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Blockchain Decentralised Ecosystems for the Public Health in China: Emerging Considerations for Decentralised Trust Theory

By

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Abstract

Existing research on Trust primarily emphasises dimensions such as Ability, Benevolence, Credibility, Dependability, Faith, Honesty, Integrity, and Predictability. In trans-organisational settings, centralised digital platforms often play a pivotal intermediary role in maintaining stakeholder relationships. However, within the decentralised ecosystems, Trust must be revisited in the decentralised context. This reassessment is crucial in sectors like Public Health, where the decentralised nature presents opportunities for blockchain-based innovative solutions. The success of these solutions in the public sector is contingent on a deeper comprehension of decentralised trust. In determining decentralised trust dimensions, Ability, Benevolence, Credibility, and Integrity are selected from traditional trust theory and justified as the retained trust dimensions in the decentralised context to begin with. On top of these concerns, Communication, Reputation, and Satisfaction are respectively selected from Social Learning Theory, Psychological Safety Theory, and Social Capital Theory, as the catalysts of trust in the decentralised context before primary data collection.

This thesis contributes to a novel approach to establishing decentralised trust framework, incorporating six key dimensions: Values in Action, Interaction Dynamics, Performance Synchrony, Trust Shaping Capabilities, Incentive Dynamics, and Conducive Trustworthy Environment. Furthermore, as implications for theory, Values in Action and Incentive Dynamics are conceptually connected with Commitment; Performance Synchrony and Trust Shaping Capabilities are conceptually related to Social Capital and Commitment; and Interaction Dynamics and Conducive Trustworthy Environment are conceptually associated with Social Learning and Psychological Safety. In doing so, this research redefines the theoretical connections between stakeholders within the blockchain decentralised ecosystems, providing crucial insights for advancing public sector entrepreneurship and marketing through decentralised trust approach.

Keywords: Blockchain, Decentralised Trust, Decentralised Ecosystem, Public Sector Entrepreneurship, Public Sector Marketing, Public Health

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Contents

1. Introduction

1.1. Overview of the Research Rationale

Traditional information systems, marked by centralised power and control within organisations (Samaddar, Nargundkar, & Daley, 2006), pose challenges for conceptual frameworks that seek to differentiate between decentralised and centralised trust. Although the actual relocation of certain decision-making processes to more peripheral locations create a semblance of decentralised decision-making, ElMassah and Mohieldin (2020) argue that the persistent use of information technology to monitor performance and standards, and to establish more codified rules and procedures, generates a renewed sense of centralised power and control. From this perspective, the discourse on centralised versus decentralised trust is not merely seen as oppositional but as inherently interdependent (Chen, Ding, & Lu, 2022). It was not until the advent of blockchain technology and similar innovations that these inherent technical limitations were surpassed, enabling the conceptual realisation of decentralisation and decentralised trust (De Filippi, Mannan, & Reijers, 2020). In this thesis, the conceptualisation hinges on the foundation that the extent of centralisation or decentralisation depends on the degree of data sharing that can mutually benefit stakeholder relationships, based on the principle that 'information is equivalent to power' (Bloomfield & Coombs, 1992, p. 460).

The interest in blockchain technology has grown exponentially in management research (Tandon et al., 2021) regarding of a fluctuating performance of cryptocurrencies and NFTs as some of its main by-products (Zhang, 2023), or the collapse of unregulated blockchain intermediary institutions (Cumming, Johan, & Pant, 2019). Praised for being decentralised, but relying on some centralised control for data and rules for transactions (Cennamo, Marchesi, & Meyer, 2020), blockchain technology offers secure, immutable and ledger solution that can be adapted in many contexts. This technology has proven useful for inter-organisational relationships (Koghut et al., 2021), entrepreneurial ecosystems (Alaassar, Mention, & Aas, 2022) or the public sector (Aloini et al., 2023). However, research has rarely considered how inherent features of blockchain technology such as decentralisation, immutability, transparency,

or consensus between parties (Viriyasitavat & Hoonsopon, 2019) can transform a whole inter-organisational ecosystem. This study contributes to this direction by advancing the concept of blockchain decentralised ecosystems based on evidence from the Public Health in China.

Blockchain-based decentralised digital platforms have the potential to improve the delivery of services in both public and private sectors (Wolfond, 2017) by making them more transparent and efficient. Tapscott and Tapscott (2016) anticipate that blockchain technology would be a critical component in service delivery to transact both monetary or nonmonetary values with reduced friction due to its technological power and capacity of increasing trust between stakeholders and the services they access. Since governments, organisations of all sizes, and consumers are exploring ways in converting into more digitalised activities, Angelis and Silva (2019) identify that blockchain-based decentralised digital platforms could be integrated with mutual beneficial purposes for policymakers, public and private organisation managers and entrepreneurs to participate in. The state of the art and development tendency of blockchain-based decentralised platforms are highlighted as crucial and breakthrough innovation for technological and industrial improvements (Alam et al., 2021). Regarding the development of technology application, blockchain-based decentralised digital platforms are extended to multiple fields including supply chain management, intelligent manufacturing, digital finance, etc (Lumineau, Wang, & Schilke, 2021). However, how to coordinate blockchain-based decentralised platforms with economy and society has not been deeply integrated and consummated. Yuan (2021) affirms that blockchain technology requires further research on its application in various industries including but not limited to education, healthcare, public welfare, wellbeing, etc. In addition, how to construct and ensure people's livelihood by means of blockchain technology is recognised as the fundamental service of supporting digitalised activities (Subramanian, 2018; Yu et al., 2020).

For the purpose of researching and analysing the blockchain-based decentralised digital platforms, the contextual understanding of decentralised ecosystems is applied as the socio-technological phenomenon that encompasses the emerging blockchain technology of managing monetary and nonmonetary activities (Botsman & Rogers, 2010; Hamari, Sjöklint, & Ukkonen,

2016). With the support in De Filippi (2017), it is further argued that blockchain technology is a representative and specified decentralised ecosystem. In terms of stakeholders, Kornberger et al. (2018) and Uzunca, Rigtering, and Ozcan (2018) explore the value co-creations in the decentralised ecosystems and find that local and central governments, traditional organisations, start-ups, and individual consumers are all potential stakeholders. Yuan (2021, p. 146) reports that blockchain technology can be applied to establish the emerging "Business to Government (B2G) + Business to Business (B2B) + Business to Consumer (B2C)" decentralised ecosystems in order to solve the pain points. According to Cundari (2015), pain points are special issues that the stakeholders in an organisation are experiencing and thus require effective solutions.

With the development of the digital technologies, the business models integrating Internet and healthcare systems have become mature, exemplified by existing online consultation and online payment reimbursement, among other online healthcare services (Wen et al., 2024). Through building up digitally-enabled hospitals and online healthcare communities, online healthcare systems have mitigated some of the difficulties associated with accessing the healthcare services and enhancing the social interactions especially for elderly (Lu, Ngai, & Yi, 2024; Zhou, Bai, & Wang, 2024). However, several issues persist within the current centralised healthcare system in China related to the inefficient flow of healthcare information, mutual distrust between the doctor and the patient, the management of healthcare data privacy and security, and the lengthy and inefficient insurance claims process.

The first issue concerns the inefficient flow of healthcare information, leading to a diminished healthcare experience (Xiao et al., 2024). According to China's cybersecurity law introduced in 2017, Filipova (2024) describes that digital entities must securely store user data to prevent data breaches. In the healthcare sector, this translates to healthcare institutions being required to maintain strict confidentiality of patient data. Consequently, healthcare institutions do not easily, nor are permitted to, disclose healthcare information, leading to inefficient information flow and the creation of data isolation within each institution (Zhou et al., 2024). After investigating 2308 Chinese counties, Song et al. (2024) reveal that although cross-hospital healthcare services are available in China, there is still a lack of data sharing and healthcare

information equity between hospitals of different grades, which results in various inconveniences during the healthcare consultation process. For instance, Liu et al. (2024) find that patients may face the predicament of undergoing duplicate examinations when transferring or being referred to different hospitals, leading to a waste of both time and money and ineffective utilisation of healthcare resources, ultimately resulting in a poor patient experience.

The second issue is the mutual distrust between the doctor and the patient (Zhang et al., 2021). While online platforms can alleviate some asymmetry in the information patients access during their search for healthcare services, Yang et al. (2024) argue that healthcare services inherently exhibit information asymmetry compounded by the scarcity of healthcare resources, making this asymmetry even more opaque. Additionally, Liu, Zhang, and Jin (2024) emphasise that the varying quality of doctors and medical staff and the low cost of tampering with patient data within the centralised healthcare system, from appointment scheduling to prescription issuance, are pervasive with conflicts of interest or healthcare data being lost or misrepresented. Since data within the centralised healthcare system can be manipulated either manually or technically (Cao, Huang, & Tang, 2024), this also complicates legal accountability and evidence collection.

The third issue relates to the management of healthcare data privacy and security (Tao, Liu, & Sun, 2024). In the centralised healthcare system, healthcare institutions collect patient data and store it in databases leased from Internet companies, over which they generally do not control root access (Yu, Wang, & You, 2024). Thus, healthcare institutions actually have a very limited control over healthcare data privacy and security, relying solely on Internet companies to maintain cybersecurity (Xiao et al., 2024). Simultaneously, the clinical and experimental data, crucial for the development of certain drugs, are dispersed across institutions, posing significant challenges for clinical physicians attempting to integrate and analyse data from different sources (Yan et al., 2024a). As implicated by Pool et al. (2024), this dispersion of critical data also hinders drug development, inadvertently raising the research and development costs for pharmaceutical companies and the purchase prices for pharmacies.

The fourth issue is the lengthy and inefficient insurance claims process (Wu et al., 2024). After

reviewing and analysing 487 policy documents, Yan et al. (2024b) identify that patient health conditions, healthcare data, and disease histories are scattered across various healthcare institutions, resulting in information asymmetry between healthcare providers and insurance companies. This leads to independent operations between these entities, with a lot of critical information not being shared (Guo et al., 2023). As explored by Wang et al. (2023), policyholders, therefore, must provide numerous proofs during the insurance purchasing, claims, and reimbursement processes, which require manual verification by the insurance companies. Such requirements not only lead to time-consuming stages, undermining efficiency and deteriorating the experience for insurers, but also escalate labour costs for healthcare insurance companies. In addition, He et al. (2024) and Xu et al. (2024) further highlight that dispersed and untraceable patient data not only lead to frequent healthcare insurance fraud, harming the insurers' interests, but also prevent insurance companies from offering multi-dimensional, fine-grained customised policies, resulting in unfair premium costs to policyholders, thereby harming their interests.

In view of the current state of centralised healthcare system in China, despite significant annual investments in human, material, and financial resources by governments and healthcare institutions, these issues remain unresolved. Therefore, this thesis introduces a novel decentralised healthcare system—the blockchain healthcare ecosystem—to empower the healthcare industry. Owing to the nature of blockchain technology, the blockchain healthcare ecosystem has the potential to secure data privacy while facilitating the flow of healthcare data, improving the current situation of data isolation between healthcare institutions, rebuilding trust between patients and healthcare providers.

The National Health Commission of China issued a document in July 2023, emphasising the implementation of high-quality development assessments and promotion initiatives in public hospitals (gov.cn, 2023). It aims to leverage the role of public hospitals as pilot demonstrations for high-quality development, strengthening the management of reform and high-quality development projects in public hospitals. A three-year action plan for nationwide interoperability and information sharing among medical and health institutions will be carried

out, advancing the construction of smart hospitals and hierarchical evaluations. It will also promote pilot projects involving “5G + healthcare”, “medical artificial intelligence”, and “blockchain + healthcare”. Initiatives focusing on improving the patient experience will be launched. Support will be provided to promote the high-quality development of medical institutions run by state-owned enterprises. This implies that blockchain healthcare will be one of the key tasks in the public health system in China from 2023 to 2025.

Blockchain technology could be deeply integrated with healthcare systems to innovatively deliver more transparent and efficient services. For example, Tencent (2019) proposes that the patient ID in blockchain healthcare could be adopted as the main index to replace the patient real-name profile and connected with different healthcare-related institutions, e.g., hospitals, insurance companies, etc. In this case, healthcare information could be interconnected both efficiently and securely. Furthermore, distributed ledge technology, multiple node consensus, advanced encryption standard, and smart contract have enabled blockchain technology to be equipped with distributed, decentralised, immutable, and transparent characteristics (Fu, Zhang, & Ao, 2020). It is expected that blockchain could help the organisations to establish strong relationships and trigger institutionalised collaborative behaviours (Balis, Tagopoulos, & Dimola, 2019; Casado-Vara et al., 2019). Therefore, considerations for conceptualising decentralised trust becomes one of the emerging research areas that requires further exploration. In traditional healthcare industry, trust is mainly established from two aspects consisting of trust between hospital and patient, and trust between insurer and patient (Zou, Cheng, & Nie, 2018). Based on health conditions, the patient has to trust the visited hospital that it would provide appropriate prescriptions and trust the chosen healthcare insurance company that it would work out reasonable premiums. However, the challenges facing traditional healthcare industry are the difficulty in maintaining patient-hospital relationships and patient-insurer relationships due to healthcare information island, informal pharmaceutical manufacturing and sales channel issues, and complicated claim procedures (Christ, 2020; Zhang, 2017). In this stance, implementing blockchain applications to healthcare industry aims to protect the stakeholders through innovative supply chain accountability and responsibility. Specifically, blockchain can be applied to simplify the way blockchain stakeholders share healthcare

information and transact with blockchain data in the decentralised ecosystems (Shifrin et al., 2019). In addition, counterfeit medicine cases could be largely reduced since blockchain ledgers could improve the tracking mechanism of administering drugs to patients from manufacturing and storage to sales and consumption. Furthermore, Hussien et al. (2019) argue that immutable medical records could enable hospitals and patients to feel protected, and insurers to mitigate the risks of fraudulent claims. Owing to the ability to benefit the healthcare, doctors from different hospitals and healthcare institutions could be authorised to read the patient historical health records in order to prescribe the right medicine without duplicating the physical examination of the same diagnostic items (De Aguiar et al., 2020). Simultaneously, insurers could fast track the patient claim procedures since blockchain evidence preservation could solve the issue of acquiring electronic evidence within a short time. By means of blockchain applications, different hospitals and healthcare insurance companies could also exclude the fraudulent claims through sharing immutable data (Balis, Tagopoulos, & Dimola, 2019). Due to the potential impact of leveraging blockchain on novel supply-demand relationships in healthcare (Greenberger, 2019), the ultimate quality of the decentralised activities could be effectively monitored by healthcare regulatory institutions.

In determining decentralised trust dimensions, Ability, Benevolence, Credibility, and Integrity are selected from traditional trust theory and justified as the retained trust dimensions in the decentralised context to begin with. In this research, decentralised trust is linked with the interactions between citizens and public service providers, as well as between upstream and downstream public service providers (Bozic & Kuppelwieser, 2019). Establishing decentralised trust enables the parties involved to foster long-term commitments, as Mohr and Spekman (1994) argue that short-term disparities can be reconciled for the success of partnerships (Scheer & Stern, 1992). These stakeholder relationships can unveil a range of social behaviours (Marion, 2009). Sih, Hanser, and McHugh (2009) underscore the importance of considering social behaviours, which are influenced by stakeholders' experiences and their social positions (Newman, 2003). The dark side of centralised digital platforms have been criticised. Specifically, the issues and challenges resulted from high intermediary powers. Although digital platforms lead to an emerging way of forming digitalised activities, the limit

of centralised circumstances needs to be considered. On top of these concerns, Communication, Reputation, and Satisfaction are respectively selected from Social Learning Theory, Psychological Safety Theory, and Social Capital Theory, as the catalysts of trust in the decentralised context before primary data collection. In this thesis, decentralised trust attributed by stakeholders will be the focal concentration of which conceptual research framework will be proposed. Key stakeholders in regard to their performance roles in the decentralised ecosystems will be investigated accordingly.

1.2. Overview of the Research Method

Qualitative data could be observed and recorded, and refers to non-numerical information such as interview transcripts, video and audio clips, and text documents (Kelly, 2019). It could also be grouped as categorical data that is based on the attributes and properties of a social phenomenon. For a researcher, qualitative data is related to the perceptions of participants in determining the particular characteristics of the study context and social world (Miles, Huberman, & Saldaña, 2020). Since qualitative data collection is exploratory, analysis involves in-depth insights beyond theoretical concepts in answering the research questions (Bazeley, 2013). In-depth interviews provide an opportunity for respondents to elaborate on their reasoning, allowing for a more nuanced understanding of their perspectives in response to research questions (Saunders, Lewis, & Thornhill, 2019). Furthermore, the formulation of questions in Study 1 has undergone refinement based on insights gained from the pilot study, contributing to the validation of the concepts outlined in the relevant literature review. Close-ended questions were used to collect information about the interviewees' role, organisation type, age, sex, and years of experience. To maximise the benefits of in-depth interviews, the interview guides will initiate with inquiries focusing on the "what" aspects, followed by a deeper exploration of the "why" and "how" aspects. Kaiser (2009) argues that the inclusion of qualitative questions addressing these aspects enables an investigation into causality. The coding processes are based on the initial thematic relevance to decentralised trust. Moreover, the emerging codes that are employed in Study 2 align with the results in Study 1.

In the pilot study, purposive sampling is adopted from Patton (2015) to discover individuals and groups that are not only knowledgeable about the studied social phenomenon but also willing to participate (Creswell & Plano, 2018). Regarding the inclusion and exclusion criteria, blockchain pioneers must have led and participated in the blockchain healthcare project for more than a completed quarter of a single blockchain project or a completed blockchain project if less than three months, during the period 2016-2018. Ultimately, four blockchain pioneers were selected from seven projects that met the specified criteria. Regarding the data collection timeline, the pilot study was undertaken between December 2020 and January 2021.

In Study 1, a representative sampling approach based on Onwuegbuzie and Leech (2007) was utilised, involving leaders from eight public organisations that are directly engaged in the same blockchain project. Regarding the inclusion and exclusion criteria, the blockchain project must have been successfully operating for four quarters and either continues to exist or intends to expand further. Ultimately, three blockchain projects that met the criteria were selected. These projects are blockchain healthcare initiatives cooperatively run by municipal-level hospitals and district-level hospitals. Because the thesis narrows down the focus to the blockchain healthcare ecosystem, mere B2B cooperation between hospitals is insufficient. Therefore, from these three blockchain projects, one was further selected that possesses a more comprehensive blockchain healthcare ecosystem. This project is composed of eight independent public organisations. These organisations comprise two hospitals, two pharmacies, two healthcare insurance organisations, and two healthcare authorities. Regarding the recruitment strategy, Study 1 employs snowball sampling, where organisation leaders at the municipal level—consisting of those from hospitals, pharmacies, healthcare insurance companies, and healthcare authorities—are initially approached to participate. These leaders are then asked to assist in identifying managers from district-level organisations, who may also be suitable participants. Snowball sampling is particularly useful when there is a scarcity of participants or when additional potential participants are needed who may not be readily apparent to the researcher. This technique is supported by (Browne, 2005) as a means for researchers to leverage existing participants to identify others, and by (Waters, 2015), who notes its efficacy in reaching hidden

populations that researchers might not otherwise have access to. Study 1 was conducted from April 2022 to June 2022, aiming to assess the conceptual importance of the selected deductive concepts for decentralised trust within the blockchain healthcare ecosystems. These deductive concepts consist of Ability, Benevolence, Credibility, Integrity, Communication, Reputation, and Satisfaction.

Study 2 was scheduled between April 2023 and June 2023, which is in the medium term of the Fourteenth Five-Year Plan. This allowed to take a longitudinal and empirical approach, building on Study 1 findings and results, and allowing for enough time between the studies to understand the respondents' knowledge boundary of blockchain healthcare ecosystems. In Study 2, judgmental sampling is adopted from Arasli, Bavik, and Ekiz (2006) to understand how the entrepreneurial organisations engaged in developing the blockchain technology for the healthcare systems, and citizens as beneficiaries of the systems, perceived and applied decentralised trust related to it. To be specific, twelve entrepreneurs and six citizens were selected to understand the involvement of innovative blockchain companies, and intention to trust a blockchain healthcare ecosystem. Regarding the inclusion and exclusion criteria, potential entrepreneurs were identified from the significant blockchain events and conferences. These gatherings cover a diverse spectrum, consisting of renowned platforms such as the Blockchain Expo World Series, NFT.NYC, Meta Week, World Blockchain Summit, and Token2049. Active engagement in these events serves as a representation of their active involvement within the blockchain community, thus substantiating their credibility and expertise in the field to be more likely to provide valuable data for Study 2.1. In addition, the startups led by these entrepreneurs in the healthcare sector must have been successfully operating for four quarters and either continue to exist or have intentions to expand further. Ultimately, from hundreds of blockchain startups, 36 that engage in blockchain healthcare were identified. From these 36 startups, 20 were selected that have a high ranking within decentralised autonomous communities on Twitter. Finally, among these 20 startups, the founders of 12 expressed an intention to participate in the interview. And the emerging inductive codes covered in Study 2.1 consisting of Synergy, Mutuality, Efficiency, Consistency, and Privacy and Security.

To understand the views of the potential users of the blockchain technology in the health sector, in accordance with Vargo and Lusch (2017), it is acknowledged that knowledge gap can significantly impact service experiences. Since blockchain healthcare ecosystem is still relatively unfamiliar to the public, citizens in Study 2.2 were chosen with great care based on their understandings of the blockchain technology and the public health. Regarding the inclusion and exclusion criteria, potential citizens must have at least an undergraduate degree and be familiar with blockchain healthcare products, having experienced at least one product in the study context. This requirement aims to ensure that as early users of blockchain healthcare-related products, they can provide more impartial opinions, laying a foundation for future popularisation and market promotion. Ultimately, six citizens that met the criteria were selected. According to Baxter and Jack (2008), focusing on a small number of cases allows for an in-depth exploration of user interactions and perceptions, which is essential for understanding the nuances of user acceptance in new technological systems, such as blockchain healthcare ecosystem. And the emerging inductive codes covered in Study 2.2 consisting of Mass Education, Voluntary Responsibility, Privacy and Security, and Service Convenience.

To sum up, 30 primary in-depth interviews were conducted and analysed over two stages to make an empirical and longitudinal contribution to reconceptualise decentralised trust theory. The 30 interviews were as follows:

- 1st stage pilot study with blockchain pioneers: 4 interviews
- 1st stage with public organisations in the Public Health: 1 interview each with two different hospitals, 1 interview each with two different healthcare insurance companies, 1 interview each with two different healthcare authorities, and 1 interview each with two different pharmacies-8 interviews
- 2nd stage with entrepreneurs in the Public Health: 12 interviews
- 2nd stage with citizens: 6 interviews

1.3. Overview of the Research Findings

In the exploration of decentralised trust within blockchain decentralised ecosystems, the investigation is divided into two distinct yet interconnected studies. Study 1 sets the foundation by assessing the critical role of decentralised trust in shaping participation intention. Through meticulous analysis of interview transcriptions, it seeks to establish the indispensability of decentralised trust, contrasting it with traditional trust theory that exhibits a higher dependency on centralised control and power dynamics. Study 1 not only identifies the disparities but also paves the way for a more egalitarian approach to decentralised trust. Building on the findings of Study 1, Study 2 delves deeper into the implications of these theoretical insights. It serves to not only validate but also to expand upon the initial findings, aiming to construct a robust framework for decentralised trust. This framework is particularly focused on recognising the unique dynamics of decentralised trust in blockchain decentralised ecosystems. By integrating the theoretical underpinnings from Study 1 with the empirical findings of Study 2, this research endeavours to reconceptualise trust theory towards a decentralised approach within blockchain decentralised ecosystems.

Study 1 endeavours to assess the imperative of integrating decentralised trust into the initiation and perpetuation of participation intention in blockchain decentralised ecosystems. Specifically, it seeks to justify the indispensability of decentralised trust by examining the interview transcriptions. As findings and results from Study 1, blockchain decentralised ecosystems highlight disparities in dependency within traditional trust theory, which tend to exhibit relatively higher dependency, and a decentralised trust theoretical approach, which embraces lower levels of dependency. Two primary considerations are taken into account for discovering emerging codes for designing Study 2. The first consideration arises from the alterations observed in the trustworthy environment, as indicated by the literature review. Based on the research findings concerning the implementation of blockchain technology in establishing ecosystem applications, a notable distinction between traditional trust and decentralised trust emerges. This distinction accommodates three substantial changes: a removal of centralised control, a fundamental transformation in dependency, and a significant shift in information

access. From these three changes, a conclusion is derived, namely, the examination of whether the concepts identified in traditional trust theory remain applicable within decentralised trust theoretical approach. Should they prove applicable, it is imperative to determine the dimensions in which their applicability manifests. The second consideration stems from the research topic, specifically, the construction of decentralised trust. According to Agag and El-Masry (2016), the establishment of trust hinges upon the participation intention. And the behaviours to engage in digitalised activities serve as an indicator of stakeholders' level of trust towards a particular matter (Viglia, Pera, & Bigné, 2018).

After conducting the process of coding, merging, and selection in Study 2, each second order theme is accompanied by representative quotes that exemplify its essence. These representative quotes are subsequently presented in conjunction with the co-occurrence concepts conceptualised in Study 1. This systematic approach, following Gioia (2021), enhances the comprehension and interpretation of the research outcomes, contributing to proposing a decentralised trust approach. Drawing upon the identified second order themes and representative quotes, this thesis aims to contribute to the development of a robust framework that could illuminate the nature of decentralised trust, thereby advancing public sector entrepreneurship and marketing success for participating in blockchain decentralised ecosystems. Reconceptualising trust theory towards a decentralised approach revolves around the egalitarianism, which emphasises the fundamental public value of equality. Decentralised trust can be enhanced by ensuring a sense of equality in autonomous decision-making processes. An egalitarian decentralised trust approach requires providing equal opportunities for participation within the blockchain decentralised ecosystems and acknowledges the equal representation of voting weights and distribution of healthcare resources. This approach stands in contrast to the conventional trust-building methods that rely on control and power dynamics (Bachmann, 2001; Luhmann, 2017). Therefore, the shift towards an egalitarian decentralised trust theoretical approach calls for revisiting trust theory.

1.4. Overview of the Research Contributions

The scholarly exploration of decentralised trust, particularly in the context of blockchain decentralised ecosystems within the public sector, represents a significant yet underexplored frontier in management research. This study seeks to illuminate this vital area, addressing the theoretical gaps and contributing a deeper understanding of what decentralised trust entails, how it functions, and its manifestations within the intricate tapestry of blockchain-enabled public services. By delving into the nuances of decentralised trust, the research aims to provide a robust theoretical foundation, elucidating its implications where traditional trust theory offers limited explanatory power. This examination is critical not only for advancing academic discourse but also for informing practical applications and policymaking in the evolving landscape of blockchain technology in decentralised ecosystems.

Given the limited empirical evidence available within the blockchain-based public service ecosystems, this research aims to make the following contributions. First, the study will conceptualise on the way stakeholders uphold trust in the decentralised context, and incorporating this into public sector research where similar approaches are missing (Dorobantu, Kaul, & Zelner, 2017; Kumar, Lahiri, & Dogan, 2018). In doing so, a decentralised trust framework with its interwoven facets is empirically conceptualised, containing six dimensions. The six dimensions comprise Values in Action, Interaction Dynamics, Performance Synchrony, Trust Shaping Capabilities, Incentive Dynamics, and Conducive Trustworthy Environment. Furthermore, as implications for theory, Values in Action and Incentive Dynamics are conceptually connected with Commitment; Performance Synchrony and Trust Shaping Capabilities are conceptually related to Social Capital and Commitment; and Interaction Dynamics and Conducive Trustworthy Environment are conceptually associated with Social Learning and Psychological Safety. Secondly, the study will contribute to public sector entrepreneurship and marketing research for investigating the stakeholders' participation intention in blockchain decentralised ecosystems. It is claimed that more entrepreneurial individuals are more receptive to new concepts, such as value co-creation, compared to their less entrepreneurial counterparts. Similarly, those who are less entrepreneurial are still more

adaptable than non-entrepreneurial individuals and are somewhat open to embracing uncertainty. Therefore, the process of establishing decentralised trust can also be seen as transforming non-entrepreneurial individuals into less entrepreneurial ones, and less entrepreneurial individuals into more entrepreneurial ones. In other words, the entrepreneurial spirits and viral marketing efforts remain integral to the performance of the blockchain decentralised ecosystems, e.g., attracting more stakeholders to adopt such innovative public service system. By systematically investigating the roles played by various stakeholders within the blockchain decentralised ecosystems, it is believed that implications for decentralised trust practice and policy could be better informed. Based on the above summarised contributions, the research is then structured as follows.

1.5. Overview of the Research Structure

In section 2, the literature review is divided into two parts. The first part, section 2.1, provides an overview of the concept of a decentralised information ecosystem relying on technologies like the blockchain. This concept is further deconstructed into two subcomponents, reviewing the nature of blockchain and the origins and evolution of decentralisation. Following this, by critiquing the deficiencies of centralised digital platforms, the increasing significance and scholarly attention towards decentralised digital platforms are highlighted. Ultimately, by contrasting centralised digital platforms with decentralised digital platforms in their fundamental nature, the section provokes contemplation on decentralised trust, questioning whether trust undergoes multidimensional changes within the decentralised ecosystems. The second part, section 2.2, reviews the research value of blockchain in relation to public sector entrepreneurship and public sector marketing, further narrowing down the research scope and establishing the research position.

Section 3 is divided into two main sections. The first section, section 3.1, concerns a theoretical review. In this part, the discussion initially focuses on which theories were not adopted and the reasons for their exclusion. It then explains how the four selected theories—Commitment-Trust

Theory, Social Learning Theory, Psychological Safety Theory, and Social Capital Theory—contribute to the construction of the conceptual research framework. The second section, section 3.2, deals with proposing the conceptual research framework based on the theoretical review conducted before the collection of primary data. Specifically, four trust dimensions are selected from Commitment-Trust Theory: Ability, Benevolence, Credibility, and Integrity. The selection of these four trust dimensions primarily considers their potential conceptual importance in decentralised circumstances. Subsequently, three catalysts of trust in the decentralised context are identified, consisting of Communication, Reputation, and Satisfaction. Communication emerges from Social Learning Theory, aiming to emphasise that communication serves as a potential catalyst for establishing decentralised trust through social connections and the transmission of values and knowledge sharing in decentralised ecosystems. Reputation, deriving from Psychological Safety Theory, aims to highlight how an advocator's active personality can endorse their behaviour in decentralised ecosystems, thereby positively influencing followers to actively participate in subsequent activities. Satisfaction, emerging from Social Capital Theory, aims to emphasise that trust mechanisms can be generated through value co-creations among stakeholders.

Section 4 delineates the research methodology employed in this thesis. Section 4.1 discusses various philosophical positions within the social sciences, ultimately adopting pragmatism as the research approach. Section 4.2 justifies the use of in-depth interviews as the method to explore both deductive and inductive research constructs. Additionally, a research protocol is outlined to demonstrate methodological rigour and further explain why the chosen research approach aligns with the research aims and objectives, thus making meaningful contributions to knowledge in the conceptualisation of decentralised trust. Section 4.3 describes how primary data were collected for this thesis. Initially, the problems of the centralised healthcare system in China are reiterated. Simultaneously, with a backdrop of healthcare policy leaning towards technological innovations, exemplified by blockchain technology, blockchain healthcare is selected as the study context. On this basis, stakeholders in China's blockchain healthcare ecosystem are identified. The primary data collection then involved two rounds of in-depth interviews. The first stage (Study 1) is an exploratory study, involving two organisation leads

from each stakeholder group to assess the theoretical applicability of concepts derived from traditional trust theory and to further develop them in a decentralised context. The second stage (Study 2) is a more detailed study involving twelve entrepreneurs and six end-users of blockchain healthcare ecosystems. Following this, section 4.4 presents the data analysis approach. Study 1 utilises both deductive and inductive analysis approaches, starting from the conceptual research framework established in section 3.2 to deductively validate the dimensions and catalysts that emerged from the literature, and then inductively proposing new dimensions from the empirical data. Study 2 employs an inductive analysis approach, systematically categorising findings and results through first order concepts, second order themes, and aggregate dimensions to facilitate discussion based on those findings. Finally, section 4.5 addresses ethics in in-depth interviews and research principles, highlighting these as indispensable elements of methodological rigour.

Section 5 elucidates the findings and results of Study 1. This section is divided into two main sections. Section 5.1 utilises data from eight in-depth interviews conducted as part of Study 1 to interpret and revisit the seven original deductive codes. It encompasses four trust dimensions: Ability, Benevolence, Credibility, and Integrity, along with three catalysts of trust: Communication, Reputation, and Satisfaction. Supported by representative quotes, these four trust dimensions and three catalysts are provided with refined definitions within the decentralised context. Based on these refined definitions, three new dimensions emerged. These dimensions are Values in Action, Interaction Dynamics, and Performance Synchrony. In section 5.2, by consolidating the original deductive codes, a further discussion on functional influences on decentralised trust is facilitated, based on the empirical data from Study 1.

Section 6 discusses the outcomes of Study 1. Using a qualitative approach, the discussions in Study 1 focus primarily on the coding process during the interviews. A deeper exploration is conducted into the interesting and critical points mentioned by different interviewees when responding to interview questions, leading to the emergence of eight inductive codes from Study 1. These emerging inductive codes are extensively discussed in section 6.1, supported by representative quotes. The emerging inductive codes consist of Synergy, Mass Education,

Mutuality, Efficiency, Voluntary Responsibility, Consistency, Privacy and Security, and Service Convenience. Section 6.2 elaborates on the interview questions designed specifically for these emerging inductive codes, intended for use in the interview guides for Study 2, with the aim of empirically revisiting their conceptual importance in decentralised circumstances.

Section 7 demonstrates the findings and results of Study 2. This section primarily verifies the seven original deductive codes and eight emerging inductive codes proposed in Study 1 through the interview guides of Study 2, thus revisiting trust theory towards a decentralised approach. Section 7.1 to 7.6 discuss these fifteen first order concepts of decentralised trust, using extensive empirical data and representative quotes to articulate six second order themes. These themes are Paradigm Creation, Anticipatory Incentive, Transient Lenience, Collective Resource Optimisation, Psychological Fairness Promotion, and Social Tie Deepening.

Section 8 discusses the outcomes of Study 2. It aims to provide a deeper inductive summary of the six second order themes identified in Section 7, resulting in three aggregation dimensions of decentralised trust: Trust Shaping Capabilities (section 8.1), Incentive Dynamics (section 8.2), and Conducive Trustworthy Environment (section 8.3). Additionally, for scholarly rigour, before claiming the conceptual originality of these aggregated dimensions, each dimension underwent a due diligence check through Google Scholar on 14th January 2024.

Section 9 constitutes the implications of this thesis. Within this section, section 9.1 discusses implications for decentralised trust theory, section 9.2 for decentralised trust practice, and section 9.3 for decentralised trust policy. The discourse in section 9.1 is founded on an integration of three new dimensions concerning decentralised trust from section 5, derived from Study 1, and three aggregate dimensions of decentralised trust from section 8, derived from Study 2. This involves a further synthesis of the six new dimensions identified from Studies 1 and 2, and a linkage and discussion with the four theories proposed in section 3, thus providing a clearer framework for constructing decentralised trust theory through two-stage empirical studies. Upon the completion of this theoretical framework, section 9.2 and 9.3 proceed from practical and policy support perspectives respectively. Using the blockchain

healthcare ecosystem as a study context and a backdrop of technological innovation reform, section 9.2 and 9.3 propose viable solutions and justify these from the perspectives of public sector entrepreneurship and public sector marketing, linking to the primary data collected.

Section 10 and 11 are titled “Limitations and Directions for Future Research” and “Conclusions”, respectively. In the former, the limitations mainly consider that the research position of this thesis is still based on public sector entrepreneurship and public sector marketing. It is conceivable that in other disciplines, such as information technology or economics, the establishment of decentralised trust could proceed from different theoretical perspectives. The directions for future research primarily involve developing robust quantitative measurement scales of decentralised trust as the next step for a postdoctoral appointment in the latter half of 2024. This thesis, through a multitude of in-depth interviews, provides indispensable academic support for scale development and quantitative analysis. Finally, in the conclusion section of section 11, the concept of Healthcare Computing Power is recalled once again, using the blockchain healthcare ecosystem as an example. This new form of rights affirmation, which does not depend on traditional computing power represented by Bitcoin, will inevitably become one of the significant means to achieve an egalitarian decentralised trust approach.

2. Literature Review

From the 14th Five-Year Plan of China (Burns & Liu, 2017), it is discerned that the years 2021 to 2025 are poised to be a period of explosive development for blockchain technology. This span will see the implementation of numerous global blockchain standards, hastening practical applications. Concurrently, there is a growing demand for blockchain technology literacy and training (Fu, Zhang, & Ao, 2020). Looking at the distribution of sectors in China's A-share market, companies with blockchain payment concepts are nearing the implementation phase, and payment tools with strong endorsements such as legal digital currencies are emerging (STCN, 2023). In vertical fields like government affairs, applications are set to be prioritised for large-scale implementation. In China, a socialist nation with politics and economics at its core, the government has consistently prioritised livelihood issues, particularly pension, education, and healthcare (Zhou, Qu, & Zhai, 2018). It is believed that blockchain applications in the public sector will find priority in these three areas. Inspired by this bold conjecture, blockchain healthcare becomes the motivation for this thesis. However, academia differs from practical application; it requires theory and context as focal points.

