal forces that will determine the adoption of blockchain in higher education.

The research applied a mixed-methods approach. Mixed methods consist of quantitative and qualitative studies that offer a more in depth and all-inclusive contemplation of a phenomenon (Creswell and Plano Clark, 2018).

Quantitative orientation: There were systematic literature review (SLR) and computational content analysis. The research utilised the help of such tools as VOSviewer to identify and visualize the patterns in the research publications on the adoption of blockchain. This provided quantifiable and objective data of what had been researched and the development of the field.

Qualitative orientation: Stakeholders such as faculty, IT professionals, and administrators were engaged using qualitative orientation instruments based on participation action research (PAR), which is a tool that includes focus groups. These provided avenues where the participants said their lived experiences and made knowledge on the potential of blockchain in higher education together.

With these strategies together, we obtained the hard data, as well as the voices of people behind blockchain adoption.

The concurrent transformative design was employed, which implied that the collection of quantitative and qualitative data occurred simultaneously when using the framework of the critical realism concept (Mertens, 2010).

A visual representation of the connections among the blockchain adoption factors realized in academic literature was created in VOSviewer on the quantitative side.

Qualitatively, focus groups offered a participatory and democratic environment in which the stakeholders were able to air their assessments. Group discussions were recorded using flip charts and Google Forms that helped the user to provide confidential contributions.

This blend promoted wide-ranging involvement, inclusivity and triangulation of results between various sources of information.

The research design was based on ethics. The study was described to the participants in a comprehensive way, consent was given, and the anonymity was provided. Participation among the participants was not pressured and equality generated through the representation of a variety of voices including different disciplines and institutional positions.

The research has also utilized real-life AI tools in a conscientious way by considering such questions as equity and bias. In order to enhance credibility, systematic literature review evidence was fully corroborated with focus group data categories based on pre-identified themes. This made the findings reliable, reusable and relevant.

Overall, the paper used a critical realist, mixed-method research design that was informed by Saunders et al. (2009) Research Onion. A retroduction as a logic of inquiry was used to construct the methodology, and the research was able to transit a superficial observation and an explanation of blockchain uptake within meaningful insights. The study offered an inclusive and extensive approach to exploring blockchain in higher education by integrating quantitative and qualitative studies, compensated with a concurrent transformative design and robust ethical protections in place. This approach to methodology has not only made contributions to the theory but has produced practical implications to be learned and applied to institutions with the aim of learning and applying blockchain technologies.

CHAPTER 4 : FINDINGS FROM FOCUS GROUPS

4.1 Introduction

This chapter looks at the empirical evidence from the literature review and the focus group conducted to identify the motivating factors of blockchain in higher education. It describes the value chain and its components, together with the activities performed by the various actors within the chain. In addition, it explores the particular contexts in which blockchain is likely to be utilised in the education sector, classifying those blockchains that meet the requirements of the higher education value chain and determining the time when these drivers are most suitable for adoption.

4.2 Research Question 1 Focus Group: Who are the Higher Education Blockchain Actors?

The focus group for the different questions 1 contains the empirical report of the analyses of the functions of the activity in which the participants of the study engaged. This is while the findings of sub-questions 1.1 and 1.2 will be discussed next.

4.2.1 Sub-Question 1.1 & 1.2 Focus Group: Blockchain Actors in Higher Education.

The researcher first introduced the background of blockchain to the participants and its context to technology. At the beginning of the focus group session, participants were introduced to basic concepts and related blockchain-related roles. Unfortunately, because the participants had a low pre-existing understanding of blockchain technology, they could not significantly contribute to the discussion regarding the specific roles in the context of blockchain. As a result, the information concerning the actors applying blockchain in higher learning was mainly obtained from scholarly publications (Mongkhonvanit, 2014; Mokhtar *et al*., 2006; Binks, 2014). The knowledge that is represented in this section is linked to the value chain perspective more than it is to blockchain. Therefore, the blockchain application was based on the democratisation of the value chain without the affordances of blockchain as a technology.

4.2.2 Sub-Question 1.3 & 1.4 Focus Group: Value Chain Actors and Activities in Higher Education

The use of blockchain within the higher education sector is predicted to reshape the traditional roles and activities within the academic value chain. A focus group discussion is being asked in Sub-Questions 1.3 and 1.4 to ascertain these likely shifts. Thus, Sub-

Problem 1.3 is related to identifying the value chain actors, while Sub-Problem 1.4 is concerned with the actors' activity involvement in higher education.

Some empirical research published lately has explored the applicative possibilities of blockchain in optimising educational activities, operating transparency, and increasing the effectiveness of HEIs (Capetillo et al., 2022; Guo *et al*., 2021). The participants were then allowed concrete opportunities to interact with these concepts via the focus group discussions, a vital method that offered insights into how blockchain might change the perspectives of the major players in administration, teaching, and learning. Furthermore, the discussions cast light on the different processes that could be disrupted by the blockchain in higher learning education, right from credential management to academic governance (Turkanović *et al*., 2018).

4.2.2.1 FG1's Perspective

FG1 has concentrated on what they consider the main categories of actors in the higher education value chain, assigning high importance to both "Lecturer" and "Learner/Students", with the highest ranking of 30. This indicates a strong belief that the core educational process involving teaching and learning is crucial for value generation. "Partners" are given a moderately high ranking of 18, recognising the significant role of collaborative networks and external expertise but placing them clearly below the central educational actors. "Management and Administration" received the lowest ranking of 17 among the categories FG1 chose to evaluate, suggesting that while these roles are essential for operational support, they are seen as less central to value creation than the direct educational roles.

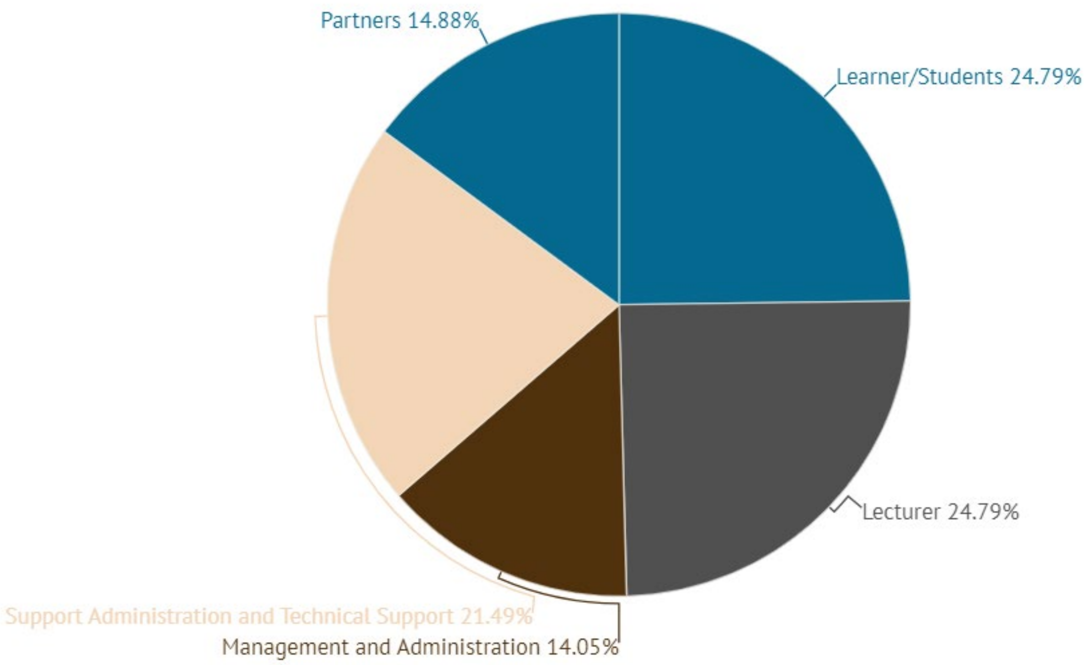


Figure 4.1: Focus Group 1 Value Chain Actors

4.2.2.2 FG2's Perspective

FG2 appears to have a broader view of the value chain, considering a wider range of actors. They align with FG1 in valuing "Lecturers" and "Students" with the highest ranking of 30, echoing the sentiment that these stakeholders are fundamental to the value chain. However, FG2 also assigns high rankings to "Community" and "Government," with scores of 30 and 28, respectively, suggesting a strong recognition of the external ecosystem's influence on higher education. "Partner and research partners," "Governance Risk and Compliance and Administration," and "Facilities" are also recognised as important, with rankings of 18, 17, and 26, indicating an appreciation for the varied contributors to the higher education environment, including operational and strategic actors.

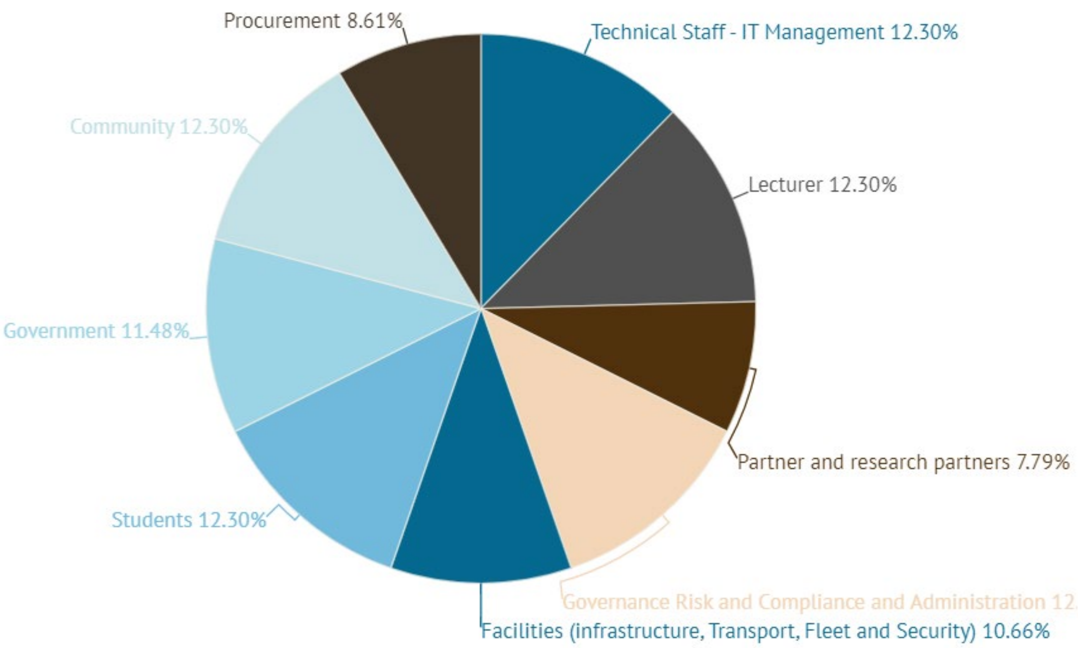


Figure 4.2: Focus Group 2 Value Chain Actors

4.2.2.3 FG3's Perspective

FG3 prioritises "Lecturer" and "Students" equally, with the highest ranking of 30, consistent with FG1 and FG2, affirming the universal agreement on the centrality of teaching and learning. FG3 further recognises "Management Leadership" with a top ranking of 30, placing a greater emphasis on the strategic and leadership roles within the institution compared to FG1. "Technical Staff" and "Security Service" are ranked 20, signifying an awareness of the importance of support services in maintaining and enhancing the educational environment. "Industry" is given the least importance, ranking at 15, implying that FG3 sees industry connections as less integral to the immediate value-generation process within higher education than the other listed actors.

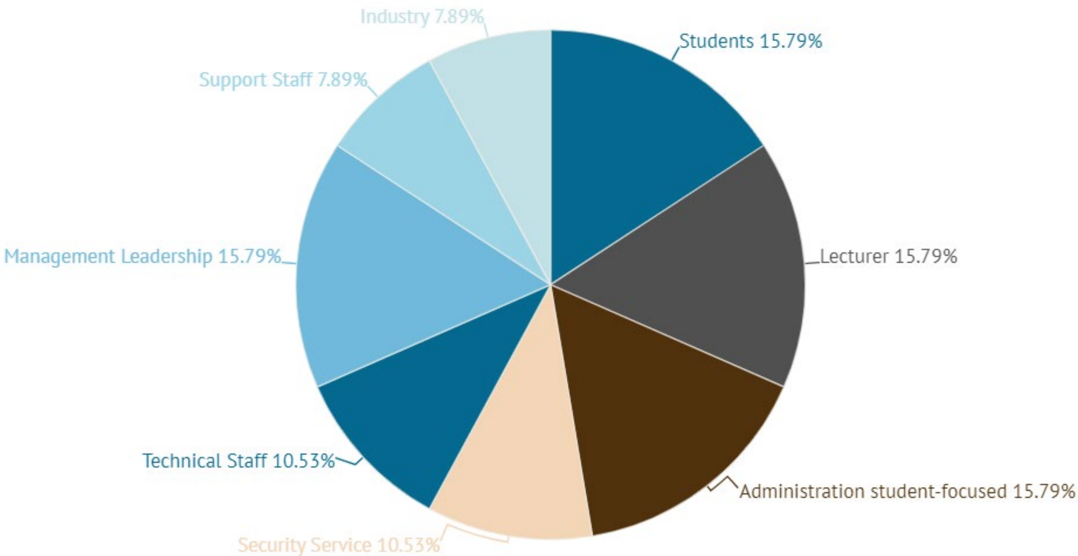


Figure 4.3: Focus Group 3 Value Chain Actors

4.2.2.4 Focus Group Level Perspective

Across all three focus groups, "Lecturers" and "Students" are consistently highly ranked, highlighting a shared understanding of the traditional core functions of higher education as the most significant contributors to value creation. The variations arise in how each group views the supporting roles and external influences.

FG1 has a more concentrated view, focusing on the prominent internal roles and recognising the contribution of external partnerships to a lesser extent. FG2 adopts a more inclusive approach by considering a broader array of internal and external actors and assigning high importance to community and governmental bodies. FG3 emphasises the importance of leadership within the institutions and recognises various support functions while attributing less importance to industry partners.

While there is a clear consensus on the importance of the educational core, the focus groups diverge in recognising the value brought by administrative, operational, and external ecosystem actors. This diversity of perspectives highlights the multifaceted nature of value generation in higher education and the different lenses through which various stakeholders can view the value chain.

At the end of the activity for identifying value chain actors, the facilitator provided the participants with a list of actors extracted from the preliminary Antconc-produced literature review and asked them to identify actors that do not belong to the list Figure 4.4: Preliminary List of Higher Education Value Chain Actors. In all three groups, all the actors acknowledged belonging to the higher education Value Chain.