2.1. Blockchain Decentralised Ecosystems

2.1.1. The Nature of Blockchain

From the technical perspective, blockchain refers to the distributed ledger that is programmed in Go language (Coyne & Onabolu, 2017; Xiao, 2018). The initial concept of such advanced technology is to utilise blockchain to create an immutable and consensually agreed record of past transactions that is publicly available and managed by the decentralised systems (Babkin et al., 2018). Since no central authority is functionally required, blockchain is claimed to have the potential to provide direct trust between suppliers and consumers (Pazaitis, De Filippi, & Kostakis, 2017). In addition, some conceptual papers, published by Lundy (2016) for example, highlight blockchain as the technology enabler to usher the decentralised forms. From the academic perspective, blockchain contributes to the extension of traditional trust theory and

hence the resolution of the fundamental challenges faced by the centralised systems (De Filippi, 2017). In the development stage, blockchain involves the need for trust between stakeholders to participate and maintain the relationships in decentralised ecosystems (Hawlitschek, Notheisen, & Teubner, 2018, 2020). Hence, the theories related to trust establishment will be further analysed in order to criticise the similarities and differences between the centralised systems and decentralised systems before proposing the conceptual research framework.

Eckhardt et al. (2019) pinpoint that a peer-to peer relationship on a reputational intermediary is one of the main criteria in the centralised digital platforms. From the technological innovation perspective, the emergence of decentralised ecosystems might potentially facilitate stakeholders to have high degree of reputation without intermediaries. However, from the sociological perspective, the consumer satisfaction might not be ensured due to the digital anonymity and low degree of regulatory mechanisms (Botsman, 2017). Hence, engendering trust in decentralised ecosystems to protect the reputations and identities of different stakeholders and improve the consumer satisfaction could be of valuable research directions.

The nature of blockchain highlights the theoretical importance of decentralised ecosystems since key stakeholders' perceptions, responses, and behaviours would be largely affected by anticipated stakeholder relationships, shared values, and the emergence of new stakeholders (Carson & Ghosh, 2019; Dorobantu, Kaul, & Zelner, 2017). In this case, decentralised ecosystems become the core of how organisations operate and create co-value for stakeholders without stiff resistance. In assessing the stakeholder relationships in the decentralised ecosystems, two intriguing conditions are initially assumed: (1) the nature of blockchain is a representative example of decentralised ecosystems; (2) the stakeholder relationships are more likely to be promoted in decentralised ecosystems.

2.1.2. The Concept of Decentralisation

During the third and fourth industrial revolutions, decentralisation can be linked with the

network production (Dalton et al., 1980). Network production is adopted to enhance the efficiency of industrial production, transportation, and communication (Coe, Dicken, & Hess, 2008). Such evolvement has weakened the concentration of production or centralised production since it is no longer necessary to create factory cities or factory sites for shortening the distance of facilitating transportation and communication (Joseph, Klingebiel, & Wilson, 2016; Tavana et al., 2020). When information technologies and telecommunications have not been advanced, the size of factory sites and the efficiency of industrial production are linearly related and reciprocally affected each other (Andrews et al., 2009). In fact, it is believed that building factory cities or factory sites is convenient to control the production processes (Pavlinek & Zizalova, 2016). Such belief is in accordance with the Fordism and Taylorism. In the Fordist era, managers tend to create a standardised relationship between supply and demand so that the planned production could be consumed just in time (Marini & Pannone, 1998). In order to achieve the goal of zero stock, managers should constantly communicate with the target markets. In this case, decentralised processes are involved.

With the fifth industrial revolution, intense technological changes and decentralised processes have increased the capacity of quickly spreading new public administrations and services between different public entities as well as between public and private sector organisations (Altamimi, Liu, & Jimenez, 2023). In other words, geographical advantages have been replaced by information and communication advantages that interaction between different parties become relatively flexible (Wang & Feeney, 2016). Through the decentralised processes, relationships between supply and demand can be practically exercised at a distance with minimal delay. In this case, public activities can be managed and coordinated simultaneously regardless of their physical locations (Jimenez, 2017). Thus, such management model can be linked with decentralised processes to increase trust by transforming the cooperation and transferring the public powers (Hansen & Høst, 2012; Tolbert & Mossberger, 2006). As a consequence, communication is no longer restricted by physical proximity. In effect, the tendency towards decentralised processes is injected with the manipulation of exchanging information and knowledge. In the emerging digital economy, Zhao et al. (2022) articulate that blockchain technology is reshaping the technology-supported trust through instigating

"decentralised autonomous organisation" (DAO) as a new form of decentralisation. Since joining and exiting a DAO are not restricted, it is criticised that ensuring DAO members' commitment to a longer-term relationship is more difficult (Lumineau, Wang, & Schilke, 2021). Therefore, how blockchain decentralised ecosystems interact with different stakeholders, especially in the public sector, requires further analysis.

2.1.3. The Importance of Decentralised Ecosystems

The rise of decentralised ecosystems changes the way for interactions among stakeholders. In this section, the potential of decentralised ecosystems will be explored. Centralised digital platforms usually involve at least three parties consisting of consumers, service providers, and platform organisers (Hawlitschek, Notheisen, & Teubner, 2018; Hawlitschek, Teubner, & Weinhardt, 2016). To be specific, platform organisers serve as the powerful intermediaries to facilitate the search of resources, match supply and demand, and maintain the stakeholder relationships (Laamanen et al., 2018; Rong et al., 2015). However, the limit of centralised digital platforms should be taken into consideration. Taking Airbnb as an example, both hosts and guests have to rely heavily on the platform organisers to satisfy their own benefits (Guda & Subramanian, 2019; Guttentag, 2018). Against the backdrop, the importance of having decentralised ecosystems is highlighted.

Previous research emphasises that digital platforms are regarded as the complementary ways to organisations for value co-creations (Amit & Zott, 2001; Dahlander & Wallin, 2006; Jeppesen & Frederiksen, 2006; Reischauer, 2018). More specifically, Faraj, Jarvenpaa, and Majchrzak (2011) and Fosfuri, Giarratana, and Roca (2011) assert that the objective of digital platforms is to enhance the degree of commitment and to effectively manage interactions among consumers and service providers. In this case, decentralised ecosystems are proposed to allow stakeholders to span their sharing boundaries. Santos and Eisenhardt (2005) allege that how to leverage technologies and social networks to scope sharing boundaries require continuous exploration. Under this circumstance, decentralised ecosystems offer valuable

insights into the theoretical review and conceptual research framework.

Given the limited theoretical frameworks in decentralised ecosystems and empirical evidence, how diverse levels of trust upheld by stakeholders and how stakeholder relationships could be incorporated into the organisations draw little research attention and remain unexplored (Bardhi & Eckhardt, 2012; Beckert, 1999; Suchman, 1995). It is argued that the study context should be considered in a more innovative manner since the emergence of decentralised ecosystems would raise relational set of opportunities for innovative solutions (Rong et al., 2015). In centralised digital platforms, organisations offer goods and/or services to consumers who interact and exchange over a single server to address societal demands (Perren & Kozinets, 2018) and gain mutual benefits (Eckhardt et al., 2019). However, the theoretical plurality prevails undetermined since decentralised ecosystems function as independent media that is not relying heavily on a single server but depends on the level of trust and the stability of relationships established by key stakeholders (Dorobantu, Kaul, & Zelner, 2017; Kumar, Lahiri, & Dogan, 2018; Porter & Donthu, 2008). Therefore, the importance of studying emerging trust topics in decentralised ecosystems is highlighted.

2.1.4. Revolutionising the Transformative Dynamics of Blockchain Forms

Blockchain forms strategically enhance the function of decentralised ecosystems to link distributed ledger and collaborative consumption with stakeholders that certain values could be concurrently accessed (Hazée, Delcourt, & Van Vaerenbergh, 2017; Martin, 2016). Upgrading from third industrial revolution to fourth industrial revolution, blockchain forms can be bestowed added value on and integrated with other advanced technologies in order to offset the potential weaknesses of the centralised digital platforms. Combined with blockchain forms, the sharing ability could be largely enhanced (Albinsson & Perera, 2012). Due to the cutting-edge technological characteristics (Babkin et al., 2018), blockchain forms are endeavoured to consolidate with AI, big data, etc. For instance, by means of smart contract, transactions in decentralised ecosystems could be proceeded securely and refrained from

potential monopoly (Krabec & Venegas, 2017). Blockchain, on account of its current literature, is considered a representative example to study the decentralised ecosystems.

As such, the typical application of blockchain forms is to establish a distributed ledger in order to transform traditional value transmission in centralised digital platforms into novel value transmission in decentralised ecosystems (Sharma, Jindal, & Borah, 2020). Blockchain-based application scenarios are not only related to the financial sector but also comprised in other practical sectors such as healthcare, education, and governance (O'Leary, 2017; Takeshi et al., 2018). Based on the current literature (Carson & Ghosh, 2019; Dorobantu, Kaul, & Zelner, 2017), it can be assumed that the promotion of the blockchain forms could not be separated from the establishment of trust. In the decentralised context, blockchain forms might potentially affect the trust establishments by connecting distributed ledgers and collaborative consumption with stakeholders, allowing for the simultaneous access to shared values (Hazée, Delcourt, & Van Vaerenbergh, 2017; Martin, 2016). The foundation of blockchain forms is a combination of the distributed database and time stamping algorithms in order to form decentralised ecosystems (Yu et al., 2020). For example, the first cryptocurrency, Bitcoin, is designed as an alternative way of transaction which is independently controlled (Babkin et al., 2018). The potential for disintermediation enables the initial users to trace the validity of database at any given point of time before agreeing on the current order (Collart & Canales, 2022). Furthermore, blockchain forms are not limited to united consensus mechanisms but tailored to different interactions. Besides decentralisation, blockchain forms could enhance the security since smart contracts are more technologically advanced than paper contracts.

Despite the advantages, blockchain forms also involve challenges and limitations at the current stage of development (Coyne & Onabolu, 2017; Hawlitschek, Notheisen, & Teubner, 2018). First, the generation of the blockchain forms is created on the availability of the historical records and the disclosure of the involved parties (Alam et al., 2021). Such open concepts would probably raise public concerns on privacy data protection. Second, smart contracts are explicitly intervened by a human so that they are not completely self-manageable (Murray et al., 2021). The immutability of blockchain restricts an autonomous platform to change its

predefined rule unless new smart contracts are deployed. Third, decentralised transactions might attract speculators and hackers to hype and launder through decentralised channels and turn into legal tender (Kwon, 2023). Thus, blockchain forms in determining the research framework remain challenging for scholars to consolidate their argumentative rigours.

In this thesis, blockchain as a representative decentralised ecosystem is selected in order to facilitate trust in stakeholder relationships. Digital platforms could be predominantly divided into two types: centralised and decentralised (Guda & Subramanian, 2019; Jiang & Tian, 2018; Zervas, Proserpio, & Byers, 2017). To be specific, the centralised one is utilised to connect organisations and consumers so that the digitalised activities could be promoted on the basis of social relations (Kornberger, 2017). In the centralised context, digital platforms act as the essential intermediaries to generate and maintain the stakeholder relationships between organisations and consumers (Laamanen et al., 2018; Rong et al., 2015). However, both organisations and consumers have to rely heavily on the centralised digital platforms so as to realise their sharing values (Guda & Subramanian, 2019; Guttentag, 2018). As such, the centralised one is recognised to have both theoretical and practical limits of effectively managing the trustworthy interactions among organisations and consumers (Faraj, Jarvenpaa, & Majchrzak, 2011; Fosfuri, Giarratana, & Roca, 2011). Therefore, a decentralised one is proposed to create relational set of opportunities (Rong et al., 2015) for stakeholders to span their sharing boundaries and share their values without depending majorly on a single server (Dorobantu, Kaul, & Zelner, 2017; Kumar, Lahiri, & Dogan, 2018; Porter & Donthu, 2008). Due to the technological innovativeness and theoretical potential of decentralised ecosystems (Hawlitschek, Notheisen, & Teubner, 2018; Hawlitschek, Teubner, & Weinhardt, 2016), it is argued that the theoretical plurality prevails undetermined and requires further exploration. Since no central authority is required, decentralised ecosystems are expected to facilitate decentralised trust between organisations and consumers (Pazaitis, De Filippi, & Kostakis, 2017). Taking the nature of blockchain into consideration, it is asserted that blockchain would contribute to the extension of traditional trust theory since the purpose of applying it is to create specific ecosystems that could engender trust (Babkin et al., 2018). In the initial development stage, trust tends to be established through the medium of certain theoretical concepts based on

systematic literature review of blockchain, decentralised ecosystems, and identified research gaps between centralised and decentralised circumstances regarding its formations.

2.2. Blockchain for the Public Sector Entrepreneurship and Marketing

2.2.1. Public Sector Entrepreneurship through Decentralisation

Public sector entrepreneurship is defined by Leyden and Link (2015) as the innovative public initiatives that transform a status quo economic environment into more conducive economic units. Through innovative public initiatives, opportunities for public sector entrepreneurship are exploited by development of new technology and innovation among economic units (Mack, Green, & Vedlitz, 2008). Being focused on the combination of inputs that will generate the desired innovation, Ramamurti (1986) implies that public sector entrepreneurs could rely on their social networks and past experiences in order to improve the effectiveness of decision making. As examined by Arnold (2019), the quality of the public sector entrepreneurs' social networks and the likelihood of identifying the entrepreneurial opportunities are fundamental for public sector entrepreneurs to achieve the success.

In this study, the initial characterisation of the public sector entrepreneurs is the entrepreneurial ones who could perceive the entrepreneurial opportunities of blockchain decentralised ecosystems and act on correspondingly. The process of entrepreneurial opportunity identification and implementation in the public sector through blockchain decentralised ecosystems is the essence of distinguishing more entrepreneurial ones from less entrepreneurial ones and/or nonentrepreneurial ones undertaking the uncertainty that arises from the innovative activities. In the face of such uncertainty, it is argued that the possible outcomes cannot be simply measured through purely deductive approach since the processes of entrepreneurial opportunity identification are based on the public sector entrepreneurs' subjective perceptions. For Alvarez and Barney (2005), the public sector entrepreneurs' subjective perceptions are concerned with value creation and value appropriation. For Peter, Lawrence, and Peter (2011), the public sector entrepreneurs' subjective perceptions are manifested in their social

interactions during the entrepreneurial processes. For Leyden and Link (2015), the public sector entrepreneurs' subjective perceptions are engaged through their experiential stakeholder relationships, referring to the public sector entrepreneurs' social networks. In line with the decentralised nature of blockchain ecosystems, the process of identifying blockchain-based innovative solutions as entrepreneurial opportunities and attempting their practical execution is associated with uncertainty. This makes it a valuable contribution to public sector entrepreneurship and provides an original perspective for justifying the conceptual research framework.

Specifically, public sector entrepreneurship through decentralisation could be considered the study of emerging entrepreneurial ecosystems. Traditional entrepreneurial ecosystems depend on fintech to facilitate interactions between actors, connectors, cultures, and resources (Saiedi et al., 2022). A significant portion of research within traditional entrepreneurial ecosystems is dedicated to identifying the key components that contribute to, or are essential for, the realisation of favourable outcomes (Alaassar, Mention, & Aas, 2022; Chen et al., 2020), such as the creation of resilient economies driven by entrepreneurial innovation (Theodoraki, Dana, & Caputo, 2022). Furthermore, the integration of digital technologies play a pivotal role in the evolution and enhancement of entrepreneurial ecosystems (Mumford & Zettinig, 2022). Theodoraki, Dana, and Caputo (2022) highlight the network perspective in studying the entrepreneurial ecosystems, viewing them as social networks comprising diverse actors and industries with intricate value transmissions. Additionally, the vulnerability of business ideas during their formative stages heightens the necessity for entrepreneurs to cultivate trust with external partners and to ensure enhanced transparency in their dealings (Bi, Boh, & Christopoulos, 2021). To a large extent, the development of partnerships is heavily reliant on the trust established between the involved parties (Karami & Read, 2021). Contrasting with the effectuation logic commonly employed by entrepreneurs, leaders and managers often adhere to a more conventional, goal-oriented logic, emphasising the identification and execution of predefined steps towards a goal rather than rapidly adapting to changes (Ancona et al., 2023). Therefore, in the context of blockchain decentralised ecosystems, it is anticipated that stakeholders other than entrepreneurs might approach the formation of decentralised trust with

more caution and less enthusiasm. The decentralised characteristics of blockchain technology enable its utilisation far removed from the traditional entrepreneurial hubs that typically form the epicenter of technology adoptions. This spatial diffusion presents a fascinating area of study for public sector entrepreneurship through decentralisation, especially considering that the digital capabilities of blockchain technology may address some of the inherent challenges, like the issue of ecosystem resilience. The potential of blockchain technology will be explored in mitigating some of these challenges and in fostering a robust level of ecosystem resilience through the establishment of decentralised trust.

Yet blockchain technology continues to be perceived as only part of the infrastructure supporting business relationships in entrepreneurial ecosystems related to transactions, supply chains, smart connectivity, security, privacy, or consensus algorithm (Choo et al., 2020). It has met closely with entrepreneurship as a core ecosystem element in the case of initial coin offerings when a new form of cryptocurrency and venture is launched based on blockchain technology and investors are welcomed to join (Schückes & Gutmann, 2021). And the decentralised nature of blockchain technology depends significantly on trust (Dorobantu, Kaul, & Zelner, 2017). Trust is also important for relationships (Khlystova, Kalyuzhnova, & Belitski, 2022) and for the ecosystem resilience (Roundy, Brockman, & Bradshaw, 2017). Blockchain technology might enhance trust through a decentralised, secure, and transparent system of exchange, allowing for the simultaneous access to "cocreate and appropriate shared value" (Williams & Fathallah, 2024). The potential of blockchain technology to create better and more inclusive entrepreneurial ecosystems has not been recognised in existing theories, and empirical evidence is missing, so this thesis contributes to this direction.

2.2.2. Public Sector Marketing through Decentralisation

Marketing incorporates the process of creating, communicating, delivering, and exchanging offerings that hold value for both recipients and society as a whole (American Marketing Association, 2017). The success of marketing campaigns, whether in the private or public

sector, is determined by the occurrence of exchanges. In the public sector, exchanges involve financial reciprocation from citizens for the services they receive, which can be used to cover the cost of provision or align with the economic value of the public service (Titman, 1995).

The adoption of marketing practices in the public sector has been relatively slow in various countries. In the United States, marketing scholars began advocating for the marketing of legislation in the 1980s (Huszagh, Huszagh, & Buice, 1981). Similarly, it was not until the 1990s that certain European countries started developing strategic marketing plans or utilising selected marketing tools to promote their policies to citizens (Cousins, 1990; Kickert, 1997). In China, marketing concepts and tools were unfamiliar to companies and individuals until the 1990s, given the late embrace of the market economy (Buurma, 2001). Consequently, the idea of public sector marketing is even more recent in the context in which it will be explored.

However, among these public value entities, social values, which enhance trust among stakeholders and their willingness to participate in public sector services, lack empirical clarity. Bouzas-Lorenzo (2010) suggests that there is untapped potential for adapting private sector customer services into public sector policy executions, awaiting discovery by the public sector research community. Unlike the profit-driven objectives of private sector marketing, public sector marketing is guided by its duties towards citizens (Buurma, 2001), influenced by various factors such as demographic changes (Ojasalo & Kauppinen, 2022), technological innovations (Nik Hashim et al., 2022), and public service distrust (de Matos et al., 2020).

The concept of decentralisation is initially proposed as the need to act more efficiently in a multi-level governmental environment and to bring the public sector policy executions closer to the citizens (Bouzas-Lorenzo, 2010). In this thesis, the purpose of highlighting decentralisation is to fine tune the public relationships between the demand for convergence of marketing and public administrations (Zaheer & Rashid, 2017) and the supply of corresponding solutions (Pollitt & Bouckaert, 2017). While some public sector officials may argue against the need for marketing and advocate for more regulations, this approach comes with high social costs, close surveillance, and severe sanctions (Buurma, 2001). An alternative approach is to

employ suitable marketing tools to effectively communicate public policies to citizens, emphasising that these policies aim to better serve their needs (Buurma, 2001). Public sector marketing strategically recognises citizens as customers and policy-led activities as products, allowing public organisations and non-governmental organisations to engage in marketing exchanges with social actors (Butler & Collins, 1995). However, public sector marketing is not solely a government-oriented tool, as governments cannot guarantee the desired effects of public sector services (de Matos et al., 2020; Zaheer & Rashid, 2017). Pablo et al. (2007) and Jarzabkowski and Kaplan (2015) argue that public sector organisations can gain advantages by strategically impacting stakeholders' participation intention to enhance their success. In addition, trust assumes a mediating role in shaping stakeholders' participation intention (Obaze et al., 2023). Therefore, it is crucial to project trust (Bouzas-Lorenzo, 2010; Pollitt & Bouckaert, 2017) for public sector marketing through decentralisation.

2.2.3. Decentralised Ecosystems for the Public Sector through Blockchain Innovations

Adapted from Hewett et al. (2022), innovative ecosystems refer to collaborative arrangements that integrate different organisations' products and/or services into coherent and customer-centred solutions. Wang (2021) adds that innovative ecosystems bring together various stakeholders to effectively integrate resources and abilities through multiple channels. Within the study context, it is proposed that such close horizontal and vertical links with various organisational and individual entities could be applied to blockchain decentralised ecosystems in order to form a collaborative approach and ultimately improve the mutual values and trust between different levels of stakeholders. Such assumption could be further assured by Lee, Moon, and Yin (2020), Pereira et al. (2022), and Scaliza et al. (2022) since innovative ecosystems can be evolved by incorporating different levels of stakeholder engagement.

With the development of advanced technologies, meanings of innovation have been shifted from non-technological processes (Nelson & Winter, 1977) that account for new products, new production methods, new markets, and new supply chain to technological processes (Garcia &

Calantone, 2002; Pishnyak & Khalina, 2022) that are measured by the acceptance of new ideas. On top of exploring meanings, existing literature also characterises innovation as the first positive sanction of the user (Hristov & Reynolds, 2015; Lee, Temel, & Uzkurt, 2016) to provide evidence of the potential success rate within the specified sector (Anselmsson & Johansson, 2009; Hoffmann & Soyez, 2010). Schreier, Fuchs, and Dahl (2012) further argue that being innovative is one thing whereas being perceived by other entities as innovative is another. Alonso, Bressan, and Sakellarios (2017) find that people will perceive the same presented innovation differently and their innovation perceptions are aligned with their actual involvements (Luu, 2022). In addition, the actual involvement could be enhanced by updating their knowledge and awareness of different innovative initiatives. Such findings are adapted from the diffusion and adoption of innovation proposed by Downs and Mohr (1979). Inspired by Füller et al. (2022), it is revealed that if a new leading technology could extend, complement, or substitute human capabilities to transform existing services into more efficient, preferential, or higher quality ones, it would lead people to perceive the potential of such technology-based innovations and usher in an initial trust of fulfilling changing needs (Pereira et al., 2019; van Hemert, Masurel, & Nijkamp, 2011). Therefore, it is assumed that the perceived value and understanding of blockchain-based technological innovations would result in strengthening people's preferences of their actual involvements or impacting on the participation intention to become members of blockchain decentralised ecosystems. Such assumption could be strongly supported by Kumar and Persaud (1996), Roberts and Frohman (1988), and Wilson and Daugherty (2018) in that perceived value would be beneficial for consolidating the knowledge base as well as the intrinsic confidence in reinforcing self-willingness to interact with technology-based innovations (Sirdeshmukh, Singh, & Sabol, 2002; Veréb & Azevedo, 2019).

In public sector entrepreneurship, the research offers a ground-breaking perspective. The application of blockchain's decentralised principles introduces an entrepreneurial mindset to the public sector by promoting technological innovations. By recognising individual stakeholders as nodes, the public sector can embrace a more dynamic approach to problem-solving and decision-making. This theoretical foundation supports the idea that public sector entrepreneurship should not be confined to traditional norms but should actively seek

innovative solutions, such as decentralised decision-making, to address complex challenges within the blockchain decentralised ecosystems. From a public sector marketing standpoint, the research contributes insights into building decentralised trust. Communicating the adoption of blockchain technology and its decentralised principles becomes a compelling narrative in public sector marketing. The emphasis on decentralisation resonates with the public, fostering a positive image of government initiatives. And decentralised trust aligns with modern expectations for a government that is not only efficient but also committed to inclusivity, thereby enhancing the effectiveness of public sector marketing campaigns.

3. Theoretical Review and Conceptual Research Framework

3.1. Theoretical Review

In section 2, current literature does not identify the potential actors that might influence the development and mechanisms for decentralised ecosystems, how to leverage digital technologies and digitalised activities for scoping sharing boundaries require continuous exploration. Under this circumstance, blockchain decentralised ecosystems are chosen as the representative technology-enabled self-manageable systems due to the independent authorised characteristics. A key challenge when introducing new technologies in this context is the alignment of discourses about change and stability (Kromidha & Córdoba-Pachón, 2017; Maran, Bracci, & Inglis, 2018). Public sector's applications of blockchain technology could be the missing link to understand government strategies, entrepreneurial interests, and citizens' needs, then converge expectations on blockchain innovations for public sector services. The aim of this study is to contribute to this unexplored area of research and practice. Therefore, the importance of studying blockchain decentralised ecosystems is underscored.

In accordance with McKnight, Cummings, and Chervany (1998), stakeholders form their initial trusting intention based on their preceding trusting beliefs (Kahneman & Tversky, 1973). Once established, the perceived level of trust is generally unaffected by occasional negative incidents (Darley & Fazio, 1980). Additionally, Albinsson and Perera (2012) argue that varying levels of uncertainty primarily stem from stakeholders' perceptions to adopting participation behaviours. Anderson and Weitz (1989) specifically highlight the importance of trust establishment in ensuring participation behaviours. In trans-organisational settings, establishing trust for securing such participation intention is strongly linked to control and power (Bachmann, 2001; Luhmann, 2017). However, the centralised context cannot be directly applied to the decentralised context due to significant changes in their contextual circumstances (Benkler, 2004). Consequently, implicated by Guo et al. (2020), trust in the decentralised context should be reconsidered based on their critical roles of distributing control and power through decentralisation. Trust in the centralised context revolves around the dependency between

parties (Doney & Cannon, 1997). When party A is highly dependent on party B, A is more likely to trust B. However, the importance of dependency between parties is diminished in the decentralised context due to the availability of alternative parties, significantly reducing dependency (Pazaitis, De Filippi, & Kostakis, 2017). This theoretical assumption can be traced back to Ford (1978), suggesting that the availability of alternative Tier-(N-1) suppliers reduces Tier-N suppliers' dependence on them. Therefore, the extent to which concepts of "trust in the decentralised context" or "decentralised trust" contribute to advancing public sector entrepreneurship and marketing requires further justification.

In the construction of the conceptual research framework for this thesis, a deliberate choice was made to prioritise Commitment-Trust Theory, Social Learning Theory, Psychological Safety Theory, and Social Capital Theory. These theories collectively offer a robust mechanism for examining the dynamics of trust within decentralised settings, particularly as they pertain to blockchain technology. However, other theoretical perspectives such as Transaction Cost Theory, Social Network Theory, and Signalling Theory, while considered, were ultimately not incorporated into the conceptual research framework.

This paragraph briefly elucidates the rationale behind their exclusion in favour of a more relationally and behaviourally oriented approach. Transaction Cost Theory was evaluated for its relevance to the study. This theory, which focuses on the costs associated with economic transactions and how these costs influence organisational structures and market behaviours, provides valuable insights into cost minimisation and efficiency (Gedajlovic & Carney, 2010). Nonetheless, the primary emphasis of the current research is not on the transactional costs but rather on the relational and psychological dimensions of trust in decentralised circumstances. Although Transaction Cost Theory could potentially illuminate aspects of why blockchain decentralised ecosystems might reduce certain economic inefficiencies, it does not extensively address the nuances of trust dynamics and participatory behaviours that are central to this thesis. Social Network Theory was also considered given its applicability in analysing the impacts of networks and the positions of actors within these networks. This theory could offer insights into the structural aspects of blockchain decentralised ecosystems, where the network itself

plays a crucial role (Patil et al., 2023). However, it was determined that Social Capital Theory provides a broader framework by not only addressing network-related aspects but also delving into the quality of relationships and the resources within communities that are essential for building trust (Putnam, Stolle, & Hooghe, 2005; Qi, 2013). Social Capital Theory, therefore, was deemed more suitable for an exploration of relational trust and commitment dynamics in decentralised settings. Lastly, Signalling Theory was assessed for its potential contributions. This theory, which describes how parties convey information about themselves to others through signals (Connelly et al., 2011), is pertinent in contexts where entities must demonstrate trustworthiness, such as in blockchain decentralised ecosystems. Despite its relevance, the focus of the thesis extends beyond initial trust formation—where signalling is most applicable—to comprise ongoing trust maintenance and community interaction. The selected theoretical perspectives are more aligned with these objectives, as they explore not only the establishment but also the sustainability of trust through continuous relational and communal interactions. By integrating the following four theories, the research not only addresses the initial formation of trust but also its maintenance and enhancement through social interactions and psychological safety, providing a nuanced understanding of decentralised trust dynamics. This approach prioritises depth over breadth, choosing theories that collectively furnish an understanding of trust as a multidimensional and dynamically sustained element in the decentralised context.

The incorporation of Commitment-Trust Theory into the exploration of decentralised trust offers a theoretical perspective for understanding how trust and commitment can be developed and maintained in blockchain decentralised ecosystems. Originating from the work of Anderson and Weitz (1989), this theory provides valuable insights into how stakeholder relationships can evolve into stable, trust-based interactions. In this thesis, the initial dimensions for studying decentralised trust will be directly derived from Commitment-Trust Theory. This decision is informed by the theory's foundational concepts, which highlight the importance of trust and commitment in fostering stable relationships. By adapting these dimensions to the decentralised context, the research aims to construct a nuanced conceptual research framework that captures the unique mechanisms of trust formation and maintenance

in decentralised circumstances. This approach ensures that the theoretical underpinnings are both relevant and specifically tailored to address the intricacies of blockchain decentralised ecosystems, facilitating a deeper understanding of the dynamics at play in such settings.

Furthermore, this thesis will utilise Social Learning Theory as a supplementary theoretical perspective alongside Commitment-Trust Theory to analyse the formation of trust in decentralised settings. While Commitment-Trust Theory provides the foundational understanding of trust and commitment dynamics, Social Learning Theory introduces a dimension of behavioural learning and social influence, illustrating how trust can be catalysed through the social environment and community interactions. Rooted in the seminal insights of Bandura (1977), this theory accentuates the critical role of observational learning, imitation, and social influences in shaping behaviours. In the decentralised context, where traditional authoritative structures and direct oversight are minimised, trust-related behaviours and norms are often adopted through the observation of peers and influential community members. By applying Social Learning Theory, this dual-theoretical approach enables a more comprehensive exploration of both the relational commitments and the socially learned behaviours that contribute to the establishment and sustainability of decentralised trust. By intertwining these two theories, the research aims to justify potential catalysts of trust, explaining how trust is not only a product of committed relationships but also influenced by the social learning processes within the blockchain decentralised ecosystems.

Additionally, this thesis will leverage Psychological Safety Theory as a supplementary theoretical perspective alongside Commitment-Trust Theory to explore trust in decentralised circumstances. This theory, developed by Edmondson (1999), emphasises the importance of creating environments where individuals can express themselves freely without fear of negative repercussions. In decentralised settings, where interactions occur across diverse and autonomous stakeholders without centralised control, psychologically safe environments encourage stakeholders to engage in reputational innovation and risk-taking, which are essential for catalysing decentralised trust. This complements the relational focus of Commitment-Trust Theory, which primarily considers how trust and commitment are fostered

through stable, long-term relationships. By examining how psychologically safe environments can act as potential catalysts of trust, this combined theoretical approach will uncover deeper layers of how trust is not only established but also maintained in blockchain decentralised ecosystems, where traditional mechanisms of control and authority are transformed into more fluid, dynamic interactions based on psychologically safe environments.

Finally, this thesis will implement Social Capital Theory as a supplementary theoretical perspective in addition to Commitment-Trust Theory to explore trust in decentralised circumstances. This theory, rooted in Granovetter (1983) and Coleman (1988), offers insights into the roles played by different forms of social capital—bonding, bridging, and linking—in shaping decentralised trust capabilities. It provides a unique perspective on how the social environment and networks influence trust dynamics, focusing on how social ties and communal resources can serve as potential catalysts for developing trust. Such a theoretical perspective is crucial in environments where traditional forms of control and power are absent, and trust is instead built on the decentralised autonomous interactions and social capital within the community. By integrating Social Capital Theory, the research aims to provide a more comprehensive understanding of how both the quality of social interactions and the depth of relational commitments together contribute to forming a robust decentralised trust framework. This dual-theoretical approach will allow for a richer exploration of how trust can be effectively established and sustained in the evolving landscape of decentralised blockchain ecosystems.

3.1.1. Commitment-Trust Theory

Incorporating Commitment-Trust Theory into the conceptual research framework addressing decentralised trust can provide significant insights into the dynamics of decentralised trust and commitment within the blockchain decentralised ecosystems. This theory, as initially developed by Anderson and Weitz (1989), focuses on the mechanisms through which stable, long-term commitments are fostered within relationships, emphasising trust as a crucial element. In the decentralised context, Commitment-Trust Theory allows for an exploration of

how decentralised entities can establish and maintain ongoing, trust-based stakeholder relationships. It delves into how mutual trust and shared commitments can emerge and sustain themselves in environments where interactions are not governed by centralised control and power but by the collective benefit/interest exchanges among participants. This perspective is vital for understanding how decentralised trust is initiated and perpetuated in blockchain decentralised ecosystems, forming the backbone of stable interactions and collaborations.

Commitment-Trust Theory is originated from Anderson and Weitz (1989) to study how stable and long-term commitment could be built up. In line with Hashim and Tan (2015), such stable and long-term commitment are represented as the symbol that internal members are more likely to engage in the activities and be responsive to partnership continuity. To be specific, Wang, Wang, and Liu (2016) indicate commitment as the perceived continuity of relationships between two parties and highlight the importance of trust in ensuring such perceived continuity of stakeholder relationships. Relationship continuity considers concepts including but not limited to trust, power, stakes, reputation, and age of relationships, etc. In the centralised context, Commitment-Trust Theory explains how and why the stakeholder relationships could be lasted. Wu, Weng, and Huang (2012) identify that the adverse effects, such as power imbalance, low levels of stakes, and egoistic reputation would be gradually adjusted over a certain period. In order to achieve high degree of fit and persist the stakeholder relationships, Commitment-Trust Theory is proposed to increase the likelihood of surviving the critical period of potential interest conflicts and influence attempts resulted from different stakeholders. Yuan, Lai, and Chu (2019) further validate that Commitment-Trust Theory lays the foundation for improving the quality of the stakeholder relationships by establishing trust.

In the centralised context, the concept of Commitment in traditional trust theory is evolved from the perceived continuity of relationships to justify how to build up stable and long-term stakeholder relationships on the strength of trust (Hashim & Tan, 2015). In line with Ponder, Bugg Holloway, and Hansen (2016), Commitment represents one party's intention to continue the long-term stakeholder relationships. In the centralised context, such relational continuity between different parties concerns the fulfilment of individual needs and agreed long-term

interests at the organisational level. Because of the emphasis on performance expectations, Commitment is positively associated with the belief that the involved parties could behave in a cooperative and satisfied manner and serve the long-term benefits. Morgan and Hunt (1994) explicate that Commitment requires the involved parties to be trusted cooperators in specified networks. Therefore, Commitment-Trust Theory is considered critical to build up stakeholder relationships in favour of long-term benefits. In addition, Yuan et al. (2018) further argue that different types of stakeholder relationships are always established and maintained by the mutual trust of the involved parties who have the enduring desires and same values to be associated with other stakeholders. The creation and maintenance of a long-term stakeholder relationships also highlights the facets that organisations would be more committed to make short-term sacrifices when they are market oriented (Baker, Simpson, & Siguaw, 1999; Siguaw, Simpson, & Baker, 1998). It could be further argued that casual long-term stakeholder relationships should contain various orientations rather than pure market orientations. The approach to initiate orientations is relied on the willingness to customise the processes of value co-creation in specified networks (Wang, Wang, & Liu, 2016; Yuan, Lai, & Chu, 2019).

In the decentralised context, it is posited that a desirable relationship continuity could be achieved through fostering decentralised trust. Based on the argumentations of Ponder, Bugg Holloway, and Hansen (2016) and Yuan et al. (2018), the major differences between centralised digital platforms and decentralised ecosystems are reflected on the differentiated system types. In addition, decentralised ecosystems involve stakeholders who desire to create certain mutual values (Hazée, Delcourt, & Van Vaerenbergh, 2017; Martin, 2016). Adapted from Li, Li, and Feng (2015), Commitment in decentralised stakeholder relationships is conceptualised as the direct outcomes of developing decentralised trust. Therefore, the conceptual research framework links commitment with the appropriate establishment of decentralised trust.

In addition, the age of relationships is argued to be not conceptually important in the decentralised context since McEvily and Marcus (2005) and Palmatier et al. (2007) find that the quality of stakeholder relationships is primarily deepened by mutual understanding between the involved parties rather than simply over a certain period. In addition to this underlying

theoretical premise, effective communication and leveraging experiential assets should significantly enhance both mutual benefits and mutual understanding before initiating any digitalised activities (Willis, Jai, & Lauderdale, 2021). In this case, mutual benefits and mutual understanding could become the causes and premises in establishing decentralised trust. To be specific, the original purpose of considering the age of stakeholder relationships in the centralised context is to resolve the conflicts due to egoism and independent interests (Ybarra & Wiersema, 1999). Such purpose is argued to be not conceptually significant in the decentralised context since the nature of decentralised ecosystems is to fundamentally highlight potential altruism and mutual interests. However, how and why mutual interests could be contributed to stabilise the decentralised stakeholder relationships has not been empirically justified. In this case, Commitment-Trust Theory is worthy of further investigations in the decentralised context.

3.1.2. Social Learning Theory

Utilising Social Learning Theory as a conceptual perspective for research on decentralised trust offers a nuanced understanding of how trust-related behaviours are acquired in environments devoid of centralised governance structures. This theory, rooted in the seminal works of Bandura (1977), emphasises the role of observational learning and social imitation in behaviour acquisition. In the decentralised context, social learning processes become pivotal, as individuals often rely on indirect experiences and the influence of peers or significant figures within their social network to navigate trust-related decisions. Social Learning Theory thus provides a lens to examine the intricacies of how decentralised trust is formed, maintained, and evolved within the blockchain decentralised ecosystems, where traditional authoritative cues are minimised. It highlights the importance of social interactions, shared experiences, and the role of influential community members in shaping perceptions, practices, and policies of forming decentralised trust. Such a conceptual perspective is instrumental in dissecting the complex dynamics of decentralised trust, offering valuable insights into the establishment and sustainability of trust in decentralised circumstances.

Pioneered by Bandura (1977), Social Learning Theory provides a theoretical perspective that people could undergo a transformative learning process where they assimilate novel behaviours, perceptions, and responses through the systematic observation and emulation of others, e.g., observing emotional states among role models or significant individuals within their social groups. This theory underscores the pivotal importance of observational learning, imitation, and modelling within the broader context of knowledge acquisition. It is particularly prominent when people identify the influential figures, illuminating the multifaceted interplay of dynamics and impact aspects that shape human behaviour (Yarberry & Sims, 2021). In the domain of management studies, Social Learning Theory offers valuable insights into how individuals within organisational settings acquire and adapt behaviours, values, and specific competencies through a process of observation and replication, thereby influencing the overall organisational culture and performance (Almaz, 2010; Liu et al., 2020). Notably, such learning process is markedly pronounced when individuals perceive certain entities as exemplars within their social sphere. Consequently, Social Learning Theory underscores the importance of establishing connections with stakeholders through active participation in learning and involvement in practice within the specified social groups (Bond & Blevins, 2020).

In terms of the theoretical positioning, Harvey et al. (2010) point out that Social Learning Theory primarily concentrates on analysing the conceptual connections among individuals and their social network structure. When a virtual community fosters more interactions among its participants, it leads to increased frequency, depth, and breadth of information exchanges, as noted by Chiu, Hsu, and Wang (2006). Moreover, Hanna, Crittenden, and Crittenden (2013) emphasise that a higher degree of interactions within a virtual social network concerning a specific topic amplifies knowledge contribution and enhances the usefulness of shared knowledge. They further establish that interaction ties have a significant and positive impact on the knowledge shared among virtual community participants. Shum and Ferguson (2012) propose that a shared language and, by extension, common goals among community participants facilitate a shared vision. Nadeem et al. (2020) assert that a shared vision strengthens interpersonal ties and enables cooperative actions, benefiting both the organisation

and its participants. According to Yarberry and Sims (2021), shared goals, interests, and visions in a virtual community provide participants with insight into the value of knowledge sharing, ultimately improving both its quantity and quality. Finally, trust, social identification, and reciprocity play pivotal roles. As illustrated by Kramer and Tyler (1996), trust fosters willingness for cooperative interactions, with high levels enhancing the digitalised activities. Social identification, explored by Bedi, Alpaslan, and Green (2016), leads individuals to align with the collective goals of their social groups, expanding opportunities for innovative solutions and increasing their anticipation of the value of knowledge sharing.

However, nurturing and sustaining these conceptual connections might be challengeable in virtual or remote settings in the decentralised context, e.g., mentoring the relationships among stakeholders. According to Bai, Lin, and Liu (2019), mentoring the relationships can be linked to organisational socialisation and access to influential figures and decision-making. For instance, the positive outcomes of mentoring the relationships could result in enhancing the optimism about the future of virtual or remote settings. They further elaborate on how virtual communities might necessitate stakeholders to become self-empowered, relying on their learning abilities while sustaining motivation excel. Their belief in their own efficacy significantly influences whether they will endeavour to confront unforeseen obstacles independently, without expecting support from external forces outside the communities. It is emphasised by Chia et al. (2021) that individuals with robust self-efficacy are more likely to overcome challenges that impede their performance in virtual or remote settings. In the decentralised context, therefore, Social Learning Theory finds theoretical relevance in explicating how individuals engage with, adapt to, and co-create their values within the emerging decentralised ecosystems, where the value transmission and the corresponding behaviour assimilation could significantly shape the character and evolution of the decentralised ecosystems. In addition, considering the nature of blockchain emphasised in section 2.1.1, those representative learning exemplars can be further interpreted as the significant blockchain nodes within the blockchain decentralised ecosystems.

3.1.3. Psychological Safety Theory

Integrating Psychological Safety Theory into a conceptual research framework focusing on decentralised trust offers an understanding of how decentralised trust dynamics evolve in environments where traditional hierarchical cues are minimal. This theory, as elucidated by Edmondson (1999) and further expanded upon by subsequent researchers, emphasises creating an environment where individuals feel safe to express themselves without fear of negative consequences. This aspect is crucial in decentralised settings, where diverse stakeholders interact without centralised authority. The psychologically safe perspective could foster an atmosphere conducive to reputational innovation and risk-taking elements for building and sustaining decentralised trust. By applying this theory, how the assurance of psychologically safe influences stakeholder engagement, trust development, and collaborative problem-solving within the blockchain decentralised ecosystems can be explored. It also helps in understanding the interplay between individual predispositions (like proactive personality) and the collective environment, shedding light on how Psychological Safety Theory could impact decentralised trust dynamics and stakeholder behaviours.

Presented by Edmondson (1999) presents Psychological Safety Theory, arguing that it is conceptually significant to management studies. At its theoretical core, this theory emphasises the creation of an environment wherein individuals feel sufficiently at ease to voice their opinions, ideas, concerns, and proactively make contributions without fearing retribution or ostracisation. It is posited that in such a psychologically safe setting, individuals are more likely to engage in open and innovative dialogues, thereby fostering enhanced collaboration and problem-solving approaches characterised by a sense of security and interpersonal trust. Psychological Safety Theory underscores the pivotal practices within the management studies in shaping an atmosphere, e.g., organisational culture, that cultivates a stimulated ground for sharing new ideas and challenging the status quo without the fear of negative consequences.

In the context of social exchange, proactive personality is defined as an inclination towards continuous enhancement in processes and outcomes (Newman, Donohue, & Eva, 2017). Those

individuals who possess a high degree of proactive personality exhibit the capability to identify and resolve the issues actively, with the aim of positively transforming their problem-solving approaches. Conversely, individuals characterised by low proactive personality tend to lean towards a passive approach, opting to adapt to prevailing circumstances and allowing situational forces to unfold naturally. It is worth noting that individuals with low proactive personality are not characterised by disinterest; instead, they engage with the activities in a distinct manner (Frazier et al., 2017). Specifically, individuals with high proactive personality endeavour to serve as advocates for constructive reform, whereas those with low proactive personality adopt a more reactive stance, addressing issues after they have already surfaced.

It is posited that when advocators and followers align in their approaches, followers are more likely to feel at ease engaging in their behaviours due to the perception of increased psychologically safe (Xu et al., 2019). As previously mentioned, psychologically safe pertains to the belief that one can express their genuine selves without fear of reprisal or negative consequences (Nguyen, 2021). Followers perceive psychologically safe when their actions conform to the advocators' preferences, thereby enhancing their own confidence that their outcomes will also be positive (Hu et al., 2018). Conversely, followers who deviate from the advocators' tendencies are less likely to feel psychologically safe, as they anticipate a negative evaluation of their preferred approach (Nguyen, 2021). The proactive personality of an individual is a significant determinant of their approach to the social exchange context. Advocators with high proactive personality proactively identify potential issues that may impact their followers in the future and formulate action plans to address these concerns to their followers (Spence, 2002). Through their actions, advocators with high proactive personality convey the expectation of proactive behaviour to their followers. Conversely, advocators with low proactive personality tend to adopt a "wait and see" conservative approach, expending effort only when confronted with a problem that necessitates a solution (Newman, Donohue, & Eva, 2017). These advocators signal their preference for a proactive approach to their followers. As followers interpret the signals from their advocators regarding the proactive approach, they are more likely to express their authentic selves when their own proactive tendencies align with those of their advocators. Followers perceive that proactivity is valued

when they witness their advocators modelling the importance of positive change (Maura, Jan, & Carsten, 2012). Followers with similar proactive tendencies as their advocators are more likely to feel a heightened sense of psychologically safe because they believe the advocators will appreciate their inherent preferences in approaching tasks (Hu et al., 2018). When advocators exhibit more proactive tendencies, it signals to followers that they prefer cautious and measured actions in handling or developing the initiatives. If followers' and advocators' proactive tendencies align, they share a preference for adaptation to existing conditions, which strengthens followers' confidence in the value of their habitual preferences and behaviours.

Therefore, when there is congruence between followers and advocators in terms of proactive personality, both parties are more likely to prioritise and interpret problems in a consistent manner (Gonzalez, 2016). Such alignment in collaboration and problem-solving approaches reduces ambiguity regarding the expectations and enhances predictability in each other's behaviour (Cai et al., 2021). Consequently, personality congruence fosters a sense of safety and support for highly proactive followers when they seek to improve the circumstances. Similarly, it allows low proactive followers to feel at ease adopting a more passive approach. Conversely, when there is incongruence between an advocator and a follower in terms of proactive personality, their approaches diverge. This misalignment can lead to psychological conflict for the follower, as their preferred approach clashes with that of the advocator. In situations of incongruence, followers find it challenging to behave authentically because management signals suggest that their proactivity will not be advantageous (Fuller, Marler, & Hester, 2012). In such incongruent situations, followers are concerned that engaging in behaviours misaligned with their advocators' tendencies will result in a loss of trust and support (Liang, Farh, & Farh, 2012). In light of these arguments, it is expected that congruence in proactive personality between advocators and followers will enhance follower perceptions of psychologically safe.

When applied to blockchain decentralised ecosystems, Psychological Safety Theory embodies a theoretical perspective that underscores the establishment of a digital environment where stakeholders could span their diverse backgrounds and contribute autonomously. The cultivation of psychologically safe becomes a pivotal angle that the creation of blockchain

decentralised ecosystems wherein stakeholders, free from fear of negative repercussions, are encouraged to express their true ideas, concerns, and innovative insights. This fosters a digital environment conducive to reputational innovation, cooperative problem-solving, and continual stimulation. In the decentralised context, Psychological Safety Theory underscores the theoretical importance of nurturing an environment that not only enhances the stakeholders' participation intention in taking interpersonal risks but also augments the potential for sustaining their committed relationships within the blockchain decentralised ecosystems.

3.1.4. Social Capital Theory

Applying Social Capital Theory to a conceptual research framework focused on decentralised trust can offer insights into how trust is built and operationalised within the blockchain decentralised ecosystems. This theory, rooted in the foundational works of Granovetter (1983) and Coleman (1988), examines the role of social networks, stakeholder relationships, and the accrued social resources in facilitating satisfied actions. In the decentralised context, Social Capital Theory provides a lens to understand how the decentralised ecosystems and the norms of reciprocity within these ecosystems influence decentralised trust dynamics. It allows for the exploration of how social ties and shared values in decentralised settings contribute to the establishment and sustainability of trust. This approach is particularly relevant in examining how different forms of social capital, e.g., bonding, bridging, and linking, play their roles in shaping the decentralised trust capabilities. By focusing on these distinct forms, Social Capital Theory offers a robust perspective for understanding the nuances of decentralised trust, where the conventional control and power of centralised digital platforms are transformed by decentralised autonomous interactions.

Social Capital Theory, firstly introduced by Granovetter (1983) and further developed by Coleman (1988), represents a theoretical perspective within the management discourse that the conceptual connections of social networks, stakeholder relationships, and social resources could facilitate satisfied actions. The concept of social capital has been applied and extended

to the social exchange context (Qi, 2013). At its theoretical core, this theory delineates the reservoir of valuable social resources embedded within the social networks and stakeholder relationships (Ray, Nyberg, & Maltarich, 2023). It can be then referred to the notion that these connections and the reciprocity they entail can be leveraged to enhance satisfied organisational performance, facilitate knowledge sharing, foster collaborative endeavours, and yield trust between participants within the social networks. Social Capital Theory, rooted in sociology and organisational behaviour, thus underscores the intrinsic theoretical importance of social ties as tangible assets that could augment the achievement of trust establishment through enhancing the overall satisfaction of the digital platforms (Gedajlovic et al., 2013). According to Putnam, Stolle, and Hooghe (2005), social capital represents the shared values that facilitate satisfaction and are manifested in stakeholder relationships. Ali et al. (2019) extend this definition to underscore the importance of social capital in linking various institutions. Teng (2017) characterises social capital as the connections among individuals, encompassing trust or loyalty that arise from these satisfied connections. Social capital also pertains to the output of diverse social groups and the evolution of communities (Spitz, 2013).

Scholars have classified social capital into three distinct forms: bonding, bridging, and linking (Halpern, 2005; Tubadji, Kourtit, & Nijkamp, 2014). Bonding social capital, considered the most robust type, reflects stakeholder relationships with close friends, family members, and individuals who share similar ideologies or situations. It reinforces the concept of homogeneity. Bridging social capital, while less strong than bonding social capital, signifies stakeholder relationships between friends of friends. Shiell, Hawe, and Kavanagh (2020) emphasise its importance in establishing satisfied connections between diverse social groups, which are more fragile but also more likely to promote social inclusion. Linking social capital, the third type, involves the stakeholder relationships between citizens and elected leaders. It connects individuals to others in different contexts, which in turn generates social resources beyond a specific single community. Putnam, Stolle, and Hooghe (2005) aptly states that “social capital is not just a public good but is for the public good”. Social capital fosters the formation of satisfied group coalitions, community empowerment, and the reinforcement of civil society (Tubadji, Kourtit, & Nijkamp, 2014). In addition, Tubadji, Kourtit, and Nijkamp (2014) views

social capital as an entrepreneurial social resource that can have either positive or negative impacts on society, depending on how it is utilised. Therefore, an understanding the different aspects of social capital is crucial for shaping decentralised trust.

Bonding social capital provides strong support to marginalised segments of society, such as women, the poor, and indigenous groups, in pursuing their common interests. This cooperative spirit acts as a safeguard for these communities against external threats when the state is unable to assist them, and trust in the system or political parties is lacking (Fukuyama, 2001). However, it can also lead to negative consequences by reinforcing illegal or unethical behaviours among its members, promoting exclusivity, and prioritising the interests of a specific social group over others, which might harm society as a whole (Ilan, 2013). Bridging social capital plays a vital role in connecting heterogeneous groups, facilitating the exchange of information and ideas, and fostering common interests among diverse groups (Putnam, Stolle, & Hooghe, 2005). It expands the radius of trust and contributes to a satisfied institutional ecosystem. Nevertheless, maintaining a balance between bonding and bridging social capital is crucial for achieving productive outcomes; otherwise, these two forms may work against each other and lead to the atomisation of society rather than integration (Marozzi, 2016). In addition, some scholars emphasise the pivotal role of deepening the social capital through linking stakeholder relationships (Agger & Jensen, 2015). They argue that linking social capital enhances trust in government, promotes civic participation, and relies on a democratic environment for its existence. The absence of a robust national government and political parties has historically driven people to join bonding closed social groups, creating challenges for social cohesion and potentially facilitating the rise of authoritarian leaders.

Credited to Bourdieu and Wacquant (2013), Social Capital Theory is highlighted as a key aspect to the fundamental ground of the role of social ties in accessing valuable information and social resources. In turn, it is assumed that social capital could also lead to increased trust and continued stakeholder relationships in the decentralised context. Therefore, within the blockchain decentralised ecosystems, Social Capital Theory represents the notion that inherent in the decentralised circumstances where digitalised activities could be theoretically supported.

Rooted in sociology and management studies, Social Capital Theory emphasises the pivotal role of blockchain decentralised ecosystems, and satisfied stakeholder relationships as fundamental assets that contribute significantly to the establishment of decentralised trust.

3.2. Conceptual Research Framework

3.2.1. The Importance of Researching Trust in the Decentralised Context

Compared with centralised digital platforms, blockchain decentralised ecosystems involve more opportunities and technological innovation. One-way trust from one party to the other party should give way to mutual trust between the parties to yield new stable and long-term partnerships. In the centralised context, trust is consistent with the theoretical assumption that one party must undertake interactions before the involved parties and count on the involved parties will fulfil its commitment and undertake coordinative behaviours (Anderson & Weitz, 1989). Through the establishment of trust, the involved parties will exploit long-term commitment since Ponder, Bugg Holloway, and Hansen (2016) believe that the short-term inequities would be reconciled to form partnership success in stakeholder relationships. During the digitalised activities, the signals that the involved parties tend to build high level of trust are regarded as potential catalysts of trust. Furthermore, Aulakh, Kotabe, and Sahay (1996) suggest that trust should be separated from different dimensions and should not be regarded as a single social construct. Hallikainen and Laukkanen (2018) further argue that the trust dimensions can be various to initiate the continuum of stakeholder relationships.

According to Isaeva, Gruenewald, and Saunders (2020), trust is a complex social construct reflecting the relationships between individuals and organisations. It is regarded as a dynamic and reflexive process that one party (or trustor) builds up confident beliefs and positive expectations on the related involved party (or trustee) (Fulmer & Dirks, 2018). As a consequence, such processes are incorporated into the considerations from cognition-based trust to behaviour-based trust based on human experience. Within the traditional trust theory, conceptualisation of trust is linked with the social interactions between consumers and service

providers, and between upstream service providers and downstream service providers (Bozic & Kuppelwieser, 2019). In line with Rousseau et al. (1998, p. 395), 'trust is a psychological state comprising the intention to accept vulnerability based on positive expectations of the intentions or behaviour of another'. In this case, trust in stakeholder relationships involve both psychological states and collaborative interactions between consumers and service providers, and between upstream service providers and downstream service providers so that scholars might have to adopt a socio-psychological perspective to understand the foundations of trust. Hence, trust is recognised as the core for proposing the conceptual research framework.

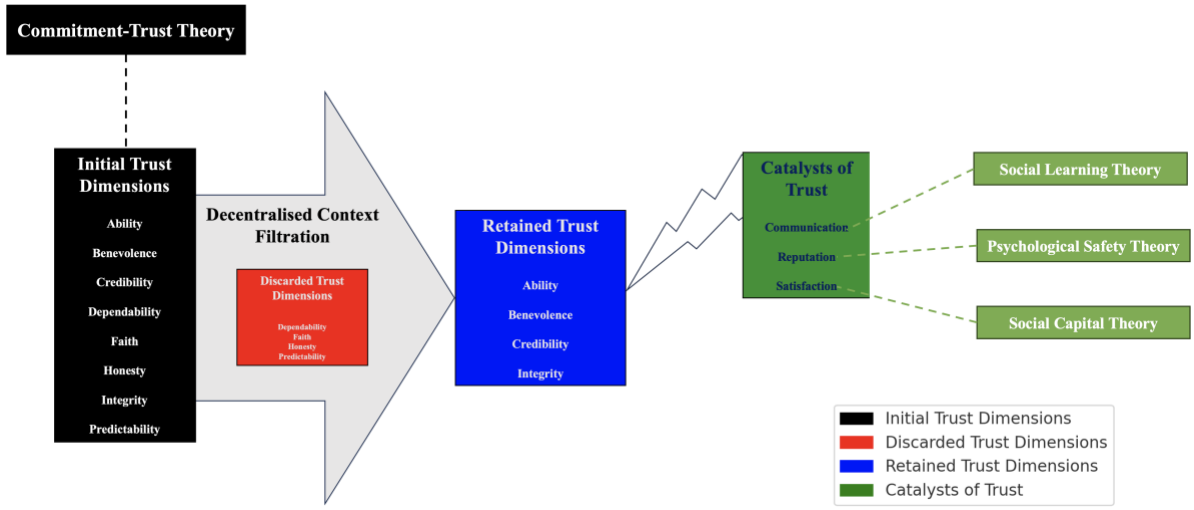

Figure 1: Conceptual Research Framework: Trust in the Decentralised Context

As depicted in Figure 1, eight trust dimensions have been selected from Commitment-Trust Theory: Ability, Benevolence, Credibility, Dependability, Faith, Honesty, Integrity, and Predictability. The choice of these eight trust dimensions was mainly influenced by their validation in centralised circumstances. In other words, they possess well-developed scale items suitable for quantitative research. Notably, for more expansive qualitative research, theories led by well-structured scale items provide an excellent starting point. This is particularly pertinent in this thesis where, although no existing scale items for decentralised trust are available, the scale items for trust in centralised circumstances offer a solid cohort starting point for qualitative study. Accordingly, this thesis begins with these eight trust dimensions, adopting a perspective of decentralised circumstances for the initial screening before primary data collection. The screening primarily considers whether these trust

dimensions contradict the nature of decentralised ecosystems. Consequently, four trust dimensions—Dependability, Faith, Honesty, and Predictability—were discarded in the decentralised context, with detailed explanations provided in sections 3.2.2.1 to 3.2.2.4. In contrast, the dimensions of Ability, Benevolence, Credibility, and Integrity were retained, with further elucidations in sections 3.2.3.1 to 3.2.3.4. Additionally, the forthcoming pilot study will revisit these eight theoretical trust dimensions based on respondents' broader understanding of decentralised trust, confirming that the four dimensions discarded are unsuitable for deep investigation in Studies 1 and 2.

Subsequently, in section 3.2.4, three catalysts of trust in the decentralised context are identified, consisting of Communication, Reputation, and Satisfaction. In section 3.2.4.1, Communication emerges from Social Learning Theory, aiming to emphasise that communication serves as a potential catalyst for establishing decentralised trust through social connections and the transmission of values and knowledge sharing in decentralised ecosystems. In section 3.2.4.2, Reputation, deriving from Psychological Safety Theory, aims to highlight how an advocator's active personality can endorse their behaviour in decentralised ecosystems, thereby positively influencing followers to actively participate in subsequent activities. In section 3.2.4.3, satisfaction, emerging from Social Capital Theory, aims to emphasise that trust mechanisms can be generated through value co-creations among stakeholders. How stakeholders actively engage in value co-creation can be informed by how to maintain the three most classic forms of stakeholder relationships in Social Capital Theory: bonding, bridging, and linking social capital. If it is possible to align the weaker satisfied stakeholder relationship—linking social capital—closer to the stronger satisfied relationship—bonding social capital—then stakeholders in decentralised ecosystems are more likely to generate decentralised trust.

In this thesis, the proposed conceptual research framework is extracted as the interactions with public organisations and citizens that maintain supply-demand stakeholder relationships in the blockchain decentralised ecosystems. The perceptions, responses, and behaviours of the identified stakeholders will trigger the combination of theories that are relevant to study decentralised stakeholder relationships through establishing decentralised trust. In other words,

stakeholder relationships are guided by this decentralised trust framework.

3.2.2. Discarded Trust Dimensions in the Decentralised Context

In line with Hawlitschek, Notheisen, and Teubner (2018), trust is interrelated between different theories reviewing trusting beliefs and intentions, trust behaviours, and institution-based trust (Albinsson & Perera, 2012; Benkler, 2004; Botsman, 2017). In terms of stakeholder relationships, trust is highlighted as one of the development purposes of having decentralised ecosystems (De Filippi, 2017; Yu et al., 2020). According to Krause, Croft, and James (2007), decentralised ecosystems consist of nodes and edges, where nodes symbolise the individual stakeholders and edges represent the relationships between them. To be specific, stakeholder relationships could represent various types of behaviours from competitive to cooperative (Marion, 2009). Sih, Hanser, and McHugh (2009) propose that both direct and indirect connections, distinguished by experiences and social positions, should be taken into account as the behaviours of different stakeholders. Such argumentation is further supported by Newman (2003). In this section, trust dimensions will be discussed within the traditional trust theory and its related values in the decentralised context, represented by blockchain decentralised ecosystems. Based on the following discussions on filtering and selecting theory-led concepts in the decentralised context, the conceptual research framework will be formulated to guide the approach to the empirical studies. Furthermore, the proposed conceptual research framework will be revisited after conducting empirical studies in order to review the initial conceptual connections and to advance decentralised trust theory.

3.2.2.1. Dependability

The concept of Dependability refers to one party's expectations that the involved parties would act in its best interest (Ybarra & Wiersema, 1999). It is a theoretical component in the centralised context to influence dependency between the two parties. However, the theoretical importance of dependability is weakened in the decentralised context since the involved parties

would proactively reduce power imbalance through establishing mutual interest (Pazaitis, De Filippi, & Kostakis, 2017). When the involved parties perform in their mutual monetary and nonmonetary interest, one party's perceived expectations would be at a higher level. Therefore, Dependability is discarded in the decentralised context.

In the decentralised context, the traditional concept of Dependability, which relies on expectations that parties will act in each other's best interest, is transformed due to the inherent nature of decentralised ecosystems. Unlike centralised systems where authority and control are concentrated, leading to a dependency based on hierarchical trust and oversight, decentralised ecosystems distribute authority among all participants equally. This shift eliminates the need for a central authoritative figure whose presence typically underpins Dependability. In decentralised ecosystems, parties are not expected to act out of a fiduciary duty to one another but are instead driven by aligned incentives, where acting in one's self-interest promotes the mutual interests. Furthermore, the reliance on transparent and immutable technological protocols, such as blockchain, ensures that all transactions and interactions are recorded permanently and openly, thereby reducing the need for trust based on personal reliability and shifting it towards trust in the system's design and operational rules. As a result, in decentralised ecosystems, Dependability as traditionally understood becomes less relevant, and is often discarded, as the structure of these systems inherently reduces the risk of exploitative behaviours through a symmetrical power distribution and self-regulating mechanisms that foster a naturally high level of perceived expectations among the involved parties.

3.2.2.2. Faith

The concept of Faith refers to one party's specific trust belief that the involved parties would not behave opportunistically, even in novel situations (Ybarra & Wiersema, 1999). Following this definition, decentralised ecosystems can be regarded as the novel situations so that one party's faith is still expected to be consistent in stakeholder relationships. In terms of the perceptions of Faith (McEvily & Marcus, 2005; Perrone, Zaheer, & McEvily, 2003), it is linked

with the perceptions of opportunistic behaviours. However, opportunistic behaviours contravene the fundamental intent behind establishing decentralised ecosystems, which is to maximise the mutual interests of stakeholders, whilst proactively relinquishing certain opportunistic behaviours. Therefore, Faith is discarded in the decentralised context.

Following the initial discussion on the concept of Faith, it is essential to further elucidate why this trust dimension is considered discarded in the decentralised context. Decentralised ecosystems are structured to diminish the likelihood of opportunistic behaviours through a combination of technological and incentive-based solutions. For instance, the structural transparency of blockchain decentralised ecosystems makes the traditional concept of Faith—reliance on the good conduct of others—less crucial because the perceptions of faith are inherently built into the system's operation rather than relying on the assumed ethical behaviours of its participants. Instead, trust in the decentralised context is redefined as the alignment of incentives that naturally discourages opportunistic behaviours, ensuring that participants act in ways that are mutually beneficial and collective adherence to protocols.

3.2.2.3. Honesty

The concept of Honesty refers to one party's specific trust belief that the involved parties would sincerely play their promised roles (Kumar, Scheer, & Steenkamp, 1995). In line with Doney and Cannon (1997), if the involved parties could continue to perform in an honest manner, they would be treated as the reputational players in specified digital platforms. On top of the above argumentations, Honesty will not be further explored since it could be fundamentally merged with Integrity due to their similar constituent items for measuring trust in the centralised context (McEvily & Marcus, 2005; Perrone, Zaheer, & McEvily, 2003). To be specific, Integrity highlights that the involved parties are expected to act in cooperative actions (Aulakh, Kotabe, & Sahay, 1996). From the perspective of Willis, Jai, and Lauderdale (2021), such cooperative actions could be simultaneously regarded as the promises made by the involved parties when they participate in specified digital platforms. As a consequence, the approach to

initiate Honesty could learn from the approach to conceptualise Integrity.

Building on the discussions of Honesty and Integrity in centralised circumstances, it is important to explore why the dimension of Honesty becomes less distinct and thus merged into the broader concept of Integrity in the decentralised context. In decentralised ecosystems, the role of reputation as influenced by ongoing honest behaviours is automated and quantified through feedback mechanisms integrated into the technology. This integration makes the differentiation between Honesty and Integrity less pronounced because the system inherently ensures that all participants adhere to the protocols, effectively merging the concept of playing one's promised role (Honesty) with acting in a cooperative and consistent manner (Integrity). The decentralised ecosystems thus ensures that the integrity of actions simultaneously assures what would traditionally be considered honest behaviours. Therefore, in the decentralised context, the trust previously placed in the individual's or organisation's capacity to act honestly according to subjective assessments or centralised verification is replaced by trust in the technological infrastructure and its capability to enforce compliance with agreed standards of smart contracts. This shift not only makes separate considerations of Honesty redundant but enhances the role of Integrity to encompass both the adherence to cooperative actions and the fulfilment of promises made by the involved parties, now governed by the immutable and transparent nature of decentralised ecosystems. Thus, while Honesty as a distinct trust dimension may fade in significance in these settings, the foundational principles it represents are not lost but are subsumed under the broader, more enforceable concept of Integrity.

3.2.2.4. Predictability

The concept of Predictability refers to the involved parties' consistency of actions in the strategic alliance (Ybarra & Wiersema, 1999). However, Predictability is subject to continual change indicating that even when stakeholder relationships exhibit trust, the strategic alliance might still be broken up due to the involved parties' self interest in their major activities (Poppo, Zhou, & Ryu, 2008). In the centralised context, Predictability would be increased by the

reduction of opportunistic behaviours (Darley, 1998). In line with the approach to discarding Faith in the decentralised context, Predictability will not be further explored.

In exploring the transformation of the trust dimension known as Predictability from centralised to decentralised context, it is important to recognise the fundamental changes in how trust is established and maintained in decentralised ecosystems. In decentralised ecosystems, the reliance on centralised mechanisms to enforce predictability is not only diminished but often entirely absent. Decentralised ecosystems are underpinned by technology-driven smart contracts that automatically execute agreed-upon actions when certain conditions are met. In such circumstances, trust is derived not from the predictability of human actions but from the smart contracts that self-govern the decentralised ecosystems. While this may seem to undermine Predictability as traditionally understood, it actually shifts the focus of predictability from behavioural consistency of individuals to the reliability of the decentralised ecosystems. Thus, just as the need for the trust dimension of Faith becomes redundant in the decentralised context, so too does the traditional concept of Predictability. This reflects a fundamental shift in how predictability-based trust is operationalised in decentralised versus centralised systems.

3.2.3. Retained Trust Dimensions in the Decentralised Context

3.2.3.1. Ability

Compared to other dimensions of trust, the concept of Ability is recently differentiated as a separate trust dimension that reflects the nature of specified digital platforms (Hallikainen & Laukkanen, 2018; Muthusamy & White, 2016). Adapted from Mayer, James, and David (1995), Ability specifically highlights the importance of competence convergence in collaborative approaches. The perceptions of Ability in stakeholder relationships are judged by the competencies of the collective group skills, the influences of the involved parties within specified digital platforms, and the characteristics of the collaborative activities. Mayer and Davis (1999) further explain that the levels of Ability-based trust can be various, depending on the complexity of the collaborative activities in the specific situations. For instance, the

collaborative activities and situations that comprise simple group tasks might not require specific competence convergence and adhere a set of capabilities in collaborative approaches, but still warrant a high degree of professional familiarity that emphasises the trusted collaborative activities in the specific situations (Coulter & Coulter, 2003).

According to Muthusamy and White (2016), Ability could be positively altered by exchanging the knowledge in order to jointly accomplish a task. In addition, Hallikainen and Laukkanen (2018) further expect that one party might be more likely to partake competently if the involved parties' decision making consider one's concerns and interests. In this research, Ability will be examined by the following interview question: ***"How could you or your organisation be able to establish trust in a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Ability in decentralised circumstances.

3.2.3.2. Benevolence

In preserving the stakeholder relationships, the concept of Benevolence is adopted to determine the perceptions of the involved parties (Baker, Simpson, & Siguaw, 1999; Isaeva, Gruenewald, & Saunders, 2020). Benevolence is particularly relevant in the decentralised context, where stakeholders are expected to collaborate (Kumar, Scheer, & Steenkamp, 1995). Specifically, the assessment of Benevolence would help one party to perceive whether the involved parties are specified as valuable stakeholders (Van Bruggen, Kacker, & Nieuwlaat, 2005). In other words, the parties who are perceived as performing in the same manner as the specified types of digital platforms, would be more likely to be benevolent (McEvily & Marcus, 2005). Analogously, in decentralised ecosystems, stakeholders are expected to behave in a collaborative manner in order to continuously enhance Benevolence, and thus trustworthy. Sirdeshmukh, Singh, and Sabol (2002) and Perrone, Zaheer, and McEvily (2003) verify that benevolence could be developed through repeatedly presenting satisfied interactions.

Furthermore, when opportunities arise, especially for which past satisfied interactions are not

available or could not be referred to, Benevolence signifies the intentions of one party to behave beneficially in the mutual interests of the involved parties (Oliveira et al., 2017; Roland & Werner, 2010). In accordance with Styles, Patterson, and Ahmed (2008), opportunistic behaviours would potentially weaken the intentions of stakeholders to perform mutually favourable, and then result in a lack of Benevolence (Robson, Katsikeas, & Bello, 2008). However, how to satisfy stakeholders with the collaborative manner to pertain decentralised trust has not been identified, and thereby necessitating further considerations. In this research, Benevolence will be examined by the following interview question: ***"How could you or your organisation care for other involved parties in a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Benevolence in decentralised circumstances.

3.2.3.3. Credibility

In the centralised context, the concept of Credibility relates to the expertise of stakeholders executing assigned roles (Ryu, Park, & Min, 2007). However, in the decentralised context, the specific aspects of such execution ability are unknown. Therefore, Credibility merits more exploration. Credibility is an expectancy that the involved parties could be trusted (Doney & Cannon, 1997). According to Hewett, Money, and Sharma (2002), Credibility can be predicted from the source of past satisfaction levels when stakeholders in specified digital platforms share a variety of each's decision making and other's valid assertions. In addition, Roland and Werner (2010) highlight the conceptual difference between Credibility and Benevolence. To be specific, if one party trusts the Credibility of the involved parties (Van Bruggen, Kacker, & Nieuwlaat, 2005), it does not necessarily mean that the party will act benevolently in the sense of mutual interests (Siguaw, Simpson, & Baker, 1998). Hence, Credibility is distinguishable and essential for constructing decentralised trust dimensions.

As the dimension of trust, Credibility is originally associated with the perceptions that the involved parties are the best ones to execute the assigned roles on the strength of the mutual interests and opportunities (Ryu, Park, & Min, 2007). Ybarra and Wiersema (1999) further

indicate that information sharing could help stakeholders to jointly facilitate relevant tasks. When stakeholders actively figure out integrative solutions and seize emerging opportunities (McEvily & Marcus, 2005; Mohr & Spekman, 1994), the perceived Credibility could be then enhanced by the information sharing activities between different stakeholders. In this research, Credibility will be examined by the following interview question: ***"How could you or your organisation be credible in a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Credibility in decentralised circumstances.

3.2.3.4. Integrity

The rationale for selecting Integrity is akin to Credibility. The concept of Integrity is crucial for balancing opportunistic behaviours (Gregori, Daniele, & Altinay, 2014; Styles, Patterson, & Ahmed, 2008). Nevertheless, the interpretation of altruism (Aulakh, Kotabe, & Sahay, 1996) in the decentralised context remains theory-deficient. Hence, this research aims to undertake an investigation into the pivotal role of Integrity, as enabled by blockchain decentralised ecosystems. In the maintenance of stakeholder relationships, Aulakh, Kotabe, and Sahay (1996) conceptualise Integrity as the dimension of trust that indicates the degree of confidence the stakeholders would have in expecting each other's cooperative actions. In other words, it is highly possible that cooperative behaviours are achieved due to one party's sufficient competence in preserving the Integrity (Sirdeshmukh, Singh, & Sabol, 2002). In addition, Gregori, Daniele, and Altinay (2014) note that opportunistic individual behaviours can be reduced mainly in two situations. On the one hand, opportunistic individual behaviours are unlikely to occur when stakeholders are in favour of mutual values of the joint partnerships (Styles, Patterson, & Ahmed, 2008). On the other hand, opportunistic individual behaviours are minimised when two or more parties within the network have a common competitive entity outside the network (Plank, Reid, & Pullins, 1999). The former situation might be more suitable for decentralised stakeholder relationships since decentralised ecosystems incorporate more mutual interests and opportunities (Eckhardt et al., 2019; Rong et al., 2015). The latter situation might be more fit for centralised stakeholder relationships since organisations would expect to

achieve more benefits towards cooperation rather than competition (Isaeva, Gruenewald, & Saunders, 2020; Sivadas & Dwyer, 2018).