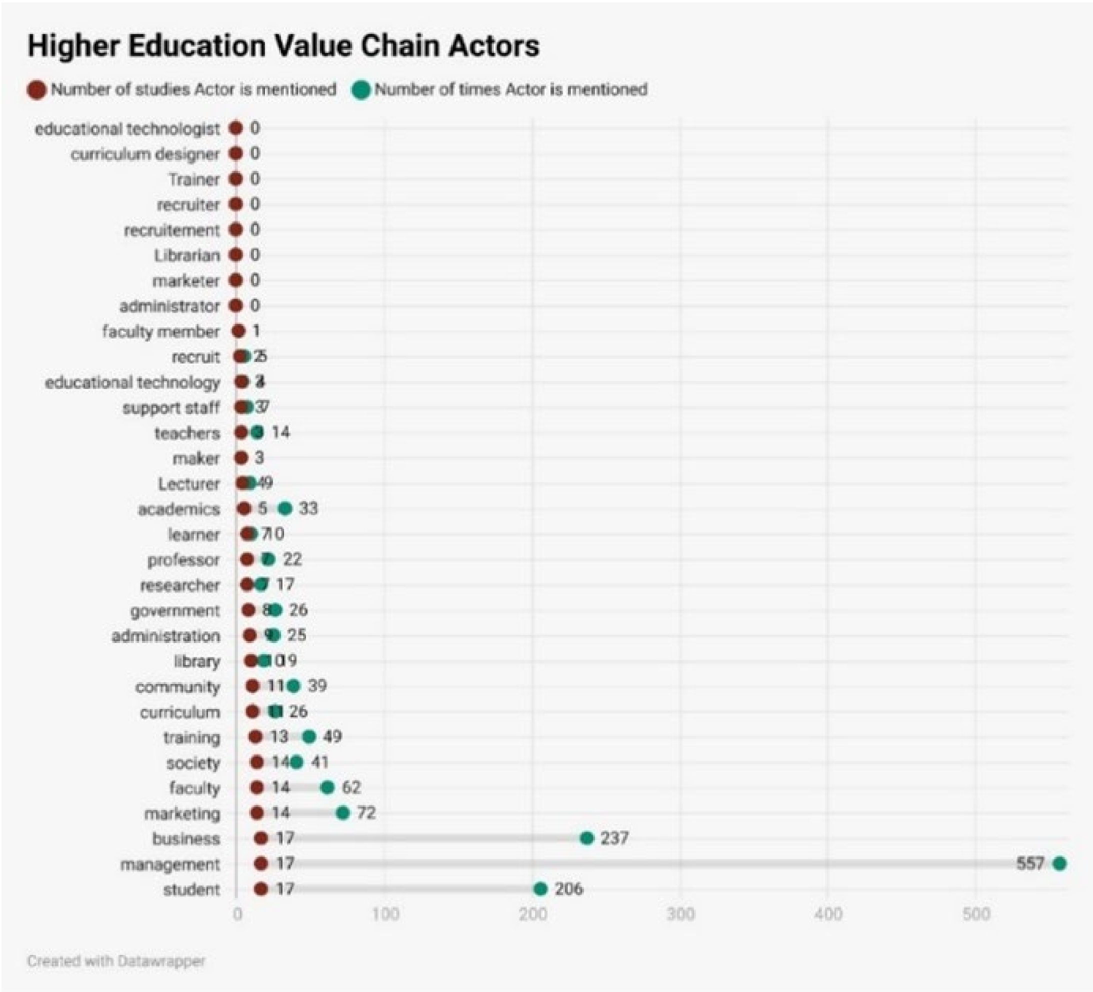


Figure 4.4: Preliminary List of Higher Education Value Chain Actors

4.3 Research Question 2 Focus Group: Under what circumstances do the drivers drive the adoption of blockchain in higher education? (Empirical – facts observed)

4.3.1 Sub-Question 2.1 – Focus Group: What are the key drivers for adoption?

4.3.1.1 FG 1-3 non-technical drivers' tables.

Table 4.1: Focus Groups Philosophical Beliefs Drivers

Drivers	Group 1	Group 2	Group 3
Decentralisation Needs	4	1	2
Enhanced Privacy	3	2	2
Alternative System	3	3	2
Technology Push	2	2	2
No Trusted Third Party	2	2	1
Political Reasons	1	1	0

Source: Author's Construct

Table 4.1 in the FG1 findings elucidates the prioritisation of various non-technical determinants that influence the decision-making processes of distinct focus groups. An analytical dissection is as follows:

Table 4.1 delineates six determinants alongside the corresponding evaluations attributed by three focus groups (FG1, FG2, and FG3). Although the evaluative criteria remain undefined, it is inferred that a higher numerical value denotes a more significant emphasis by the respective group.

Pertinent Observations cover decentralisation imperatives, privacy enhancement, systemic alternatives, technological advancement, independence from centralised entities and political considerations.

FG1 accorded the highest importance to this determinant (4), with FG2 and FG3 providing moderate acknowledgements (1 and 2, respectively). This infers FG1's preference for a system where governance is disseminated amongst stakeholders. Uniformly, all groups recognised the importance of privacy enhancement (with ratings between 2 and 3), reflecting a collective inclination towards data confidentiality. Uniform ratings (2 and 3) across all groups indicate a consensus on the potential of the proposed solution as a viable substitute for prevailing systems, denoting a general discontent with the status quo. A consistent rating of 2 by all groups suggests that technological progression is not the exclusive factor influencing their decisions. FG1 deemed this determinant of notable importance (2), with FG2 and FG3 expressing a moderate preference (2 and 1, respectively), indicating an aversion to centralised administrative control. All groups deemed this the least critical factor, with FG1 attributing the highest relative importance (1).

The data presented in Table 4.4 highlights the substantial impact of non-technical elements on the decision-making framework within the blockchain domain. The emphasis on decentralisation, the quest for enhanced privacy, and the collective dissatisfaction with established systems highlight the driving forces behind the adoption of blockchain innovations in this milieu.

4.3.1.2 FG 1-3 non-technical drivers' tables blockchain adoption in percentages

Table 4.2: Focus Groups Philosophical Beliefs Drivers in Percentages

Driver Element	*Focus Group 1 (Weight%)*	*Focus Group 2 (Weight%)*	*Focus Group 3 (Weight%)*
Decentralisation Needs	57.14%	14.29%	28.57%
Enhanced Privacy	42.86%	28.57%	28.57%
Alternative System	37.50%	37.50%	25.00%
Technology Push	33.33%	33.33%	33.33%
Rejecting Trusted Third-Party	40.00%	40.00%	20.00%
Political Reasons	50.00%	50.00%	0.00%

Source: Author's Construct

Table 4.2 delineates the prioritisation of blockchain adoption by Focus Group 1 (FG1), quantified in percentage weights.

Six determinants are identified as pivotal in FG1's decision-making process regarding the adoption of blockchain technology. Predominance of Decentralisation (57.14%): FG1 places paramount importance on decentralisation, underscoring a marked preference for systems that eschew centralised control in favour of distributed authority. Priority of Enhanced Privacy (42.86%): Safeguarding data privacy emerges as a significant concern for FG1, indicative of the group's aspiration for a system that ensures the confidentiality of user data.

Consideration of an Alternative System (37.50%): The group considers blockchain a potential replacement for current systems, suggesting a potential disillusionment with current approaches. The impetus of Technological Advancement (33.33%): Technological advancement is considered fairly important, indicating that FG1 seeks to innovate even as it seeks to address particular needs. Rejection of Trusted Third Parties

(40.00%): This testing result, showing a highly significant preference of FG1 to avoid central authorities, supports their preference for decentralised structures. Weight of Political Factors (50.00%): The bias toward political considerations is especially marked here, and despite the absence of any indication of what ‘clarification’ entails, one can suppose that the FG1 prefers a form that will suit some political ideology or purpose.

Table 4.4 sheds more light on why FG1 is interested in blockchain and out of it with a clear emphasis on decentralisation, privacy and away from the conventional system which is in line with the benefits of blockchain as outlined in Figure 4.5. That is why analysing political factors suggests searching for further explanations to understand the position of FG1 in its strategic context.

It does not mention some finely grained contextual elements, define specifics of each determinant, or reveal much more about the ‘political reasons’ that form quite a large part of FG1’s drivers.

Table 4.4 does not provide details about the context or the specific meaning attached to each factor. Additionally, the high weighting of "political reasons" without further explanation limits a complete understanding of FG1's drivers.

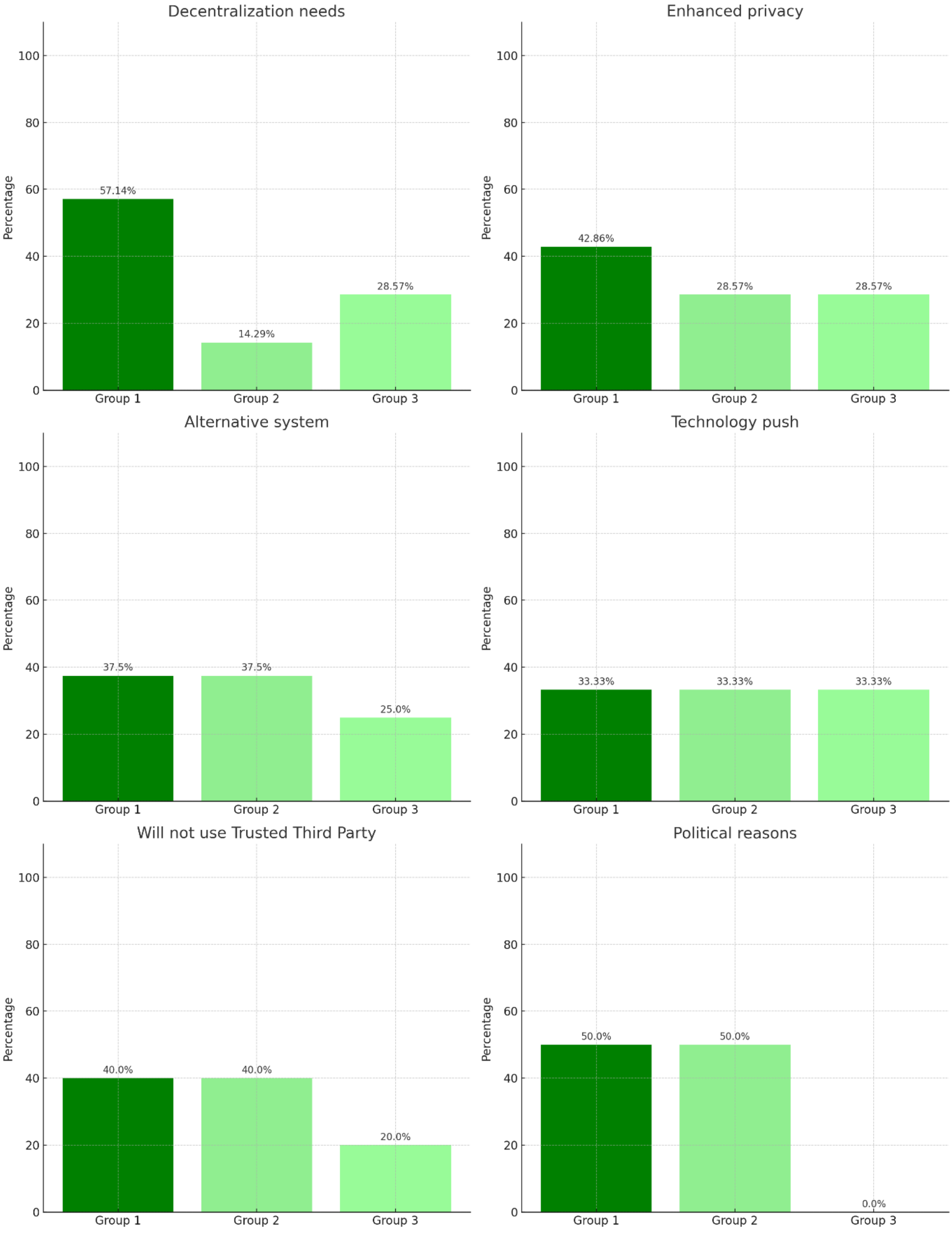


Figure 4.5: Summary of Philosophical Beliefs

Source: Author's Construct

4.3.1.3 Drivers Propelling Each Focus Group

Table 4.3 elucidates the drivers' dynamics propelling each focus group's engagement with blockchain technology. It delineates three principal factors that could sway the groups' inclinations. Community-Driven Engagement (Rated 4-5): A unanimous high rating by all groups for this factor denotes a substantial impact from their immediate social circle or colleagues engaged with blockchain technology. Trend Appeal (Rated 1-2): Across the board, this aspect garnered minimal ratings, signifying that the allure of blockchain as a trend does not serve as a chief incentive. Inquisitiveness (Rated 0-1): Group FG2 exhibited the most pronounced curiosity (rated 1), in contrast to FG1 and FG3, which demonstrated negligible curiosity (rated 0). This disparity suggests differing levels of pre-existing knowledge or the intent to study the technology autonomously.

Table 4.3: Focus Groups Network Effects Drivers

Driver	*Group 1*	*Group 2*	*Group 3*
Driven by Community	4	5	5
Cool Factor	1	1	2
Curiosity	0	1	0

Source: Author's Construct

The predilection towards community influence is the predominant motivator for all focus groups (FG1, FG2, and FG3), indicating that the discourse and advocacy by their network of peers or specialists are instrumental in fostering their interest in blockchain technology. The minimal regard for the technology's trendiness and curiosity highlights that these are not the primary driving forces.

These observations highlight the critical role of societal influence and communal backing in the adoption of blockchain technology. The scant emphasis on the technology's trendiness points to a more utilitarian outlook, concentrating on the tangible advantages over the mere popularity of the technology.

4.3.1.4 Drivers Propelling Each Focus Group Percentages

Table 4.4: Focus Group Network Effects Drivers Percentages.

Factor	*Group 1*	*Group 2*	*Group 3*
Driven by Community	28.57%	35.71%	35.71%
Cool Factor	25.0%	25.0%	50.0%
Curiosity	0.0%	100.0%	0.0%

Source: Author's Construct

Table 4.4 offers a complex perspective on the varying incentives propelling each focus group's engagement with blockchain technology, quantified in percentages.

Driver Elements and Their Proportional Impact

Three determinants are posited to sway the groups' inclinations: community-driven engagement, trend appeal, and exploratory interest.

Community-Driven Engagement (28.57% - 35.71%)

A consensus across the cohorts places substantial emphasis on the sway of communal forces, underscoring a potent external impetus. Focus Groups 2 and 3 exhibit marginally more pronounced community-driven drivers than Focus Group 1. Trend Appeal (25.0% - 50.0%): The importance of this element exhibits greater disparity among the groups. Focus Groups 1 and 2 attribute a modest significance (25%) to the allure of blockchain's trendiness, suggesting it is not a pivotal incentive. Conversely, Focus Group 3 ascribes a heightened significance (50%), indicating a potential susceptibility to the technology's trend perception. Exploratory Interest (0.0% - 100%): This determinant shows notable fluctuations. Focus Groups 1 and 3 demonstrate no exploratory interest (0%), denoting an absence of a driver to investigate the technology for its inherent novelty. In stark contrast, Focus Group 2 manifests an absolute exploratory interest (100%), denoting a keen enthusiasm to inspect blockchain and its prospective utilities.

The predilection for community influence stands out as the foremost stimulant for all focus groups (Focus Groups 1, 2, and 3), reaffirming the pivotal role of societal interaction and peer dynamics in cultivating their interest. The impact of the trend appeal diverges among the groups. Focus Groups 1 and 2 appear to prioritise pragmatic applications, whereas Focus Group 3 may be modestly swayed by the technology's fashionable perception. The degree of exploratory interest is markedly varied. Focus Group 2 exhibits a vigorous curiosity about blockchain, in contrast to Focus Groups 1 and 3, which concentrate on the technology's practical implications.

The study highlights the significance of communal influence and elucidates the diverse factors among distinct cohorts. Although community feedback is universally esteemed, the disparate emphasis on the "cool factor" and inquisitiveness indicates a spectrum of incentives driving their fascination with blockchain technology. This accentuates the imperative of accommodating social dynamics and personal cognitive preferences in examining technological uptake.

The data presented does not delineate the precise causative factors for the driver discrepancies observed. Additional insights into the personal histories and proclivities of the respective groups would facilitate a more complex comprehension of these variations.

4.3.1.5 Drivers influencing various focus groups' engagement with blockchain technology.

Table 4.5: Focus Group Economic Incentives Drivers

Driver	Group 1	Group 2	Group 3
Charging for Platform	2	2	0
Process Improvement	4	3	4
Marketing Product	1	1	1
Fear of Missing Out (FOMO)	2	0	0
Selling Consultancy	0	2	1
Alternative Investment	0	1	1
Selling Mining Equipment	0	0	1

Source: Author's Construct

Table 4.5 offers an analytical examination of the drivers influencing various focus groups' engagement with blockchain technology, emphasising potential financial or commercial benefits:

- **Revenue Generation through Platform Development**. Focus Groups 1 and 2 have attributed moderate importance to the development of a revenue-generating platform, while Focus Group 3 does not prioritise this as a significant incentive.
- **Enhancement of Operational Processes**: All focus groups unanimously place high importance on leveraging blockchain technology to enhance operational processes within their respective domains.
- **Product Marketing**: All groups have accorded low importance to the utilisation of blockchain for marketing initiatives, indicating a consensus that it is not a primary driver factor.
- **Fear of Missing Out (FOMO)**: Focus Group 1 exhibits a moderate concern over missing out on the blockchain trend, whereas Focus Groups 2 and 3 display an indifference to this sentiment.
- **Blockchain Consultancy Services**: Focus Group 2 shows a notable interest in providing consultancy services pertaining to blockchain, in contrast to the minimal interest shown by Focus Groups 1 and 3.
- **Blockchain as an Alternative Investment**: Focus Groups 2 and 3 assign a moderate level of interest in considering blockchain as an alternative investment avenue, which is not shared by Focus Group 1.
- **Sale of Blockchain-Related Equipment**: Only Focus Group 3 indicates a moderate interest in commercialising equipment for blockchain mining, a driver not shared by the other groups.

This academic reformulation presents the drivers in a structured and hierarchical manner, facilitating a clearer understanding of the priorities and interests of each focus group in relation to blockchain technology.

Enhancement of processes emerges as the predominant collective incentive across all cohorts (FG1, FG2, and FG3), resonating with their prior emphasis on pursuing alternative and potentially more efficacious methodologies. Divergences are observed in the cohorts' aspirations to monetise blockchain technology. Cohorts FG1 and FG2 exhibit inclinations towards creating platforms that could generate revenue. Cohort FG2 also displays a tentative interest in providing blockchain advisory services. Notably, neither the fear of missing out (FOMO) nor promotional strategies are identified as significant motivators for any cohort. Cohorts FG2 and FG3 perceive blockchain as a conceivable investment avenue, contrary to FG1. Solely cohort FG3 demonstrates an interest in the commerce of mining apparatus.

The data indicate that, notwithstanding the presence of financial interests among certain cohorts, the principal driving force is the enhancement of processes. The evidence points to a confluence of utilitarian and potential economic drivers influencing their engagement with blockchain technology, underscoring the imperative to acknowledge both the quest for improved solutions and the prospects of financial returns in the context of blockchain adoption drivers.

The evaluations do not encapsulate a comprehensive understanding of the cohorts' fiscal drivers. Subsequent inquiries might investigate the intricacies of prospective platform establishment, advisory offerings, or investment ventures.

4.3.1.6 Financial and Commercial Impetuses propelling each Focus Group's Engagement with Blockchain technology.

Table 4.8 delineates the financial and commercial impetuses propelling each focus group's engagement with blockchain technology, quantified through percentages. It elucidates eight drivers influencing blockchain involvement:

Table 4.6: Focus Groups Economic Incentives Drivers (Percentages)

Driver	*Group 1*	*Group 2*	*Group 3*
Charging for Platform	50.0%	50.0%	0.0%
Process Improvement	36.36%	27.27%	36.36%
Marketing Product	33.33%	33.33%	33.33%
Fear of Missing Out (FOMO)	100.0%	0.0%	0.0%
Selling Consultancy	0.0%	66.67%	33.33%
Alternative Investment	0.0%	50.0%	50.0%
Selling Mining Equipment	0.0%	0.0%	100.0%

Source: Author’s Construct

Revenue Generation via Platform Usage (0%-50%): FG1 and FG2 exhibit a pronounced inclination (50%) towards creating a monetizable platform, whereas FG3 does not regard this as an incentive. Enhancement of Operational Processes (27.27%-36.36%): All groups attribute moderate to substantial importance (27.27%-36.36%) to process enhancement, indicating its continued relevance as a driving factor, albeit with a marginal deviation from previous assessments. Blockchain as a Marketing Vehicle (33.33%): Uniform moderate importance assigned by all groups to this factor suggests recognising blockchain's ancillary benefits in marketing endeavours. Fear of Missing Out on Technological Advancements (FOMO) (0%-100%): A high priority is placed by FG1 (100%) on FOMO, reflecting its significant sway in their strategic decisions, unlike FG2 and FG3, which appear unaffected by it. Consultancy Services in Blockchain (0%-66.67%): FG2's substantial weighting (66.67%) highlights a keen interest in blockchain consultancy, with FG3 showing a moderate inclination (33.33%), and FG1 displaying no interest. Blockchain as an Alternative Investment Avenue (0%-50%): FG2 and FG3 ascribe a moderate significance (50%) to blockchain for investment purposes, unlike FG1, which does not prioritise it. Commerce in Blockchain Mining Apparatus (0%-100%): A high valuation (100%) by FG3 indicates a strong interest in the commerce of blockchain mining equipment, a sentiment not shared by FG1 and FG2.

Principal Outcomes

The significance of process enhancement may be marginally less than earlier assessments have suggested, whereas economic factors appear to have a more substantial impact on certain collectives. Distinct variances are evident in the collectives' aspirations to monetise blockchain technology:

Groups FG1 and FG2 exhibit a preference for creating platforms that generate revenue. Group FG2 demonstrates a pronounced inclination towards providing blockchain advisory services.

The fear of missing out (FOMO) is a notable driving force for FG1, albeit it is not as prevalent among other collectives. A general interest in utilising blockchain for marketing is observed across all groups, indicating it may be an ancillary strategy. Groups FG2 and FG3 regard blockchain as a viable financial venture, a sentiment not shared by FG1. Group FG3 alone shows a keen interest in the commerce of mining apparatus.

Scholarly, upon re-evaluation with an emphasis on the relative importance of each determinant, the findings highlight a more pronounced predilection towards financial incentives among certain groups, diverging from earlier conclusions drawn from rudimentary evaluations. Despite the sustained relevance of process enhancement, the emerging focus on developing platforms, consultancy provisions, investment prospects, and mining equipment commerce reflects a diverse array of pragmatic and financially promising pursuits within the Scope of blockchain exploration.

Research Limitations

The numerical data provided does not study the complicated drivers underlying the interests. Subsequent inquiries might investigate the business frameworks for prospective platforms, the specifics of advisory services, or the fiscal strategies pertinent to blockchain ventures.

4.3.1.7 Two principal drivers for each focus group's engagement with blockchain technology

Table 4.7: Focus Group Breaking the Gridlock Drivers

Factor	***Group 1***	***Group 2***	***Group 3***
Organisational Push	5	4	4
Third-Party Transfer	1	2	2

Source: Author’s Construct

Table 4.9 delineates two principal motivators for each focus group's engagement with blockchain technology. In an academic context, the analysis unfolds as follows:

Drivers Dynamics

Table 4.9 elucidates two determinants that shape the groups' inclinations: Institutional Incentivisation (Rating 4-5): Uniformly, groups have attributed raised ratings to this determinant, indicating a robust impetus from their respective institutions towards the adoption of blockchain technology or advocate for the investigation of blockchain technology. Intermediary Data Exchange (Rating 1-2): The groups have conferred low to intermediate ratings, suggesting that facilitating data exchange via a third party is not a central incentive for their interest in blockchain.

These observations highlight the salient role of internal institutional dynamics in the propulsion towards blockchain integration. The pronounced institutional encouragement is indicative of an alignment with prospective strategic objectives or an overarching desire to remain at the vanguard of technological progress.

Research Limitations

The data presented does not disclose the explicit motives underpinning the institutional incentivisation. Subsequent research could investigate the particular ambitions or policies of each institution that may be influencing their pursuit of blockchain technology.

4.3.1.8 Two principal drivers Percentages for each focus group's engagement with blockchain technology

Table 4.8: Focus Group Breaking the Gridlock Drivers Percentages

Driver	Group 1	Group 2	Group 3
Organisational Push	38.46%	30.77%	30.77%
Third-Party Transfer	20.0%	40.0%	40.0%

Source: Author’s Construct

Table 4.10 elucidates the complex dynamics influencing each focus group's engagement with blockchain technology, quantified through percentage distributions. The academic dissection reveals two pivotal factors:

Organisational Impetus (30.77% - 38.46%): A consistent emphasis on this element by all focus groups indicates its continued predominance. Nonetheless, relative to prior assessments, a marginal decline in its weighting intimates the emergence of additional influential factors.

Intermediary Data Exchange (20.0% - 40.0%): An uptick in the importance assigned to this factor is observed, particularly within Focus Groups 2 and 3, which allocate a substantial 40% weighting. This shift highlights the enhanced pertinence of third-party data transactions for these groups, in contrast to Focus Group 1, which attributes a lesser significance at 20%.

Principal Observations

The notion of Organisational Impetus is corroborated as a substantial motivator across all focus groups. However, the distribution of percentages hints at a more complex interplay of internal and external elements shaping their blockchain interests.

Intermediary Data Exchange: This factor's increased salience, especially for Focus Groups 2 and 3, suggests it is an influential, albeit secondary, consideration in their blockchain deliberations, potentially driven by concerns over data sovereignty and security in third-party exchanges.

Scholarly Implications

The analysis highlights a subtle interrelation between the drive from within the organisation and apprehensions surrounding external data exchanges. The adjusted weightings imply that while organisational governance is pivotal, it is not the sole determinant of the groups' blockchain inclinations.

Limitations

The data does not divulge the sophisticated drivers behind the Organisational Impetus or the specific apprehensions concerning Intermediary Data Exchange (Figure 4.6). Further investigation is warranted to unpack these underlying factors.

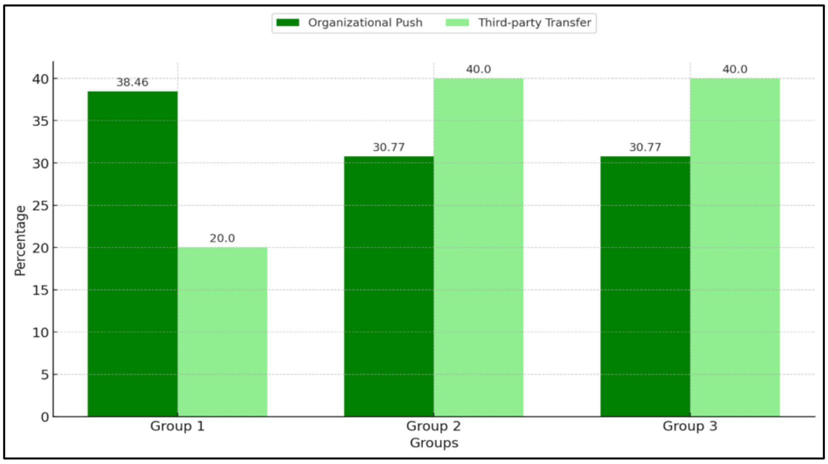


Figure 4.6: Comparison of Focus Groups 1 – 3: Organisational Push and Third-party Transfer

Source: Author’s Construct

4.3.2 Sub-Question 2.2 – Focus Group: Types of Blockchains Required by Higher Education Institutions

In this section, the facilitator used a Scenario Properties Decision Flow Chart to facilitate the participants' discussion and map the type of blockchain suitable for higher education needs.

4.3.2.1 FG1 - Type of higher education blockchain

Table 4.9: FG1-Blockchain decision flow chart results

#	Blockchain decision flow chart conditions	Yes	No	Drivers
1	Do you need a store state?	6	0	store state
2	Are there multiple writers (value chain actors)?	6	0	multiple writers
3	Can you always use an online trusted third party?	2	4	Intermediaries Consistency Online trusted party
4	Are all writers known?	6	0	Transparency Identification
5	Are all writers trusted?	0	6	Trust
6	Are all writers verifiable?	6	0	Verifiability

Source: Author's Construct

The framework illustrated in ` 2.9 outlines a structured algorithm designed to assess the relevance of blockchain technology within a specific context. This algorithm serves as a systematic tool, guiding stakeholders through a comprehensive evaluation process essential for determining the suitability of blockchain adoption in particular use cases.

Regarding the assessment of blockchain's appropriateness, positive responses to the preliminary pair of questions, and potentially the third, depending on the requirement for a thrustless trust, may indicate the suitability of blockchain technology. This inference is predicated on blockchain's inherent capabilities to forge a permanent, shared ledger that many participants maintain, thereby enabling the facilitation of secure, multi-party transactions without the imperative of a centralised authoritative body. In contrast, negative responses to these inquiries, such as the non-requirement to maintain a state or the adequacy of a singular authoritative entity, may suggest that blockchain technology is not the most advantageous option. Under these circumstances, alternative strategies, such as traditional databases with integrated access control mechanisms, might be more appropriate.

The data regarding Focus Group 1 participants do not provide a direct correlation to the specific requisites for blockchain deployment. Nevertheless, examining the roles and prospective interactions of these individuals within the educational sector's value chain could yield indirect correlations pertinent to the decision-making algorithm for blockchain implementation.