If trust is embedded in decentralised stakeholder relationships, there is a strong probability that short-term opportunistic individual behaviours are abnegated for long-term mutual benefits of the joint partnership through shared Integrity. Besides the dimension of trust that could help to reduce opportunistic behaviours, building Integrity is argued to have significant influences of developing blockchain decentralised ecosystems. In this research, Integrity will be examined by the following interview question: ***"How could you or your organisation preserve its integrity in a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Integrity in decentralised circumstances.

3.2.4. Catalysts of Trust in the Decentralised Context

3.2.4.1. Communication

In the centralised context, the concept of Communication concerns how to resolve disputes and coordinate actions in the digital platforms. Arndt (1979) emphasises that the importance of effective Communication is to keep the involved parties better informed so that they can become more confident in committing relationship continuity. Dwyer, Schurr, and Oh (1987) describe that the relationships between different parties would be developed and maintained if the involved parties have significant level of stakes. In other words, if one of the involved parties begin to have low stakes, then it would not be motivated to make more effort, thereby decreasing the likelihood of committing relationship continuity. In addition, Anderson and Weitz (1989) further argue that when the involved parties have significant level of stakes, they will be more willing to interact with each other. Consistent with the above reasoning, Communication retains its conceptual importance in decentralised ecosystems since stakeholders rely heavily on the accessibility of shared data in order to make their decisions (Hawlitschek, Notheisen, & Teubner, 2020). By resolving disputes and coordinating actions, Communication not only reduces role ambiguity but also enhances trust in stakeholder

relationships within the decentralised ecosystems (Babkin et al., 2018). When values are co-created as mutual benefits, the involved parties will achieve high level of trust and become more open-minded to sharing information (Hazée, Delcourt, & Van Vaerenbergh, 2017). Such emerging interactions would lead to more strengthened stakeholder relationships (Steven, 2019). Taking the advantages of information sharing, potential issues and opportunities might be actively exchanged among stakeholders to enhance the awareness of need for participation in decentralised ecosystems. In line with Morgan and Hunt (1994), by being aware of each other, organisations would be more able to perform independently and simultaneously in maintaining stakeholder relationships. Revised from Sivadas and Dwyer (2018), trust can be fostered by timely and meaningful communication. In line with this finding, high level of trust might be realised by enhancing the level of mutual thoughts and values (Yuan et al., 2018).

It is argued that communication methods will be changed accordingly. In the centralised context, McEvily and Marcus (2005) indicate that the level of trust might be enhanced by solving particular issues together. It requires the involved parties to exchange information that might jointly facilitate relevant activities (Ybarra & Wiersema, 1999). In the decentralised context, stakeholders are expected to achieve high levels of trust due to the initiatives of maximising mutual benefits so that they look forward to making more efforts to accomplish such initiatives. As a consequence, stakeholders would believe that the involved parties would act in accordance with their mutual interests in terms of discovering integrative solutions and taking emerging opportunities. In the decentralised context, the importance of Communication as a catalyst of trust can be further understood from the perspective of Social Learning Theory. As decentralised ecosystems lack a central authority, stakeholders must rely heavily on informal communication channels to gather information, resolve disputes, and coordinate actions. This process mimics the observational learning aspect of Social Learning Theory, where stakeholders learn not only about the specific issues at hand but also about the trustworthiness of other parties based on their communications. Effective communication in decentralised settings ensures that all parties are equally informed and can make decisions based on a shared understanding of mutual stakes. This shared understanding, reinforced through transparent communication, helps in building trust by reducing perceived risks

associated with decentralised activities. Moreover, as stakeholders observe others acting in alignment with shared objectives, they might be more likely to increase their trust in the committed relationships, further fostering a decentralised autonomous community that supports ongoing learning and adaptation. Thus, communication serves as a foundational element in the social learning processes that underpin trust in decentralised ecosystems.

In this research, Communication will be examined by the following interview question: ***"How could you or your organisation communicate with other involved parties to put together a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Communication in decentralised circumstances.

3.2.4.2. Reputation

To carry out this study and contribute towards a decentralised trust approach, it is posited that Reputation demonstrates inherent variability and presents a heightened level of complexity when compared to its prevailing notion in the centralised context. In the centralised context, the concept of Reputation represents the signal of future actions that whether the involved parties would destabilise, terminate, or continue the relationships. According to Anderson and Weitz (1989), the perceived reputation concerns whether the involved parties would play their roles fairly and whether the behaviours are presented as cooperative rather than competitive. In addition, Reputation is usually considered when the partner relationships are developed between upstream and downstream enterprises. This is due to the fact that upstream enterprises are more likely to set higher standards than expected for downstream enterprises during the collaboration (Wu, Weng, & Huang, 2012). As a consequence, upstream enterprises are more likely to be dissatisfied with the performance of downstream enterprises and downstream enterprises are more likely to perceive unfair demands and declined reputation of upstream enterprises so that the partner relationships will be destabilised or terminated.

In light of the nature of blockchain (Eckhardt et al., 2019), decentralised stakeholder

relationships might be highly possible to be continued since the involved parties would have already concerned with mutual interests before participating in decentralised ecosystems. The perceived fairness, a theme of signalling good reputation, could be earned through upholding mutual interests and conducting cooperative behaviours (Robson, Katsikeas, & Bello, 2008), thereby building trust in decentralised stakeholder relationships. Apart from appropriate profitable accounts, other emerging concerns might be presented with fairness together as the new theme of signalling good reputation. The reason behind such assumption is that in the decentralised ecosystems, the mutual interests between the involved parties should be agreed and created before participation, whereas in the centralised digital platforms, the mutual interests between the involved parties are gradually established and modified after participation (Guda & Subramanian, 2019; Guttentag, 2018). In line with the nature of decentralised ecosystems (Dorobantu, Kaul, & Zelner, 2017; Kumar, Lahiri, & Dogan, 2018; Porter & Donthu, 2008), the failure of a singular entity does not preclude the continued operation of other participating entities. This aspect potentially enhances the ecosystem resilience to individual failures, thereby influencing the perception of each participant as a reputational node.

In the decentralised context, the concept of Reputation can be particularly significant when analysed through the lens of Psychological Safety Theory. This perspective is crucial for understanding the dynamics between advocators and followers who are navigating the complexities of new systems like decentralised ecosystems. Advocators, who often push for the adoption of and participation in these systems, rely on a robust reputation to garner support and trust from potential followers. In decentralised ecosystems, where formal controls are less pronounced and the impact of individual actions can be more transparent, the reputation of each participant becomes a critical element of trust. The psychological safety created by a strong reputation allows participants to feel secure in their interactions within the decentralised ecosystems, encouraging them to advocate for the decentralised approach. Followers, on the other hand, seek assurance in the reputations of their peers, enabling them to engage more confidently within the ecosystem. This dynamic is vital in decentralised settings, where trust must be built without the traditional hierarchies or formal safeguards found in centralised systems. Moreover, the decentralised nature of these ecosystems means that the failure of one

entity does not necessarily jeopardise the continuation of the entire system. This resilience contributes to a more stable perception of reputation, where the collective behaviours of participants ensure the sustainability of the ecosystem, thereby reinforcing the trust placed in individual reputations. In this way, Reputation emerges as a foundational component of the Psychological Safety that encourages active participation, fostering a trustworthy environment where both advocators and followers feel empowered to contribute to the system's success.

In this research, Reputation will be examined by the following interview question: ***"How could the reputation of you or your organisation be affected in a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Reputation in decentralised circumstances.

3.2.4.3. Satisfaction

In the centralised context, the concept of Satisfaction has a strong linkage with one party's trust of the involved parties (Crosby, Evans, & Cowles, 1990; Grayson, Johnson, & Chen, 2008; Scheer & Stern, 1992). In addition, Satisfaction can be reflected by value co-creation (Siguaw, Simpson, & Baker, 1998). In keeping with Willis, Jai, and Lauderdale (2021), the objective of enclosing Satisfaction in the decentralised trust approach is to acquire insights into stakeholders' perceptions through blockchain cases in the Public Health. Satisfaction is also proposed by Baker, Simpson, and Siguaw (1999) to indicate the stakeholder relationships. Its theoretical assumption is based on the predicted argumentation of Kumar, Stern, and Achrol (1992) that end consumer satisfaction with the reseller is associated with the supplier satisfaction with the reseller. Such conjecture could be further explained that when resellers' sales is improved by the increase of end consumers' demand, suppliers' sales is also improved by the increase of resellers' demand (Grayson, Johnson, & Chen, 2008). Cullen, Johnson, and Sakano (1995) recognise that the Satisfaction is directly reflected by the sales volume of both resellers and suppliers. Li, Li, and Feng (2015) further indicate that the increased sales volume inclusively stands for the greater values in the market-oriented stakeholder relationships and higher levels of overall satisfaction. The importance of intimacy highlighted by Ponder, Bugg Holloway, and

Hansen (2016) is also complementary to Scheer and Stern (1992) in terms of the effectiveness of decision making. Since the effectiveness of decision making is highly associated with Satisfaction, Hashim and Tan (2015) argue that satisfactory levels in the trust-building processes could be increased in collaborative decision-making approach.

Collaborative decision-making approach can be further adapted from Van Bruggen, Kacker, and Nieuwlaat (2005) and Muthusamy and White (2016) that stakeholders in the decentralised context might apply the mutual decision-making processes as the appropriate determination for evaluating the satisfactory levels. On the one hand, one of the purposes of establishing decentralised ecosystems is to co-create the values and agree on the mutual benefits. On the other hand, when the level of sharing values is high, the involved parties would make more efforts to interact with each other and be appropriated with higher level of satisfaction. Furthermore, mutually agreeable orientations to participate in the decentralised ecosystems are lack of empirical clarity, requiring worthy of research attention.

In the decentralised context, Satisfaction as a catalyst of trust can be understood through Social Capital Theory, particularly focusing on the transition from weaker relationships characterised by linking social capital to stronger relationships indicative of bonding social capital. This theoretical perspective is especially relevant when considering decentralised ecosystems, where traditional hierarchical structures are absent and the reliance on peer-to-peer interactions is significantly heightened. Satisfaction within these decentralised ecosystems emerges from the cumulative experience of building social capital among participants. The importance of satisfaction in this transition lies in its capacity to reflect the perceived value and success of interactions among stakeholders. As stakeholders become more satisfied with their interactions within the ecosystem, they might be more likely to develop stronger, trust-based relationships that support the sharing of resources, information, and support, further enriching the social capital within the community. Thus, satisfaction facilitates a crucial transformation in the nature of relationships within the decentralised ecosystems, strengthening the social fabric and enabling the development of a robust bonding social capital and committed relationships.

In this research, Satisfaction will be examined by the following interview question: ***"How could you or your organisation enhance the level of satisfaction by other parties in a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Satisfaction in decentralised circumstances.

3.3. Summary of Theorical Review and Conceptual Research Framework

In this thesis, theory-led concepts are mainly derived from traditional trust theory and further developed with theoretical perspectives in the decentralised context. Based on the theoretical review, blockchain decentralised ecosystems are actually relied upon the specified digitalised activities by means of blockchain technology and encrypted mechanisms of coordination (Rikken et al., 2019). In other words, blockchain decentralised ecosystems are comprised of different organisations that will sustain the exchange of data assets between the various key stakeholders. However, applying blockchain to traditional business scenarios does not unambiguously signify the resolution of pain points and build up decentralised trust (Schmeiss, Hoelzle, & Tech, 2019). In the centralised context, Kamble, Gunasekaran, and Arha (2019) identify that organisations would encounter the trust issues due to information island (a body of information that requires to be shared but has no connections between organisations because each involved party only records and maintains its own business data). Hence, it is necessary to comprehend the importance of decentralised ecosystems and the nature of blockchain in order to ascertain the research opportunities. The study of Khan et al. (2020) helps to constitute blockchain decentralised ecosystems and lay the foundation of decentralised trust for stakeholders who will be involved in collaborative decision-making approach.

As a pragmatist, it is argued that the immutable nature of blockchain could secure the traceability of transactions (Collart & Canales, 2022; Ding et al., 2020), enable stakeholders to access the transparent records, and improve the collaboration efficiency between core enterprises and their business partners or business clients (Saberi et al., 2019). Although there are several research attempts to conceptually expound blockchain (Casado-Vara et al., 2019;

Lao et al., 2020; McConaghy et al., 2017), none of them treat blockchain as a representative decentralised ecosystem (social mechanisms) in the decentralised context (social world/social phenomenon). Hence, the conceptual research framework will contribute to justifying decentralised trust dimensions and catalysts and grounding decentralised trust theory.

In determining decentralised trust dimensions, Ability, Benevolence, Credibility, and Integrity are selected from traditional trust theory and justified as the retained trust dimensions in the decentralised context to begin with. The dark side of centralised digital platforms have been criticised. Specifically, the issues and challenges resulted from high intermediary powers. Although digital platforms lead to an emerging way of forming digitalised activities, the limit of centralised circumstances needs to be considered. On top of these concerns, Communication, Reputation, and Satisfaction are respectively selected from Social Learning Theory, Psychological Safety Theory, and Social Capital Theory, as the catalysts of trust in the decentralised context before primary data collection. Then, interview topic guide for Study 1 (see Appendix 1) is designed accordingly. Finally, after proposing the conceptual research framework, the philosophical underpinnings of the research methodology will be delineated in section 4.

4. Research Methodology

4.1. Research Philosophy

4.1.1. Ontology

The term ontology is derived from Greek, meaning the theory of the nature of reality, and concerns what is real and what is the nature of what is real (Delanty & Strydom, 2004). In terms of social ontology, the philosophy of social science has three dimensions: reductionism, naturalism, and normativism (Risjord, 2014). Ontological positions are initially focused on the contrast between realism and idealism. The realism/idealism debate makes sense of how the philosophy of social science should be conceived to explain the essence of the being.

Adapted from the ontology of natural phenomenon, Risjord (2014) reconsiders the theoretical aspects of ontological reductionism in order to explain social phenomenon. Unlike the natural phenomenon, social phenomenon, such as education, market, power, and revolution, is more complicated since it involves multiple realisations of social events and actions rather than simple physical events. In addition, human's actions could be discussed in different research contexts depending on how scholars would conceptualise such social events (Hollis, 2002; Sugden, 2000). In this case, the explanation of ontological reductionism is theoretically switched from the study of physical/material components to understand natural phenomenon to the study of behavioural components to understand social phenomenon. Therefore, the study of natural phenomenon and social phenomenon are not actually undertaken using the same theoretical logic. However, instead of debating whether the social science subjects could be simply reduced to natural science subjects, ontological reductionism has its own theoretical perspective of the philosophy of social science (Beinhocker, 2013; Osorio, 2014). The reductionism question regarding the philosophy of social science is raised as follows: whether the study of group behaviours could be reduced to the study of individual behaviours (Kumar, Channa, & Maharvi, 2018). Following this reductionism question, individualism and holism are emerged in the social science (Benton & Craib, 2011; Rosenberg, 2012). Individualists claim that group behaviours/actions are composed of different individual behaviours/actions

so that the study of group choices could be reduced to the study of individual choices. For example, a team could not win a game, the individual players get the scores cumulatively. Holists argue that group sentiment actually determines and shapes individual choices since different groups are supposed to have their own way of thinking and decision-making. For example, an Apple lover group does not buy Nokia phones not because an individual buyer says Nokia phone is not trendier, but because the group thinks Apple phone is better.

Hollis (2002) conceptualises the above two different argumentations as two different approaches to the reductionism question. He adapts Mill's bottom-up approach to individualism to highlight the importance of individual influences on group and Marx's top-down approach to holism to highlight the importance of group enforcement on individuals. From the theoretical perspective, the ontological position of individualism is realism whereas the ontological position of holism is idealism (Benton & Craib, 2011; Rosenberg, 2012). The former ontological position holds that a group does not exist and is merely a collection of individuals. The latter ontological position argues that a collective group identity does exist and is more important than individual decisions. Callahan (2010) further examines that the integration of realism and idealism might be mutually beneficial to the design of research methodology, especially for undertheorised themes.

In a philosophical way, the reductionism question in the social science depends on the naturalism question in the social science as the naturalism question concerns the relationships between natural science and social science (Risjord, 2014). The naturalism question regarding the philosophy of social science is raised as below: are human beings and human societies natural phenomenon or are they specific phenomenon (Kumar, Channa, & Maharvi, 2018). Such distinctive questions of whether the social sciences should be like the natural sciences has engaged into two debate groups: naturalists and anti-naturalists (Floridi, 2017). Naturalists believe that human beings and human societies in the social science are like animals and fauna in the natural science since human beings are just a certain kind of ape from the biological perspective (Furst & Skrine, 2018). However, could biologists turn over the study of human beings to the study of apes? Anti-naturalists insist that human societies are different from other

fauna since the behavioural actions of human beings are beyond the thinking of animals (Rowe, 2013). In this case, social phenomena are more complicated than natural phenomenon regardless of the overlapped explanations.

Taking the interactions between natural science and social science into consideration, Hollis (2002) proposes that non-naturalism might be more accurate than anti-naturalism to describe the philosophy of social science. For instance, consumer socialisation is connected with specific consumer attitudes towards prices and markets rather than a single logic of the characteristics of animal intelligence in the natural science (Moschis, Churchill, & Gilbert, 1978). Pearce (2008) further claims that the ontological naturalism of human learning and cognition behaviours in the social science are more specific than the ontological naturalism of animal learning and cognition behaviours in the natural science. In other words, human beings and apes are different in what they think, feel, and behave. For instance, naturalistic thought process could not explain why apes do not commit crimes, buy shares, or organise higher education (Toppinen, 2018). Therefore, social science researchers will study these distinctly human behaviours to explain a specific social phenomenon that could not be explained using a biological explanation (Beed & Beed, 1996; Moschis, Churchill, & Gilbert, 1978).

Unlike natural science that deals with objectives, social science involves the judgement of norms, values, and rules that changes regularly rather than remain invariably and depends heavily on what human beings perceive or conceive (Risjord, 2014). Flyvbjerg, Landman, and Schram (2012) argue that the reason why the philosophy of social science is distinctive and entirely different from the philosophy of natural science is attributed with not only the judgement of norms, values, and rules, but also the context of social phenomenon and the time of the research. For instance, in the 1980s, McCarty and Shrum (1993) considered watching TV programming the most significant lifestyle segmentation and mass media communication tool that is valued by the general public. However, Barrett, Oborn, and Orlikowski (2016) reveal that the importance of television or watching TV programming has been weakened or been replaced due to multiple social and cultural values changed over time through technological innovation and digital revolution. Therefore, the normativism question in the

social science clarifies how to define a specific social phenomenon that contains the judgement of specific norms, values, and rules, arising from human behaviours (Flyvbjerg, Landman, & Schram, 2012).

In a philosophical way, Searle (1996) emphasises that the social ontology needs its own research methods and approaches. Since the social world is beyond the explanations of natural behaviours, the construction of social reality consists of both observer-independent properties and observer-relative properties (Koepsell & Moss, 2003). In general, observer-independent properties refer to the chemical or physical compositions of an object; observer-relative properties refer to what human beings think about this object and how human beings behave around it. Philosophically, observer-independent properties have their objective meanings, whereas observer-relative properties are people's subjective interpretations in a certain way. Furthermore, similar as ontological naturalism that comprises naturalism, anti-naturalism, and non-naturalism, Maksymilian (2010) divides ontological normativism respectively into three dimensions: normativism, anti-normativism, and humanism (or humanist pragmatism).

Normativists hold that normative facts will determine the correct descriptive theory so that sociological concepts must be explained in terms of certain norms. Anti-normativists argue that certain norms are actually constitutive of mental states or acts. For instance, laws are constitutive of legal aspects so that in the context of law, certain norms should be legitimately evaluated rather than subjectively assessed (Maksymilian, 2010). In this case, the debate between normativists and anti-normativists is concentrated on the genuineness of norms. Hlobil (2015) points out that 'if the rules of rationality are just general thoughts that could not guide performance, the rules would not be considered genuinely normative and motivate human beings to follow'. As a philosophical stance, humanism (or humanist pragmatism) is introduced in order to reconcile the ethical concerns between normativism and anti-normativism (Law, 2011). Affirming the dignity of human beings, humanism derives the philosophy of social science from human needs and interests rather than theological and ideological views (Petrosyan, 1972). Humanists sought to emphasise the value and agency of human beings, both individually and collectively, to make sense of the social world through logics, reasons, and

evidences (Davies, 2008). For humanists, Planinc (2020) contextualises that the ontological humanism in the contemporary social world is build up through ethics based on human values and human capabilities to reform the philosophical relationships between nature and humanity.

4.1.2. Epistemology

The term epistemology is derived from Greek, meaning the theory of knowledge (Delanty & Strydom, 2004). In terms of social epistemology, the understanding of knowledge is identified as justified true belief (Risjord, 2014). In other words, epistemology refers to a foundation of philosophical study that considers sources and limits, rationality and justification of knowledge (Turri, 2014). To be specific, epistemological positions are initially centred on the contrast between positivism and interpretivism. In the social science, the perspectives of positivism and interpretivism are concerned with the ways of investigating different epistemological forms of knowledge and learning about social reality (Matthew, 2021). In addition, there is a recursive relationship between social science and human behaviours since the study of social science would change human behaviours constantly (Rosenberg, 2012). After exploring epistemology, the assumptions for the evaluation of conceptual research frameworks will be developed in order to justify epistemological assumptions and to resolve epistemological issues.

Positivists believe that if there are strict social laws that could be discovered, then social science could adopt natural scientific methods to conduct social experiments or statistical generalisation (Halfpenny, 2015). The epistemological positivism question asks whether social laws and science of society exist. Keating and Della Porta (2010) make assumptions of positivism that social science should be quantitative, strives for objective knowledge, and separates facts from values. They also claim that the purpose of studying social science is to develop causal laws through demonstrating regularities in how human beings and human societies behave. In a positivist view, the study of social science is the way to get truth and to predict and control the social world. The social world is deterministic that it is operated by laws of cause and effect. Positivists apply deductive reasoning to postulate and revise theories based

on the results in order to better predict the social reality. Keating and Della Porta (2010) accept the statement of Mises (1951) that the social world is empirical and can be tested by scientific methods. In addition, positivists prefer quantitative methods such as a reasonable scale of social surveys in order to explore the social facts and uncover social trends.

Hothersall (2019) implies that positivism and interpretivism are not distinguished in terms of research methods (quantitative vs. qualitative) but are distinguished in terms of the research orientations towards the social reality and towards social science. Adapted from Fumerton (2006), it is argued that human beings are not like other natural things, such as mountains, rivers, fruits, plants, and animals, that always behave in law-like ways. In the epistemological interpretivism, natural things are referred to the objects that exist or occur in nature without any human actions. Daxecker (2017) highlight that the purpose of social science is to make sense of the interpretation of people's experiences since interpretivists also have their own value judgements to value people's rich inner lives. Interpretivists employ qualitative methods such as interview or participant observation to understand human actions. In this case, a specific social phenomenon that interpretivists investigate in the social science will be philosophically described and analysed with a defined value dimension.

4.1.3. Research Approach

For studying blockchain as a representative decentralised ecosystem, a reasonable research approach to a non-naturalistic methodology is held, according to the arguments that social phenomenon should be distinguished from natural phenomenon (Hollis, 2002; Maksymilian, 2010; Pearce, 2008; Sugden, 2000). Specifically, blockchain is dependent on complex distributed ledger technology to establish the decentralised ecosystems. Such ecosystems involve human experiences and interactions, as well as qualified knowledge. In this case, blockchain could be socially constructed and interpreted in order to unfold it in the social science. Therefore, the research for the ultimate explanation of blockchain forms requires the reconceptualisation of the existing theories related to trust establishment.

Constructivism refers to the research approach that recognises researchers construct new knowledge or novel understandings, combining with what they already know or the existing theories (Mir & Watson, 2001). In this study, non-naturalism might be further revised on the basis of the availability of the related knowledge. Since blockchain is an emerging research topic, a deeper philosophical view is essential in order to construct and justify the proposed conceptual research framework. As a consequence, the philosophy of constructivism as a specific kind of non-naturalisms is recommended based on the philosophical assumptions of a constructivist approach (Floridi, 2017). Adapted from Matthew (2021), the constructivist approach will demonstrate how to apply blockchain to study decentralised stakeholder relationships and how human beings and human societies will come to know decentralised trust.

1. Look at trust and its connections in the existing theories
2. Distinguish activities between centralised circumstances and decentralised circumstances
3. Justify these distinguished activities from the theoretical perspective of maintaining trust
4. Construct the concepts related to these justifications in order to propose the conceptual research framework for designing Study 1
5. Group themes derived from the findings and results of Study 1
6. Discover more emerging codes for designing Study 2
7. Group themes and aggregations derived from the findings and results of Study 2

After classifying different philosophical positions in social science, it becomes apparent that neither positivism nor interpretivism is entirely suitable. It is suggested by Rosenberg (2012) that each social science study requires its own appropriate research methods. Adapted from Keating and Della Porta (2010), pragmatism can be adopted as the alternative approach in this study. The term pragmatism is derived from Greek, meaning action (Delanty & Strydom, 2004). In addition, the words practice and practical also come from the original meaning of pragmatism. In the research philosophy, pragmatism is a philosophical doctrine towards the formation of theories, concepts and assumptions, and pragmatists highlight that the practicality of ideas, proposals and truths is based on the verification and justification (Talisse & Aikin, 2008). On the one hand, pragmatists emphasise the practical usefulness of theories as an

instrument for adapting to the nature of reality. For example, Powell (2020) argues that quantitative research could not address emergent social problems as the clarification and development of ideas need to be interpreted through scientific beliefs. On the other hand, pragmatists argue that propositions or hypotheses could only be identified through the process of their empirical verifications. In other words, they are theoretical forecasts of what will result from the planned actions or organised behaviours in the social world (Ormerod, 2020). For pragmatists, the interpretations will be further justified by considerations of their workability and efficacy in serving their theoretical and practical interests. As a philosophical consequence, pragmatists do not just look only for causal laws as positivists do or commit to a form of relativism like interpretivists do. Instead, they conceptualise the functional character of interpreted ideas and emphasise the anticipations of possible assumptions that resulted from a given action plan. It is worth mentioning that pragmatism approach is subject to the critical objective of ideas and beliefs and is differentiated from humanity's various demands (Misak, 2016).

In this research, decentralised trust is counted as the theory of knowledge and the theory of knowledge indicates the epistemology of this study. In order to understand such specific knowledge, possible decentralised trust dimensions and catalysts will be conceptualised based on the nature of blockchain decentralised ecosystems. However, the causal relationships between decentralised trust dimensions and catalysts could not be directly assessed without further empirical validation since the human cognitions and behaviours related to decentralised trust are not yet presented and require further articulations. Using Hoddy (2019)'s study as an illustration, decentralised trust could be drawn on grounded theory (e.g., trust theory in this thesis) and pre-existing theoretical knowledge (traditional trust or trust in the centralised context) to identify and postulate emerging causal relationships and social mechanism. With the cognitive and behavioural explanations through interpretations, different themes into aggregate dimensions will be justified. After clarifying the philosophical boundaries of decentralised trust (knowledge) between the proposed conceptual research framework informed by literature view and findings and results derived from twelve interviews in Study 1, decentralised trust dimensions and catalysts will be then empirically justified using another

eighteen interviews in Study 2. The coding processes are based on the initial thematic relevance to decentralised trust. Moreover, the emerging codes that are employed in Study 2 align with the findings and results obtained in Study 1. In order to fulfil the pragmatist approach to justify the theoretical assumptions of decentralised trust from the testimony of respondents or participants, this thesis values blockchain as a representative decentralised ecosystem (social mechanisms) in the decentralised context (social world).

4.2. Research Method

4.2.1. In-depth Interview

In-depth interview is to justify why and how decentralised trust dimensions and catalysts can be theorised. Led by the conceptual research framework, decentralised trust dimensions and catalysts are facilitated by deductive and inductive research constructs and. In-depth interview could respectively illustrate why and how decentralised trust can be promoted through meeting the perceptions of different stakeholders in decentralised ecosystems (Chen, 2018; Saberi et al., 2019). In addition, the stakeholder relationships between blockchain stakeholders is argued to be synergistic (Schmeiss, Hoelzle, & Tech, 2019) since the blockchain stakeholders thrive in decentralised activities to strengthen the decentralised stakeholder relationships and then realise the innovative industry-specific applications (Borkowski et al., 2019). Expanding the scope of blockchain still needs to rely on the injection of academic resources from traditional trust theory (Memon et al., 2019). Simultaneously, decentralised stakeholder relationships would relatively offset the traditional way to manage and preserve the digital assets so that the compliance infrastructure could be consummated with the blockchain solutions (Mohamed et al., 2024). In this case, the blockchain stakeholders in decentralised ecosystems could be adapted from Smith and Castonguay (2020), and broadly defined as the core enterprises on the blockchain, their Tier-1 to Tier-N suppliers linked to blockchain, and corresponding regulatory institutions (Subramanian, 2018) who could trace the transaction history transparently and verify the authenticity of the supply chain (Kamble, Gunasekaran, & Arha, 2019).

In terms of exploring deductive and inductive research constructs, simply adopting research concepts without appropriate translation into considerable research questions might result in the failure of in-depth interview or limited outcomes. In this case, the first key to managing a successful in-depth interview is to ensure that respondents can easily understand and accurately interpret the research questions. In order to discover research opportunities and gaps from the interviewee, the second key of managing a good in-depth interview is to set clear goals prior to interviewing. After identifying the thematic coding of qualitative data, the main purpose of interpreting in-depth interview is to exact from answers provided in respondent's own words to interpretations of different codes. To maximise the benefits of in-depth interviews, the interview guides will initiate with inquiries focusing on the "what" aspects, followed by a deeper exploration of the "why" and "how" aspects. Kaiser (2009) argues that the inclusion of qualitative questions addressing these aspects enables an investigation into causality.

In-depth interviews provide an opportunity for respondents to elaborate on their critical reasoning, allowing for a more nuanced understanding of their perspectives in response to research questions (Saunders, Lewis, & Thornhill, 2019). In exploring the relatively nascent area of trust in blockchain decentralised ecosystems, this thesis incorporates a pilot study. According to Percy, Kostere, and Kostere (2015), the initiation of a pilot study is a crucial component in qualitative research methodologies, facilitating necessary adjustments in broader studies. In this thesis, the pilot study employs a qualitative approach to delve into the subjective experiences, perspectives, and beliefs of four blockchain pioneers, specifically targeting the queries outlined in sections 3.2.3 and 3.2.4. This selection of pioneers, all of whom are engaged with the blockchain healthcare ecosystems, aids in identifying any potential inadequacies or constraints within the interview guides, thereby allowing for tailored refinements in the primary data collection. Moreover, as accentuated by Sandelowski (2015), the pilot study could serve not only as a practical test for the formulated interview questions but also as a probe into the conceptual research framework. In this thesis, it specifically examines potential trust dimensions in the decentralised context to assess their alignment with or contradiction to the established conceptual research framework depicted in Figure 1, thus informing necessary adjustments to the interview guide prior to initiating Study 1. Despite the valuable insights

gained from these four pioneers, the findings will not be directly utilised in the subsequent data collection for Study 1. This decision stems from the fact that unlike the consistent participant base of Study 1, which originates from a singular blockchain project, the pilot study's participants are drawn from diverse projects, offering varied perspectives on the blockchain healthcare ecosystems. Nevertheless, conforming to Shoozan and Mohamad (2024), the insights derived from the pilot study enhance the robustness of the interview questions, contributing to achieving the research objective of constructing the decentralised trust theory.

Then, the formulation of questions in Study 1 was refined based on insights gained from the pilot study. Referring to sections 3.2.3 and 3.2.4, the concepts related to the dimensions of decentralised trust and its catalysts will be classified into different deductive codes in Study 1. This qualitative coding process is based on the initial thematic relevance of these concepts to decentralised trust. Moreover, the emerging inductive codes that are employed in Study 2 align with the findings and results obtained in Study 1. It is worth mentioning that the interview questions have been further modified to facilitate easy understanding of the topic guide for non-academic participants (see Appendix 1). Studies 1 and 2 aim to capture dynamic perceptions of how blockchain decentralised ecosystems could be implemented in practice. Due to the pandemic, these semi-structured in-depth interviews were conducted remotely via telephone and video calls in the UK. Lastly, close-ended questions were used to collect information about the interviewees' roles, organisation types, age, sex, and years of experience.

4.2.2. Research Protocol

The importance of writing a research protocol serves many purposes. Research protocol is an element of methodological rigour to consider the research questions, the theoretical importance of adapted theories and concepts, and the feasibility of proposing the conceptual research framework (Huber et al., 2017). To be specific, the research protocol is designed to solve the identified research questions and outline the corresponding research plans. More than a detailed description, the research protocol in this investigation could be presented as methodological

contributions for the study of trust in decentralised circumstances. In addition, informed by research concepts derived from existing theories, the research protocol in effect could be employed to further explain and justify why the proposed research approach would fit with the research aims and objectives and make meaningful contributions to knowledge in the conceptualisation of decentralised trust. This study is not to exploit the tenets of developing blockchain from the information technology perspective but to concentrate on the conceptualisation of trust in blockchain decentralised ecosystems from the public sector entrepreneurship and marketing perspective. Therefore, the research protocol should be explicitly specified in the research discipline before the conceptualisation of research framework in conformity with decentralised trust (see Figure 2).

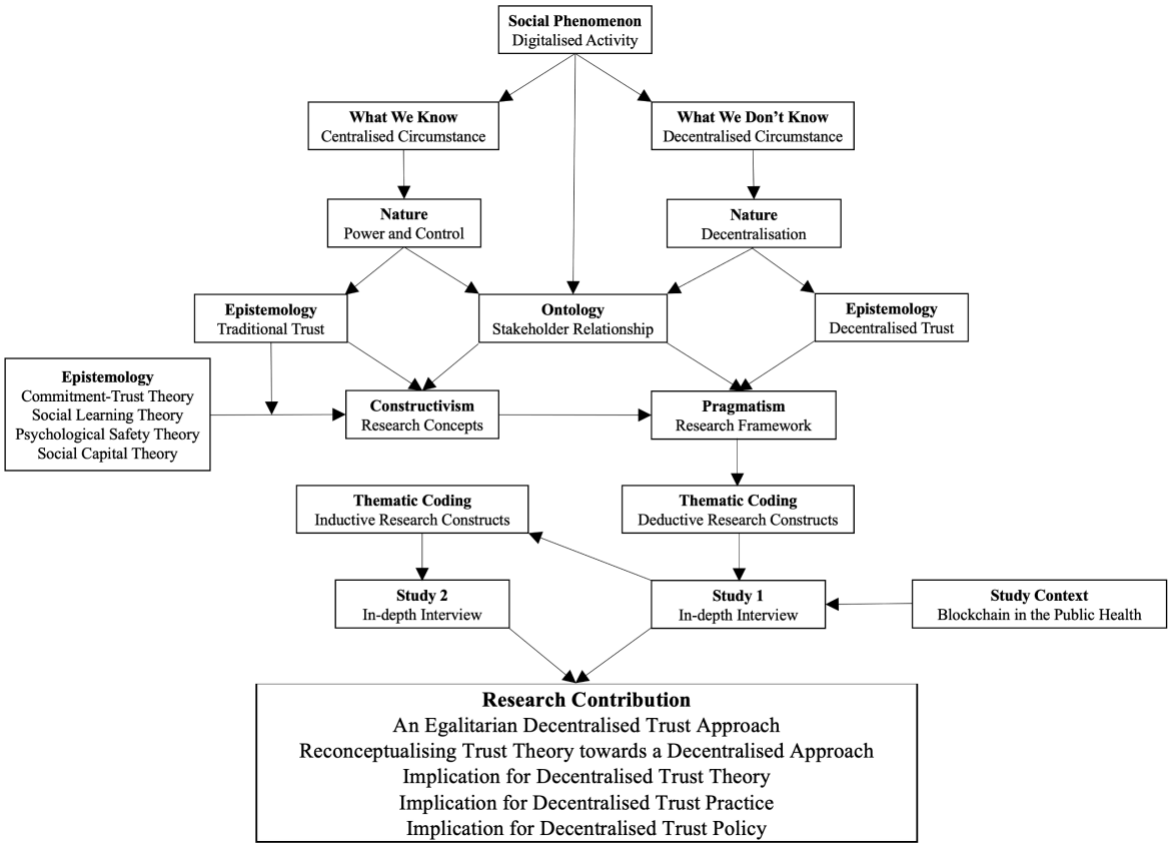

Figure 2: Research Protocol

4.3. Data Collection

4.3.1. Research Background and Study Context

The current centralised information systems across various sectors face significant limitations

and issues. These systems often lead to fragmented and isolated data silos (Idowu et al., 2023; Vinod, 2013), impeding effective communication and collaboration among different entities. Additionally, they pose challenges in maintaining data privacy and security, as centralised databases are susceptible to breaches and unauthorised access (Madhani, 2022).