Preliminary findings from the initial focus group reveal a complex network of contributors to the data ecosystem within higher education. The involvement of academic staff, governmental bodies, and possibly representatives from the industry sector suggests a multifaceted input to the educational value chain, encompassing elements such as academic performance metrics, official transcripts, and accreditation documentation. This multifaceted contribution conforms to the affirmative criteria of the multiple authorship in the decision-making flowchart. In addition, the presence of educators plus an emeritus pedagogue emphasises the need for validation procedures that guarantee the credibility of education credentials. While the flowchart does not indicate, in a more or less direct manner, the fact that, after a certain amount of time, the information collected needs to be validated, it is connected to one of the principles of validating data sources with the notion of ‘trusted authors.’

In connection with the discussed Blockchain Decision Flowchart, its general conditions for usage are likely to depend on several factors in the process of data interchange in the frameworks of the higher education sector. Such requirements are a constant data state, dependence upon authenticated intermediaries, acknowledgement and recognition of data providers, and the verification of authors. Certificates credentials are of immense importance in education and require protection and storage. Posing a positive response to this requirement may recommend Blockchain as a proper technology. Traditionally, academic institutions have acted as responsible officials of record for education. However, concerns with regard to data manipulation could offset the use of these institutions, thereby presenting Blockchain as the solution. Although it is understood that universities have already built their reputations as established institutions, potential internal trust issues in data management may require a negative response, thus favouring the permissioned Blockchain architecture. Another potential negative response could result from verifying the authenticity of external assessors/ additional data contributors: zero-knowledge proofs appear as a potential future solution.

Regarding the Scope of higher education, the application of blockchain technology requires certain characteristics to work correctly. A permissioned ledger structure is preeminent since only specific entrants are allowed access to enter data into the system, thus enhancing credibility among scholars. The architecture has to be scalable, to contain a vast number of institutions, learners and records of their results and qualifications. Interoperability is a fundamental requirement or priority; the proposed ECS must be integrated smoothly with existing educational data systems. High security is inherent to this technology, which is technically secured with the help of cryptography to ensure data accuracy and prevent the invasion of unauthorised personnel. They must respect privacy; there are strict rules for the disclosure of information while maintaining student records. In addition, proper attention to dynamic educational data and privacy regulation is mandatory; thus, it is quite essential.

The data collected in Focus Group 1, up to the point that they do not overlap with the decision-making factors of Blockchain in the context of higher education, helped elucidate the major stakeholders involved and potential evolution of data within the discussed ecosystem. Together with the fundamental parameters of the decision framework, these insights provide an example for the subsequent discussions and meetings on the necessary characteristics for this sector's blockchain implementation.

The decision framework provides pedagogical value by presenting the blockchain in a summarised manner while outlining its primary functions, which users can apply to different settings. To help evaluate how blockchain is implemented into the value chain of a business, it identifies specific points of interest that include shared state, stakeholders, trust assumptions and identity. Looking at the framework further, it captures features for data persistence, concern with multiple stakeholders, and the prerequisites of trust and identity to give a holistic view of how blockchain can fit into the future of educational development.

Focus Group 1 = Public permissioned blockchain.

4.7.2.1 Focus Group 2 - Type of higher education blockchain

Table 4.10: Focus Group 2 - Blockchain decision flow chart results

#	Blockchain decision flow chart conditions	Yes	No	Drivers
1	Do you need a store state?	6	0	Store state
2	Are there multiple writers (value chain actors)?	6	0	Multiple writers
3	Can you always use an online trusted third party?	2	4	Intermediaries, Consistency, online trusted party, Regulation Sovereignty, and Privacy
4	Are all writers known?	0	6	Identification
5	Are all writers trusted?	0	6	Trust
6	Are all writers verifiable?	0	6	Verifiability

Source: Author's Construct

FG2 = Private Permissioned Blockchain

The FG2 report builds upon the decision-making framework initially laid out in FG1. It maintains the core decision-making structure of its predecessor while introducing additional criteria that follow a negative trajectory, particularly after the third inquiry, which questions the long-term viability of employing a reliable online intermediary. In addition, FG2 applies additional evaluative elements to establish whether blockchain technology should be implemented. This indicates an overall view of the way the possibility of integrating blockchain to the current systems can be assessed. The methodology of the report is exhaustive because the decision to use the blockchain technology is taken with the aim of paying attention to all the factors involved. The fact that FG1 evolves into FG2 shows the interest and effort in developing and improving the decision-making process, particularly in the setting of technological advancement and their meaning regarding strategic development. The fact that new evaluative criteria were included is the indicator of adaptive and progressive direction in evaluating the approach to issues because of the dynamism of the technological sphere and its influence on the decision-making models. The FG2 report, thus, is a huge step towards the progress of the decision-making framework, especially in the coverage of digital technologies and its application in diverse spheres. The FG2 report adds additional criteria that is exhaustive to the list, thus making them adopt new technologies like blockchain, on a new level where such conclusions are made with a thorough view of the potentials and shortcomings of such a technology. The methodology of the report speaks about the need to follow a careful and systematic method of integration of new technologies, as it relates to a stratified perception of the dynamics surrounding any decision to do so.

The analytical results obtained under the Focus Group 2 Blockchain decision-making flowchart explain why they required a Stored State with unanimous affirmation, which is why it is highly needed to store the evidence of academic achievement in form of transcripts, certificates, and potentially skill endorsements on a platform that is both secure and has resistance against unauthorised modifications. The agreement with Multiple Writers also supports the presence of various stakeholders in the process of providing data, such as academic institutions, regulation agencies, and (possibly) employers, who can also provide evaluations of internships. This common contribution increases the need to have an infrastructure that will guarantee integrity and transparency of communication and data sharing and facilitate it in a smooth manner. The dichotomous responses that were carried out on Trusted Third Party Reliance indicate the split position on the matter with some entities showing loyalty to the old custodians of records, including educational institutions, whilst others are hesitant, which makes the Blockchain technology an opportunity that celebrates the tenets of decentralisation and might reduce the reliance on centralised organisations. The lack of a clear answer to the question related to the category of Known Writers can be explained by the lack of data in the chart.

However, the make-up of the Focus Group 2, which consists of professionals including a Lecturer in BTech Nursing and an IT Manager implies that there would have been partial familiarity with the contributors. However, it is not yet determined whether there are other potential contributors, e.g. external assessors or business partners. Similarly, the query regarding 'Trusted and Verifiable Writers' remains unresolved due to the lack of conclusive data, presenting a conundrum in establishing trustworthiness, particularly with external collaborators, thereby potentially raising concerns regarding the reliability of the data provided.

FG2 emphasises the importance of considering supplementary factors beyond the intrinsic capabilities of blockchain technology. Compliance with legal standards, the crucial aspect of data autonomy, and safeguarding privacy are essential in making informed decisions about deploying blockchain in real-world scenarios. FG2 adopts a detailed and critical perspective on the practicality of blockchain, acknowledging the importance of external factors and the necessary trade-offs when comparing traditional infrastructures with blockchain-based alternatives. In line with the aforementioned discourse, challenges such as establishing and sustaining a sophisticated blockchain network, expanding the solution to accommodate a multitude of educational institutions and learners, adapting to the dynamic legal frameworks governing blockchain in the educational sector, and harmonising with pre-existing data management infrastructures are pivotal considerations.

4.7.2.2 FG3 - Type of higher education blockchain

Table 4.11: FG3-Blockchain decision flow chart results

#	*Blockchain decision flow chart conditions*	*Yes*	*No*	*Drivers*
1	Do you need a store state?	6	0	store state
2	Are there multiple writers (value chain actors)?	6	0	multiple writers
3	Can you always use an online trusted third party?	0	6	Intermediaries Online trusted party
4	Are all writers known?	5	1	Identification
5	Are all writers trusted?	3	4	Trust So, all the lecturers said no

6	Are all writers verifiable?	6	0	Verifiability

Source: Author's Construct

FG3 = Public permissioned blockchain

The findings of FG3 enhance the blockchain-based decision-making framework by focusing on a specific scenario within the educational sector's value chain. Within this framework, FG3 applies the decision-making paradigm initially developed in FG1 and FG2 to a case involving faculty members at an academic institution. This application demonstrates the adaptability and relevance of the blockchain decision-making model in addressing complex scenarios inherent to the educational environment. By doing so, FG3 contributes to the body of knowledge by providing empirical evidence of the model's utility in a real-world educational setting, thereby offering insights into the strategic decision-making processes that can benefit from integrating blockchain technology. The study's approach highlights the potential of blockchain to transform decision-making mechanisms within the educational sector, particularly in enhancing transparency, accountability, and efficiency among faculty members.

The principal discoveries are as follows:

- **In response to the inquiry on State Storage (Question 1)**, an affirmative conclusion is deduced, underscoring the imperative to maintain a collective state, exemplified by academic records, which should be accessible to relevant entities.
- **Regarding the issue of Multiple Writers (Question 2)**, there exists a substantial probability of a positive response, given the necessity for diverse faculty members to contribute data to student records.
- **Concerning the Trusted Third-Party question (Question 3)**, the negative reaction emanating from the faculty's unanimous disapproval signifies a predilection for a decentralised approach to managing student records.
- **The Shift in Focus (Question 4)** becomes apparent as the decision-making diagram refrains from posing direct questions concerning 'known writers,' likely due to the assumption that faculty members are recognised entities within the academy.

- **The Emphasis on Trust (Question 5)** is perceived through the faculty's collective disavowal, alluding to potential scepticism towards a centralised system for the governance of student records, possibly stemming from apprehensions regarding data integrity, administrative control, or lack of transparency.
- **Regarding Verifiability (Question 6)**, a positive outcome is foreseen, premised on the belief that faculty members are identifiable within the academic framework. The inferences drawn imply that, in light of the responses to the initial set of questions coupled with the palpable mistrust in a centralised governance model, the decision schematic might advocate for integrating blockchain technology as an efficacious alternative for the stewardship of student records in this context.

The scholarly significance of FG3 is encapsulated in its depiction of the blockchain decision diagram's tangible application within a genuine educational milieu, accentuating the importance of confronting trust-related concerns in contemplating technological interventions.

4.7.2.3 FG 1-3 Types of blockchain tables.

Table 4.12: Types of Blockchain in Higher Education

Focus Group	*Type of blockchain selected*
FG1	Public permissioned blockchain
FG2	Private permissioned blockchain
FG3	Public permissioned blockchain

Source: Author’s Construct

In Table 4.12, the data presented from the Focus Group dialogues and the Blockchain Decision Flowchart Conditions do not conclusively indicate a unanimous preference for a particular Blockchain architecture, Public Permissioned or Private Permissioned. Nevertheless, examining the stipulated conditions alongside certain suppositions makes it feasible to deliberate on plausible reasons for each focus group's inclination towards a distinct architecture. The limitations of the data are explained by the focus of the tables on the general requirements of Blockchain implementation and its failure to choose a specific architecture. Further, the fact that little is available as per the discussions of the Focus Groups is a hindrance in verifying what their specific requirements and preferences are. Such imprecision problematizes the task of inferring conclusive architectural decision makings out of the information that is known.

Within the context of blockchain architecture choice, many reasons can be assumed depending on the needs and limitations of the entities. As an example, the first focus group, operating in Public Permissioned structure, indicates that several parties should be able to record data. It is based on the assumption that although it is necessary to control the institutions that may add data, it is also possible to be too reluctant to rely on one, centralised information source. In turn, a Public Permissioned Blockchain platform might become the solution as it may provide certain institutions, e.g., academic or governmental ones, with the rights to authoritatively record data, but leave the information transparent on a public blockchain, thereby making it accessible.

The second faction, the supporters of a Private Permissioned form of structure, also emphasizes the need to have several data contributors. The attitude of this group towards dependency on a trusted third party is however split. The lack of clear data about either the identity or credibility of the contributors makes the Public Permissioned the less feasible model. A Private Permissioned Blockchain could be more suitable in this case, especially when the group is more concerned with a more closed network, access that is closely controlled and restricted to groups that are well-known and trusted parties within a matching educational consortium or network.

The third focus group view is similar to the former as it makes numerous contributors and the possible benefits of decentralisation. The tendency of this group towards a Public Permissioned Blockchain may be explicable in case transparency and the overall access to diverse stakeholders, including the prospective employers intending to confirm the qualifications, will necessitate the system, which will go beyond a limited network.

It is important to agree that these reasons are conditional and based on a small amount of data. The ultimate selection of a blockchain architecture would also be influenced by additional considerations such as the scalability of the system, adherence to regulatory standards, and the particular necessities of the value chain involved. Therefore, while the aforementioned justifications provide a foundational understanding, they should be considered part of a broader deliberation process considering a comprehensive range of factors.

The data obtained from the focus group discussions in this study reveal a rather detailed context in which the concept of blockchain technology could be implemented in tertiary education systems. The main drivers driving this adoption are hinged on the requirement for openness, security and immutability in the records management. Moreover, the possibility of reorganisations in the administrative sphere and enhancing the educational service provision chain is realised. The range of participants contributing to this continuum is the students, teachers, heads of institutions, and outside service providers, who all participate in the processes that define the dynamics of technology implementation. The juncture at which adoption becomes feasible is contingent upon a confluence of factors: the level of innovation of the technology involved, the propensity of the culture to accept such innovations and the prevalent statutes of regulation. All in all, depending on the specific requisites and make-shift goals of the particular academic institution, the pragmatic application of the variant of blockchain technology–a public ledger, a privately owned network, or the consortium-based model – will be deployed.

4.4 Conclusion

This chapter presented the empirical findings derived from the focus group discussions, synthesising the perspectives of higher education actors to determine the contextual readiness and driving forces behind blockchain adoption. The analysis revealed that the adoption of blockchain in higher education is not only a technological question but also a systemic transformation shaped by social, institutional, and philosophical dimensions.

Across the focus groups, students and management consistently emerged as the pivotal actors influencing blockchain adoption within the value chain. Their convergence across functional areas, including development and access, search and discovery, authority, relevance and fulfilment, primary support, and secondary support, highlights where blockchain is most likely to generate institutional value. This convergence demonstrates that blockchain's potential adoption points lie where user needs for transparency, access, and autonomy align with institutional goals of efficiency, compliance, and trust.

The findings also distinguished between technical and non-technical drivers of adoption. Technical drivers, encapsulated under Scenario Properties, were instrumental in determining the type of blockchain suitable for higher education applications. Through the decision flow analysis, the focus groups identified the public-permissioned blockchain as the most appropriate model. This configuration enables secure, verifiable, and transparent record management while maintaining institutional control, a balance essential for academic governance and student data protection.

Non-technical drivers, comprising Philosophical Beliefs, Network Effects, Economic Incentives, and Breaking the Gridlock, underscored the human and organisational motivations behind adoption. These included the desire for decentralisation, enhanced privacy, efficiency improvement, and institutional autonomy. Collectively, they reflect a shift in higher education towards systems that promote accountability, equity, and shared governance, principles resonant with the broader movement toward the democratisation of higher education.

In essence, this chapter established that blockchain's potential value in higher education lies in its ability to synchronise technological capability with institutional purpose. When effectively implemented, blockchain can bridge the trust gap between students and institutions, streamline administrative processes, and enhance transparency across the educational value chain. The identification of a public-permissioned model further reinforces blockchain's suitability as an enabling infrastructure for future academic ecosystems.