With the development of the digital technologies, the business models integrating Internet and healthcare systems have become mature, exemplified by existing online consultation and online payment reimbursement, among other online healthcare services (Wen et al., 2024). Through building up digitally-enabled hospitals and online healthcare communities, online healthcare systems have mitigated some of the difficulties associated with accessing the healthcare services and enhancing the social interactions especially for elderly (Lu, Ngai, & Yi, 2024; Zhou, Bai, & Wang, 2024). However, several issues persist within the current centralised healthcare system in China related to the inefficient flow of healthcare information, mutual distrust between the doctor and the patient, the management of healthcare data privacy and security, and the lengthy and inefficient insurance claims process.

The first issue concerns the inefficient flow of healthcare information, leading to a diminished healthcare experience (Xiao et al., 2024). According to China's cybersecurity law introduced in 2017, Filipova (2024) describes that digital entities must securely store user data to prevent data breaches. In the healthcare sector, this translates to healthcare institutions being required to maintain strict confidentiality of patient data. Consequently, healthcare institutions do not easily, nor are permitted to, disclose healthcare information, leading to inefficient information flow and the creation of data isolation within each institution (Zhou et al., 2024). After investigating 2308 Chinese counties, Song et al. (2024) reveal that although cross-hospital healthcare services are available in China, there is still a lack of data sharing and healthcare information equity between hospitals of different grades, which results in various inconveniences during the healthcare consultation process. For instance, Liu et al. (2024) find that patients may face the predicament of undergoing duplicate examinations when transferring or being referred to different hospitals, leading to a waste of both time and money and ineffective utilisation of healthcare resources, ultimately resulting in a poor patient experience.

The second issue is the mutual distrust between the doctor and the patient (Zhang et al., 2021). While online platforms can alleviate some asymmetry in the information patients access during their search for healthcare services, Yang et al. (2024) argue that healthcare services inherently exhibit information asymmetry compounded by the scarcity of healthcare resources, making this asymmetry even more opaque. Additionally, Liu, Zhang, and Jin (2024) emphasise that the varying quality of doctors and medical staff and the low cost of tampering with patient data within the centralised healthcare system, from appointment scheduling to prescription issuance, are pervasive with conflicts of interest or healthcare data being lost or misrepresented. Since data within the centralised healthcare system can be manipulated either manually or technically (Cao, Huang, & Tang, 2024), this also complicates legal accountability and evidence collection.

The third issue relates to the management of healthcare data privacy and security (Tao, Liu, & Sun, 2024). In the centralised healthcare system, healthcare institutions collect patient data and store it in databases leased from Internet companies, over which they generally do not control root access (Yu, Wang, & You, 2024). Thus, healthcare institutions actually have a very limited control over healthcare data privacy and security, relying solely on Internet companies to maintain cybersecurity (Xiao et al., 2024). Simultaneously, the clinical and experimental data, crucial for the development of certain drugs, are dispersed across institutions, posing significant challenges for clinical physicians attempting to integrate and analyse data from different sources (Yan et al., 2024a). As implicated by Pool et al. (2024), this dispersion of critical data also hinders drug development, inadvertently raising the research and development costs for pharmaceutical companies and the purchase prices for pharmacies.

The fourth issue is the lengthy and inefficient insurance claims process (Wu et al., 2024). After reviewing and analysing 487 policy documents, Yan et al. (2024b) identify that patient health conditions, healthcare data, and disease histories are scattered across various healthcare institutions, resulting in information asymmetry between healthcare providers and insurance companies. This leads to independent operations between these entities, with a lot of critical information not being shared (Guo et al., 2023). As explored by Wang et al. (2023),

policyholders, therefore, must provide numerous proofs during the insurance purchasing, claims, and reimbursement processes, which require manual verification by the insurance companies. Such requirements not only lead to time-consuming stages, undermining efficiency and deteriorating the experience for insurers, but also escalate labour costs for healthcare insurance companies. In addition, He et al. (2024) and Xu et al. (2024) further highlight that dispersed and untraceable patient data not only lead to frequent healthcare insurance fraud, harming the insurers' interests, but also prevent insurance companies from offering multi-dimensional, fine-grained customised policies, resulting in unfair premium costs to policyholders, thereby harming their interests.

In view of the current state of centralised healthcare system in China, despite significant annual investments in human, material, and financial resources by governments and healthcare institutions, these issues remain unresolved. Therefore, this thesis introduces a novel decentralised healthcare system—the blockchain healthcare ecosystem—to empower the healthcare industry. Owing to the nature of blockchain technology, the blockchain healthcare ecosystem has the potential to secure data privacy while facilitating the flow of healthcare data, improving the current situation of data isolation between healthcare institutions, rebuilding trust between patients and healthcare providers.

The National Health Commission of China issued a document in July 2023, emphasising the implementation of high-quality development assessments and promotion initiatives in public hospitals (gov.cn, 2023). It aims to leverage the role of public hospitals as pilot demonstrations for high-quality development, strengthen the management of reform and high-quality development projects in public hospitals. A three-year action plan for nationwide interoperability and information sharing among medical and health institutions will be carried out, advancing the construction of smart hospitals and hierarchical evaluations. It will also promote pilot projects involving "5G + healthcare", "medical artificial intelligence (AI)", and "blockchain + healthcare". Initiatives focusing on improving the patient experience will be launched. Support will be provided to promote the high-quality development of medical institutions run by state-owned enterprises. This implies that blockchain healthcare will be one

of the key tasks in the public healthcare system in China from 2023 to 2025.

On the 24th of October 2019, the Political Bureau of the Central Committee of the Communist Party of China conducted its 18th collective study session on the current status and trends of blockchain technology development (CPC News, 2019). Xi, President of the People's Republic of China, pointed out the importance of seizing the opportunities presented by blockchain technology integration, functional expansion, and industry segmentation. Blockchain's potential in facilitating data sharing, optimising business processes, reducing operational costs, improving collaborative efficiency, and constructing trusted systems should be harnessed. This will provide the public with more intelligent, convenient, and high-quality public services. Xi further emphasised the importance of strengthening regulation of blockchain technology, conducting research and analysis on blockchain security risks, closely monitoring its development trends, and actively exploring its development patterns. Exploring the establishment of a security guarantee system adapted to blockchain technology mechanisms and guiding and encouraging blockchain developers and platform operators to strengthen self-discipline and fulfil security responsibilities are vital. Implementing the governance of cyberspace in the management of blockchain in accordance with the law and promoting secure and orderly development of blockchain are essential. During China's Fourteenth Five-Year Plan (2021-2025), which is regarded as a crucial period for fostering innovation and promoting high-quality development, China emerges as a compelling case for investigating public sector entrepreneurship and marketing in the context of blockchain innovations. Within this context, the People Daily Online identified the pension industry, education industry, and healthcare industry as the "Three New Engines" that are expected to drive the long-term advancement of contemporary China (Zhou, Qu, & Zhai, 2018). Notably, the healthcare industry has been prioritised by the Chinese government for long-term optimisation and enhancement (Burns & Liu, 2017; Huang, 2013). Consequently, exploring blockchain innovations within China's healthcare sector presents a unique opportunity for strategic analysis. Nevertheless, the widespread implementation of blockchain-based public service ecosystems, from a public sector entrepreneurship and marketing perspective, remains a formidable challenge that has yet to be fully addressed. As of July 2023, based on the published data sources, it is evident that,

no other country except China has provided clear public policy regarding the implementation of blockchain technology in the Public Health, for the period from 2021 to 2025. Consequently, it is asserted that the study context in this thesis represents the optimal and singular viable option for studying the decentralised trust approach to blockchain healthcare ecosystems.

Blockchain technology could be deeply integrated with healthcare systems to innovatively deliver more transparent and efficient services. For example, Tencent (2019) proposes that the patient ID in blockchain healthcare ecosystems could be adopted as the main index to replace the patient real-name profile and connected with different healthcare-related institutions, e.g., hospitals, insurance companies, etc. In this case, healthcare information could be interconnected both efficiently and securely. Furthermore, distributed ledge technology, multiple node consensus, advanced encryption standard, and smart contract have enabled blockchain technology to be equipped with distributed, decentralised, immutable, and transparent characteristics (Fu, Zhang, & Ao, 2020). It is expected that blockchain could help the organisations to establish strong relationships and trigger institutionalised collaborative behaviours (Balis, Tagopoulos, & Dimola, 2019; Casado-Vara et al., 2019). Therefore, considerations for conceptualising decentralised trust theory becomes one of the emerging research areas that requires further exploration. In traditional healthcare industry, the trust relationships are mainly established from two aspects consisting of trust between hospital and patient, and trust between insurer and patient (Zou, Cheng, & Nie, 2018). Based on health conditions, the patient has to trust the visited hospital that it would provide appropriate prescriptions and trust the chosen healthcare insurance company that it would work out reasonable premiums. However, the challenges facing traditional healthcare industry are the difficulty in maintaining patient-hospital relationships and patient-insurer relationships due to healthcare information island, informal pharmaceutical manufacturing and sales channel issues, and complicated claim procedures (Christ, 2020; Zhang, 2017). In this stance, implementing blockchain applications to healthcare industry aims to protect the stakeholders through innovative supply chain accountability and responsibility. Specifically, blockchain can be applied to simplify the way blockchain stakeholders share healthcare information and transact with blockchain data in the decentralised ecosystems (Shifrin et al., 2019). In addition,

counterfeit medicine cases could be largely reduced since blockchain ledgers could improve the tracking mechanism of administering drugs to patients from manufacturing and storage to sales and consumption. Furthermore, Hussien et al. (2019) argue that immutable medical records could enable hospitals and patients to feel protected, and insurers to mitigate the risks of fraudulent claims. Owing to the ability to benefit the healthcare, doctors from different hospitals and healthcare institutions could be authorised to read the patient historical health records in order to prescribe the right medicine without duplicating the physical examination of the same diagnostic items (De Aguiar et al., 2020). Simultaneously, insurers could fast track the patient claim procedures since blockchain evidence preservation could solve the issue of acquiring electronic evidence within a short time. By means of blockchain application, different hospitals and healthcare insurance companies could also exclude the fraudulent claims through sharing immutable data (Balis, Tagopoulos, & Dimola, 2019). Due to the potential impact of leveraging blockchain on novel supply-demand relationships (Greenberger, 2019), the quality of the activities could be effectively monitored by regulatory institutions.

In the context of this study, the organisational blockchain stakeholders, comprising vertically subdivided organisations in Public Health, will be further examined in this section. The healthcare industry is one of the industries that the government always commits to optimise and improve in terms of three aspects: healthcare service industry, pharmaceutical industry, and healthcare insurance industry (Burns & Liu, 2017). From the management perspective, this section will clarify potential blockchain stakeholders in the blockchain healthcare ecosystems. To be specific, the blockchain healthcare ecosystems will be proposed considering the current situations of the healthcare industry including differentiated healthcare experience, counterfeit medicines, and low efficiency and accuracy of healthcare insurance claims, etc (Burns & Liu, 2017; Huang, 2013). Subsequently, the supply-demand relationships will be defined at the organisational level in order to conceptualise the research framework of decentralised trust. According to Meng et al. (2015), China's healthcare system could be divided into 5 management levels consisting of state level, provincial level, city level, county/district level, and township level. Among interdependent organisations, China's healthcare system could be further classified into health service delivery system and health financing system. Adapted

from Meng et al. (2015), the health service delivery system is composed of health education institutions, health information institutions, health supervision and management institutions, and hospitals at state, provincial, city, county/district, and township level. The health financing system in China involves both public and private organisations. The public financing input is mainly focused on three medical insurances: Urban Employee Basic Medical Insurance, Urban Residence Basic Medical Insurance, and New Rural Cooperative Medical Scheme. The private financing input covers commercial insurance, out-of-pocket payments, workplace health financing schemes and non-profit-making organisation's financing schemes. In this study, in order to shortlist the potential blockchain stakeholders in the Public Health, the organisational structure of Chinese healthcare system is simplified as follows. First, the medical colleges of Ministry/Department/Bureau of Education will not be considered at the initial implementation stage since the medical colleges are future resources that will not be directly interacted with patients. Second, the university affiliated hospitals of Ministry/Department/Bureau of Education will be merged with hospitals of National/Provincial/City/County Health and Family Planning Commission and collectively defined as Hospitals. Third, the community health service centre/station, township hospital, and village clinic will not be considered in this study since their management teams might not yet be familiar with blockchain at the current stage. Fourth, the private financing input will not be discussed further in this study. Therefore, in this study, Healthcare Insurance Companies refer to public financing sources consisting of Urban Employee Basic Medical Insurance, Urban Residence Basic Medical Insurance, and New Rural Cooperative Medical Scheme. Fifth, Pharmacies in this study refer to the ones in designated public financing schemes. Sixth, Healthcare Authorities in this study comprise but not limited to Food and Drug Administration, Administration of Traditional Chinese Medicine, Development and Reform Commission, and Human Resource and Social Security. Seventh, Entrepreneurs refer to the founders of blockchain healthcare start-ups in China. Patients refers to the Chinese citizens between 18 and 60 years old who hold valid healthcare insurances. In this case, four types of organisational stakeholders and two types of individual stakeholders are picked out in blockchain-based public service ecosystem for guiding Study 1 and Study 2. Based on the identified main actors in China's healthcare system, Figure 3 illustrates potential transformation of decentralisation that is led by blockchain in healthcare application.

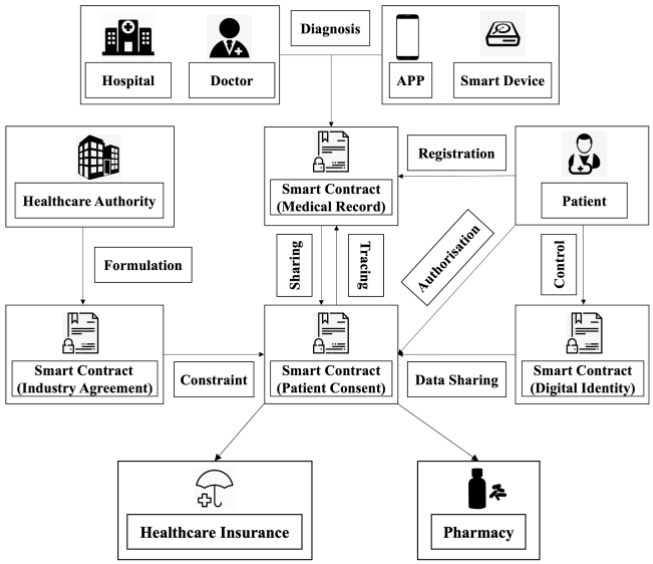

Figure 3: Blockchain Stakeholders in China's Healthcare System

4.3.2. Data Sources and Sampling Strategy

In academic research, the unit of analysis refers to who or what will be studied as the entity to address research questions or objectives. It is considered the basis for designing the sampling strategies and data analysis methods. Plank et al. (2018) regard unit of analysis as the main parameter of the research in order to obtain a meaningful result determined by the research questions or objectives. In the social science, social phenomenon might also be a potential determinant of unit of analysis since a variety of interactions would be connected and different sociological concerns or perspectives about the research topic would yield different unit of analysis (Gorichanaz, Latham, & Wood, 2018). In line with the literature review, the importance of investigating the blockchain decentralised ecosystem is to conclude that the advancing technological innovations and shifting societal perceptions will create emerging digitalised activities that related behaviours and relationships of stakeholders might be changed accordingly (Bucher, Fleck, & Lutz, 2018; Schneider, 2017). Then, with the introduction of blockchain forms, special issues related to decentralised trust warrant further research. In alignment with this research purpose and focus, the unit of analysis in this thesis is determined as the blockchain healthcare ecosystems in China.

On the other hand, the unit of observation can either correspond to the unit of analysis or be more granular, representing the smallest unit described in the dataset (Park & Moon, 2024). This approach is consistent with Spanò, Massaro, and Iacuzzi (2023), who highlight the flexibility and precision in defining unit of observation according to the research focus and data availability. In this thesis, the unit of observation specifically focuses on the responses of stakeholders at both individual and organisational levels. These responses can then be aggregated to facilitate conclusions at the broader level of the blockchain healthcare ecosystem. As demonstrated in Figure 3, the blockchain stakeholders in China's healthcare system form the primary unit of observation for data collection and sources. Given that stakeholder involvement is crucial in the adoption and effectiveness of blockchain technology in healthcare (Dange & Nitnaware, 2024), such a unit of observation is believed to adequately support the analytical goals associated with the blockchain healthcare ecosystem level (the unit of analysis).

In the pilot study, purposive sampling is adopted from Patton (2015) to discover individuals and groups that are not only knowledgeable about the studied social phenomenon but also willing to participate (Creswell & Plano, 2018). Regarding the inclusion and exclusion criteria, blockchain pioneers must have led and participated in the blockchain healthcare project for more than a completed quarter of a single blockchain project or a completed blockchain project if less than three months, during the period 2016-2018. These projects, which were quite early yet had not been further promoted to the market, include the "Future Hospital" pilot project created by Alipay and Wuhan Central Hospital. This project combined blockchain technology to provide real-name authentication, healthcare insurance support, and logistics delivery services. However, after the failed IPO of Alipay's parent company, Ant Financial, the project was temporarily shelved. This still demonstrates Alibaba Health's ongoing commitment to deploying blockchain technology in the healthcare industry. Another example is the strategic partnership between JD.com and Yinchuan Hospital, which delivered 827 community medical services to 517 residents, with large-scale applications still in the planning stages. Additionally, Tencent Cloud collaborated with Heart Life Insurance to build a blockchain alliance for healthcare institutions, insurance companies, and health information platforms. Leveraging

Tencent's accumulated business and technical expertise, they aimed to realise a secure and efficient direct insurance payment model using blockchain. Ultimately, four blockchain pioneers were selected from seven projects that met the specified criteria. These blockchain pioneers are anonymously marked in Table 1. Regarding the data collection timeline, the pilot study was undertaken between December 2020 and January 2021.

Table 1: Respondent Profile in the Pilot Study

Name	Role	Organisation Type	Age Band	Sex	Experience
Leader 1	Dean	Public Financing	31-35	Male	7 Years
Leader 2	Dean	Hospital	36-40	Male	9 Years
Leader 3	Officer	Government	56-60	Male	33 Years
Leader 4	Officer	Healthcare Authority	46-50	Male	22 Years

Leader 1 from public financing mainly represents the interests and perspectives of the healthcare insurance side. Leader 2 from hospital primarily represents the interests and perspectives of public hospitals. Leader 3 from government mainly represents the attitudes and determination of local government. Leader 4 from healthcare authority predominantly represents the interests and viewpoints of the public health. These four blockchain pioneers helped to highlight the conceptual importance of researching decentralised trust on the basis of the conceptual research framework. Leader 1 suggests that *"we do require the exploration on the public accountability system or government accountability office in order to manage the processes and help dispel potential crisis of trust"*. Leader 2 claims that *"trust between patient and hospital are one of the most difficult relationships to be maintained…we must maintain absolute fairness with the help of the blockchain healthcare solutions in order to reconstruct trust between patients and us"*. Leader 3 explains that *"people adopt such means of transaction are the ones who trust what blockchain has elaborated to have transaction safety, privacy, and immutability…however, the application of blockchain should realise the policy initiatives. The blockchain projects must be trustworthy and feasible"*. Leader 4 argues that *"we are not only look for monetary values but also nonmonetary values like gaining trust and reputation from the general public…blockchain healthcare might help patients to resolve their concerns about expensive medical bills and difficult access to quality medical services"*. In line with the literature review, the result of the pilot study further strengthens that trust is worth to be

explored in decentralised circumstances and decentralised trust is undertheorised.

In Study 1, a representative sampling approach based on Onwuegbuzie and Leech (2007) was utilised, involving leaders from eight public organisations that are directly engaged in the same blockchain project. Regarding the inclusion and exclusion criteria, the blockchain project must have been successfully operating for four quarters and either continues to exist or intends to expand further. Ultimately, three blockchain projects that met the criteria were selected. These projects are blockchain healthcare initiatives cooperatively run by municipal-level hospitals and district-level hospitals. Because the thesis narrows down the focus to the blockchain healthcare ecosystem, mere B2B cooperation between hospitals is insufficient. Therefore, from these three blockchain projects, one was further selected that possesses a more comprehensive blockchain healthcare ecosystem. This project is composed of eight independent public organisations. These organisations comprise two hospitals, two pharmacies, two healthcare insurance organisations, and two healthcare authorities. The leaders from these organisations are anonymised and listed in Table 2, where subscript 1 indicates organisations at the municipal level and subscript 2 at the district level; 'H' stands for hospital, 'HI' for healthcare insurance, 'HA' for healthcare authority, and 'P' for pharmacy. Regarding the recruitment strategy, Study 1 employs snowball sampling, where organisation leaders at the municipal level—consisting of those from hospitals, pharmacies, healthcare insurance companies, and healthcare authorities—are initially approached to participate. These leaders are then asked to assist in identifying managers from district-level organisations, who may also be suitable participants. Snowball sampling is particularly useful when there is a scarcity of participants or when additional potential participants are needed who may not be readily apparent to the researcher. This technique is supported by (Browne, 2005) as a means for researchers to leverage existing participants to identify others, and by (Waters, 2015), who notes its efficacy in reaching hidden populations that researchers might not otherwise have access to. Study 1 was conducted from April 2022 to June 2022, aiming to assess the conceptual importance of the selected deductive concepts for decentralised trust within the blockchain healthcare ecosystems. These deductive concepts consist of Ability, Benevolence, Credibility, Integrity, Communication, Reputation, and Satisfaction.

Table 2: Respondent Profile in Study 1

Name	Role	Organisation Type	Age Band	Sex	Experience
$Leader_{H1}$	Dean	Hospital	36-40	Male	10 Years
$Leader_{H2}$	Dean	Hospital	31-35	Female	6 Years
$Leader_{HI1}$	Director	Healthcare Insurance	31-35	Female	8 Years
$Leader_{HI2}$	Director	Healthcare Insurance	36-40	Male	12 Years
$Leader_{HA1}$	Officer	Healthcare Authority	36-40	Male	14 Years
$Leader_{HA2}$	Officer	Healthcare Authority	31-35	Female	9 Years
$Leader_{P1}$	Director	Pharmacy	31-35	Female	7 Years
$Leader_{P2}$	Director	Pharmacy	31-35	Male	5 Years

Study 2 was scheduled between April 2023 and June 2023, which is in the medium term of the Fourteenth Five-Year Plan. This allowed to take a longitudinal and empirical approach, building on Study 1 findings and results, and allowing for enough time between the studies to understand the respondents' knowledge boundary of blockchain healthcare ecosystems. In Study 2, judgmental sampling is adopted from Arasli, Bavik, and Ekiz (2006) to understand how the entrepreneurial organisations engaged in developing the blockchain technology for the healthcare systems, and citizens as beneficiaries of the systems, perceived and applied decentralised trust related to it. To be specific, twelve entrepreneurs and six citizens were selected to understand the involvement of innovative blockchain companies, and intention to trust a blockchain healthcare ecosystem. Regarding the inclusion and exclusion criteria, potential entrepreneurs were identified from the significant blockchain events and conferences. These gatherings cover a diverse spectrum, consisting of renowned platforms such as the Blockchain Expo World Series, NFT.NYC, Meta Week, World Blockchain Summit, and Token2049. Active engagement in these events serves as a representation of their active involvement within the blockchain community, thus substantiating their credibility and expertise in the field to be more likely to provide valuable data for Study 2.1. In addition, the startups led by these entrepreneurs in the healthcare sector must have been successfully operating for four quarters and either continue to exist or have intentions to expand further. Ultimately, from hundreds of blockchain startups, 36 that engage in blockchain healthcare were identified. From these 36 startups, 20 were selected that have a high ranking within decentralised autonomous communities on Twitter. Finally, among these 20 startups, the founders of 12 expressed an intention to participate in the interview. These founders are

summarised in Table 3.1. And the emerging inductive codes covered in Study 2.1 consisting of Synergy, Mutuality, Efficiency, Consistency, and Privacy and Security.

Table 3.1: Respondent Profile in Study 2.1

Name	Company Nature	Founded	Size	Age Band	Sex
Founder 1	Blockchain-enabled data storage	2017	14	36-40	Male
Founder 2	Software as a Service	2016	18	41-45	Male
Founder 3	Blockchain-enabled drug logistics	2019	8	31-35	Male
Founder 4	Blockchain-based financial solutions	2017	36	31-35	Male
Founder 5	Blockchain-based data analytics	2017	25	31-35	Female
Founder 6	Software as a Service	2020	6	26-30	Female
Founder 7	Blockchain-based data exchange	2019	52	31-35	Female
Founder 8	Blockchain-enabled micro insurance	2020	7	26-30	Male
Founder 9	Hospital administrative management	2018	26	31-35	Male
Founder 10	Software as a Service	2021	32	26-30	Male
Founder 11	Software as a Service	2018	45	36-40	Male
Founder 12	Blockchain-enabled drug logistics	2020	11	26-30	Female

To understand the views of the potential users of the blockchain technology in the health sector, in accordance with Vargo and Lusch (2017), it is acknowledged that knowledge gap can significantly impact service experiences. Since blockchain healthcare ecosystem is still relatively unfamiliar to the public, citizens in Study 2.2 were chosen with great care based on their understandings of the blockchain technology and the public health. Regarding the inclusion and exclusion criteria, potential citizens must have at least an undergraduate degree and be familiar with blockchain healthcare products, having experienced at least one product in the study context. This requirement aims to ensure that as early users of blockchain healthcare-related products, they can provide more impartial opinions, laying a foundation for future popularisation and market promotion. Ultimately, six citizens that met the criteria were selected. According to Baxter and Jack (2008), focusing on a small number of cases allows for an in-depth exploration of user interactions and perceptions, which is essential for understanding the nuances of user acceptance in new technological systems, such as blockchain healthcare ecosystem. These respondents are anonymously marked in Table 3.2, and the emerging inductive codes covered in Study 2.2 consisting of Mass Education, Voluntary Responsibility, Privacy and Security, and Service Convenience.

Table 3.2: Respondent Profile in Study 2.2

Name	Patient with Profession	Education Level	Age Band	Sex
Citizen 1	Angel Investor	Master's degree	36-40	Male
Citizen 2	Lawyer	Master's degree	31-35	Female
Citizen 3	Officer of Women's Federation	Bachelor's degree	46-50	Female
Citizen 4	Literary Writer	Bachelor's degree	46-50	Male
Citizen 5	Financial Analyst	Doctor of Philosophy	26-30	Female
Citizen 6	Associate Professor	Doctor of Philosophy	31-35	Female

4.4. Data Analysis

Qualitative data could be observed and recorded, and refers to non-numerical information such as interview transcripts, video and audio clips, and text documents (Kelly, 2019). It could also be grouped as categorical data that is based on the attributes and properties of a social phenomenon. For a researcher, qualitative data is related to the perceptions of participants in determining the particular characteristics of the study context and social world (Miles, Huberman, & Saldaña, 2020). Since qualitative data collection is exploratory, analysis involves in-depth insights beyond theoretical concepts in answering the research questions (Bazeley, 2013). Two main approaches to qualitative data analysis are deductive approach and inductive approach (Azungah, 2018). The deductive approach is based on a predetermined structure or framework by the researcher (Gioia, 2021). The research questions could be used as a guide for analysing the qualitative data. The first order concepts depend on whether the priori codes capture something important in line with the overall research. The inductive approach is a more time-consuming approach that the researcher needs to derive themes from raw data and assign codes relevant to the research phenomenon (Learmonth & Motl, 2016). To be specific, key concepts or themes in the inductive approach are identified and further refined by clustering the data. Saunders, Lewis, and Thornhill (2019) further argue that deductive and inductive approaches to research could be combined based on the philosophical assumptions.

In this thesis, deductive and inductive approaches are used to analyse the qualitative data (Dubois & Gadde, 2002; Kromidha, Gannon, & Taheri, 2023), meaning that theory-driven propositions allow for undiscovered themes and emergent aggregations. The advantages of

adopting abductive approach to analyse the qualitative data are that the codes that attend closely to the study context and grounded theory for in-depth interview allow flexibility and support the generation of new research constructs. In qualitative research, Creswell and Plano (2018) find that data collection and data analysis could be carried out at the same time since the researchers could move back and forth. By reviewing the transcriptions or notes from the completed interview will allow the researcher to continue exploring each research constructs and making academic assessments of the qualitative data in an interpretative format (Stephens, Dunn, & Hayes, 2018). For the qualitative research, the social phenomenon could be understood from a particular point of view based on each interviewees' experiences. Following the Gioia, Corley, and Hamilton (2013) for rigour in qualitative research, findings and results start with the exploration of deductive research constructs based on traditional trust theory, and inductive research constructs emerging from Study 1. An egalitarian trust approach based on second order themes is presented by combining them with evidence from Study 2. Reflections on both studies are synthesised into aggregate dimensions in the final part of findings and results, and discussions. Although the interviews were conducted in the healthcare context, they are not linked with the sensible questions such as patients' physical conditions. In line with Richards and Schwartz (2002), no personal information will be indicated in order to protect confidentiality. Consent forms and participation information sheets were given before each interview to inform the interviewees about different clarifications (Comstock, 2013). Participants maintain the prerogative to retract their data at any time from the study (Saunders, Lewis, & Thornhill, 2019).

4.5. Ethical Considerations

4.5.1. Ethics in In-depth Interviews

Research fraud of conducting data analysis might be found due to inadequate methodological competence and dishonesty of the researcher. Considering the nature of in-depth interviews, the interaction between the researcher and interviewees will not be ethically challenging from research design to data analysis in this research. Although the in-depth interview of this study is conducted in the healthcare context, the research questions are not linked with the patients'

personal data. In different stages of the in-depth interview, anonymity, confidentiality, informed consent, and the researcher's potential influence on the interviewees or vice versa need to be premeditated (Sanjari et al., 2015). As emphasised by Gerber (2004), qualitative researchers have to deal with a range of ethical concerns or challenges in order to identify, transcribe, and criticise related research constructs and avoid misrepresentations. According to Richards and Schwartz (2002), confidentiality for healthcare organisations and researchers means that no personal information should be indicated subject to certain exemptions. During the data collection sessions, the researcher needs to clarify who can have access to the raw data and how the data would be stored and used. Without mentioning names, the researcher will number each respondent when transcribing the qualitative data. In addition, the importance of informed consent is to inform the interviewees about different clarifications of the in-depth interview including but not limited to the nature and object of the research, the potential role of the researcher and participants, the identity of the researcher and supervision team, the financing institutions, and how the qualitative data will be stored, used, and published (Comstock, 2013). In both Study 1 and Study 2, participants need to fully understand the implications of informed consent before giving decisions about participating in the interviews or not without any coercion (Sanjari et al., 2015). In the formulation of interview guides, offensive, discriminatory, or other unacceptable language will be completely avoided.

4.5.2. Research Principle

According to Saunders, Lewis, and Thornhill (2019), privacy and anonymity are important throughout both qualitative research and quantitative research that participants have the rights to withdraw from the research at any stage. Specifically, healthcare researchers are expected to make contributions to the improvement of healthcare sector or current status quo when conducting the primary data collection (Holloway & Kathleen, 2017). In line with ESOMAR (2016), researchers should clarify the purpose of the research before collecting the primary data and ensure that participation is voluntary and the nature of the research is not misleading. In addition, the data subject should not be shared with other parties unless the participants give

consent and agree to such specific purpose of using the collected personal data. Regarding the length of holding the data, it should be no longer than the necessary period for the research purposes. The University of Birmingham Research Data Store and Archive also provides the solutions that could back up a subset of the recorded data at two physical data centres in two different sites. Furthermore, researchers must obey the data breach notification laws and be responsible for the data subjects that are involved in this study. MRS (2019) further suggests that if the researcher needs to work with vulnerable people, he/she must ensure that these participants would not be unfairly pressured and be able to make independent decisions in order to cooperative with the research requests. Otherwise, they should be given opportunities to decline the participation and rights to withdraw.

5. Findings and Results of Study 1

5.1. Original Deductive Codes

Original deductive codes are derived from the research constructs in traditional trust theory that are interrelated in the decentralised context. Thematic coding for qualitative data in Study 1 is initially emphasised in order to justify the research questions in regard to each research construct defined in the proposed conceptual research framework. Gioia, Corley, and Hamilton (2013) claim that original priori codes should be able to allow discovery and exploration rather than affirmation of existing research constructs so as to generate emergent research constructs and ground new theories. Then, the conceptual connections of original deductive codes will be interpreted and themed by the participants' views on the studied topic (Braun & Clarke, 2006). The approach of Braun and Clarke (2006) is defined as the thematic analysis for original deductive codes. However, potential pitfalls related to thematic analysis should be taken into considerations. For example, if patterns and themes are identified by primary data without theories, there might be a mismatch between research questions and the result of thematic analysis or a mismatch between qualitative data and analytic claims. In this case, Gioia (2021) proposes a systematic approach to grounded theory generation, consisting of first order analysis and second order analysis. To be specific, first order concepts are still open to be modified as they should be used to identify similar qualitative data chunks by the participants' voices. Second order themes are axial codes that will be discovered to further reduce the categories to a more manageable number by the researchers' propositions. Regarding the selection of decentralised trust dimensions and catalysts, the first-round filtration has been conducted before the primary data collection based on their theoretical connections in the decentralised context. As a consequence, Ability, Benevolence, Credibility, and Integrity are justified as the retained trust dimensions in the decentralised context; Communication, Reputation, and Satisfaction are initially selected as the catalysts of trust in the decentralised context. These deductive codes will be interpreted with the transcriptions of in-depth interviews.

As a first order concept, Ability is deductively defined as the first dimension of decentralised

trust. Adapted from and Mayer and Davis (1999), Ability primarily refers to the competence and skills required to establish trust in blockchain decentralised ecosystems. In the decentralised context, the findings and results from Study 1 can help infer whether the ways of building decentralised trust differ from those in the centralised context, thus further validating the necessity of theorising Ability. In this case, Ability is grounded as original deductive code in this research and will be further justified by identifying and interpreting patterns and themes across qualitative data. Respondents connect the dots between Ability and organisational integration. Representative quote for Ability from Hallikainen and Laukkanen (2018) is *"the chosen (company name) is competent and effective"*. In the context of blockchain healthcare, thinking of Ability as the prowess to seamlessly weave data into the fabric of an organisation, is not just in a haphazard way, but with finesse. It is about gathering data in a way that is not just authentic but also traceable, creating databases that are the epitome of completeness and accuracy. $\text{Leader}_{\text{HI2}}$ paints the picture vividly, noting that *"with the uploaded data become more and more, the database will be more completed and precise…our decision will be made in front of everyone to show why and how we make such a decision"*. Ability takes centre stage as a linchpin in safeguarding the blockchain healthcare ecosystems. It is a cape for transparent decision-making and a commitment to trust with stakeholders. $\text{Leader}_{\text{HI1}}$ sheds light on this, emphasising that *"establishing trust is to make our decision-making processes more transparent and be honest to our clients…let customers know that every decision is made with proper reasons"*. In essence, Ability is not just about skills; it is the competency to safeguard and enhance the blockchain decentralised ecosystems, the confidence to actively participate, and the art of unleashing the full potential of multiple resources by fostering seamless data sharing among stakeholders.

As a first order concept, Benevolence is deductively defined as the second dimension of decentralised trust. Benevolence is particularly relevant in the decentralised context, where stakeholders are expected to collaborate (Baker, Simpson, & Siguaw, 1999; Kumar, Scheer, & Steenkamp, 1995). In this case, Benevolence is grounded as original deductive code in this research and will be further justified by identifying and interpreting patterns and themes of decentralised trust across qualitative data. Benevolence, as the respondents see it, is the

heartbeat of cultivating win-win relationships in the dynamic dance of demands and coordination. Representative quote for Benevolence from McEvily and Marcus (2005) is *"though circumstances change, I believe that the chosen (company name) would be ready and willing to offer me assistance and support"*. In the context of blockchain healthcare, Benevolence is the secret sauce for transparently sharing data, swiftly meeting customer or partner demands, and meticulously weighing the fairness of the stakeholders' actions. $\text{Leader}_{\text{P1}}$ breaks it down, saying, *"based on different demands, we should do the corresponding deployments to cope with the emergency situations. And then, we use the transparent data to understand the market demands and to enhance the commercialised levels"*. Responses paint a picture of Benevolence as an active concern that institutions should passionately embrace. It is a call for effective communication and coordination, a synchronised effort to freely share data within the same ecosystem. $\text{Leader}_{\text{H2}}$ lays it bare, emphasising, *"when we actively upload our data, we hope that other institutions can be honest to share their data and upload them as well. As the node of the blockchain, only if we work hard to communicate and coordinate, can the ecosystem become better"*. In essence, Benevolence is not just a principle; it is the core belief, the guiding light in forging win-win relationships among stakeholders. It is fuelled by intrinsic motivations—sharing data, providing support to fellow stakeholders, meeting demands, and responsibly shaping the blockchain-based industrial standards in a timely manner.