The insights gained here form the empirical foundation for Chapter 5, which interprets these findings within the broader theoretical and practical framework of the study. It reflects on how the identified drivers and actor interactions, from literature and empirical investigations, converge into the Higher Education Blockchain Adoption Drivers Framework, offering a tool through which institutions can assess readiness and strategically plan for adoption that supports the democratisation and transformation of higher education.

CHAPTER 5 : DISCUSSION OF FINDINGS.

5.1 Introduction

In this chapter, the data collected in the empirical research regarding blockchain technology's adoption in HE was analysed to determine drivers for uptake, stakeholder categories, and activities encompassing the value chain in HE.

The chapter is formulated in two major parts. Section one responded to research questions one and two by synthesising data confirmed from the literature and focus group discussions. The second part included the author's commentary regarding the study and seeking the findings' real-world support, its contribution, and the issues of ethical nature.

This chapter summarised the specific conditions for blockchain integration in HE, focusing on the key drivers and the types of blockchain systems appropriate to the needs of the value chain in education. In this regard, this analysis became critical for establishing how and at what stage blockchain could further increase the value and efficiency of the HEIs.

In this chapter, the potential identified for blockchain in the process of democratising HE was discussed in relation to how it may be able to reconfigure the politics of governance and engagement within academic organisations.

5.2 Research Question 1: Who are Higher Education Blockchain and Value Chain Actors, and what are their Activities?

5.2.1 Sub-questions 1.1 & 1.3 – Literature and Focus groups Corroborate: Who are the key actors for adoption?

In this section, the actors mentioned in the literature also agreed with the ones identified by the focus groups. The first activity was about distilling the focus group actor results documented in Table 5.1 below. These research findings were then compared, contrasted, and mapped against the literature findings, as shown in Table 5.2. The findings in the literature were recorded in two formats: occurrence and counts of articles to facilitate the evaluation of the articles using the established criteria. Reporting their occurrences enabled disparities between key actors and the rest of the items or articles to be established. The details regarding the actors corroborated in the two sources were quantified into percentages in Table 5.3 below to compare the findings from the literature and the focus group.

In Table 5.1, the differences and similarities between FG1, FG2, and FG3 have come up with patterns that have shown that there were similarities but also different priorities in the academic setting originating from the participants' experiences.

In all three focus groups, lecturers and students were deemed key players, and each group was given a vote of 30. It was a testimony to the fact that students and lecturers seemed to agree with one another as the core of the educational process, and this was because of their roles, which were essentially teaching and learning. Also, the respondents mentioned Management and Administration in FG1 and FG3, with FG2 changing the term slightly to incorporate Governance, Risk and Compliance. Furthermore, the respondents touched on administrative leadership with a score of 30 out of 30. This was evidenced by the respondents' consistency in seeing the need for good governance and efficient management to enhance the institutional performance and firm operationality of colleges.

Table 5.1: Higher Education Value Chain Actor

#	FG1	Points	FG2	Points	FG3	Points
1	Learner/Students	30	Students	30	Students	30
2	Lecturer	30	Lecturer	30	Lecturer	30
3	Management and Administration	17	Governance Risk and Compliance and Administration	30	Management Leadership	30
4			Facilities (infrastructure, Transport, Fleet and Security)	26	Security Service	20
5			Technical Staff - IT Management	30	Technical Staff	20
6	Partners	18	Partner and research partners	19	Industry	15
7			Government	28		
8			Community	30		
9			Procurement	21		
10					Administration student-focused	30

Source: Author’s Construction

However, the relative significance of different roles was highlighted with different focal stress across the four focus groups. For example, Technical Staff was rated as having high importance in FG2 (30) and FG3 (20) but not mentioned in FG1. This variation showed that while some of these groups understood the importance of technical support in maintaining IT infrastructure and technological responsiveness, others either neglected or valued other factors. Similarly, the same two functions elicited substantial discussions in FG2. Moreover, Facilities and Security were mentioned only in FG2, while no participant referred to these roles in either FG1 or FG3; these findings show that the importance of these roles can change depending on certain institutional demands or the ways of perceiving the problem by different focus groups.

Another major demarcation was that Strategic Partners and External Relations were given more focus. FG1 allocated 18 votes to partners, FG2 allocated 19 votes to partners and research partners, and FG3 allocated 15 votes to industry. This variance indicated that even though every group found it essential to develop external partnerships, the kind of partnership, the research, industrial and general external relations were not given the same importance by the groups because of their priorities.

Government and community roles were only discussed in the second focus group, and scores of 28 and 30 were received, respectively, while the other two focus groups did not discuss them. This echoed a possible conflict in how these groups saw the place and participation of government and community in the academia and learning process, with some possibility that some focus groups saw these actors as less involved or peripheral to the core teaching and learning process.

Lastly, Procurement and Administration Student-Focused were identified in FG2 FG3 only and received 21 and 30 votes, respectively. The fact that these roles were present in only one of the three focus groups indicated that the overall concern might not necessarily be widespread across all the institutions and seemed to depend on certain functional issues within the various organisations that were not widespread across the groups involved.

These findings showed the identification of core actors, including students, lecturers, and administration, and they highlighted the differences in other roles within the context of the academic environment. These differences between the focus groups illustrated that it is valuable to triangulate data to understand institutions' needs better. Such practice would co-ordinate the above-mentioned discrete approaches to develop a strategic harmony linking such aspects of practice to the unique environment of the institution to support all the core roles towards improving educational efficiency. This pointed to the fact that there was a need to find a way of balancing the similarities and differences of the actors in terms of their importance in order to arrive at more appropriate and competent decision-making in HE.

5.2.1.1 Mapping Literature Actor Scoring and Focus Group Scoring.

In Table 5.2, the researcher aligned the findings of the focus group and compared and contrasted them with the literature with a view of making meaningful comparisons between the perceptions of practitioners and the theoretical or academic discourse in the literature. This process started with defining the various players in the educational ecosystem as revealed by the two focus groups, which included Students, Lecturers, Management and Technical Staff. For the actors of the play, the focus groups reserved certain voter points allocated according to their importance for the educational environment.

After that, the identified actors were affiliated with their positions within the educational value chain. This mapping was also based on the data regarding the frequency of these actors within the value chain literature as well as the number of works citing each of them. This step showed how often and in what terms these actors were depicted in more general debates over educational processes and their governance.

It then expanded this comparison across the literature focusing on blockchain, identifying how frequently these actors were discussed in relation to blockchain usage in education and the amount of research targeting their part. This comparison was necessary to establish whether the actors that practitioners considered relevant were also important in the emerging field of blockchain in education.

Lastly, the results of the focus group discussions were analysed in relation to published literature that was wider than that used in the previous stage, as well as the quantitative analysis, which included the count of frequency and the number of the released sources, which mentioned every actor, which would provide a general view of the discussed actors' significance explored in the educational research field. To do this, focus group perceptions were compared, confirmed, or denied with a much broader perspective, which is how these actors were perceived in the larger academic community.

This kind of analysis and mapping aimed to establish a broad match and mismatch between practitioner knowledge and viewpoint (focus groups) and abstract or scholarly perception (literature), as illustrated in Table 5.3. In this way, besides signalling which actors were consistently identified as relevant across the various sources and which might have been under- or over-represented in practice and theory, Table 5.3 maps the various actors across the two sets of sources. The complete approach offered in this book was methodical and, in offering the big picture, guided decisions and research concerning the education system and practitioners while addressing the best evidence available from academics.

Table 5.2: Blockchain Driver Theme

#	Focus Groups Actors	Actor voter points	Value Chain	Occurrences	No of Studies	Blockchain	Occurrences	No of Studies	Literature Actor	Occurrences	Number of studies
1	Students	90	Student	1203	27	Student	575	24	Student	1778	51
2	Lecturer	90	Lecturer	198	8	teacher	66	11	Lecturer	264	19
3	Governance Risk and Compliance and Administration/ Management	77	Management	479	33	Management	276	23	Management	755	56
4	Facilities (infrastructure, Transport, Fleet and Security)	46	Administration	62	16	Administration	71	9	Administration	133	25
5	Technical Staff - IT Management	50	ICT Infrastructure	27	4	IT Personnel	17	6	ICT Infrastructure	44	10

#	Focus Groups Actors	Actor voter points	Value Chain	Occurrences	No of Studies	Blockchain	Occurrences	No of Studies	Literature Actor	Occurrences	Number of studies
6	Partner, Industry and research partners	52	Industry	461	21	Industry	6	5	Industry	467	26
7	Government	28	Government	180	21	Government	9	7	Government	189	28
8	Community	30	Community	61	21	Community	1	1	Community	62	22
9	Procurement	21	Procurement	3	2	Procurement	0	0	Procurement	3	2
10	Student Support	30	Student Support	2	2	Student Support	0	0	Student Support	2	2

Literature Actors Composite Score Calculation

1778 * 51 = 90,678

264 * 19 = 5,016

755 * 56 = 42,280

133 * 25 = 3,325

44 * 10 = 440

467 * 26 = 12,142

189 * 28 = 5,292

62 * 22 = 1,364

3 * 2 = 6

2 * 2 = 4

Corroboration was extremely helpful in ensuring agreement of the many unique views in the academic environment. In comparing actor vote points with the literary mappings of both blockchain and the value chain, it became evident that while there was an overlap in the ranking of importance, there were also discrepancies in different actors. For instance, students were overemphasised in both perspectives; The literature provided them with a 56.48% importance vote, while the focus group vote point for them was 17.51%. This meant that students were recognised as central players, though the literature assigned much more importance to the aspect. Likewise, governance, risk, compliance, and administration/management were recognised in both views; the literature devoted 26.34% to these compared with 14.98% in the focus groups. This paper needed to perform comparative analyses in order to capture the areas of agreement and disagreement with subsequent potential for strategic practice formation in HE.

The substantial realist philosophical orientation, which established the position that structures and mechanisms of social existence are objectively present, offered the conceptualisation of these differences. From this viewpoint, the divergences between focus group results and literature findings, including the latter's higher appreciation of students and governance systems, involved a spectrum of recognition of these latent structures within academia. The realist sampling approach applied in this work extended the probe into these structures to know why some actors, like the students and the governance bodies, are often reflected. In contrast, other actors like the lecturers (3. 12% in the literature review versus 17. 51% in focus groups) and the technical staff (0. 27% in the literature review versus 9. 73 in focus groups) were less featured.

Moreover, the use of the realist perspective highlighted the veracity of these varying perceptions and confirmed that theoretical and practical knowledge were real occurrences in the academic environment. The gaps that were pointed out, which included Community Roles in the literature, were estimated to be only 0. 85%, while in the focus group, they valued them at 5. 84%, and even student support, which was given 0. 002% in the literature, would be valued at 5.84% in the focus group. This demonstrated the importance of taking an integrated approach that considers both the big picture at the strategy level and the hard, pragmatic level. It demonstrated that by incorporating these perspectives, theoretical models used by institutions would be more in line with practical implementations of innovations such as blockchain in higher education, resulting in better-informed decisions.

Thus, in this regard, based on the activities derived from the literature, mapping the actors to the value chain, which is presented in Table 5.3, enables us to identify particular areas within the value chain that have the greatest potential for the application of blockchain in HE. Specifically, by learning more about how these actors relate to particular value chain activities, one is better placed to determine where blockchain technology can be applied to optimise value in the academic setting. This alignment is important in focusing efforts towards blockchain initiatives with the most potential for transformational impact, particularly in the areas where this is likely to be the greatest. Finally, corroboration, with reference to a vast realism of integration, guarantees the appropriateness of the combination of blockchain and other advancements in the educational field in theoretical and practical aspects.

Table 5.3: Blockchain Driver Theme

#	Focus Groups Actors	Actor vote points	Literature Blockchain & Value Chain Actors	Percentage Literature
1	Students	17.51%	Students	56.48%
3	Governance Risk and Compliance and Administration/Management	14.98%	Governance Risk and Compliance and Administration/Management	26.34%
6	Partner, Industry and research partners	10.12%	Partner, Industry and research partners	7.56%
7	Government	5.45%	Government	3.30%
2	Lecturer	17.51%	Lecturer	3.12%
4	Facilities (infrastructure, Transport, Fleet and Security)	8.95%	Facilities (infrastructure, Transport, Fleet and Security)	2.07%
8	Community	5.84%	Community	0.85%
5	Technical Staff - IT Management	9.73%	Technical Staff - IT Management	0.27%
9	Procurement	4.09%	Procurement	0.004%
10	Student Support	5.84%	Student Support	0.002%

5.2.2 Sub-question 1.3 & 1.4 – Literature and Focus groups Corroborate: What are the key actors' activities for adoption?

In Table 5.4, the delineation of FG1, FG2, and FG3 elucidates the diverse and critical roles within the educational ecosystem, providing a comprehensive view of the functional domains that drive the institution's success.

Table 5.4: FG 1.3 Value chain activities in HE tables - in order of importance.

Value Chain Activity	***Description***	***FG1***	***FG2***	***FG3***
Creation & Selection	Conceptualisation of educational content, topic, and specialist selection	Senior Lecturers and Coordinators: Involved in curriculum development and course content selection.	Media Studies Lecturer: Involved in creating and selecting course content, especially in media and law, which is central to the educational offerings and curriculum development.	Program Coordinators (e.g., in graphic design) may interact with students during the curriculum development process. Curriculum designers should consider student needs and feedback when creating course content.
Development & Access	Creation and refinement of educational platforms and materials	IT Support and Maintenance: Ensuring technology infrastructure is in place for educational content delivery and access.	Technical Support: Responsible for the development of technical infrastructure, ensuring that students and faculty have access to necessary technological resources.	Educational Technologists may work on tools and platforms that students use for learning. Trainers, including those for library staff, would directly or indirectly support student learning and research capabilities. Senior Lecturers and other faculty members are directly involved in the educational development of students.
Aggregation	Compilation and integration of content for market and institutional needs	Administrative Staff: Aggregating necessary resources and support for academic and administrative functions.	Media and Communications: This role involves aggregating news, information, and communications within the institution and its interactions with external stakeholders.	curriculum designer
Search & Discovery	Enhancement of content discoverability and visibility	Students and Lecturers: Engaged in research and discovery within their fields of study.	While not explicitly mentioned, roles that typically involve aiding in search and discovery, such as librarians or academic researchers, could be inferred.	Librarians support students in finding research materials and navigating library resources. Professors may guide students in discovering relevant academic fields and research topics.
Authority & Relevance Fulfilment	Maintenance of content's authority, relevance, and educational standards	Quality Management and Assurance Teams: Ensuring academic standards and relevance of educational offerings.	Risk and Governance Personnel: Overseeing risk management across various domains, such as financial and technical, ensuring that institutional activities remain compliant and relevant to regulations and standards.	Senior Lecturers and Town Planners establish authoritative content and relevant applications of knowledge that students rely upon for their academic and professional development.
Secondary Support Services	Additional support services that are not directly involved in the	Support Staff (lab assistants, technicians): Providing necessary technical support for academic activities. Management Personnel: Overseeing the operational aspects of the institution.	Management: Providing necessary organisational and administrative support to facilitate the institution's operations.	Security personnel ensure a safe learning environment for students. Administrative roles, such as registration and finance, deal directly with student-related administrative tasks.

Value Chain Activity	Description	FG1	FG2	FG3
	primary educational process.		i.e. Private insurance company Council Member: Acting as a partner to the institution, providing external oversight, financial support, or strategic guidance.	
Primary Support Services	Responsible for supporting the core educational services.	Technology management; Network and Relationship Management; Content development and management; procurement management; Author; Academic institution Administration	Not referred to by Focus Group 2.	Technology management; Network and Relationship Management; Content development and management; procurement management; Author; Academic institution Administration

In the area of Technology Management, the research highlights roles such as IT Support, Maintenance, Technical Support, and Educational Technology Specialists. These positions are crucial for maintaining technological infrastructure, developing educational platforms, and ensuring accessibility for both students and educators (Chen et al., 2022). The stewardship of technology is foundational in enabling access to educational resources and facilitating seamless learning experiences, as efficient technology management is key to optimising the pedagogical journey (Zhao *et al*., 2021).

In terms of Network and Relationship Management, roles such as librarians, media and communication liaisons, and the involvement of private companies as Council Members signify the importance of cultivating both internal and external partnerships (Wang *et al*., 2023). Such roles are valuable for discovering new resources and external collaborations that can enrich the institution. Orchestration of networks is highly important for building a collaborative educational environment and securing valuable external resources for the institution.

Regarding Content Development and Management, the research highlights the role of Senior Lecturers, Media Studies Educators, Programme Coordinators, and Educational Technology Experts. They are involved in creating, curating, and enriching academic content for different disciplines ranging from media studies to law (Xie *et al*., 2023). Including curriculum designers also speaks to the fact that educational input has been tailored to address the needs of students based on feedback. Good and effective content development would thus speak to relevant and high-quality academic offerings aligned with education standards and expectations from learners.

With respect to procurement management, specific roles are not named in this regard; however, the likelihood is that such activities are undertaken by administrative staff. There is no direct mention, but most likely, procurement activities support the essential requirements of tools and resources necessary for educational delivery.

Regarding the role of authorship, the research points out that senior lecturers, town planners, and media studies lecturers significantly contribute to content generation. This testifies to the huge support of academic faculty in developing the academic material, reiterating the importance of subject-matter experts as they prepare authoritative and relevant content to meet curricular demands (Zhang, 2020).

The study also expanded the understanding of academic institution administration by providing definitions for quality management and assurance teams, risk and governance personnel, and administrative staff registered and responsible for finances. These roles were crucial in maintaining academic standards, managing institutional processes and being responsive to the relevant regulatory requirements (Chen et al., 2022). This was critical to sustaining quality education and the ongoing operation of the institution, as it was indicated that sound administrative structures were required to achieve the university's objectives.

5.2.3 Dichotomy of Blockchain Democratisation and the Actor Corroboration

The confirmation of only two actor groups in the value chain – students and the management – highlighted an important issue of exclusion of other important actors in the process of higher learning. It was, therefore, important to design an engagement mechanism encompassing a wider participation of faculty, administrative staff, policymakers, technologists, and key partners, including industry. The primary focus on students and management may discourage other participants from contributing and sharing their perceptions, ideas, and experiences despite all these people being the stakeholders actively involved in the educational process (Zhao et al., 2021). This exclusion could result in the development of strategic plans and decisions which are not balanced in terms of the full and proper development of the HEIs.

For instance, students/management sketched potential and useful perspectives, but they could not cover the requirements of the operation, pedagogy, and technicalities to improve learning processes. Faculty, as the group which deals with students in terms of teaching-learning and research activities, offered valuable information regarding their requirements. Teachers and educational support specialists are at the forefront of adopting an innovation that requires digital enhancement of learning materials; administrative personnel and members of the university community, such as experienced industry personnel, guarantee that the curricula developed and the technologies recommended match curriculum expectations and industry needs, respectively (Wang et al., 2023). Thus, institutions could bring together these groups in order to close the gap between educational goals on the one hand and realities of the labour market on the other.

These findings helped highlight the use of consultation strategies that involved more key areas within value chains so that an extensive combination of stakeholders' opinions could be included in creating and improving HE systems (Xie et al., 2023). A more equitable approach did not only decentralise or partial decision making but also accessibility and applicability of educational procedures. Diversity promoted more partnership, improving curriculum delivery, technology selection and management, and governance. For instance, blockchain integration can support establishing more democratic governance models in which all participants within a particular value chain axis can contribute equally.

Applying such models opened up possible means within institutions to produce a responsive value chain that is more sensitive to the various needs of the various players. This corresponded to the general trend towards digital democracy, which implied decentralisation of decision-making mechanisms and the enhancement of citizens' voices. Finally, the study proposed that HE institutions broaden the scope of interest and include not only students and management but all the players involved in the education process (Zhang & Zhang, 2021).

5.3 Research Question 2: Under what circumstances do the drivers drive the adoption of blockchain in HE? (Empirical – facts observed).

5.3.1 Sub-question 2.1 – Literature and Focus Groups Corroborate: What are the key drivers for adoption?

These potential benefits aligned with the study done by Molopa and Cronje (2024), which establishes transparency, trust, blockchain applications, and enhancement as the drivers towards the adoption of Blockchain in HE. Their investigation focused on the fact that these drivers were essential for integrating blockchain within the sector and that blockchain may revolutionise the means through which HEIs operate and the value they deliver to their various stakeholders. In this respect, as highlighted in Figure 5.1, the 'trust', 'proof', 'blockchain applications', and 'enhancements' were explored as the driver elements that had higher relevance scores than 'use'. This signified that apart from 'proof,' which is directly associated with blockchain, as shown, has a direct connection with the HE value chain, denoted by 'HE', as well as a chance to increase the relevance of the key drivers.

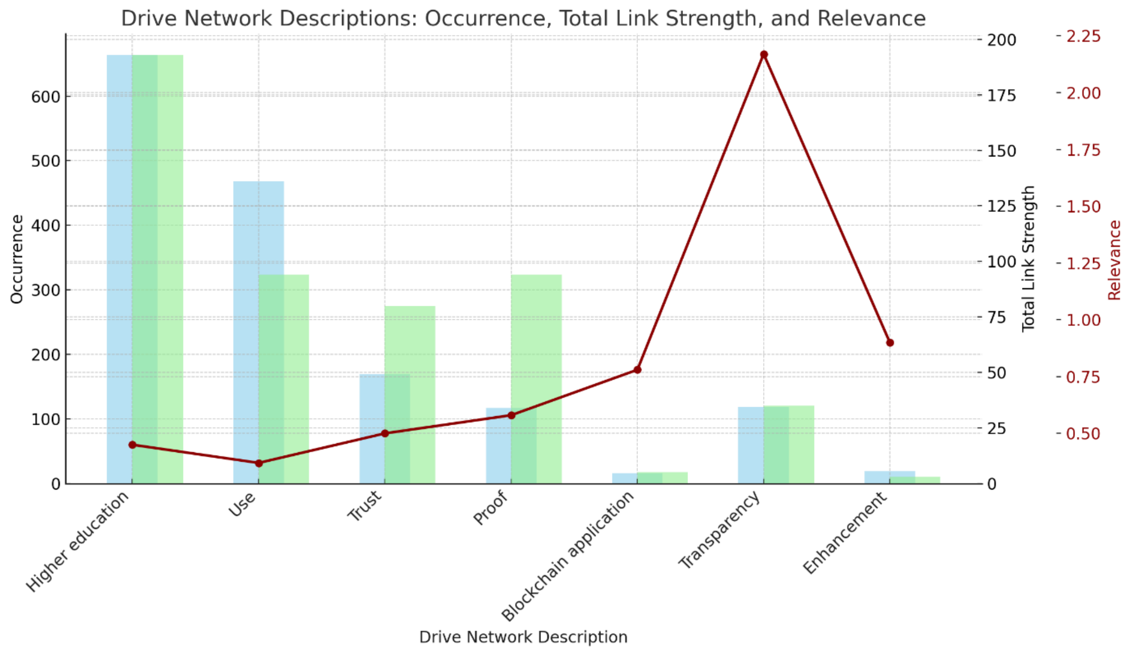


Figure 5.1: Driver Network Description: Occurrence, Total Link Strength, and Relevance.

5.3.1.1 Focus Group 1.3 Variance Score of Driver Elements

Table 5.5 ranks various driver elements under categories such as *Philosophical Beliefs*, *Economic Incentives*, *Breaking the Gridlock*, and *Network Effect* based on their variance. Variance in this context indicates the degree of difference or variability in responses or importance assigned to these driver elements by participants.

Table 5.5: Variance score of driver elements

#	Driver	Driver Element	Variance
1	Philosophical Belief	Decentralisation needs	5.333333
2	Economic Incentives	Process improvement	4
3	Economic Incentives	Charging for platform	2.333333
4	Economic Incentives	Fear of missing out (FOMO)	1.333333
5	Economic Incentives	Alternative system	1
6	Economic Incentives	Selling consultancy	1

#	Driver	Driver Element	Variance
7	Breaking the Gridlock	Organisational push	1
8	Philosophical Belief	Technology push	0.333333
9	Philosophical Belief	Will not use Trusted Third Party	0.333333
10	Philosophical Belief	Political reasons	0.333333
11	Network Effect	Curiosity	0.333333
12	Economic Incentives	Alternative investment	0.333333
13	Economic Incentives	Selling mining equipment	0.333333
14	Breaking the Gridlock	Third-party transfer	0.333333
15	Philosophical Belief	Enhanced privacy	0
16	Network Effect	Driven by community	0
17	Network Effect	Cool to use	0
18	Economic Incentives	Marketing product	0

5.3.1.2 High Variance Drivers

Looking at the high-variance drivers, values under Philosophical Beliefs were identified to have the highest variance by having an OV of 5.33, which pointed out loopholes in how the participants understood the need for decentralisation in the blockchain for HE. It was evident that some participants considered decentralisation a key concept while others did not place much importance on it, hence different perspectives or poor appreciation of decentralisation (Turkanović et al., 2018). This high variance indicated that decentralisation was a contentious topic; some people are either for or against it or are simply not well informed. This suggests that people must be educated or informed on the advantages and disadvantages of decentralisation in higher learning institutions (Capetillo et al., 2022).

Another high-variance driver was Process improvement under Economic Incentives, wherein the variance was 4, which suggests that participants had divergence in terms of the contribution of blockchain in improving various processes in educational institutions.

This suggested that while some stakeholders perceived very high levels of process reformation, particularly using blockchain, others were less optimistic or unsure of blockchain's ability (Guo et al., 2021). “Platform monetisation” under Economic Incentives (Variance= 2.33) also had moderate variances and highlighted variability in the opinions on the possibility or the morality of charging for blockchain platforms in higher learning institutions. The first is the preference for freemium, where some of the participants suggested that they should start charging for the blockchain services while others worried about either the issue of accessibility or the issue of commercialisation of educational resources (Li & Han, 2019).

On the other hand, several driver elements had no variation; for instance, Philosophical Belief: E-Privacy was unchanged at 100%, Network Effect: Driven by community and Cool to use, and Economic Incentives: Marketing product (Variance = 0). With this lack of volatility, it was possible to deduce that participants understood the relevance or irrelevance of several of these components or arrived at a general consensus regarding the roles provided by this technology in adopting blockchain or its significance (Prinz et al., 2020). For example, participants perceived enhanced privacy as one of the major benefits of blockchain, reflecting the consensus within the community about its developmental nature (Turkanović et al., 2018).

Minimal variance was observed in drivers such as "Technology push," "Will not use Trusted Third Party," "Political reasons," "Curiosity," "Alternative investment," "Selling mining equipment," and "Third-party transfer" (Variance = 0.33). The very short variance implied a general agreement among the participants, with a very small variance of opinion. Some considered the elements quite important, if not critical, or had a sufficiently similar understanding of their roles in the blockchain ecosystem (Capetillo et al., 2022). The very little variance may indicate a mature understanding of these facets, where participants were largely seen as aligned yet acknowledged some nuances. For instance, the small difference in "Technology push" could have stemmed from different views on the pace at which one should or could push the adoption of blockchain technology into education or its maturity for teaching and learning (Guo et al., 2021).

This section shows how successful blockchain adoption in HE will require effectively leveraging crucial driver elements such as decentralisation, process improvement and enhanced privacy. Such online identification of focus group views of key drivers on the adoption of blockchain in HE will also lead to actual identification of the circumstances where blockchain will be embraced in HE. Addressing the challenges of these drivers and presenting the potential benefits can lead to institutions building a stronger rationale for adopting blockchain.

As this portion of the paper indicates and elaborates, decentralisation, process improvement, and enhanced privacy are some of the critical drivers whose effective leveraging would lead to the successful adoption of blockchain in HE. In this way, the research will support the assumptions about focus group assessments regarding the most important drivers of blockchain adoption by HEIs and will make it possible to determine the conditions for adopting blockchain in HE. Thus, by acknowledging the problems related to these drivers and furthering the prospects of blockchain applications, institutions can form a more convincing narrative for the implementation of blockchain solutions.

5.3.2 Sub-question 2.2 – Literature and Focus Group Corroborated: What type of blockchain does the HE value chain require?

5.3.2.1 Literature Type of HE blockchain

Permissionless blockchain, as the most important type, achieved the highest composite score of 3.150. This was in line with other research on the usefulness of combining scores from such indicators as relevance and link strength as a way of capturing the relative importance of items within a given network. In bibliometric studies, combining multiple indexes, such as citations and relevance, was used to determine areas of emphasis using composite scores (van Eck & Waltman, 2010).

$$CS = \frac{Occurrence \times Relevance}{Total\ link\ strength}$$

$$CS_{Permissioned} = \frac{54 \times 0.66}{40} = 0.891$$

$$CS_{Private} = \frac{42 \times 0.75}{13} = 2.423$$

$$CS_{Public} = \frac{43 \times 0.77}{11} = 3.010$$

$$CS_{Permissionless} = \frac{19 \times 0.90}{3} = 3.150$$

Applying this method to blockchain types, as presented in Table 5.6, Permissionless blockchain received the highest total index, although it has fewer occurrences or links compared to other types; however, since it has higher link strength compared to its frequency, it is viewed as comparatively more important in the entire picture. The importance of the Permissionless blockchain can be further emphasised by normalising it for visibility and connections and having a considerably bigger worth. After the Permissionless blockchain, the importance of Public and Private is detected, while the importance of Permissioned is the lowest. In this analysis, the Permissionless blockchain stands out in the studied context, which is consistent with the hypothesis that higher centrality within a VOSviewer network diagram is expected to impact on the magnitude towards the middle of the diagram (Molopa & Cronjé, 2024).