As a first order concept, Credibility is deductively defined as the third dimension of decentralised trust. In centralised circumstances, Credibility relates to the expertise of involved parties executing assigned network roles (Ryu, Park, & Min, 2007). However, in decentralised circumstances, the specific aspects of its ability of execution are unknown. Therefore, Credibility merits exploration in the decentralised context. In this case, Credibility is grounded as original deductive code in this research and will be further justified by identifying and interpreting patterns and themes of decentralised trust across qualitative data. Boosting Credibility among diverse stakeholders is like mastering the art of spotlighting data security and the swift flow of information. Representative quote for Credibility from Roland and Werner (2010) is *"the chosen (company name) fulfils its duty exactly as I expect"*. In the context of

blockchain healthcare, $\text{Leader}_{\text{HA1}}$ lays it out, noting, *"data security is more related to the trust between our business partners and us. It is also important to patients. Regarding this, we will have professional technical teams who will maintain this system to avoid data leak and increase our credibility"*. Credibility, as echoed in responses, is a heartfelt acceptance of the blockchain healthcare ecosystems. $\text{Leader}_{\text{HI1}}$ captures the essence, emphasising, *"giving out the best premiums with the best prices is our goal. With the blockchain technology, we will take the advantage of the simplified claim settlement procedures to let our clients believe that they have made the right choices"*. In a concise summary, Credibility is a holistic approach to navigating different scenarios, driven by the internal motivations to nurture stakeholder relationships in the decentralised landscape. Various aspects, from timeliness to the service quality, play a role in this conceptual dance.

As a first order concept, Integrity is deductively defined as the fourth dimension of decentralised trust. In centralised circumstances, Integrity is crucial for balancing opportunistic behaviours (Gregori, Daniele, & Altinay, 2014; Styles, Patterson, & Ahmed, 2008). Nevertheless, the interpretation of altruism (Aulakh, Kotabe, & Sahay, 1996) in decentralised circumstances remains unclear. Hence, the study aims to investigate the role of Integrity empowered by blockchain technology in the decentralised context. In this case, Integrity is grounded as original deductive code in this research and will be further justified by identifying and interpreting patterns and themes of decentralised trust across qualitative data. Respondents link Integrity with cooperation as they respond to interview questions. Representative quote for Integrity from Muthusamy and White (2016) is *"the chosen (company name)'s actions are guided by sound principles"*. In the context of blockchain healthcare, Integrity is not about rigidly enforcing rules but delicately steering various actions—like navigating the flow of inventory by tapping into rich customer data. $\text{Leader}_{\text{P2}}$ highlights this, noting, *"when we deploy the inventory level, we also need to prioritise the affordable drugs. In this case, we can preserve our integrity by providing the most suitable medicine considering both quality and price"*. Responses paint Integrity as a force capable of elevating healthcare levels by generously sharing resources and knowledge from the summit to the grassroots. It is not a lofty goal; it is about fostering enduring connections between different levels of stakeholders.

$\text{Leader}_{\text{H1}}$ elaborates, *"we will devote ourselves to share our resources and knowledge to help those friendship hospitals who do not have the same medical level as us to increase their healthcare levels. Then, we can provide a better healthcare environment to different locations, different districts, different cities, or different patients"*. In a nutshell, Integrity is ignited when mutual interests are met, and efficiency is cranked up a notch. Managing decentralised stakeholder relationships is not about rigid control; it is about implementing cooperative actions, like gathering and sharing ample data, crafting savvy strategies, and meeting the dynamic demands of customers with finesse.

As a first order concept, Communication is deductively defined as the first catalyst of decentralised trust. In blockchain decentralised ecosystems, the first digitalised activity is related to one party's perceived pleasantness of communication between the involved parties. Thanks to distributed ledger technology, blockchain is created to guarantee a smooth operation and maintenance of information on the basis of its characteristics of transparency, immutability, and traceability (Collart & Canales, 2022; Ding et al., 2020; Saberi et al., 2019). In addition, blockchain innovates the methods of communication in order to establish the foundation of decentralised trust (Zhao et al., 2020). Additionally, with the integration of blockchain technology, the ways people share information have also evolved (Hazée, Delcourt, & Van Vaerenbergh, 2017; Martin, 2016). Since information sharing is a vital component of communication (Mohr & Spekman, 1994), it is argued that communication methods are worth to be empirically explored within decentralised ecosystems. Respondents view Communication as more than an exchange of information—it is the lively interplay among stakeholders rallying around a shared mission and vision. Representative quote for Communication from Sivadas and Dwyer (2018) is *"the chosen (company name) shares proprietary information with me"*. In the context of blockchain healthcare, picture Communication as unearthing a similarity report while dissecting the intricacies of communication in relation to pathological features. $\text{Leader}_{\text{HI1}}$ underscores a pivotal insight, highlighting that *"coordinating the benefits between insurant and us is the key to communicate in a pleasant way"*. Responses echo a sentiment that Communication transcends words—it is the mindset that lays the groundwork for a sustainable trajectory and a traceable system. For

example, $\text{Leader}_{\text{HA1}}$ emphasises that *"we need to have an entrepreneurial mind to set up long-term direction and responsibility mechanism, to ensure that everyone can communicate in a pleasant way under the blockchain healthcare field"*. In essence, fostering pleasant Communication in decentralised ecosystems hinges on aspects like *"effectiveness, the degree of automation, and the associated costs"*. To delve deeper, achieving pleasant Communication requires stakeholders to embrace an entrepreneurial mindset, shaping long-term, viable mechanisms that resonate with the decentralised circumstances.

As a first order concept, Reputation is deductively defined as the second catalyst of decentralised trust. In blockchain decentralised ecosystems, the second digitalised activity is related to one party's perceived reputation of the involved parties. Within decentralised ecosystems, it is argued that perceived reputation varies. In the centralised context, perceived reputation is primarily based on fairness (Guda & Subramanian, 2019; Guttentag, 2018; Robson, Katsikeas, & Bello, 2008). For instance, during collaboration, upstream organisations tend to set higher standards than expected for downstream organisations (Wu, Weng, & Huang, 2012). Considering this, the study aims to explore the impact of reputation and other potential themes on perceived reputation in the decentralised context. When it comes to Reputation, respondents connect it to the art of building mechanisms and fostering collaboration. Representative quote for Reputation from Styles, Patterson, and Ahmed (2008) is *"the chosen (company name) has a reputation for being fairness"*. In the context of blockchain healthcare, Reputation is imagined as a dynamic dance of upgrading healthcare standards, where the key moves involve assessing shared data sources and orchestrating a seamless supply circulation using smart contracts. $\text{Leader}_{\text{HI2}}$ puts it succinctly, saying, *"if we use a smart contract mechanism…no matter it is healthcare insurance or other types of insurance, we can then minimise the claim settlement period in order to be a reputable enterprise"*. In the responses, Reputation emerges as the result of crafting win-win scenarios. Take $\text{Leader}_{\text{HI1}}$, for example, who champions the idea that *"establishing a blockchain-based solution helps us to ensure that even if we finally give out a low premium, our customers will not suspect that they have not been fairly treated because they can check why and how the decision has been made by other similar cases"*. In essence, achieving a stellar Reputation in decentralised ecosystems boils

down to playing fair and being transparent. The recipe for being reputational nodes lies in turbocharging cooperation efficiency, ensuring that the supply circulation is not just effective but also manageable.

As a first order concept, Satisfaction is deductively defined as the third catalyst of decentralised trust. In blockchain decentralised ecosystems, the third digitalised activity is related to one party's perceived satisfaction of the involved parties. Although building Satisfaction requires time (Crosby, Evans, & Cowles, 1990; Grayson, Johnson, & Chen, 2008; Scheer & Stern, 1992), the study aims to delve deeper into this aspect by focusing on successful blockchain pilot projects. The objective is to gain insights into stakeholders' perception of Satisfaction through existing cases and derive emerging inductive codes for designing Study 2. In the sphere of Satisfaction, respondents focus keenly on the timely delivery of expected services and the right directional vibe. Representative quote for Satisfaction from Grayson, Johnson, and Chen (2008) is *"the chosen (company name) meets my expectations in terms of products and services"*. In the context of blockchain healthcare, Satisfaction is like the magic moment when services align with expectations and the whole experience just clicks. To crank up the brand value, Satisfaction becomes an art that could tweak the deployment pace to sync with the rhythm of customer demand. As $\text{Leader}_{\text{P2}}$ aptly puts it, *"we need to satisfy the clients' demand by keeping the inventory at a reasonable level. We need to know the degree of operation to adjust the deploy rate according to the blockchain data sharing"*. Responses cast Satisfaction as a vibrant behaviour that not only bridges the human experience across different parties but also supercharges competitive edges on a transparent stage. Satisfaction is a collaborative symphony: early adopters become maestros, guiding later entrants through the meaningful activities in the blockchain decentralised ecosystems. $\text{Leader}_{\text{HA2}}$ offers this nugget of wisdom: *"we should realise that we need to be more actively to participate in this blockchain decentralised ecosystems. In this case, we can help the local enterprises…to upload their information, and then interact with and exchange the valuable data"*. In a nutshell, the decentralised social fabric thrives when stakeholders elevate the Satisfaction levels in the blockchain decentralised ecosystems. It is about infusing a human touch into the interaction between stakeholders, nailing the service delivery timeline, and being proactive in assisting

others down the road in the decentralised circumstances.

5.2. Functional Influences of Original Deductive Codes on Decentralised Trust

To highlight the varied aspects of decentralised trust dimensions and catalysts that each concept addresses, three overarching dimensions emerge, underscored by distinct functional influences of the original deductive codes (see Figure 4). The first dimension, Values in Action, centres on the concepts of Benevolence and Integrity from Commitment-Trust Theory, emphasising the practical application of ethical values in fostering decentralised trust. The second dimension, Interaction Dynamics, contains the main concepts of Credibility from Commitment-Trust Theory, Communication from Social Learning Theory, and Reputation from Psychological Safety Theory. This dimension underscores the pivotal role of dynamic interactions in shaping decentralised trust, as well as the importance of safeguarding sensitive information. The third dimension, Performance Synchrony, encapsulates the main concepts of Ability from Commitment-Trust Theory and Satisfaction from Social Capital Theory, showcasing how operational excellence synchronises to cultivate trust within decentralised ecosystems.

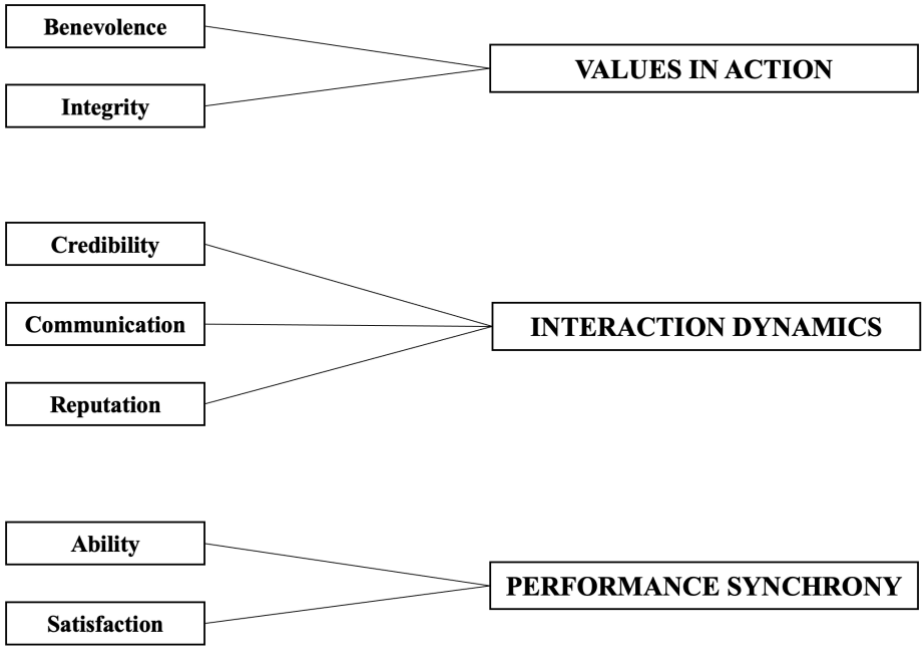

Figure 4: Functional Influences on Decentralised Trust

5.2.1. Values in Action

In the intricate tapestry of trust-building within decentralised ecosystems, Values in Action emerges as a conceptual dimension. This dimension encapsulates the tangible expressions of core ethical and moral principles that guide stakeholder actions, particularly emphasising the Benevolence and Integrity. Benevolence signifies the proclivity of stakeholders to act with kindness and goodwill, fostering an environment to collaborative with each other. It is posited that Benevolence is not merely as an abstract value but as a trust belief, cemented through repeated, mutually beneficial actions among participants. Conversely, the manifestation of opportunistic behaviours and perceived unfairness can erode this benevolent foundation, impacting participation intentions and the overall fabric of decentralised trust. Integrity, another pivotal element within Values in Action, is underscored as essential for ethical engagement in decentralised ecosystems. It represents the steadfast adherence to moral principles, balancing opportunistic tendencies and underpinning the construction of a decentralised trust infrastructure. Integrity is portrayed as a multi-dimensional construct, crucial for maintaining confidence in cooperative actions among stakeholders. Within the blockchain decentralised ecosystems, Integrity enables the sustenance of stakeholder relationships through shared moral values, mutual interests, and innovative opportunities.

Demonstrating kindness and goodwill contributes to positive benevolent values. The literature underscores the importance of Benevolence, emphasising that stakeholders are expected to collaborate for the establishment of trust (Li, Li, & Feng, 2015). Benevolence is viewed as a trust belief that parties will act in a mutually beneficial manner, with its development tied to repeated satisfied actions and a collaborative approach among stakeholders. However, the literature notes that opportunistic behaviours and a lack of perceived fairness can weaken participation intentions (Styles, Patterson, & Ahmed, 2008) and, subsequently, Benevolence.

Upholding moral principles is fundamental in ethical engagement, playing a key integrous role in building decentralised trust. In the literature review, Integrity is positioned as a critical element for balancing opportunistic behaviours, building decentralised trust, and maintaining

long-term partnerships (Gregori, Daniele, & Altinay, 2014). Integrity is seen as a multifaceted concept encompassing the degree of confidence stakeholders have in expecting each other's cooperative actions (Sirdeshmukh, Singh, & Sabol, 2002). The study emphasises that blockchain decentralised ecosystems enable the maintenance of stakeholder relationships through shared integrity, mutual interests, and innovative opportunities. The catalysts of trust, such as Reputation, are tied to avoiding opportunistic individual behaviours (Plank, Reid, & Pullins, 1999), emphasising the importance of Integrity in the decentralised context.

5.2.2. Interaction Dynamics

Interaction Dynamics, as a conceptual dimension, delves into the ways in which stakeholders engage, communicate, and perceive each other, thereby influencing the establishment of decentralised trust. This dimension underscores the pivotal role of dynamic interactions in shaping decentralised trust, along with the importance of safeguarding sensitive information. Within this dimension, Credibility is rooted in the authenticity and reliability of interactions; Communication is seen as the conduit for clarity and mutual understanding; and Reputation stands as the cumulative perception formed through these interactions. Together, these components construct a conceptual dimension in decentralised settings, inviting a deeper exploration of how decentralised trust is built, maintained, and sometimes eroded.

Credibility is established through credible interactions, forming a foundation for decentralised trust. The literature review on Credibility highlights its conceptual importance in traditional trust theory, particularly in the centralised context where it is linked to the expertise of stakeholders (Roland & Werner, 2010; Ryu, Park, & Min, 2007). The review underscores the need for further exploration of Credibility in the decentralised context, pointing out the unknown aspects of execution ability in this setting. The distinction between Credibility and Benevolence is emphasised that Credibility does not necessarily imply Benevolence in terms of mutual interests (Van Bruggen, Kacker, & Nieuwlaat, 2005).

The literature review on Communication establishes a foundational understanding of its role in building decentralised trust. In the centralised context, effective communication is deemed essential for resolving disputes and coordinating actions, thereby reducing role ambiguity and enhancing trust in stakeholder relationships (Anderson & Weitz, 1989; Arndt, 1979). This importance extends into decentralised ecosystems (Babkin et al., 2018), particularly those employing blockchain-enabled distributed ledgers, where stakeholders heavily rely on accessible shared data to make mutual decisions (Hawlitschek, Notheisen, & Teubner, 2020). Dynamic and communicative interactions is crucial for building decentralised trust. The conceptual dimensions of stakes emerge as a crucial component influencing communication (Collart & Canales, 2022) and, subsequently, decentralised trust. Stakes, interpreted as mutual benefits and requiring substantial stakeholder involvement, contribute to the open exchange of information during the decentralised processes (Hazée, Delcourt, & Van Vaerenbergh, 2017).

Reputation is shaped by how an entity is perceived through various interactions, influencing the level of decentralised trust other stakeholders place in it. In the centralised context, Reputation has been considered a signal for predicting future actions and sustaining relationships, especially between upstream and downstream enterprises (Wu, Weng, & Huang, 2012). The perceived unfair demands may lead to destabilised or terminated partnerships. However, in the decentralised context, shaped by the nature of blockchain (Eckhardt et al., 2019), Reputation becomes a more intricate concept. The mutual interests involve both monetary and nonmonetary values, requiring a nuanced understanding of reputation's role in fostering decentralised trust. The theoretical considerations suggest that in the decentralised context, the perception of reputation is linked to perceived fairness, cooperation, and opportunistic behaviour (Robson, Katsikeas, & Bello, 2008).

5.2.3. Performance Synchrony

In the evolving landscape of decentralised ecosystems, Performance Synchrony stands out as a conceptual dimension in the development and maintenance of decentralised trust. This

dimension intricately intertwines the concepts of Ability and Satisfaction, demonstrating how operational excellence and the fulfilment of expectations work in tandem to cultivate trust within decentralised ecosystems. Performance Synchrony extends beyond functional competence, embedding itself in the synchronisation of capabilities and stakeholder contentment. It underscores the notion that the demonstrable ability of entities to meet and exceed expectations is not just a measure of their competence but also a vital contributor to the confidence stakeholders place in them. Concurrently, Satisfaction, stemming from the successful delivery of promises and joint decision-making processes, plays a pivotal role in reinforcing this trust. The interplay of these elements – Ability reflecting the competence and capability to perform and Satisfaction emanating from the fulfilment and contentment of stakeholders – forms the bedrock of Performance Synchrony. This dimension highlights the importance of not just achieving operational goals but doing so in a way that aligns with and satisfies the expectations and values of stakeholders in the decentralised context, thus fostering a robust and resilient ecosystem.

Demonstrated Ability to meet expectations contribute to decentralised trust, instilling confidence in the entity's capabilities. In the literature review on Ability, the emphasis is placed on competence convergence in collaborative approaches (Hallikainen & Laukkanen, 2018). The levels of Ability-based trust can vary based on the complexity of collaborative activities, with certain situations requiring competence convergence while others may prioritise industry familiarity (Mayer & Davis, 1999; Mayer, James, & David, 1995).

The delivery of promises enhances overall Satisfaction and decentralised trust in the entity. In the literature review on Satisfaction, the emphasis is placed on joint decision-making and participative orientations as crucial aspects (Muthusamy & White, 2016). The mutual Satisfaction is posited to be determined by shared values, with stakeholders co-creating and agreeing on mutual benefits. The importance of high levels of sharing values is highlighted, suggesting that increased efforts in interactions result in higher satisfaction levels (Palmatier et al., 2007). Moreover, this research introduces the concept of participative orientations as a key aspect that initiates decision-making processes and prioritises value creation. In blockchain

decentralised ecosystems, stakeholders co-create values, and high levels of sharing values lead to increased Satisfaction. Study 1 introduces participative orientations as conceptually key aspects, arguing that understanding these orientations is vital for examining the fundamental differences between centralised and decentralised activities. It also links decentralisation, trust, and satisfaction, highlighting that advanced decision-making and orientations contribute to preserving decentralised stakeholder relationships. Overall, the assumption where Satisfaction is intricately linked to Performance Synchrony has been proposed, emphasising the role of decision-making processes, shared values, and participative orientations.

6. Discussions of Study 1

Study 1 endeavours to assess the imperative of integrating decentralised trust into the initiation and perpetuation of participation intention in blockchain decentralised ecosystems. Specifically, it seeks to justify the indispensability of decentralised trust by examining the interview transcriptions. As findings from Study 1, blockchain decentralised ecosystems highlight disparities in dependency within traditional trust theory, which tend to exhibit relatively higher dependency, and a decentralised trust approach, which embraces lower levels of dependency. Two primary considerations are considered for discovering emerging inductive codes for designing Study 2 (see Appendix 2). The first consideration arises from the alterations observed in the trust environment, as indicated by the literature review. Based on the research findings concerning the implementation of blockchain technology in ecosystem applications, a notable distinction between traditional trust and decentralised trust emerges. This distinction accommodates three substantial changes: a removal of centralised control, a fundamental transformation in dependency, and a significant shift in information access. From these changes, a conclusion is derived, namely, the examination of whether the identified concepts remain applicable within the decentralised trust approach. Should they prove applicable, it is imperative to determine the specific dimensions in which their applicability manifests. The second consideration stems from the research topic, specifically, the construction of decentralised trust. According to Agag and El-Masry (2016), the establishment of trust hinges upon the participation intention. And the behaviours to engage in activities serve as an indicator of stakeholders' level of trust towards a particular matter (Viglia, Pera, & Bigné, 2018).

6.1. Emerging Inductive Codes from Study 1

Emerging inductive codes refer to those that are found from Study 1 and which can later be further explored in Study 2. These new codes are believed to be important in understanding decentralised trust and formulating decentralised trust theory. It is worth mentioning that some of them might not be the same meanings as their previous denotations in other theories rather

than decentralised trust theory so that they will be refined with the interviewee responses.

6.1.1. Synergy

When delving into the original deductive code 'Ability', responses shed light on Synergy as the driving force behind urging diverse stakeholders to actively partake in a blockchain healthcare ecosystem. As $\text{Leader}_{\text{HA2}}$ emphasises that *"you cannot say that the hospital wants to participate, whereas the healthcare insurance company does not want to participate; or the healthcare insurance company wants to participate, other companies do not want to participate, right? The more institutions participate in, the more meaningful sharing data will be"*. In addition, Synergy meets the urgent beat of understanding customer demands swiftly. $\text{Leader}_{\text{HA2}}$ says that *"it needs a motivation that we promote it together"*. And such motivations might come from the stakeholders who are pioneers to participate in a blockchain healthcare ecosystem. To support this assumption, $\text{Leader}_{\text{P2}}$ states that *"we shall prepare the forecasted demands in advance. And we are hoping that other stakeholders can step forward"*. In other words, stakeholders see the knack for rallying others as a specific ability, a trust-building prowess within the blockchain healthcare ecosystem. To validate Ability, responses remark Synergy as the original intention to encourage different stakeholders to participate in blockchain decentralised ecosystems. Adapted from Mayer and Davis (1999), Synergy is specifically highlighted owing to the importance of competence convergence, such as ability to collectively excel in accomplishing tasks (Sivadas & Dwyer, 2018), to warrant a high degree of trust (Coulter & Coulter, 2003). In summary, Synergy is not merely about a willingness to understand customer demands promptly; it is a dance where different stakeholders groove together. Its importance becomes clear when considering the dynamic insights from Study 1. It underscores that working seamlessly together is the bedrock for establishing decentralised trust, especially since the ability to fostering stakeholder participation in a blockchain healthcare ecosystem hinge on the intention to collaborate.

6.1.2. Mass Education

In discussing the original deductive code 'Benevolence', responses shine a spotlight on Mass Education as a crucial learning outcome for stakeholders. This emphasis is particularly directed at addressing and challenging customer stereotypes. On the one hand, respondents have offered some reasons to enhance the level of mass education. For example, $\text{Leader}_{\text{H1}}$ suggests that *"we might encourage our patients to download this new software, and then offer guidance to teach them how to download, control, manage, and upload their healthcare records"*. $\text{Leader}_{\text{P2}}$ adds that *"sometimes, the customers are more willing to go to the flagships because it is big. And their measures of increasing trust, services, and advertisements might be better than the branch stores"*. On the other hand, respondents delve into reasons for integrating blockchain technology. For example, $\text{Leader}_{\text{HI2}}$ assumes that *"if more and more people have the consensus of blockchain technology…current challenges might be disappeared and no longer exist"*. $\text{Leader}_{\text{P2}}$ believes that *"if customers want to buy drug in the future, they will no longer judge a pharmacy by the means of size and influence"*. In other words, customers' stereotyping will be fundamentally reduced. Finally, $\text{Leader}_{\text{HA2}}$ links mass education with trust by means of having a proper justification that *"in this case, people will fully understand the meaning of doing this thing, and they will satisfy with it"*. To validate Benevolence, responses emphasise Mass Education as the learning outcome of the customer's stereotyping. In public sector research on trust, governments may encounter challenges in providing the desired public sector services (de Matos et al., 2020; Zaheer & Rashid, 2017) if they do not effectively employ appropriate strategies to showcase the citizen-oriented stakes of policy-led services (Buurma, 2001). Zeng, Qiu, and Zhang (2022) indicate that learning has a positive impact on promoting trust. This substantiates the theoretical highlight of bridging the knowledge gap in a service-dominant logic (Chen, Schuster, & Luck, 2023; Vargo & Lusch, 2017). In conclusion, Mass Education emerges as an inductive code to mitigate customer stereotyping, a concept worth exploring further in light of Study 1's findings. The acknowledgment of technological innovation proves crucial in establishing decentralised trust, especially since Benevolence can be swayed by stakeholders' preconceived notions. These stereotypical judgments hinder transpositional considerations and pose a threat to the

cultivation of decentralised trust.

6.1.3. Mutuality

In exploring the original deductive code 'Credibility', responses, underscore Mutuality as the foundational behaviour crucial for building trust in a blockchain healthcare ecosystem. $\text{Leader}_{\text{HA1}}$ explains that *"on the one hand, it is a kind of trust between different enterprises. On the other hand, it is a kind of trust between patients and us"*. In addition, regarding the *"two-way interest exchange and concern"* that $\text{Leader}_{\text{H2}}$ mentions, $\text{Leader}_{\text{H1}}$ suggests that *"if they want to become an alliance city or an ecological city…we also hope other stakeholders could do the same things as us to try their best to open their data sources. In this case, we can share the data based on our best knowledge"*. And $\text{Leader}_{\text{HA2}}$ highlights that *"it is not only related to a province, a city, but to bundle people's stakes together in this ecosystem"*. However, understanding the importance of a two-way interest exchange and concern does not mean that stakeholders will cooperate with such activities. Therefore, multiple-win situations are highly recommended by different respondents. $\text{Leader}_{\text{HA1}}$ answers that *"to a large extent, there might be someone or some organisation that hasn't received the deserved rewards. If realising a win-win situation, or multiple win situations, the problem can be solved"*. $\text{Leader}_{\text{P1}}$ answers that *"to build up a win-win relationship…we use the transparent data to understand the market demand, in order to enhance the commercialised level"*. Also, the importance of realising multiple-win situations through implementing blockchain healthcare ecosystem is explained by $\text{Leader}_{\text{P2}}$ that *"before the introduction of blockchain healthcare, it is difficult to deal with the relationship between upstream and downstream partners"*. In the responses, there is a distinct emphasis on Mutuality as the prevailing attitude, one that orchestrates the harmonious coordination of benefits among stakeholders. Direct interpretation could be drawn from $\text{Leader}_{\text{HI1}}$ that *"coordinating the benefits between insurant and us is the key to communicate in a pleasant way"* and $\text{Leader}_{\text{HI2}}$ that *"it is also very helpful for us to complete the deal with customers since we could precisely understand their purchasing demand. In this case, our communication costs can be largely reduced"*. And $\text{Leader}_{\text{HI1}}$ supplements that *"all in all, the*

foundation is to establish such verifiable stuff. Such parameters must be adjusted by humans, according to the market demand and change". It implies that mutuality can be affected by human interventions, e.g., their attitude or willingness to share the benefits. For example, Leader_{P2} recalls that *"when we are willing to share the data, we will then be ready to prepare things based on the actual demand"*. To validate Credibility, responses describe Mutuality as the fundamental behaviours to establish trust in blockchain decentralised ecosystems. It is regarded as a two-way interest of concerning digitalised activities that multiple win situations are expected. Responses emphasise Mutuality as the attitude to coordinate the benefits between stakeholders. Mutuality is linked with cohesion (Spanier, 1976) and cohesion imposes a form of trust (Ahmed, Evangelista, & Spanjaard, 2021). This further emphasises the necessity of investigating Mutuality. In summary, Mutuality is suggested as the key to aligning stakeholder benefits, fostering collective behaviour within a blockchain healthcare ecosystem. Further exploration is warranted, highlighting the fundamental role of willingness to engage in mutual benefit exchange activities in establishing decentralised trust. This is crucial, as perceived depth of mutual benefits exchange significantly influences Credibility.

6.1.4. Efficiency

When investigating the original deductive code 'Integrity', responses highlight Efficiency as the key to expediting service delivery within a blockchain healthcare ecosystem. This underscores the importance of streamlining time for a more effective healthcare experience.Leader_{H1} comments that *"such efficient communication actually shortens the time of analysing the pathological features by doctors…through such a platform…the patient can be cured more efficiently"*. Thus, it can be seen efficient service delivery is one of the important focus points of participating in a blockchain healthcare ecosystem. Taking the healthcare insurance industry as an example, Leader_{HI1} concerns that *"sometimes, it might take more than one year, even a shorter period can be half a year…people will think it is really time consuming. Maybe he/she still waits for the premiums after he/she is fully recovered"*. In other words, the claim settlement procedures are bureaucratic in the centralised circumstances.

However, in the decentralised circumstances, the claim settlement procedures can be simplified as all of the information are simultaneously uploaded and shared without any delay or tamper. In this case, the audit work of the claim settlement procedures, e.g., verification of the authenticity and severity of accident could be more integrous. As $\text{Leader}_{\text{HI1}}$ says, *"especially during the Covid-19, people's financial conditions are not good, paying in time becomes more important since the claim settlement procedures is simplified"*. And *"if such asymmetric information can be shared in a real time, in this case, the entire claim settlement procedure will become very quick"* ($\text{Leader}_{\text{HI2}}$). Meanwhile, $\text{Leader}_{\text{HI2}}$ also believes that *"if we have this blockchain stuff, we can upload the answers to the system, then the system will automatically issue a result. In this case, our time costs, or our insurance personnel will become very professional because the feedback is very timely"*. In addition, $\text{Leader}_{\text{P1}}$ confirms that *"we need to establish a visualised and manageable inventory in order to keep an efficient drug circulation"*. It indicates that stakeholders are trying to make their service become more efficient with the help of external forces, such as blockchain decentralised ecosystems. In the responses, Efficiency takes centre stage as the linchpin for sustaining enduring stakeholder relationships within a blockchain healthcare ecosystem. This underscores the pivotal role of streamlined processes in nurturing long-term partnerships. $\text{Leader}_{\text{HA1}}$ argues that *"low efficiency will lead to the result that we cannot maintain a long-term relationship"*. It shows that blockchain technology applications are still at the early development stage so that the efficiency at the operational level has not been fully exerted. Therefore, $\text{Leader}_{\text{P2}}$ proposes that *"we need to make sure of that the data can be transferred in time. In this case, we care about the entire blockchain healthcare field through helping our business partners and maintaining the upstream and downstream relationship, in order to enhance their satisfactory level"*. To validate Integrity, responses describe Efficiency as the shortened time of service delivery in blockchain decentralised ecosystems. Responses highlight Efficiency as the crux to maintain a long-term stakeholder relationship. In conformity with Orvik et al. (2015), the efficient operations in sharing data could lead to higher levels of Integrity. Consistent with Aulakh, Kotabe, and Sahay (1996), efficiently managing on-chain data is the strategic means of preserving Integrity. To sum up, Efficiency is put forth as the concept driving the delivery of quality service in a blockchain healthcare ecosystem. In light of Study 1, delving deeper into

this concept is crucial, highlighting its fundamental role in establishing decentralised trust.

6.1.5. Voluntary Responsibility

Voluntary Responsibility emerges as expression of the self-willingness to establish trust. This new code was identified when exploring the original deductive code 'Communication'. For example, $\text{Leader}_{\text{HA1}}$ claims that *"at the bottom level, you cannot say because of sharing my data, my work and life will face a lot of issues and harms"*. And $\text{Leader}_{\text{HA2}}$ adds that *"if we regard this ecosystem as the solution of contemporary healthcare, we need to consider the actual cases…and our responsibility is to enable that the implementation of the ecosystem is workable"*. To be specific, Voluntary Responsibility will smooth the interactions, e.g., proactive communication with other stakeholders. As it is, $\text{Leader}_{\text{P2}}$ finds that *"the role of trust stays at the core position in the blockchain healthcare field…we do not have a matched mechanism to deal with the shared data so that sometimes people can't clearly distinguish their responsibilities"*. To validate Communication, responses highlight Voluntary Responsibility as the ability to establish trust in blockchain decentralised ecosystems. In addition, Voluntary Responsibility will smooth the interactions between stakeholders through the feasible implementations. In compliance with Pazaitis, De Filippi, and Kostakis (2017), increasing users' Voluntary Responsibility for clarifying their duties can further deepen their values, fostering trust among stakeholders and promoting greater participation intention. In summary, Voluntary Responsibility is deemed as a behavioural outcome that the implementation of the blockchain healthcare ecosystem is workable. It deserves to be further explored that being voluntarily responsible is fundamentally important to establish decentralised trust when interactions must be involved in a blockchain healthcare ecosystem.

6.1.6. Consistency

When diving into the 'Reputation' code, respondents unveil Consistency as a pivotal aspect—being able to sync decisions with other stakeholders, all in the pursuit of earning and preserving

a stellar reputation. Thanks to the advent of the blockchain healthcare ecosystem, stakeholders now get a backstage pass, witnessing every decision-making move unfold transparently and etched indelibly on the chain. For example, $\text{Leader}_{\text{HI1}}$ explains that *"we can be constantly holding our information the same as other involved parties, including hospitals, pharmacies, etc. If customer knows that the decision made by other companies are similar with us, the premium is similar, service follow up is similar, then it is very good that he/she could understand the market immediately"*. In other words, one stakeholder will perceive another stakeholder as a reputable party when the consistent decision-making processes can be realised. Consistency is the guardian of data authenticity before sharing the healthcare solutions. For example, $\text{Leader}_{\text{HI1}}$ highlights that *"our whole claim settlement procedure needs to understand the situation from different aspects in order to be credible"*. In this case, the whole claim settlement procedure is deemed as the decision-making processes on the chain. And trustworthy is interpreted as the outcome when different stakeholders expect consistent decision-making processes. Regarding the data authenticity, $\text{Leader}_{\text{H1}}$ further emphasises that *"we must make sure of that as a hospital, we choose a reliable node to authorise. Then, different nodes can strengthen this relationship, establish a more solid partnership…we have to share unutilised healthcare resources as we always do in order to avoid the potential waste of healthcare resources"*. Regarding the healthcare solutions, $\text{Leader}_{\text{HA2}}$ describes that *"blockchain healthcare, applies the same rules, we can share the healthcare solutions, and react in time. And then, we do not need to wait for the functional department at the higher level to verify the feasibility and then imitate their implementations"*. And $\text{Leader}_{\text{P1}}$ supplements that *"if you can gather those people's information, more precise healthcare solutions to drugs will be given"*. To validate Reputation, responses describe Consistency as the ability to make decisions with other involved parties. Given the emphasis on the importance of information access and on-chain decision-making, thereby exerting a ground on the cultivation and maintenance of trust (De Filippi, 2017; Yu et al., 2020), Consistency emerged as a new inductive code. In summary, Consistency is the backbone of the organisation. It is the guiding force, helping key stakeholders nail consistently sound, on-chain decisions as they navigate the electrifying dance of sharing healthcare solutions through the blockchain healthcare ecosystem. Its importance is underscored by the rock-solid evidence from Study 1, proving that

Consistency is the bedrock for establishing decentralised trust, especially since Reputation can sway in the breeze of stakeholders' decision-making processes.

6.1.7. Privacy and Security

When exploring the original deductive code 'Satisfaction', responses underscore Privacy and Security as indispensable components for safeguarding the blockchain healthcare ecosystem and reinforcing decentralised stakeholder relationships. As $\text{Leader}_{\text{H1}}$ concerns, *"the biggest challenge with a blockchain healthcare ecosystem is to protect the shared healthcare data"*. $\text{Leader}_{\text{HI1}}$ also emphasises that *"to guarantee the patient's privacy not to be infringed is very important"*. In addition, $\text{Leader}_{\text{HI2}}$ explains that *"we need to be careful about the public information since peers or authorised institutions might be suspicious of your data since it is a bit sensible"*. Regarding the decentralised stakeholder relationship consolidation, $\text{Leader}_{\text{HA1}}$ links privacy and security with trust in a way that *"we will set up the firewall in order to protect cyber-attack as we always highlight the importance of data security…data security is more related to the trust"*. The crux lies in recognising that the preservation of Privacy and Security not only averts information and data leaks but also fosters stakeholder satisfaction, ultimately instilling trust in the system. $\text{Leader}_{\text{HA2}}$ describes the system that *"it must be built up under a situation that the data can be secured…protecting the healthcare data is the foundation of building up long-term stable relationship"*. Furthermore, $\text{Leader}_{\text{P2}}$ considers that *"we need to focus on its data safety because we store so many privacies. Regarding the communication, we should not only protect the customer privacy, but also share the data in time, in order to strengthen the relationship"*. To validate Satisfaction, responses emphasise Privacy and Security as the vital component in protecting blockchain decentralised ecosystems and strengthening decentralised stakeholder relationships. This shows that privacy protection and data security in blockchain decentralised ecosystems rely on tamper-proof and traceable smart contracts (Zhao et al., 2020). Since upgrading data privacy and security levels are necessary approaches to create a blockchain-based decentralised systems (Shin, 2019), Privacy and Security is emerged as a new inductive code. In summary, Privacy and Security are the dynamic

duos that elevate decentralised stakeholder relationships in the pulsating heart of a blockchain healthcare ecosystem. This dance is worth a closer look, especially when considering the solid evidence from Study 1. It lays bare that being psychologically safe is the cornerstone for establishing decentralised trust because Satisfaction hinges on the Privacy and Security.