Table 5.6: Type of Higher Education Blockchain

Focus Group	***Type of blockchain selected***
FG1	Public permissioned blockchain
FG2	Private permissioned blockchain
FG3	Public permissioned blockchain

The support and replication of the results of this study with reference to both the literature and focus groups indicated that the adoption of blockchain requires the combination of different methods in order to provide a more accurate understanding of the phenomenon. By matching the focus group preferences with the detail of the composite scores evidenced in the literature, a deeper understanding of the drivers of types of blockchain choice in several scenarios was obtained. As van Eck and Waltman (2010) claimed, combining multiple measures ensured the overall improvement of evaluation reliability that directly affected the results and conclusions. Specifically, this was true while examining the several types of blockchains mentioned in the literature and as discussed in the focus groups.

The study found that Permissionless blockchain recorded the highest composite score (3. 150) in the literature, showing high importance in the field, though it has been discussed fewer occurrences or links than other types of blockchain. However, if the comparative analysis of the two sets of specific composite scores were made, there would be a different orientation. In particular, the sum of the composite scores for Public Permissioned blockchain (3. 010) and Permissioned blockchain (0. 891) equaled 3. 901. This combined score was much greater than the Private Permissioned blockchain (2. 423) and Permissioned blockchain (0. 891) totals of 3. 314.

This calculation proved that when made with an identical comparison, the literature preference for Public Permissioned blockchain aligned with the choices made by the focus group. In line with the higher combined composite score of D1 and D3, both FG1 and FG3 prefer a Public Permissioned blockchain about this framework for scenarios where both transparency as well as security are important (Zheng et al., 2018; Pilkington & Marc, 2016).

The concurrence between the high composite score of the Public Permissioned blockchain and the focus groups' preference established the applied utility of this type of blockchain. Although Permissionless blockchain was theoretically meaningful in more extensive, multiple-aspect, composite-score analysis, comparing the combined scores and the focus group members' preferences proposed that Public Permissioned blockchain is a more balanced solution in certain educational settings. This has served as a solution to the issues of controlled access, and at the same time, it should be made public and verifiable, which were key issues for consideration in higher learning institutions (Tapscott & Tapscott, 2016; Swan, 2017).

Together with the literature review results that were represented by the scores in the composite variables, the focus group findings pointed to the need to fit the blockchain solutions in accordance with the characteristic features of applications in various fields. This way, the analysis ensured that the identified blockchain architecture was practical and met the needs highlighted by focus groups and theoretical models as important for implementing blockchain in HE (Franco, 2014).

5.4 Empirical Corroboration

The study attempts to extract a whole spectrum of data to generate confidence that the hypothesised Higher Education Value chain Blockchain mechanisms, contexts, causality and outcomes are an approximate reality, as advised by (Wynn & Williams, 2012). The corroboration process applied during the focus group and the follow-up study sample involves the evaluation of the extent to which the causal explanation holds across multiple stakeholders (Hu, 2018). Furthermore, triangulations and descriptive quantitative analysis of the follow-up survey serve as respondent corroboration.

5.5 Outcomes and Value.

The study's findings shed light on the complexities of technical and non-technical drivers existing in HEIs in relation to the adoption of blockchain technologies. They create a clearer perception of how blockchain might democratise the making and distribution of value in this sector. This research is relevant as it adds to the developing corpus of knowledge surrounding the nuanced and contextual qualifications with which blockchain may be useful in HE (Zhao et al., 2021). In this context, the model of the Blockchain Adoption Drivers is used to illustrate how blockchain technology could potentially implement itself in an ecosystem for HE. In addition, identifying the technical and non-technical drivers adds value to the literature on the core factors affecting the adoption of blockchain technology in this domain (Kamble et al., 2018).

Ongoing investigations into blockchain technologies promise to usher in a new epoch in the capability of institutions of higher learning to rethink the implementation and delivery of value chain activities, especially participatory decision-making processes propelled towards a digital democracy. This research intervenes in making value chain actors' understanding clearer of the drivers of blockchain adoption and factors boosting participatory democracy in HE in technology administration (Xie et al., 2023). Institutions could develop better governance models by focusing on such drivers and boosting student and faculty participation in decision-making models for more transparent and equitable systems.

Students are actively involved in various educational activities, especially in areas such as platform development and access, as well as research and discovery. Students benefit from creating and continuously refining educational resources and digital platforms in the development and access phase. Educational technologists and IT support teams are critical in maintaining and improving these platforms, ensuring students have seamless access to the tools and technologies required for their learning experience (Chen et al., 2022). Furthermore, students engage in research and discovery activities with the guidance of lecturers and librarians, who play a pivotal role in helping them navigate academic resources and discover relevant materials for their studies (Zhang & Zhang, 2021).

Management activities are focused on maintaining the institution's educational standards and supporting core and secondary educational services. Regarding authority and relevance fulfilment, management personnel, including quality management and risk governance teams, work to ensure that the institution’s offerings are academically rigorous and aligned with professional standards. They oversee primary support services, such as technology management, content development, procurement, and overall administration, which are important for the institution's operational efficiency. Furthermore, management is also responsible for secondary support services, which include providing technical and operational support, ensuring a safe learning environment, and managing administrative functions that indirectly contribute to the institution's educational mission.

5.5.1 The Relationship between Blockchain Adoption Key Drivers and Technology Adoption Theory elements

The key drivers of blockchain provides valuable insights into the contexts and conditions under which blockchain technology might be adopted in higher education. By examining these drivers, we gain a clearer understanding of the factors that shape its integration and impact. Table 5.7 highlights the potential value creation nodes, offering a structured view of how blockchain adoption can lead to measurable outputs and outcomes, ultimately enhancing its strategic implementation within the education sector.

Table 5.7: Blockchain Adoption Key Drivers

Driver	Description	Use Requirements	Technological Capability	Usage of Technology
Technical Drivers				
Proof	Mechanisms to verify and validate data within the blockchain.	High accuracy, reliability, and security requirements	Advanced cryptographic algorithms and consensus methods	Used for credential verification and validation processes.
Blockchain application	Specific uses of blockchain in various applications within HE.	Application-specific requirements	Customisable smart contracts, APIs, and integrations	Used for credentialing, record-keeping, and transaction logging.
Enhancement	Technical improvements and advancements to the blockchain system.	Scalability, efficiency, and performance improvements	Enhanced protocols, improved network infrastructure	Applied in system upgrades and performance optimisation.
Non-Technical Drivers				

Driver	Description	Use Requirements	Technological Capability	Usage of Technology
Trust	Confidence and reliability in the blockchain system by users and stakeholders.	High trust and reliability	Transparent processes, robust security measures	Promotes user adoption and engagement with the blockchain.
Transparency	Openness and visibility of blockchain processes and data, ensuring clear and accessible information.	Full disclosure and accountability	Visible and auditable transaction logs	Ensures accountability and fosters trust among stakeholders.

Source: Author's Construct

In Table 5.8, the drivers identified in the literature, Trust, Proof, Blockchain Applications, Transparency, and Enhancement, are aligned with the elements of the Blockchain Adoption Model, specifically highlighted in the driver element column (shaded in peach). These elements provide a framework for understanding the adoption of blockchain technology within various contexts.

The "Driver Scenario Properties," identified through the Scenario Properties Decision Flow Chart shaded in yellow in Table 5.9, serve as a technical evaluation (shaded in yellow) of the necessity for blockchain implementation. The type of blockchain selected is inherently linked to Trust, Transparency, and Proof, which are integral to the technology's structure. The three driver elements, Trust, Transparency and Proof, correspond directly with the Blockchain Adoption Model's scenario properties, specifically "Cannot use Trusted Third Party," "Writers Untrusted," and "Public Verifiability," respectively. Additionally, Trust is a corroborating non-technical driver element (shaded in green) associated with the broader driver of "Philosophical Beliefs."

In the Scenario Properties Decision Flow Chart (Figure 2.9), the decision-making process is validated through a combination of literature review and focus group discussions, which consistently support the selection of a public permissioned blockchain via the "Public Verifiability" criterion. This selection process demonstrates reliability, grounded in the consistency between the literature, focus group choices, and the Scenario Properties Decision Flow Chart methodology used in this investigation.

Moreover, the driver element "Will Not Use Trusted Third Party" is further supported by the "Philosophical Beliefs" driver, which aligns with "Blockchain Applications" through the driver element "Alternative System" Additionally, the adoption driver "Economic Incentives" corroborates with "Enhancements" through the driver element "Process Improvement." These connections highlight blockchain adoption's multifaceted nature, integrating technical and non-technical considerations.

Table 5.8: Literature, Focus Group Corroboration

#	Drivers	Driver Elements
1	Scenario Properties (Figure 2.9).	Storing state
		Multiple writers
		Cannot use Trusted Third Party (Trust)
		Writers' unknown
		Writers untrusted (Trust)
		Public verifiability (transparency, Proof)
2	Philosophical beliefs	Will not use Trusted Third Party (Trust)
		Decentralisation needs
		Enhanced privacy
		Alternative system (Blockchain Applications)
		Political reasons
		Technology push
3	Network Effect	Driven by community
		Curiosity
		Cool to use
4	Economic incentives	Marketing product
		Selling mining equipment
		Selling consultancy
		Charging for platform
		FOMO
		Alternative investment
		Process improvement (Enhancement)
5	Breaking the gridlock	Organisational push
		Third-party transfer

Source: Author's Construct

In Table 5.9, elements of the value chain model are integrated into the mapping of corroborating actors, thereby enabling the identification of specific circumstances where blockchain adoption can be accelerated based on actor activities. Table 5.4 maps the value chain circumstances where students and management will most likely adopt blockchain technology, identified as Grid Intersection Data (GID) Convergence Points.

From Table 5.4, student actors are associated with the value chain element "Development & Access" and “Search and Discovery” activities. Concurrently, management is linked with "Primary Support," "Secondary Support," and "Authority Relevance Fulfilment."

Within the scenario properties, the driver elements "Cannot Use Trusted Third Party," "Writers Untrusted," and "Public Verifiability" are mapped to both students and management, reflecting the activities identified by focus groups in Table 5.9. Additionally, the driver "Philosophical Beliefs" is mapped to the corroborating actors through the elements "Will Not Use Trusted Third Party" and "Alternative System." Finally, the driver "Economic Incentive" is also mapped through “process improvement”, which is linked to “enhancement” in this context, highlighting its relevance in promoting blockchain adoption.

To this end, the study recommends demonstrating the potential application of the Blockchain Technology Adoption Drivers model to democratise the HE value chain by focusing on key actors, specifically students and management. The value chain activities associated with these actors include students' involvement in "Development and Access" and "Search and Discovery," as well as management activities categorised under "Authority and Relevance Fulfilment," "Primary Support Services," and "Secondary Support Services."

The study further identifies the circumstances under which blockchain can be adopted to democratise HE, particularly through implementing a public permissioned blockchain. This adoption is driven by "Philosophical Beliefs" and "Economic Incentives" within the value chain’s "Development & Access" and "Search and Discovery" for students, as well as within "Primary Support," "Secondary Support," and "Authority Relevance Fulfilment" for management. Additionally, Table 5.9 highlights the specific areas within the value chain where blockchain adoption holds the highest potential for impact.

Table 5.9: Higher Education Blockchain Adoption Drivers Framework

#	Drivers	Driver Elements	Creation Selection Smart Contracts	Development & Access	Aggregation	Search & Discovery	Authority Relevance Fulfilment Performance Value	Secondary Support	Primary Support
1	Scenario Properties	Storing state							
		Multiple writers							
		Cannot use Trusted Third Party (Trust)		Student		Student	management	management	management
		Writers' unknown							
		Writers untrusted (Trust)		Student		Student	management	management	management
		Public verifiability (Transparency, Proof)							
		Will not use Trusted Third Party (Trust)		Student		Student	management	management	management
2	Philosophical beliefs	Decentralisation needs							
		Enhanced privacy							
		Alternative system (Blockchain Applications)		Student		Student	management	management	management
		Political reasons							
		Technology push							
3	Network Effect	Driven by community							
		Curiosity							
		Cool to use							
4	Economic incentives	Marketing product							
		Selling mining equipment							
		Selling consultancy							
		Charging for platform							
		FOMO							
		Alternative investment							
		Process improvement (Enhancement)		Student		Student	management	management	management
5	Breaking the gridlock	Organisational push							
		Third-party transfer							

Source: Author's Construct

Table 5.9 outlines the drivers along with their descriptions and the corresponding use requirements, technological capabilities, and usage of technology.

5.6 Delineation (Transferability)

The Blockchain Adoption Drivers model has been used and exemplified extensively in HE. The proposed study describes the applicability of the adoption drivers to HE, and it portrays how the implementation process of the blockchain adoption drivers can be democratised conceptually and in practice.

5.7 Conclusion

This chapter demonstrated a strong corroboration between the findings from the literature and those obtained from the empirical data, thereby validating the proposed Higher Education Blockchain Adoption Drivers Framework. It further showed how the framework can be practically applied as a diagnostic tool to identify where, within the higher education value chain, blockchain adoption holds the greatest potential. The framework also helps determine which blockchain drivers are most likely to influence adoption readiness.

Overall, the Higher Education Blockchain Adoption Drivers Framework is based on the x-axis representing the value chain and the y-axis representing blockchain. The higher education value chain was mapped along the x-axis, including the stages of Creation and Selection, Development and Access, Aggregation, Search and Discovery, (Authority, Relevance, and Fulfilment), Secondary Support, Primary Support, and Performance Value. Correspondingly, the y-axis of the framework represents the blockchain adoption drivers: Scenario Properties, Philosophical Beliefs, Network Effects, Economic Incentives, and Breaking the Gridlock.

The synthesis of empirical and theoretical findings revealed that students and management are the two most influential actors shaping blockchain adoption readiness. Their convergence across value-chain activities, including Development and Access, Search and Discovery (Authority, Relevance, and Fulfilment), Primary Support, and Secondary Support, highlights the institutional areas where blockchain integration is both feasible and impactful. The key intersections between these value-chain activities and blockchain drivers were found mainly under Philosophical Beliefs and Economic Incentives, indicating where adoption readiness is strongest.

A central finding of this chapter is the convergence between specific value-chain activities and blockchain drivers. The driver, Philosophical Beliefs, particularly through its element, Alternative System, aligns with the literature's key driver, Blockchain Applications. This connection illustrates how both students and management perceive blockchain as an alternative technological system that can strengthen transparency, decentralisation, and trust in academic processes. Likewise, the driver Economic Incentives, through its element Process Improvement, corresponds with the literature's driver Enhancement, emphasising blockchain's role in improving efficiency, reducing administrative burdens, and enhancing institutional performance.