6.1.8. Service Convenience

When validating the original deductive code 'Satisfaction', responses describe Service Convenience as the upshot of flattening different levels of stakeholders (stakeholders at either organisational or individual level) and weakening the regional discrepancy. For example, $\text{Leader}_{\text{H2}}$ complains that *"transferring patients to other hospitals is also very difficult regarding the administration processes"*. Such complaints have clearly explained the necessity of weakening the regional discrepancy. However, in a blockchain healthcare ecosystem, $\text{Leader}_{\text{HA2}}$ states that *"as a functional department at the district level, we need to see the timeliness of policy implementation first, and then implement slowly. But now, we can simultaneously catch up the steps at the municipal or even provincial level, to strictly verify the shared solution and react in time…we do not need to wait for the functional department at the higher level to verify the feasibility and then imitate their implementations"*. And $\text{Leader}_{\text{HI1}}$ supplements that *"if the data can be shared…we can verify data and let them feel more convenient that everything can be done online"*. These statements and descriptions highlight the importance of service convenience for different levels of stakeholders. In addition, $\text{Leader}_{\text{P2}}$ claims that *"we shall always share the data with different areas in order to have a good deployment. For example, if the anti-inflammatory drug is running out of stock, we could deploy it from other areas"*. By means of the blockchain healthcare ecosystem, cross-regional resource deployment becomes possible to build a satisfied public service. To validate Satisfaction, responses describe Service Convenience as the upshot of flattening different levels of stakeholders (stakeholders at either organisational or individual level) and weakening the regional discrepancy. This is evidence that Service Convenience as exemplified by Seiders et al. (2007) can emphasise the necessity of examining users' assessments to understand the

reasons why individuals are more satisfied with convenience-related services (Benoit, Klose, & Ettinger, 2017). In summary, Service Convenience is proposed as the corresponding catalytic actions that can be embodied in flattening different stakeholders and weakening the regional discrepancy. It deserves to be further explored that being a flattening stakeholder is fundamentally important to establish decentralised trust.

6.2. Designing Study 2 with the Emerging Inductive Codes

Collaborative efforts in operations foster a sense of reliability and teamwork, influencing decentralised trust. Synergy showcases the willingness of different stakeholders to know the customer demands in a timely manner. The findings and results on Synergy within a blockchain healthcare ecosystem reveal a different dimension of trust-building. The interviews highlight the belief that the more institutions participate, the more meaningful data sharing becomes, emphasising the importance of collective involvements. Synergy is seen as an intention to address the timeliness of understanding customer demands, with motivations for collaboration arising from stakeholders who act as pioneers in the decentralised ecosystems. The competence of encouraging others to work together is identified as a specific ability crucial for building decentralised trust. This perspective on Synergy diverges from the literature review on Ability, expanding the understanding of trust-building in the decentralised context beyond individual competence to include the collaborative competence of encouraging collective participation. This contrast underscores the evolving nature of trust in blockchain decentralised ecosystems, encompassing not only individual capabilities but also the collective ones of diverse stakeholders. Adapted from Mayer and Davis (1999), Synergy is specifically highlighted owing to the importance of competence convergence, such as ability to collectively excel in accomplishing tasks with each other (Sivadas & Dwyer, 2018), to warrant a high degree of trust (Coulter & Coulter, 2003). In Study 2, Synergy will be further examined by the following interview question: ***"How could the ability of working well together with other parties affect your participation intention to join a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Synergy in decentralised circumstances. It is seen as the empirical

research to validate Synergy as an inductive concept.

Mass Education underscores the cognitive abilities in fostering values and decentralised trust. The findings and results on Mass Education contribute a conceptual dimension to the discussion, illustrating how stakeholders in the decentralised context, particularly within the blockchain healthcare ecosystem, perceive mass education as a crucial element. Stakeholders express a perspective on Mass Education, linking it directly to building trust by reducing customer stereotyping. The emphasis on educating customers about new software and blockchain technology reflects a proactive approach to enhancing trust. Notably, respondents highlight that educating customers can lead to a fundamental reduction in stereotyping, demonstrating a potential alignment with the literature review's emphasis on collaborative behaviours for benevolent development. Moreover, the integration of blockchain technology is seen as a transformative force, with the belief on its benefits expected to eliminate current challenges and reshape customers' judgments, thereby reinforcing the link between Mass Education and Trust. Overall, these findings suggest that in the decentralised context, Mass Education becomes a practical avenue for cultivating the collaborative behaviours that underpin Benevolence, thereby enhancing trust in blockchain decentralised ecosystems. In public sector research on trust, governments may encounter challenges in providing the desired public sector services (de Matos et al., 2020; Zaheer & Rashid, 2017) if they do not effectively employ appropriate strategies to showcase the citizen-oriented stakes of policy-led services (Buurma, 2001). Zeng, Qiu, and Zhang (2022) indicate that learning has a positive impact on promoting trust. This substantiates the highlight of bridging the knowledge gap in a service-dominant logic (Chen, Schuster, & Luck, 2023; Vargo & Lusch, 2017). In Study 2, Mass Education will be further examined by the following interview question: ***"How would you make sure you could understand technology innovations in a new healthcare system"***. The aim is to revisit the conceptual importance of Mass Education in decentralised circumstances. It is seen as the empirical research to validate Mass Education as an inductive concept.

Mutuality plays a pivotal role in establishing a sense of shared understanding, contributing to decentralised trust. It is proposed to balance the benefits of stakeholders to behave collectively

in a blockchain healthcare ecosystem. Mutuality is portrayed as a two-way interest exchange, where multiple win situations are expected. The emphasis is on cooperation and the importance of realising multiple-win situations for different stakeholders in the decentralised ecosystems. From a strategic perspective, respondents highlight the importance of bundling people's stakes together in the decentralised ecosystems and the necessity for a guarantee behind the two-way interest exchange. However, it is acknowledged that understanding Mutuality does not guarantee cooperation, and the establishment of multiple-win situations is recommended to address potential issues. The contrast between Credibility and Mutuality in the decentralised context becomes apparent. While Credibility in the literature review is framed within the context of expertise and the execution ability of stakeholders, Mutuality in the findings and results focuses on two-way interest exchange and the establishment of multiple-win situations. The literature review lays the groundwork for understanding Credibility as a dimension of trust in decentralised stakeholder relationships, while the findings and results highlight Mutuality as a key behavioural aspect influencing decentralised trust. Mutuality in this research is theoretically correlated with cohesion (Spanier, 1976) and cohesion imposes a form of trust (Ahmed, Evangelista, & Spanjaard, 2021). In Study 2, Mutuality will be further examined by the following interview question: ***"How could practices of collective benefit/interest exchanges affect your participation intention to join a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Mutuality in decentralised circumstances. It is seen as the empirical research to validate Mutuality as an inductive concept.

Efficiency contributes to decentralised trust by showcasing the entity's ability to deliver results promptly. As expressed by participants, it is manifested in shortened service delivery times, streamlined claim settlement procedures, and enhanced operational processes. In the Public Health, for instance, the decentralisation of information through blockchain is shown to expedite processes such as data analysis, claim settlement, and drug circulation, ultimately leading to more efficient and timely services. Interestingly, the study reveals a tension between the potential of blockchain technology for efficiency enhancement and the current challenges faced in achieving optimal efficiency within blockchain healthcare applications. The findings underscore the practical implications of integrating measures, shedding light on the

complexities and nuances of balancing Integrity and Efficiency in the decentralised context. In conformity with Orvik et al. (2015), the efficient operations in sharing data could lead to higher levels of integrity. Consistent with Aulakh, Kotabe, and Sahay (1996), efficiently managing on-chain data is required as the means of preserving Integrity. In Study 2, Efficiency will be further examined by the following interview question: ***"How could efficient operations affect your participation intention to join a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Efficiency in decentralised circumstances. It is seen as the empirical research to validate Efficiency as an inductive concept.

Taking responsibility voluntarily goes beyond mere obligations, showcasing a commitment to ethical behaviour and building decentralised trust. The findings and results emphasise Voluntary Responsibility as a pivotal aspect in establishing decentralised trust. Participants articulate that Voluntary Responsibility is fundamental for the workability of the decentralised ecosystems, emphasising the need to address real cases and potential issues related to data sharing. The statements from key figures underscore the importance of acknowledging individual responsibility in data sharing to mitigate negative consequences, aligning with the literature review's emphasis on the importance of Communication in reducing ambiguity and fostering understanding. The findings provide a conceptual manifestation through the lens of Voluntary Responsibility in the blockchain healthcare ecosystem. This alignment highlights the tangible impact of responsible behaviour on decentralised trust, suggesting that Communication identified in the literature play out in real-world scenarios, particularly in the context of blockchain decentralised ecosystems. In Study 2, Voluntary Responsibility will be further examined by the following interview question: ***"Would you be voluntarily responsible for clarifying and fulfilling different duties in a blockchain healthcare ecosystem, and why"***. The aim is to revisit the conceptual importance of Voluntary Responsibility in decentralised circumstances. It is seen as the empirical research to validate it as an inductive concept.

Consistency in actions, messages, and behaviour over time builds a sense of psychological safety, contributing to decentralised trust. In Study 1, Consistency is defined at the organisational level to assist the key stakeholders to make on-chain decisions consistently when

sharing the healthcare solutions through blockchain decentralised ecosystems. It is deemed as the ability to make decisions aligned with other parties, contributing to a shared reputation score. The transparency of the blockchain healthcare ecosystem ensures that decisions are transparently recorded and can be consistently understood by all involved parties. From a strategic standpoint, stakeholders emphasise the importance of reliable nodes for authorisation and the need to share unutilised healthcare resources. The blockchain facilitates the sharing of healthcare solutions and expedites decision-making processes, eliminating the need for higher-level verifications. The strategic perspective underlines the trustworthy derived from consistent decision-making processes, reinforcing the notion that Reputation in the decentralised context is closely tied to the consistent execution of operations within the blockchain healthcare ecosystem. With an emphasis on the importance of consistency in information access and on-chain decision-making (De Filippi, 2017; Yu et al., 2020), there is a significant influence on the cultivation and maintenance of trust. In Study 2, Consistency will be further examined by the following interview question: ***"How could consistent decision-making processes affect your participation intention to join a blockchain healthcare ecosystem"***. The aim is to revisit the conceptual importance of Consistency in decentralised circumstances. It is seen as the empirical research to validate Consistency as an inductive concept.

Ensuring the Privacy and Security of information adds a layer of decentralised trust. It involves transparent practices and measures to protect sensitive data. They are proposed as the corresponding catalytic actions that can be embodied in intensifying decentralised stakeholder relationships in a blockchain healthcare ecosystem. The link between Privacy, Security, and Trust is highlighted, with the establishment of data encryption seen as essential for building and maintaining long-term, stable relationships. The findings and results suggest that maintaining Privacy and Security in the decentralised context is critical for satisfying stakeholders by preventing information and data leaks, consequently fostering decentralised trust. Leaders in the blockchain healthcare ecosystem stress the importance of careful handling of public information to avoid suspicion and emphasise the importance of data security in strengthening decentralised stakeholder relationships. This contrast underscores the assumptions of ensuring Privacy and Security in decentralised ecosystems, aligning with the

theoretical underpinnings of Satisfaction from the literature review. Zhao et al. (2020) show that privacy protection and data security in blockchain decentralised ecosystems rely on tamper-proof and traceable smart contracts. And upgrading data Privacy and Security levels is deemed essential, as highlighted by Shin (2019). In Study 2, Privacy and Security will be further examined by the following interview questions: ***"How could privacy and security concerns affect your participation intention to join a blockchain healthcare ecosystem"***, and ***"How important is the privacy and security of a new healthcare system regarding your personal data and healthcare services, and why"***. The aim is to revisit the conceptual importance of Privacy and Security in decentralised circumstances. It is seen as the empirical research to validate Privacy and Security as an inductive concept.

The ease and convenience of accessing and using a service contribute to a positive user experience, influencing decentralised trust. Stakeholders in a blockchain healthcare ecosystem emphasise the Service Convenience of streamlined administrative processes and the ability to implement policies swiftly across different levels. The decentralisation of data in healthcare enables timely verifications, facilitating online procedures and cross-regional resource deployment. The importance of Service Convenience is highlighted by statements such as the ability to verify data and deploy resources from other areas as needed. The findings and results suggest that Service Convenience is critical for stakeholders at various levels, fostering satisfactory public service. In contrast to the literature review, the findings and results ground the discussion in examples of how Service Convenience manifests in blockchain decentralised ecosystems, providing a nuanced understanding of its impact on Satisfaction. It is evidence that Service Convenience as exemplified by Seiders et al. (2007) can emphasise the importance of examining users' assessments to understand the reasons why individuals are more satisfied with convenience-related services (Benoit, Klose, & Ettinger, 2017). In Study 2, Service Convenience will be further examined by the following interview question: ***"How would you assess the service convenience in using a new technology in the healthcare system"***. The aim is to revisit the conceptual importance of Service Convenience in decentralised circumstances. It is seen as the empirical research to validate it as an inductive concept.

7. Findings and Results of Study 2

In Study 2, the research advances longitudinally and empirically, building upon the insights gleaned from Study 1. This approach strategically incorporates a research gap between the studies to assess the evolving understanding of blockchain technology within the Public Health. Specifically, the study engaged a carefully selected group of twelve entrepreneurs and six citizens, examining their willingness to participate in, and trust, a blockchain healthcare ecosystem. Study 2 is distinguished by its exploration of emerging inductive codes: 'Synergy', 'Mutuality', 'Efficiency', 'Consistency', and 'Privacy and Security' in Study 2.1; and 'Mass Education', 'Voluntary Responsibility', 'Privacy and Security', and 'Service Convenience' in Study 2.2. These codes, which emerged from the thematic analysis of qualitative data in Study 1, play a pivotal role in understanding the nuances of decentralised trust. Additionally, the interview guides for Studies 2.1 and 2.2 was informed by the need to explore the unique stakeholder roles that entrepreneurs and citizens occupy within the blockchain healthcare ecosystem, thereby enriching the discussions with diverse perspectives.

On top of the discussions of Study 1, the necessity of conducting Study 2 is also based on the following reasons. First, blockchain has many potential applications for public sector research and are yet to be fully understood and embraced on the business landscape. Second, decentralised ecosystems are having increasingly profound impacts on the innovative perceptions of different stakeholders. Therefore, reshaping the theories and constructs that are related to blockchain deserves more empirical approach to inform and guide future researchers, practitioners, and policymakers. Third, Study 2 is highlighted as the strategic approach to realise decentralised trust for patients, startups, healthcare institutions, and society at large.

Retheorising trust theory towards a decentralised approach emphasises the fundamental public value of equality. Decentralised trust can be enhanced by ensuring a sense of equality in autonomous decision-making processes. An egalitarian decentralised trust approach requires providing equal opportunities for participation within the blockchain healthcare ecosystem and

acknowledges the equal representation of voting weights and distribution of healthcare resources among stakeholders. This approach stands in contrast to the conventional trust-building methods that rely on control and power dynamics (Bachmann, 2001; Luhmann, 2017). Therefore, the shift towards an egalitarian decentralised trust approach in the blockchain healthcare ecosystem calls for revisiting trust theory. Figure 5 aims to show the underlying concepts of the decentralised trust approach, shedding light on the intricate dynamics and relationships between first order concepts and second order themes.

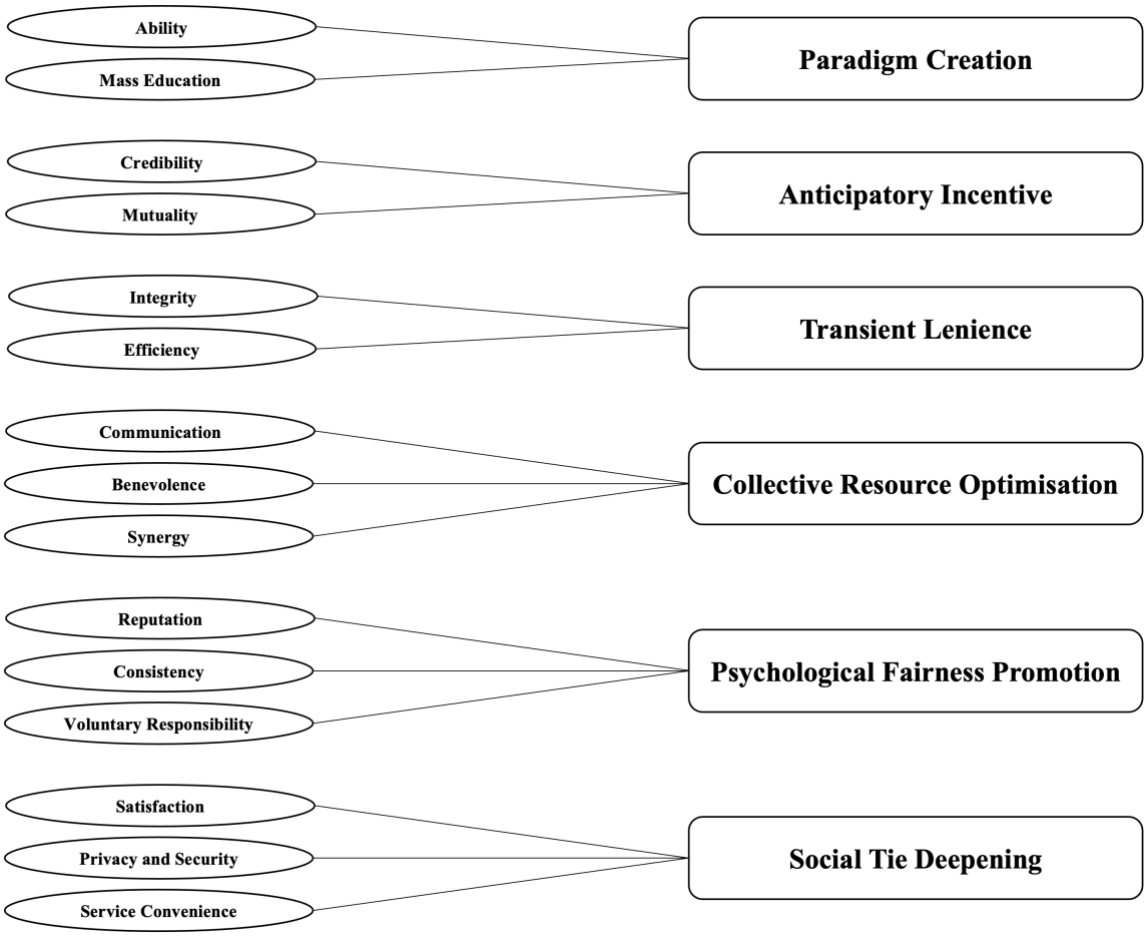

Figure 5: Second Order Themes of Decentralised Trust

7.1. Paradigm Creation

To revisit Ability in the decentralised context, responses highlight it as the competence to accomplish practical applications of blockchain technology such as hierarchical diagnosis and treatment. In doing so, tangible evidence could be achieved to build trust between stakeholders

and technology acceptance of blockchain. Cultivating awareness and shared goals, along with third-party oversight, can also contribute to establishing committed stakeholder relationships. Founder 2 emphasises decentralisation in healthcare by integrating hierarchical diagnosis and treatment. They advocate for a system where community hospitals play a crucial role in managing minor issues, reducing the reliance on major institutions like Peking Union Medical College Hospital. This approach not only distributes healthcare services across various levels but also prevents the isolated dominance of major hospitals. It underscores the Ability to create a more expansive paradigm within the blockchain healthcare ecosystem, fostering trust among diverse medical entities for decentralised healthcare solutions.

> *"Let me explain the aspect of hierarchical diagnosis and treatment: with hundreds of community hospitals compared to one Peking Union Medical College Hospital, we can overcome the isolated island effect of major hospitals" (Founder 2).*

Founder 3 and Founder 5 highlight the importance of building trust in the blockchain healthcare ecosystem. They advocate showcasing data security and technological advancements through real-life case studies. Founder 3 stresses the gradual process of demonstrating superiority over traditional methods to instil confidence. Founder 5 supports this by proposing tangible case studies to exhibit blockchain's practical applications, fostering competence in the community. Founder 9 draws parallels with Alipay, illustrating the step-by-step process of gaining trust through small, successful interactions. This approach emphasises the Ability to establish a foundational level of trust and the paradigm shift towards blockchain healthcare by addressing concerns through incremental positive experiences.

> *"One way is to emphasise the assurance of data security and showcase the technological advancements through relevant cases. By effectively demonstrating the superiority and positive outcomes compared to traditional methods, we can gradually build trust and acceptance among individuals" (Founder 3).*

> *"We can create real-life case studies to showcase the practical applications of blockchain*

technology. Presenting such cases will provide tangible evidence of the feasibility and help others to build competence" (Founder 5).

"The foundation for gaining trust from unfamiliar audiences lies in the following steps: establishing a basic level of mutual trust, gradually building upon that trust, and continually promoting values that are recognised by the users" (Founder 9).

Founder 6 underscores trust-building in the blockchain healthcare ecosystem through transparency, accuracy, and compliance. They stress the importance of secure data sharing, ethical standards, and collaboration with regulatory bodies to instil confidence. This perspective aligns with the ability to create a paradigm emphasising adherence to legal requirements and ethical standards while fostering a collaborative and transparent environment. Founder 12 adds depth by highlighting that while blockchain ensures trust in data interactions, the authenticity of the original data must be established independently. This dual-layer approach, verifying data authenticity before applying blockchain for immutability, underscores the nuanced ability to build trust by addressing trustworthiness at multiple levels.

"By implementing transparent and secure data sharing protocols, maintaining the privacy and confidentiality of sensitive information, and ensuring that all parties involved adhere to ethical and legal standards, trust can be fostered" (Founder 6).

"Blockchain addresses the issue of trust in data, but it cannot guarantee the authenticity of the data itself. If healthcare entities want to establish trust, they must first ensure the authenticity of the original data and then apply blockchain to guarantee the immutability of data interactions" (Founder 12).

Founder 7 emphasises trust-building in the blockchain healthcare ecosystem through the foundation of a robust system that includes thorough data verification, participant qualification reviews, identity authentication, and validation of data authenticity. Third-party oversight further highlights the ability of blockchain to create a paradigm that prioritises data authenticity,

participant qualifications, and external regulations, ultimately fostering decentralised trust.

> *"Trust is primarily built upon the foundation of authenticity in data or service provision. This requires the blockchain platform to provide thorough data verification. Additionally, third-party oversight is necessary to ensure that all parties are subject to regulation, thereby enhancing trust" (Founder 7).*

To revisit Mass Education in the decentralised context, responses highlight it as the solution to increase awareness of blockchain decentralised ecosystems. By promoting understanding of the principles of decentralisation, long-term collaborative relationships could be maintained. Founder 4 highlights a crucial challenge in the blockchain healthcare ecosystem. The quote emphasises the inherent resistance in healthcare towards decentralised ecosystems, citing a preference for centralised structures and trust in established institutions. The reluctance to adopt unfamiliar blockchain healthcare ecosystem suggests a need for extensive Mass Education. Overcoming this scepticism requires educational efforts to inform individuals about the benefits, security, and applicability of decentralised solutions in healthcare. Bridging this knowledge gap is essential for shifting the paradigm and fostering acceptance of innovative blockchain technologies within the Public Health.

> *"Unlike consumer products, where it is relatively easy to switch to a new and technologically advanced brand of mineral water, in healthcare, individuals are reluctant to trust a decentralised healthcare system that they have never heard of before. I believe mass education issues will arise" (Founder 4).*

Founder 3 anticipates initial disparities in insurance quotes within the evolving blockchain healthcare ecosystem. While some companies may offer lower or higher quotes due to early variations, the competitive nature is expected to drive improvements. As blockchain awareness grows, companies are likely to refine their practices, fostering a transparent decentralised environment. This process aligns with the paradigm shift towards more reasonable solutions that cater to individual needs. Founder 5 underscores the importance of real-life case studies.

By showcasing blockchain applications in healthcare, these case studies serve as tangible proof, enhancing competence and understanding. This educational approach contributes to paradigm creation, demystifying blockchain technology and encouraging its adoption.

> *"As awareness and usage of blockchain technology increase, companies will be motivated to improve their practices and offer more reasonable and competitive solutions. This will lead to a more transparent and trustworthy environment where individuals receive offers that align with their needs" (Founder 3).*

> *"We can create real-life case studies to showcase the practical applications of blockchain technology. Presenting such cases will provide tangible evidence of the feasibility and help others to build competence" (Founder 5).*

Founder 6 emphasises the importance of joint training and educational programs in fostering committed trust relationships. These initiatives not only facilitate mutual understanding but also contribute to long-term partnerships. This approach aligns with the Mass Education perspective, as it promotes shared knowledge and expertise, laying the foundation for a more cohesive and informed blockchain healthcare ecosystem. Founder 9 focuses on the necessity of explaining blockchain principles and their application in healthcare to individuals (A and B). This education is crucial for identifying opportunities and enhancing the overall ecosystem. Bridging the knowledge gap is essential for fostering widespread understanding and buy-in, contributing to the paradigm shift towards blockchain integrations in healthcare. Founder 12 underscores the sensitivity of medical information and the potential of blockchain to enhance security. The quote highlights the encryption of health-related records and the secure storage of information, addressing concerns about data breaches. This application of blockchain in securing medical information aligns with the Mass Education perspective, emphasising the technology's role in providing authentic confidential health data, thus contributing to a paradigm shift in healthcare practices.

> *"Offering joint training programs can help cultivate and foster long-term collaborative*

relationships while promoting mutual understanding" (Founder 6).

"Firstly, we need to explain to A and B what blockchain is, what healthcare entails, and how these two concepts can be combined. By enabling more individuals to understand the principles of decentralisation and blockchain, we can identify potential opportunities and further enhance the ecosystem" (Founder 9).

"Blockchain technology can encrypt and securely store various types of information records…reliable, and confidential information can assist patients in gaining a basic understanding of their medical condition, recommending suitable hospitals, and even suggesting relevant doctors" (Founder 12).

Citizen 1 emphasises the importance of official publicity and personal experiences shared by others for healthcare decision-making. Proximity to individuals does not impact their choices, highlighting the importance of information authenticity. In the context of Mass Education, this underscores the need for reliable channels and shared experiences to build trust in the blockchain healthcare paradigm. Citizen 2 describes a feasible approach, starting with online research, insurance coverage checks, and doctor recommendations. This aligns with the paradigm shift, showcasing the integration of technology and online platforms in healthcare decision-making. Citizen 6 highlights the convenience brought by technology in healthcare processes, such as WeChat Mini Programs for appointments. Their self-sufficient navigation through digital interfaces indicates a comfort with technology. In the context of Mass Education, this reflects a growing acceptance of technological advancements, emphasising the need for education to empower individuals in utilising such blockchain healthcare ecosystem.

"The first one is some necessary official publicity, and the second one is about the people around me. They share their experiences with me after seeing a doctor. These two channels provide a greater amount of information. I would not choose whose information to listen to base on the closeness of relationship" (Citizen 1).

"If it is a simple and straightforward case, I might handle it directly through a healthcare app. If I find the app somewhat confusing…I would certainly search for videos or other people's experiences to see if there are similar cases. Then, when I go to the hospital, I would consult with the reception" (Citizen 2).

"Since the Mini Program's functionality is straightforward, it is possible that if its purpose is solely for appointment scheduling, the interface will be simple…It is a convenient approach, and there is not much reliance on someone guiding or communicating with me directly" (Citizen 6).

Citizen 3 underscores the importance of self-learning and peer collaboration in healthcare, especially with written instructions and mobile applications. The emphasis on practical exploration and problem-solving through discussions with colleagues or a spouse highlights the value of communal knowledge. In the context of Mass Education, this approach advocates for accessible and user-friendly materials, fostering collaborative mass education within communities to navigate the complexities of healthcare technologies, including those related to blockchain. Citizen 4 discusses diverse mass education channels for new technologies in healthcare. While acknowledging the ease of obtaining information from various sources, they emphasise the crucial role of consulting professionals. This reflects a recognition of the limitations of personal experiences and the need for expert insights. In the context of Mass Education, promoting awareness of seeking professional guidance aligns with creating a paradigm where individuals are informed not just about technology use but also its broader implications, including ethical considerations and potential future developments.

"It is about self-learning or studying with peers of the same age, such as your spouse or colleagues. For topics like healthcare, it is important to have written instructions and some mobile applications that provide guidance. By collaborating with them, you can effectively solve most of the challenges" (Citizen 3).

"I can search the instructions and user manuals, consult with doctors, or even inquire with

patients who have already used it to learn from their experiences. While a technology may seem promising, professionals' expertise and access to diverse data can guide me towards long-term use of the technology" (Citizen 4).

7.2. Anticipatory Incentive

To revisit Credibility in the decentralised context, responses highlight it as the attainable benefits that can be obtained in multiple methods including discounted healthcare services, win-win situations, and increased social capital. Additionally, it also helps to dispel doubts and concerns especially when the expected outcomes have not been achieved. This is due to the fact that stakeholders are willing to foster stable stakeholder relationships once their intrinsic motivations are gradually incentivised. Founder 9 emphasises the importance of Credibility in the blockchain healthcare ecosystem. They suggest that setting attainable goals linked to tangible benefits is crucial. However, they caution against making benefits too easily accessible, as instant gratification may hinder sustained engagement. Credibility lies in the balance between achievability and challenge. Moreover, the idea of individuals spreading benefits to others implies a network effect, enhancing credibility through collective participation. This perspective aligns Credibility with a nuanced approach to incentives, ensuring a sustainable and impactful outcome in the blockchain healthcare ecosystem.

"Linking them to tangible benefits is necessary. Only by following this approach can the desired outcome be achieved, as when someone instantly obtains the benefits they desire, they are less likely to continue the endeavour" (Founder 9).

Founder 2 emphasises the value of individuals sharing data for mutual benefit in the blockchain healthcare ecosystem. This comprises data for pharmaceutical research and clinical trials, with participants accumulating points for medical services. The respondent proposes a tripartite relationship among individuals, doctors, and pharmaceutical companies, fostering long-term Credibility. Founder 3 suggests a credible mechanism where hospitals earn points for sharing

medical cases. These points can be traded or used for referencing cases, fostering an ecosystem akin to carbon credits. This system incentivises knowledge-sharing among healthcare organisations. Founder 6 highlights the positive impact of a shared ecosystem, emphasising community, altruism, and win-win situations. This communal approach fosters Credibility, encouraging increased participation towards common goals. Founder 8 stresses the importance of credible value in onboarding companies to the platform. Leadership expertise and decentralisation allow startups without inherent advantages to contribute Credibility to the ecosystem. Founder 11 proposes Healthcare Contribution Points tied to credible contributions, increasing the chances of proposal adoption. This aligns incentives with Credibility, linking future rewards to the frequency of implemented proposals, ensuring sustained engagements.

"By contributing such data, it enhances the capabilities of doctors, benefiting hospitals as well…by participating in these programs, individuals can accumulate points, which could result in significant discounts…through this mutual beneficial arrangement, a long-term credibility can be established" (Founder 2).

"They would need to share at least one case to accumulate a point, and in return, they could refer to other shared cases when necessary. Alternatively, these points could be traded among hospitals, similar to carbon credits, allowing them to incentivise sharing among different organisations" (Founder 3).

"When individuals are able to exchange and have vested interests, and when there are shared benefits, whether through knowledge sharing or resource sharing, it creates a sense of community and credibility within the ecosystem…it emphasises a sense of altruism and win-win situation" (Founder 6).

"When it comes to onboarding a company onto a platform, it is natural to consider the benefits and advantages it brings. Additionally, the decentralised nature of the platform does not necessarily exclude startups without inherent advantages. It simply means they don't need to actively engage in subservience" (Founder 8).

"We can design a concept called healthcare contribution points. Participants can accumulate their own points, and those with more points meaning that they have made credible contributions. But they will not receive actual rewards until their proposals are adopted or implemented more frequently" (Founder 11).

Founder 1 emphasises the objectivity of decentralisation supported by data in the blockchain healthcare ecosystem. By leveraging data, they can create patient-centric solutions, addressing specific needs and understanding pain points. This approach not only establishes credibility but also enables a nuanced form of communication that combines emotional understanding with market-oriented strategies. The use of data-driven insights enhances the founder's ability to tailor solutions and foster credibility.

"It enables me to create solutions that are more tailored to patients' needs and gain a deeper understanding of their pain points. Through the utilisation of data, I can establish a sense of credibility and engage in a form of communication that combines emotional and market-oriented aspects" (Founder 1).

Founder 5 advocates for a strategic entry into the market by focusing on complex and rare diseases initially, gradually expanding. This targeted approach builds a strong foundation for long-term growth and establishes credibility, ensuring a solid market presence. Founder 12 acknowledges the inherent vested interests in the blockchain healthcare ecosystem. They propose that the key lies in creating a credible community of shared interests, emphasising reduced transaction costs and stable relationships. This collaborative model aligns with the fundamental design of blockchain, enabling participants to pursue individual objectives while fostering a collective and credible community within the blockchain healthcare ecosystem.

"Starting with complex and rare diseases and gradually expanding the range of diseases as we penetrate the market can be a faster approach. It allows us to have long-term growth and establish credibility" (Founder 5).

"If all participants in the blockchain decentralised ecosystems of healthcare have no vested interests, it would be unrealistic. If we can establish a credible community of shared interests, reduce transaction costs, and foster stable relationships, I would certainly be willing to actively participate" (Founder 12).

To revisit Mutuality in the decentralised context, responses highlight it as the shared interests on leveraging collective benefits and social value to stimulate stakeholders' willingness to join an ecosystem. Founder 2 emphasises the importance of mutual benefits in the blockchain healthcare ecosystem, viewing long-term cooperative relationships as essential. This underscores the need for a balanced ecosystem where patients, doctors, and pharmaceutical companies all gain from collaboration. Founder 3 advocates leveraging blockchain as a bridge to connect diverse entities, tailoring services to users, hospitals, governments, and insurance companies. The emphasis on tailored services indicates an Anticipatory Incentive, with blockchain facilitating mutual benefits by addressing specific needs of each group. Founder 7 articulates a nuanced perspective, suggesting that sacrificing individual interests for mutual benefits can lead to longer-term industry development. This highlights the interdependence of individual and mutual interests in fostering industry growth. Founder 10 discusses collaborative scenarios, highlighting the importance of Anticipatory Incentive. The mention of revenue sharing, and partnership agreements reflects an Anticipatory Incentive, demonstrating a proactive approach to ensure mutual benefits as the platform expands.

"We previously envisioned a business model that considered three aspects: individuals, on-chain doctors, and pharmaceutical companies. We believe that establishing long-term cooperative relationships should be based on mutual benefits and interests" (Founder 2).

"This approach acts as a bridge, facilitating integration and analysis internally, and providing different services to address the unique needs of various groups, ultimately achieving a mutual benefit for all parties involved" (Founder 3).

"Mutual interests and individual interests are not necessarily in absolute opposition. If the mutual interests can bring about longer-term and more standardised development for the enterprise, sacrificing a portion of individual interests may be acceptable" (Founder 7).

"In a multi-party collaboration scenario, where we possess the technology and the hospital possesses the resources, it is important to address the challenge of collaboration when our team lacks medical experts" (Founder 10).

Founder 1 suggests that the impact of blockchain on motivation within an ecosystem depends on the shared interests. If the focus is solely on cost reduction, it might dampen motivation. However, if the shared interests revolve around collective strength for commercialisation and individual profit optimisation, motivation is likely to be enhanced. This emphasises the importance of aligning shared interests with broader goals to drive motivation effectively. Founder 6 underscores the efficiency gains from shared benefits in the blockchain healthcare ecosystem, leveraging the strengths of ecosystem participants. The mention of incentive programs, such as discounts on medical services or exclusive resource access, highlights an Anticipatory Incentive strategy. These practices foster collaboration, creating a more participatory ecosystem with improved healthcare outcomes for all involved. This aligns with the idea that mutual benefits drive engagement and efficiency in decentralised ecosystems.

"If the shared interests are focused on leveraging collective strength to achieve commercialisation, marketisation, and individual profit optimisation, it would certainly enhance motivation" (Founder 1).

"If the ecosystem or platform also implements incentive programs to encourage individual participation and facilitate mutual interest or value exchange, such as providing discounts on medical services or access to exclusive resources, it can further enhance collaboration and engagement" (Founder 6).