These intersections demonstrate that adoption readiness arises when ideological motivation, a belief in fairness, autonomy, and decentralisation, meets practical motivation, the pursuit of operational efficiency and value creation. At these convergence points, blockchain is no longer viewed merely as a technological innovation but as a systemic enabler of institutional transformation and democratisation within higher education.

From a technical standpoint, the driver Scenario Properties was instrumental in determining the most suitable blockchain configuration for higher education. Through actor-based mapping and blockchain decision flow chat, the study identified the public-permissioned blockchain as the optimal model. This configuration supports transparent and verifiable record-keeping while maintaining institutional control and regulatory compliance. It allows for decentralised collaboration among stakeholders without compromising governance, a balance critical to the academic environment.

Reflectively, the Higher Education Blockchain Adoption Drivers Framework developed in this study functions both as a theoretical model and a practical decision-support tool. It enables institutions to assess their readiness for adoption, identify active drivers within their value chains, and implement blockchain technologies strategically. The framework thus bridges the gap between technological capability and institutional purpose, providing a foundation for sustainable adoption.

In conclusion, this chapter established that blockchain adoption in higher education is driven by the convergence of belief, purpose, and capability. The alignment between the philosophical drive for transparency and the economic drive for enhancement demonstrates blockchain's potential to democratise higher education by empowering students, strengthening institutional governance, and fostering shared accountability. The insights developed in this chapter lay the groundwork for Chapter 6, which presents the study's overall conclusions, theoretical contributions, limitations, and recommendations for future research.

CHAPTER 6 : CONCLUSION.

6.1 Introduction

This chapter presents the overall conclusions of the study titled “The Potential Value of Blockchain for Use in Higher Education.” It integrates the key theoretical and empirical insights discussed in previous chapters and provides a holistic reflection on how blockchain technologies can transform higher-education institutions through enhanced trust, transparency, and efficiency.

The study has shown that blockchain adoption in higher education depends on the convergence of technological capability, institutional purpose, and human motivation. The Higher Education Blockchain Adoption Drivers Framework developed in this research provides a structured approach for identifying the readiness, drivers, and value-chain activities that influence blockchain integration. Through this framework, institutions can determine where blockchain has the most potential for adoption, who the key actors are, and which drivers, both technical and non-technical, are most influential in facilitating that adoption.

Chapter 5 showed that the main value-chain activities, Development and Access, Search and Discovery, Authority, Relevance and Fulfilment, Primary Support, and Secondary Support, connect with the blockchain drivers called Philosophical Beliefs and Economic Incentives. This relationship reveals a meeting of institutional processes and technological objectives. It implies that the introduction of blockchain should be the most widespread in case the concepts of decentralisation, fairness, and transparency (of the Philosophical Beliefs) are reconciled with the practical aims of efficiency, improved performance, and value creation (of the Economic Incentives). These intersection points demonstrate where blockchain can be implemented in a manner that is helpful and sustainable.

Based on such findings, the current chapter presents the primary findings of the study and highlights the theoretical, conceptual, and practical contributions of the study besides presenting its limitations. It also gives the recommendations to the future research and practice and the way to extend the framework and to check how well it can work in other fields.

The chapter begins by summarising the key findings in regard to the purpose and goals of the study. It then gives the contributions of the study to the theory, methodology, and practice and finally the limitations of the study. Finally, it provides the recommendations on future research on how the potential of blockchain to democratise higher education may be further developed and implemented in a variety of institutional contexts.

6.2 Study Contribution

The thesis includes a series of contributions to theoretical and practical knowledge about blockchain implementation in HE, indicating an in-depth consideration of the intricacies of the topic and providing valuable information in a variety of areas.

6.2.1 Empirical Contribution:

The thesis has a significant empirical contribution in that it establishes the HE value chain actors in the process of adoption of blockchain. The study provides essential information about the role of each actor to create value in the educational ecosystem by mapping the roles and interaction of these actors. This empirical result advances our knowledge on the creation, maintenance, and possibly improvement of value created using blockchain as a means of collaboration that creates a subtle perspective on the collaborative efforts needed to achieve successful implementation at HEIs.

In this respect, this research shows the application of one model to the adoption of Blockchain in higher education (Table 5.9).

6.2.2 Theoretical Contribution

The theorising of USE is one of the key pillars of the blockchain adoption theory that should be noted in terms of theoretical contribution. This concept is developed in the paper as a critical component of the adoption framework and gives the specifics of the practical application of blockchain in the area of HE. The study further reduces to the application of the technology in generating value, stream operations, and supporting innovation, leaving it narrowed to the existing adoption theories. This innovation can help to achieve the peculiarities of the cases when blockchain is performed or will have issues in the field of education, which contributes to a more accurate theoretical explanation of the role of blockchain in HE.

6.2.3 Contributions to methodology.

The study provides three significant research methodology contributions:

6.2.3.1 Participatory Methodology

The research involves the stakeholders of the HE ecosystem in the research process through the participatory approach. This participatory approach will ensure the participants experience and their personal knowledge are considered as the foundation of the study, which will make the research results more topical and comprehensive. The engagement nature of the research presents a deeper, more in-depth understanding of the implementation of blockchain and the importance of taking into account different views in the introduction of a complex technology..

6.2.3.2 VOSviewer Computational Content Analysis.

The second contribution to the methodology is the application of VOSviewer content analysis network diagrams. These maps are used to determine the main gaps in the literature, which forms the basis of the theorisation of the use of USE as a central factor in blockchain adoption. Through the analysis of the events, connection strength, and significance of major words and terms, the research will be able to visualise the trends and identify the primary factors behind the adoption of blockchain in HE. This method of analysis that relies on the data will introduce rigour to the process and can identify the most influential factors that contribute to the process of adoption, which is methodologically and theoretically valuable.Integrated research design visualisation

The researcher developed a visual diagram that illustrates the relationship between the research's philosophy, theory, study questions (method), and conceptual model (Table 2.5).

6.2.4 Conceptual Contribution

The study makes a critical conceptual contribution by exploring the idea of democratisation within the blockchain adoption process. Using a democratised approach to investigate blockchain adoption, the study mirrors the principles of decentralisation, transparency, and stakeholder empowerment that are core to blockchain technology. This dual application in the research methodology and the technological framework offers a fresh perspective on how blockchain can democratise HEIs, fostering more inclusive and participatory governance models. This conceptual contribution advances the discourse on democratisation and provides a practical framework for understanding how decentralised technologies can reshape institutional structures.

6.2.5 Practical Contribution

Developing a model under which the current study examines the beneficial circumstances for adopting blockchain technology in HE would be a key practical contribution to this research. The applicability of blockchain technology in HE would be determined based on participants' critical to adoption, activities that called for integration, and applications that could lead to its adoption. This model becomes a reference tool for administrators and managers when deciding whether necessary conditions, such as stakeholder readiness, enabling activities, and suitable applications, exist. Thus, this contribution would help educational leaders gain actionable insights for making informed decisions towards implementing blockchain technology in their institutions by providing a structural framework for assessing the adoption of blockchain.

This study is vast in dimensions for empirical, theoretical, methodological, conceptual, and practical contributions, as it provides an extensive overall framework for understanding and driving forward an adoption plan for blockchain technology in HE. These contributions add more insight into academic knowledge and contribute towards practical encouragement for stakeholders engaged in linking what blockchain could offer within educational institutions.

6.3 Limitations of the study

This study was limited in scope to the specific context in which the data were collected, and the findings may not fully represent all perspectives across higher education institutions. The research design focused primarily on qualitative and computational analyses, which, while insightful, did not include survey data or a broad range of stakeholder interviews. Future research should therefore expand on these findings by incorporating surveys and semi-structured interviews with key participants across higher education institutions and related organisations that influence blockchain adoption. Such an approach would strengthen the generalisability of the findings and provide a more comprehensive understanding of the factors that shape blockchain implementation in education.

From a methodological perspective, the study was limited by time, resources, and the size of the participant group. Although the mixed-methods design allowed for meaningful triangulation, the number of focus group participants may have restricted the diversity of viewpoints captured. Additionally, the study’s reliance on voluntary participation might have introduced self-selection bias, as those already interested in blockchain were more likely to engage. Future studies could address these limitations by employing larger and more diverse samples, extending the duration of data collection, and including multiple institutions to enhance representativeness and reliability.

6.4 Recommendations

Future research should build on the findings of this study in the following ways:

- Framework Testing Across Sectors
  Conduct similar studies in other industries to evaluate the broader applicability of the Blockchain Adoption Drivers Framework beyond higher education.
- Frequency of Framework Application
  Examine how often the framework should be applied to detect patterns of adoption and measure institutional maturity in blockchain use.
- Blockchain-Based Research Platforms
  Explore the integration of blockchain-enabled research systems for data collection, validation, and collaboration, enhancing research integrity and transparency.
- Mixed-Method Expansion
  Develop surveys complemented by semi-structured interviews with key stakeholders to capture diverse perspectives and strengthen empirical evidence.
- Cross-Institutional Studies
  Investigate how different institutional cultures and governance models influence blockchain adoption outcomes.

6.5 Concluding remarks

This paper has examined the prospects of blockchain technology utilization in the context of higher education by discussing the motivation to the adoption, and the situations where such motivation fits within the value chain processes that characterize institutional operations. The general results affirm that the use of blockchain in the context of higher education is a technological and social phenomenon that needs to have its technical, institutional, and human values coupled. This framework is the Higher Education Blockchain Adoption Drivers Framework that was created in the current study and it is a structured approach to the understanding and prediction of this alignment.

6.5.1 Goal 1: To explain the motivations of blockchain implementation in higher education.

The former was aimed at outlining the major factors that affect the adoption of blockchains. The researchers found five major drivers namely Scenario Properties, Philosophical Beliefs, Network Effects, Economic incentives and breaking the gridlock.

The driver Scenario Properties was found to be the major technical driver, which defines the best blockchain that fits better in higher education. The paper found the public-enabled blockchain as the most suitable setting through the integration of literature and empirical data. This model is able to balance between openness and control in governance enhancing safe, transparent, and verifiable academic processes and institutional adherence.

The four other drivers, Philosophical Beliefs, Network Effects, Economic Incentives and Breaking the Gridlock, are non-technical drivers which describe the social, cultural and organisational forces of adoption. Such drivers indicate the increased awareness that the successful implementation is not only dependent on the technological readiness but also the institutional trust, shared values, and usefulness.

Specifically, the study found that Philosophical Beliefs (at the element Alternative System) and Economic Incentives (at the element Process Improvement) were the most influential. Philosophical Beliefs reflect ideological motivations for adopting blockchain as a transparent, decentralised alternative to traditional systems. Economic Incentives, on the other hand, emphasise the practical benefits of efficiency, cost-effectiveness, and performance enhancement. Together, these drivers form a balanced foundation for blockchain adoption, linking moral purpose with measurable outcomes.

6.5.2 Objective 2: To corroborate the circumstances under which the blockchain adoption drivers support higher education value-chain democratisation

The second objective focused on identifying how blockchain adoption drivers align with the higher education value chain to promote democratisation. The study demonstrated that adoption readiness emerges where value-chain activities, namely Development and Access, Search and Discovery, Authority, Relevance and Fulfilment, Primary Support, and Secondary Support, converge with the blockchain drivers Philosophical Beliefs and Economic Incentives.

This convergence defines the institutional circumstances where blockchain has the greatest potential to create value. It shows that adoption is most feasible when ideological motivations such as decentralisation, fairness, and transparency (from Philosophical Beliefs) intersect with practical motivations such as efficiency, process improvement, and value creation (from Economic Incentives). These intersections mark “readiness zones” in which blockchain can enable democratisation, empowering students, improving governance, and fostering mutual accountability across the higher education system.

The study further revealed that students and management are the key actors driving blockchain adoption. Students encourage bottom-up adoption, which requires a transparent yet autonomous and trusted ownership of records. The management makes adoption a top-down approach, which centers on governance, performance and compliance. Once such motivations coincide, the use of blockchain becomes technically feasible and socially acceptable, which will allow a participatory and fair change in the institutional processes.

6.5.3 Summary of Conclusions

Overall, the paper has found that the adoption of blockchain in higher education is instigated by both the cumulative impact of technical and non-technical forces and the congruousness between value-chain processes and human incentives. The Higher Education Blockchain Adoption Drivers Framework is a theoretical and a practical tool, which assists organisations in mapping their level of readiness to adopt and where the use of blockchain will have the greatest effect.

The results prove the idea that blockchain can democratise higher education through decentralising trust, enhancing efficiency, and promoting collaboration among the main participants. Blockchain, by establishing a connection between technological capability and institutional purpose, creates a baseline to a more transparent, inclusive, and accountable system of higher education.

6.6 Final Reflection

The basis of this research was a simple yet compound question What is the potential value of blockchain within the higher education environment? The answer to this question became clear as blockchain is not only a significant technological innovation, but it is also the way to change the idea of trust, openness, and collaboration in academic processes that are perceived by universities, students, and the society at large.

During the work, it was apparent that implementing blockchain is not merely a matter of introducing a new digital system and redesigning institutional relationships and practices. The results indicated that the effectiveness of adoption is determined by the fit between human urge, institutional targets and technological design. The creation of Higher Education Blockchain Adoption Drivers Framework proved that it is necessary to comprehend not only the societal component of technological interaction, but also the technical elements to be considered which allow making its use feasible.

This study was a form of academic and personal learning process. The continued literature analysis, focus group discussions and interpretation of the interactions of the adoption drivers and value-chain activities enhanced the intellectualized approach that higher education reaps maximum advantages on innovations based on inclusion, collaboration, and shared accountability. The opinions of students and the management demonstrated once again that the technological advancements must contribute to the human potential, but not overcome it.

A methodologically speaking, the use of the mixed-method design underpinned by a critical realism was a helpful tool to help bridge the gap between theory and practice. This strategy allowed not only looking at observable patterns but also exploring the underlying institutional and philosophical backdrop of decision-making, such as the chief forces of adoption. The multi-layered analysis enabled the development of the framework that is theoretically sound and practically applicable to the higher education institutions.

Among the most relevant consequences of the study, it can be stated that blockchain will turn out to be an instrument of democratisation within the field of higher education. Blockchain will enable students to have control over their academic data and make universities accountable and responsible by decentralising power, enhancing transparency, and making transactions secure and traceable. This encourages a shift towards a more participative and participatory type of academic government that puts into consideration both the technological and human input.

The completion of this study convinced me also of the necessity of flexibility and critical reflection in scholarly inquiry. Due to the rapid development of blockchain, the latter introduces new mentalities that disrupt the existing teaching, management, and research. To stay abreast with these developments, one needed to be open to life-long learning and interaction with many fields. It also suggested that there would be also a need to conduct future studies that would still be sensitive to ethical, technological and social changes that form the innovation.

Overall, this paper has validated that purposeful digitalisation in higher education is expanded through partnership, both among students and management, as well as technologies and individuals, along with theory and practice. The potential of the blockchain is not just among technical possibilities but also in its ability to relate institutional processes, values and people in a common quest to achieve transparency, integrity and enablement.

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