Founder 4 emphasises the situational nature of impact, stating that for pioneering companies

exploring new territories, the realisation of mutual value can compensate for financial gains. However, in established markets, where resources are limited and transparency is high, the importance of entering becomes weaker. This perspective underscores the importance of innovation and social impacts in driving value, particularly in dynamic industries. Founder 9 discusses the strategic approach to engaging authoritative hospitals, highlighting the challenge of convincing established entities. The proposed suggestion involves targeting underserved patients, offering them a higher level of service, and creating a gradient of access. This aligns with the concept of providing value to users and creating a win-win situation where both patients and authoritative hospitals benefit, emphasising the need for strategic targeting and innovative service models in decentralised ecosystems.

> *"I believe that it depends on the specific situation. If a company is a pioneer in the industry, exploring new territories and creating innovative models, then everyone benefits. It benefits the industry and society as a whole. In such cases, the realisation of social value can compensate for any financial gains" (Founder 4).*

> *"I believe this is the model to pursue, rather than relying on idle resources at the local county-level hospital or other county-level hospitals elsewhere" (Founder 9).*

Founder 5 highlights the perspectives of focusing on complex and rare diseases, as they attract attention and stand out. However, for common ailments like the common cold, differentiation based on symptoms alone is challenging. Building trust for common ailments takes time compared to rare diseases with a higher impact, like COVID-19. This perspective emphasises the need for tailored approaches depending on the nature and prevalence of diseases within the blockchain healthcare ecosystem. Founder 11 introduces a concept of Healthcare Contribution Points, suggesting a reward system tied to credible contributions. Accumulating points enhances the chances of proposal adoption, creating an Anticipatory Incentive structure. The delay in receiving actual rewards until proposals are adopted encourages sustained participation, aligning individual contributions with the overall success of the ecosystem. This approach promotes a collaborative and value-driven blockchain healthcare ecosystem.

"I agree that finding solutions for complex and rare diseases is particularly intriguing from a business perspective. These cases tend to attract more attention and are more likely to stand out…it takes longer to build trust with the audience compared to complex and rare diseases, which have a higher impact" (Founder 5).

"We can design a concept called healthcare contribution points. Participants can accumulate their own points, and those with more points meaning that they have made credible contributions. But they will not receive actual rewards until their proposals are adopted or implemented more frequently" (Founder 11).

7.3. Transient Lenience

To revisit Integrity in the decentralised context, responses highlight it as the preservation to facilitate anonymous voting or decision-making processes. Its effectiveness could be evaluated through conducting retrospective analysis and granting integrous leeway in the short term. Founder 3 emphasises the importance of diverse perspectives, highlighting that truth often resides with experts, officials, and practitioners. Blockchain's capacity for anonymous voting is seen as a remedy to herd mentality, fostering critical thinking and integration of viewpoints, ultimately enhancing decision-making in the blockchain healthcare ecosystem. Founder 7 underscores the necessity of Integrity in a blockchain healthcare ecosystem. Qualifications for doctors and trust in pharmaceuticals are paramount. The decentralised nature empowers users to make informed choices, and blockchain's Efficiency is deemed crucial for tasks ranging from treatment plans to insurance, emphasising a symbiotic relationship between Integrity and Efficiency. Founder 11 speaks to the stability of a blockchain healthcare ecosystem, where transparency can lead to accountability. They propose a workable Efficiency index, considering both the performance of nodes and the challenge of proposing and voting for solutions. This holistic evaluation aims to optimise the ecosystem resilience.

"By utilising blockchain technology, where one cannot see others' opinions before forming their own, individuals are compelled to express their own thoughts. This can lead to a more comprehensive integration of various viewpoints and better reflect the actual situation by identifying commonalities" (Founder 3).

"Furthermore, decentralisation empowers users with the ability to compare and choose, and integrity can be optimised within the process. The inherent advantage of blockchain decentralisation lies in its ability to significantly improve efficiency, which is crucial in the healthcare system" (Founder 7).

"In this workflow, when the performance of different nodes is made transparent and public, the slowest node will inevitably face complaints from other nodes. Additionally, efficiency is just one aspect. By combining this difficulty and time taken, we can derive a weighted efficiency index" (Founder 11).

Founder 4 advocates for an approach in the initial stages of implementing blockchain healthcare. They emphasise the importance of trying and testing, conducting retrospective analysis to identify issues. The suggestion is to allow for a learning curve and not immediately attribute challenges to a specific node. Periodic evaluations, preferably every two to three months, can determine whether a node needs to be eliminated, aligning with the iterative nature of projects. Founder 8 acknowledges the importance of considering the impact on a majority of blockchain nodes in decision-making. In the early stages, they propose granting some lenience in the short term, recognising that achieving Efficiency may involve allowing a certain level of flexibility. This reflects a practical approach, balancing the need for Integrity with a transient allowance for smoother transitions during the initial implementation phase.

"It becomes evident that the problem lies with a specific node, then it is the right time to make a decision…conducting retrospective evaluations every two to three months to consider whether to retain a node" (Founder 4).

"In the early stages, the number of blockchain nodes that are affected by a particular case should be considered. If the case affects the majority of the blockchain nodes to efficiently make the decision, I believe that granting some integrous leeway in the short term is necessary" (Founder 8).

To revisit Efficiency in the decentralised context, responses highlight it as the integrated supply and demand capabilities to evaluate quality of service delivery. However, the number of blockchain nodes that are affected by a particular case should be considered. Efficiency in the early implementation stages should not be viewed as a high-level impact on the envisioned end result. Therefore, granting some integrous leeway in the short term is highly necessary. Founder 2 emphasises the efficiency gained by integrating genetic information into data protection and utilisation processes, enhancing the efficacy of personalised therapies in the blockchain healthcare ecosystem. Founder 11 sees the influx of participants in new healthcare workflows as a catalyst for industry efficiency. This increased involvement can lead to improved services, amplifying the benefits of blockchain in serving a broader population. Founder 12 underscores the inefficiencies of emergencies in centralised healthcare systems. The lack of standardised platforms for data exchange hampers information flow, impacting epidemic prevention. In the context of Public Health, a decentralised approach could streamline supply chain management, reducing inefficiencies and enhancing overall effectiveness.

"Many targeted therapies and small molecules are personalised based on individual genetic information. By incorporating genetics into the data protection and utilisation process, higher efficacy can be achieved" (Founder 2).

"With any new concept, there will be many individuals and institutions eager to participate in this workflow, which can enhance the efficiency of the healthcare industry. The improvement in efficiency can ultimately lead to providing more and better services to a larger population" (Founder 11).

"Inadequate integrated supply and demand capabilities heavily rely on centralised models,

limiting the information exchange among stakeholders. These issues directly impact the effectiveness of epidemic prevention and control" (Founder 12).

Founder 3 underscores blockchain's Efficiency in timesaving and achieving favourable outcomes. For voting, blockchain eliminates traditional methods, streamlining the process and contributing to Efficiency. The focus is on quick, effective results through blockchain's elimination of certain aspects. Founder 4 acknowledges that Efficiency, influenced by decentralisation, might vary initially but expects improvement over time. The founder emphasises the importance of Efficiency for startups and is willing to tolerate short-term inefficiencies if they align with the broader goal. However, persistent inefficiency, especially across nodes, could pose long-term challenges, potentially affecting the Efficiency.

"Blockchain technology can eliminate certain aspects and facilitate anonymous voting, thus saving time that would otherwise be spent on raising hands or conducting traditional voting methods. From a time-saving perspective, it can indeed contribute to improving efficiency" (Founder 3).

"It is possible that the efficiency may vary initially but improve over time. Therefore, based on this premise, if there are efficiency issues, I can tolerate them in the short term. However, if it is a mechanism problem and other nodes continue to lag, the efficiency will never meet expectations" (Founder 4).

Founder 5 prioritises disease-focused considerations in the blockchain healthcare ecosystem, emphasising Efficiency maximisation through market-driven decisions. The founder's ideal system centres on disease-related aspects, aligning decisions with market forces to achieve optimal efficiency. Founder 8 introduces the notion of integrous leeway in decision-making during the early stages of blockchain implementation. Acknowledging that certain cases may impact a significant number of nodes, the founder advocates for short-term flexibility to ensure efficient decision-making. This approach reflects a pragmatic understanding of the initial challenges and the need for adaptability to optimise Efficiency.

"My primary focus is on diseases within this ecosystem. I do not consider other broad concepts like medical aesthetics and the like. Therefore, my emphasis remains on the diseases themselves. In an ideal system, efficiency is maximised when decisions are driven by market forces" (Founder 5).

"In the early stages, the number of blockchain nodes that are affected by a particular case should be considered. If the case affects the majority of the blockchain nodes to efficiently make the decision, I believe that granting some integrous leeway in the short term is necessary" (Founder 8).

7.4. Collective Resource Optimisation

To revisit Communication in the decentralised context, responses highlight it as the continuous process improvement to effectively optimise the resources. For example, the voting weight is initially set up higher weightage to authoritative institutions but is dynamic by considering multiple perspectives. Founder 3 emphasises the importance of unity in the blockchain healthcare ecosystem. By identifying commonalities and representatives among entrepreneurs, they advocate for a shared perspective. This approach aims to address conflicts through effective communication, suggesting that finding a maximum common denominator can lead to a consensus, fostering a collective resolution, such as resource optimisation in the ecosystem.

"For instance, among the 100 entrepreneurs, we can form a unified opinion by finding out the common grounds, the maximum common denominator, or the representatives to reflect the collective conflicts and reach a final resolution through effective communication" (Founder 3).

Founder 2 highlights the dynamic nature of evaluating hospitals in the blockchain healthcare ecosystem. They propose adjusting the weightage for accuracy based on market growth,

emphasising a balance between authoritative institutions and grassroots hospitals. This approach enables continuous improvement opportunities and aligns incentives for accuracy, showcasing a commitment to fairness and adaptability in conflict resolution. Founder 4 advocates for the transformative impact of blockchain on communication. They stress the elimination of subjective aspects like charisma in decision-making, promoting a system where valuable perspectives, not just persuasive skills, are recognised. Their insight underscores the potential for a more objective and inclusive conflict resolution process by leveraging blockchain's ability to minimise irrelevant influences. Founder 10 emphasises effective communication and collaboration in the blockchain healthcare ecosystem. They recognise the pivotal role of key individuals, from leaders to technical engineers, in successful project execution. This perspective underscores the importance of aligning values, demonstrating functionalities, and fostering collaboration with government and healthcare entities. Founder 10 highlights the importance of both policy adherence and individual dedication for successful conflict resolution and project implementation.

> *"During the initial establishment of the model, it is still essential to give higher weight to authoritative institutions. Nonetheless, smaller hospitals at the grassroots level also have opportunities to improve" (Founder 2).*

> *"We can eliminate irrelevant aspects, such as public speaking skills or personal charisma, and focus on the essence of the ideas presented. Traditional models are susceptible to being influenced by less important aspects, but with blockchain technology, these influences can be minimised" (Founder 4).*

> *"By effectively communicating our value proposition, demonstrating its functionalities, and aligning with existing policies, we can establish a solid foundation for successful collaboration with the endorsing company. This will increase their confidence in our capabilities" (Founder 10).*

To revisit Benevolence in the decentralised context, responses highlight it as the polyadic

cooperation between different stakeholders to deliver better solutions or create win-win situations. Its ultimate goal is to foster a benevolent culture that stakeholders are willing to align towards the collective objectives. Founder 1 emphasises the scarcity of healthcare resources in China and sees blockchain's advantages outweighing disadvantages in the industry chain. They stress the significant impact of benevolent efforts from all stakeholders due to the vast population and persistent market demand. Founder 2 suggests a benevolent approach to resource optimisation. Through contractual agreements with doctors, the system ensures timely user responses by rotating duty hours. This collective effort optimises doctor availability, efficiently utilising spare time to address users' concerns promptly. Founder 7 advocates for a decentralised blockchain healthcare ecosystem to address resource concentration. The approach enables better resource allocation, particularly in addressing the overcrowding of medical resources in top-tier hospitals. Decentralisation, coupled with pre-diagnosis, optimises resource prioritisation, easing pressure on specialist consultations and reducing waiting times.

> *"In China, healthcare resources are scarce, and the advantages of blockchain technology outweigh its disadvantages. Considering the vast population and the persistent market demand over an extended period, the benevolent efforts of all stakeholders would be significant in this field" (Founder 1).*

> *"Firstly, if doctors sign a contract with our system, they can take turns to be on duty. Secondly, contracted doctors will have certain requirements to fulfil in terms of their availability" (Founder 2).*

> *"The decentralised healthcare ecosystem empowered by blockchain technology primarily addresses the issue of excessive concentration of medical resources… relieving the pressure on specialist consultations in top-tier hospitals and resolving the issue of waiting for hours for a brief consultation" (Founder 7).*

Founder 6 underscores the importance of a benevolent culture and collaborative channels among stakeholders. This approach ensures alignment towards shared goals of optimising

collective resources, ultimately leading to improved healthcare solutions. The emphasis on cooperation highlights the belief that a united effort among stakeholders can effectively address challenges. Founder 12 emphasises the mutual benefits of collaboration through resource complementarity. By sharing risks and increasing profits, various models like data transactions, remote healthcare, and drug supervision create a win-win scenario for drug suppliers, healthcare institutions, and patients. This approach reflects a commitment to collective prosperity and resource optimisation within the blockchain healthcare ecosystem.

> *"By fostering a strong benevolent culture and establishing effective cooperative channels among stakeholders, we can ensure that everyone is aligned towards the same goals and objectives of optimising collective resources to deliver better healthcare solutions" (Founder 6).*

> *"Through collaboration, I can leverage resource complementarity, share risks, and increase profits. For example, the data transaction model, remote healthcare model, and drug supervision model, they are beneficial for both drug suppliers, healthcare institutions, and patients, creating a win-win situation" (Founder 12).*

To revisit Synergy in the decentralised context, responses highlight it as the collective efforts on enhancing the smoothness of collaborative operations. For instance, resolving conflicts and optimising resources are specific areas that stakeholders should focus on in order to work well together with other parties in blockchain healthcare ecosystem. Founder 2 suggests an inclusive approach to onboarding participants in the blockchain healthcare ecosystem, acknowledging the learning curve. Recommending an initial leniency (70-80%) for new adopters, the focus is on gradual performance improvement. This strategy fosters Synergy by accommodating diverse understanding levels. The proposal to differentiate between new and existing customers and implementing elimination for consistent underperformance aligns with inclusiveness, aiming for a high-performing network. Meanwhile, Founder 9 highlights the importance of immediate benefits, long-term vision, belief, and trust for success. Emphasising these aspects fosters trustworthy environment, ensures participants' values, and envisions goals.

"It is necessary to be more lenient in the early stages because the general public may not fully understand new technologies, including blockchain. A certain percentage, such as 70% to 80%, could be considered acceptable" (Founder 2).

"When a person has no immediate benefits, cannot envision long-term goals, lacks belief, and fails to establish trust, it is highly unlikely that they will succeed in pursuing a task. Therefore, at least one of these aspects must be prominently emphasised, even taken to the extreme" (Founder 9).

Founder 7 emphasises the foundational aspects of cooperative relationships in the blockchain healthcare ecosystem, highlighting the importance of supply and demand alignments and mutual benefits. Technological support ensures data authenticity, process optimisation, and the introduction of value-added services, fostering collaboration. Regulatory mechanisms, overseen by third parties, contribute to trust. In contrast, Founder 11 outlines a dynamic development process, acknowledging the initial immaturity of models. The committee mechanism, iterative optimisation, and periodic evaluations align with Synergy. The comparison to e-commerce rating mechanisms underscores the required adaptability, acknowledging patient concerns and emphasising communication in cooperative ecosystems.

"Both technological support and regulatory mechanisms play crucial. Through technological advancements, value-added services can be introduced, thereby increasing the stickiness of the cooperation. Regulatory mechanisms, facilitated by third-party oversight, enhance trust among all parties" (Founder 7).

"After a period of solidification, the efficiency of individuals or groups within the system is evaluated to identify those with higher or lower efficiency. It may be necessary to re-evaluate and screen individuals or groups at specific nodes. Dynamic adjustments are required" (Founder 11).

Founder 1 underscores the potential of blockchain in addressing the complexity of healthcare by enhancing precision and resource allocation. Through optimised efforts in specific areas, blockchain minimises wastage, fostering Synergy among diverse healthcare stakeholders. This approach aligns with inclusiveness by ensuring efficient resource utilisation for improved collaboration. Founder 3 advocates for consensus-building among entrepreneurs. Identifying common grounds and utilising effective communication channels, the emphasis is on finding shared perspectives and resolving collective conflicts. This cooperative approach aligns with Synergy, promoting a unified front among entrepreneurs in the blockchain healthcare ecosystem. Founder 6 focuses on building a benevolent culture and effective cooperative channels to align stakeholders towards shared healthcare goals. This emphasises inclusiveness by fostering collaboration and ensuring that collective resources are optimised for delivering better healthcare solutions. The cooperative channels enhance Synergy, facilitating cohesive efforts within the blockchain healthcare ecosystem.

"With blockchain technology, it becomes possible to focus more precise efforts on specific areas, avoiding wastage in healthcare resources. This optimisation can help allocate resources more effectively and reduce wastage, making it a key aspect in working well together with other parties" (Founder 1).

"For instance, among the 100 entrepreneurs, we can form a unified opinion by finding out the common grounds, the maximum common denominator, or the representatives to reflect the collective conflicts and reach a final resolution through effective communication" (Founder 3).

"By fostering a strong benevolent culture and establishing effective cooperative channels among stakeholders, we can ensure that everyone is aligned towards the same goals and objectives of optimising collective resources to deliver better healthcare solutions" (Founder 6).

7.5. Psychological Fairness Promotion

To revisit Reputation in the decentralised context, responses highlight it as the intuitional outcomes of successfully fostering a sense of the Psychological Fairness. In the blockchain healthcare ecosystem, establishing a dedicated oversight team, as suggested by Founder 6, ensures consistent and fair decision-making. This fosters inclusivity, promoting Reputation and encouraging broader participation. Founder 8 emphasises the pivotal role of Reputation in mitigating conflicts among involved parties, promoting the Psychological Fairness. Citizen 3 highlights the scepticism in doctor-patient relationships, advocating for transparency and consistency in the new system. This, according to Citizen 3, promotes Psychological Fairness by enabling individuals to willingly take responsibility, enhancing decentralised trust.

> *"These approaches can help foster a sense of inclusivity and fairness in the decision-making process, ultimately promoting reputation and encouraging wider participation within the ecosystem" (Founder 6).*

> *"Building reputation among the parties involved can help mitigate potential conflicts and ensure fairness within the ecosystem" (Founder 8).*

> *"Doctors and patients are often suspicious of each other so that it affects the doctor-patient relationships. But if the new system were transparent and the healthcare process were consistent from the very beginning, we would voluntarily take our own responsibilities. This is very fair" (Citizen 3).*

Founder 11 underscores the importance of promoting the Psychological Fairness in collaborations for healthcare start-ups. Beyond expertise, building a solid Reputation based on professional principles, domain knowledge, industry experience, and achievements is crucial. Reputation, as mentioned by Founder 11, elevates the credit rating, enabling longer and sustainable collaborations with other companies. Citizen 2 highlights the practical benefits of blockchain healthcare. The system's ability to provide consistent and targeted medical records

addresses issues like repeated examinations and disregarded previous records in centralised settings. For individuals with chronic illnesses, blockchain enables the identification of patterns, facilitating self-assessment and precise medical interventions based on age-specific developments. Despite benefits, Citizen 2 acknowledges challenges like resource allocation and potential stratification of high-quality resources in blockchain healthcare implementations.

> *"We should focus on building a solid reputation based on professional principles, understanding of the healthcare domain, familiarity with healthcare workflows, relevant industry experience, and accumulated convincing achievements in the field of decentralised healthcare" (Founder 11).*

> *"For women, there are several crucial periods, and certain diseases undergo changes during these times due to physiological reasons. I think blockchain is particularly beneficial in this aspect…" (Citizen 2).*

To revisit Consistency in the decentralised context, responses highlight it as the decision-making processes, such as on-chain voting, to affect the participation enthusiasm and collaboration enthusiasm. Within the blockchain healthcare ecosystem, doctor-patient relationships are affected by the medical consultations and discussions to a greater degree. Founder 2 proposes a tiered diagnosis and treatment approach to tackle consistency issues in online medical consultations within the blockchain healthcare ecosystem. By adjusting fees and loyalty points based on the number of inquiries, the system encourages multiple consultations for complex cases, enhancing confidence through multiple professional opinions. This addresses consistency concerns by involving various experts in multidisciplinary discussions, promoting the Psychological Fairness. Citizen 3 emphasises that Consistency from the outset can foster trust between doctors and patients, promoting a fair healthcare process where individuals willingly take responsibility for their well-being.

> *"But for slightly more serious cases, we can address the problem through multiple consultations and multidisciplinary discussions to reduce inconsistency. In addition, we*

can ask the same question multiple times, maybe two or three times, and reduce the loyalty points or fees for each subsequent inquiry" (Founder 2).

"Doctors and patients are often suspicious of each other so that it affects the doctor-patient relationships. But if the new system were transparent and the healthcare process were consistent from the very beginning, we would voluntarily take our own responsibilities. This is very fair" (Citizen 3).

Founder 5 highlights the Consistency of market forces in decentralised ecosystems, emphasising individual decision-making based on preferences. Founder 6 stresses the importance of a transparent, fair, and consistent decision-making process to build the Psychological Fairness in the blockchain healthcare ecosystem, advocating for a balanced and inclusive approach. Founder 7 acknowledges the impact of Consistency standards on participation enthusiasm in the blockchain healthcare ecosystem, suggesting that benefits, such as market share, can outweigh potential losses. Founder 10 suggests collaboration with smaller hospitals, emphasising the challenge of achieving Consistency without healthcare authorities' support. Founder 11 sees on-chain voting as a motivating force, paralleling doctors' career progression with accumulating experience through patient consultations, linking it to active participation in decision-making within the ecosystem. Overall, these perspectives underscore the critical role of promoting the Psychological Fairness in catalysing the decentralised trust.

"Therefore, decentralisation can offer a favourable environment for development, allowing market dynamics to guide decision-making and enabling individuals to pursue their goals efficiently and cost-effectively" (Founder 5).

"I agree that having a consistent decision-making process would make me more willing to join. When I understand that the decision-making process is transparent, fair, and consistent, it gives me confidence in the overall functioning of the ecosystem and its ability to meet the healthcare needs of all" (Founder 6).

"Being part of a blockchain-enabled decentralised ecosystem implies accepting its consistency standards. The impact on participation enthusiasm mainly depends on the comparison between the benefits gained from participating in the blockchain platform and the impact of consistency standards on those benefits" (Founder 7).

"Although their medical expertise may not be as authoritative as that of larger hospitals, they may exhibit a higher level of enthusiasm for collaboration. However, achieving consistency among these hospitals would be challenging without the support of the healthcare authorities or a provincial-level initiative" (Founder 10).

"Similar to the accumulation of experience through patient consultations, each on-chain vote becomes an opportunity for me to showcase my abilities and contribute to the decision-making process…on-chain voting becomes a force that influences my motivation and active participation" (Founder 11).

To revisit Voluntary Responsibility in the decentralised context, responses highlight it as the promoted Psychological Fairness to incentivise the stakeholder activities. Furthermore, the public should be acknowledged that the introduction of blockchain technology does not alter legal and moral responsibilities in the centralised context. Founder 1 emphasises that decentralisation fosters Voluntary Responsibility by enabling tailored solutions based on patient data. This approach addresses patients' concerns, cultivating a sense of responsibility through data utilisation. Founder 3 highlights the need for self-willingly data sharing, suggesting a point-based system for hospitals. This approach aims to overcome individuals' indifference by creating tangible benefits for sharing, ensuring the Psychological Fairness. Founder 6 underscores the pivotal role of trust in voluntary data sharing. Trust, linked to Voluntary Responsibility, is crucial for patients to self-willingly share sensitive medical information, emphasising the importance of the Psychological Fairness Promotion. Citizen 1 advocates for decentralised decision-making in healthcare, citing the example of allergy disclosure. Distributing responsibilities between patients and doctors ensures a more balanced approach, promoting the shared accountability. Citizen 4 argues for transparency in patient-

doctor interactions, noting that honesty about insurance and privacy concerns is essential. Blockchain's ability to enhance historical medical data understanding aligns with a rational approach to healthcare information management.

> *"Through the utilisation of data, I can establish a sense of voluntary responsibility and engage in a form of communication that combines emotional and market-oriented aspects" (Founder 1).*

> *"They would need to share at least one case to accumulate a point, and in return, they could refer to other shared cases when necessary… these points could be traded among hospitals, similar to carbon credits, allowing them to incentivise sharing among different organisations" (Founder 3).*

> *"The most immediate reason, both for entrepreneurs and patients, is that if we do not trust that our individual data will be protected with security and privacy, it is highly likely to cause hesitation in voluntarily sharing sensitive medical information or personal data" (Founder 6).*

> *"As a patient, there are instances where the responsibility for certain decisions should be decentralised…it would be sufficient for each party to assume their own responsibilities rather than placing the burden entirely on one side" (Citizen 1).*

> *"Doctors will be dedicated to diagnosis and treatment, while patients may sometimes voluntarily withhold information regarding insurance or privacy…if blockchain technology can provide a better understanding of medical histories, it represents an advancement compared to previous technologies" (Citizen 4).*

Citizen 2 acknowledges blockchain's potential to enhance information flow. Stressing the importance of truthful data uploading, they advocate for maintaining legal responsibilities. Blockchain, while improving evidence gathering, does not alter fundamental responsibilities

but enhances traceability and assignment of duties. Citizen 3 sees transparency as crucial for building trust between doctors and patients. A consistent and transparent healthcare process, enabled by the new system, is perceived as fair, encouraging individuals to voluntarily embrace their responsibilities. Citizen 5 places responsibility on patients for awareness in decentralised ecosystems. They advocate for improved public education and knowledge to bridge the gap in doctor-patient relationships. By aligning expectations with agreed-upon outcomes, the citizen emphasises the need for promoting the Psychological Fairness by having an improved understanding of the chosen service, such as blockchain healthcare ecosystem.

> *"Blockchain technology can potentially facilitate smooth information flow and enable hospitals to disclose more information. At the same time, individuals should truthfully upload their relevant information and refrain from falsifying it. This may require additional responsibilities to be added" (Citizen 2).*

> *"Doctors and patients are often suspicious of each other so that it affects the doctor-patient relationships. But if the new system were transparent and the healthcare process were consistent from the very beginning, we would voluntarily take our own responsibilities. This is very fair" (Citizen 3).*

> *"As ordinary patients, our responsibility primarily lies in awareness. We need to ensure, at the very least, that if we choose to use a decentralised system or service, we have an improved understanding of it and know what we are getting into. In any discussion, there is an underlying agreement" (Citizen 5).*

7.6. Social Tie Deepening

To revisit Satisfaction in the decentralised context, responses highlight it as the result-oriented evaluations after comparing the practical and feasible advantages and disadvantages between centralised and decentralised digital platforms. Although consumer's perspective should be

prioritised, the right balance should be stroked between professional expertise and consumer satisfaction score especially when cognitive blind area exists between different stakeholders. Founder 1 emphasises integrating participative orientations into consumer experiences for targeted operations. This approach, rooted in data analysis, enhances Satisfaction by identifying and addressing specific concerns, aligning strategies with market demands. Founder 7 highlights blockchain's potential to lower costs and improve accessibility. By enabling online consultations and treatment plan comparisons, blockchain fosters empowered decision-making, reducing anxiety and enhancing overall Satisfaction in healthcare choices. Founder 12 underscores blockchain's role in ensuring drug traceability, preventing counterfeit drugs. This contributes to deepened social ties among consumers concerned about the authenticity of medications. Citizen 5 emphasises the importance of aligning service expectations with outcomes in blockchain healthcare. This perspective underscores the need for informed decisions and managing expectations, crucial for deepening the social ties and Satisfaction in the evolving blockchain healthcare ecosystem.

"In terms of entrepreneurial orientations, this concept can be integrated into the individual consumer experiences. This integration of business and market demands can lead to more precise and satisfied outcomes" (Founder 1).

"From a patient's perspective, first and foremost, blockchain platforms can lower medical costs. Additionally, it can alleviate anxiety and reduce tension in doctor-patient relationships. Patients can consult multiple hospitals online and compare treatment plans, empowering them with more satisfied choices" (Founder 7).

"Blockchain can enable reliable traceability of every step in the circulation of drugs, from the source of production to consumer purchases, enhancing the satisfaction by preventing counterfeit drugs" (Founder 12).

"It is essential to have expectations for the outcomes. In other words, when I choose a service and invest my money and effort, it should align with the agreed-upon results. It is

unnecessary to get involved blindly without any understanding and then argue when the outcomes don't satisfy your expectations" (Citizen 5).

Founder 2 highlights the Satisfaction of data protection on the blockchain, emphasising that users feel more secure knowing their personal information is safeguarded. The contrast with traditional banks, known for insufficient data protection, supports the idea that blockchain adoption can be driven by increased awareness and a desire for enhanced privacy, ultimately fostering user participation. Founder 6 envisions a blockchain healthcare ecosystem providing simplified, transparent services. The potential benefits include faster diagnoses, lower costs, and heightened patient satisfaction, suggesting that the blockchain's role in improving healthcare processes contributes to overall contentment among users. Founder 11, approaching the blockchain healthcare ecosystem from an institutional standpoint, recognises that patient Satisfaction hinges on comparisons between decentralised and traditional healthcare systems. This underscores the importance of end-user experience and perception in driving blockchain adoption within the healthcare landscape. Citizen 4 addresses the issue of mutual recognition of test results between hospitals, advocating for technology-driven solutions. The proposal to share test results and medical history for efficient diagnosis and treatment aligns with the Satisfaction aspect of reducing redundancy, enhancing the healthcare experience for patients.

"If we can make users or individuals aware that their data is better protected on the blockchain, they will be more satisfied in participating, knowing that their personal information will be safeguarded…by gradually spreading awareness of the improved security, we can increase participation and adoption" (Founder 2).

"…blockchain-based solution for medical record storage, payment processing, and supply chain management. These could potentially result in faster and more accurate diagnoses, lower costs, and higher patient satisfaction" (Founder 6).

"Patients would make comparisons between the decentralised medical ecosystem and the traditional hospital-based diagnostic and treatment processes…they would draw

conclusions regarding whether they are satisfied and need to adopt the decentralised healthcare ecosystem to address their needs" (Founder 11).

"If we could share the results of previous tests and allow professionals to access the patient's medical history, it would be more advantageous for diagnosis and treatment…especially considering the vast amount of data available in China, which requires technological support" (Citizen 4).

Founder 9 emphasises a consumer-centric approach in the blockchain healthcare ecosystem. Personalised recommendations based on illness type, medical conditions, and treatment preferences prioritise individual needs. This tailored approach fosters Satisfaction by ensuring healthcare institutions align closely with consumers' specific requirements. Citizen 2 outlines a process for decision-making in the healthcare ecosystem, emphasising transparency and blockchain recording. The approach involves representatives engaging in focused discussions. This method ensures informed decision-making, promotes understanding, and prevents overwhelming choices, contributing to Satisfaction through a well-structured process. Citizen 6 cautions against excessive patient influence in evaluating treatment effectiveness, citing potential misunderstandings. While patient Satisfaction is crucial, an overemphasis on their role may lead to misconceptions about professional expertise. Balancing patient input with professional evaluation is vital to avoid an inversion of roles and maintain a comprehensive understanding of healthcare outcomes, contributing to deepening the social ties in the system.

"…it is essential to recommend various healthcare institutions that align with their specific needs. For instance, based on the type of illness or medical condition, or even preferences for specific treatments or facilities, consumers should be provided with personalised recommendations" (Founder 9).

"Striking the right balance requires a lengthy process of negotiation and consensus-building to establish the rules…selecting representatives to engage in focused discussions on specific issues and then conducting a vote based on the conclusions reached" (Citizen

2).

> *"Hence, I believe that patients should not have excessive decision-making power in terms of professional expertise. Their evaluation should primarily focus on their personal experience" (Citizen 6).*

To revisit Privacy and Security in the decentralised context, responses highlight it as the viable solutions to address the issues caused by real-name registration system. Its ultimate goal is to positively affect participation intention to join a blockchain healthcare ecosystem through dividing into different situational levels and deepening the social ties respectively. Founder 4 highlights generational differences in privacy attitudes, noting that older adults may be less privacy-conscious, having adapted to sharing data with established digital platforms. Meanwhile, younger individuals prioritise privacy, though viable solutions are lacking. In China, concerns arise due to centralised data aggregations by major corporations, limiting user control. Despite the current lack of assurance, there is optimism about ongoing efforts to enhance information security. This underscores the evolving nature of privacy challenges in the blockchain healthcare ecosystem, where balancing user concerns with technological advancements remains pivotal for deepening the social ties.

> *"Older adults may have a limited sense of privacy awareness and willingly provide their data without much concern. However, it appears that there is a gradual movement towards addressing this issue and striving for improvements in information security" (Founder 4).*

Founder 1 emphasises the challenge of ensuring data security within the blockchain healthcare ecosystem. The statement reflects the difficulty of navigating information security amid hearsay and the risk of blindly following trends. This perspective underscores the need for robust security measures to safeguard company data in an environment susceptible to misinformation. Founder 6 expresses the pivotal role of Privacy and Security in shaping intention to engage with the blockchain healthcare ecosystem. The concerns highlighted comprise hesitancy to share sensitive information and doubts about system transparency and

accountability. Emphasising the importance of clear guidelines, trust-building measures, and regulatory alignment, the founder underscores that prioritising Privacy and Security is essential for deepening the social ties and encouraging broader participation and adoption.

> *"Serving a group of people brings about a challenge. On the one hand, relying on hearsay makes it easy to be led by misinformation, as individuals may lack the energy to verify the credibility of the sources. On the other hand, the tendency to follow the crowd without seeking confirmation may also be possible" (Founder 1).*

> *"Developers and stakeholders must prioritise privacy and security in the design and implementation of the ecosystem, providing clear and transparent guidelines on how data will be collected, stored, and shared" (Founder 6).*

Founder 9 provides a nuanced perspective on Privacy and Security, emphasising that its importance varies based on the severity of medical conditions. In life-threatening situations, Privacy and Security takes a back seat to immediate survival, while aesthetic concerns may lead to a higher priority on confidentiality. The founder categorises concerns into levels, reflecting the diverse priorities individuals place on Privacy and Security depending on their health conditions. This nuanced understanding underscores the need for flexible Privacy and Security approaches within the blockchain healthcare ecosystem, tailored to the varying concerns of different user groups. Founder 12 highlights the reliability in drug circulation, emphasising its capacity to ensure traceability from production to consumer purchase. By preventing counterfeit drugs, blockchain deepens the social ties in the pharmaceutical supply chain. This perspective underscores the role of blockchain in cultivating Privacy and Security.

> *"Individuals facing severe medical conditions will likely prioritise their lives and the treatment of their illnesses over privacy concerns since their primary focus is on survival. Those with moderate or average medical difficulties will likely prioritise quick recovery" (Founder 9).*

"Blockchain can enable reliable traceability of every step in the circulation of drugs, from the source of production to consumer purchases, enhancing the satisfaction by preventing counterfeit drugs" (Founder 12).

Citizen 1 advocates for remote healthcare, citing inefficiencies in the current healthcare system where patients in cities like Beijing face long queues and scalpers to secure appointments. According to a recent report by CCTV (2024), within China's centralised healthcare system, the role of companion doctors originally emerged to meet the accompaniment needs of certain groups during hospital visits. However, because they offer services such as accompanying patients to healthcare appointments, handling inquiries, delivering various healthcare reports, assisting with medicine purchases, and booking examinations, many scalpers have exploited this role under the guise of being companion doctors. They resell doctors' appointment slots, thereby disrupting the healthcare order. The markup on these slots can range from a few hundred to tens of thousands of Chinese Yuan, particularly for appointments with designated specialists. Furthermore, despite the official system indicating that a doctor's schedule is fully booked, these scalpers are able to secure appointments through so-called "special channels" offline, exploiting their privileges as companion doctors. Additionally, as noted by China Discipline Inspection and Supervision Newspaper (2023), even if companion doctors are prohibited from providing appointment-booking services in the future, scalpers can still exploit loopholes in the management of the centralised healthcare system. They engage in corrupt practices with hospital security guards and healthcare assistants, among other service personnel, to gain entry through staff entrances and thus prioritise their access to appointment slots. Therefore, remote healthcare and AI-assisted preliminary diagnostics are seen as valuable alternatives. This perspective aligns with the idea that technologies, including blockchain, can play a role in improving access and streamlining healthcare processes, emphasising the need for deepening the social ties to accompany these innovations. Citizen 3 highlights the serious consequences of personal information leaks in healthcare. The fear of scams and the potential misuse of AI to deceive individuals with manipulated voices underscore the critical importance of robust security measures. This perspective emphasises the imperative for stringent Privacy and Security in the blockchain healthcare ecosystem to protect individuals from fraudulent

activities and potential harm. Citizen 6 supports the digitisation of patient information for convenience but expresses concerns about information breaches. The lack of transparency regarding data storage and protection raises worries, emphasising the need for deepening the social ties and strong Privacy and Security measures. This perspective underscores the delicate balance between technological convenience and the protection of sensitive health information.

> *"I believe that, if possible, remote healthcare could be a viable solution…many medical images can be reviewed online, which could greatly improve the efficiency of receiving medical care. Patients can then make informed decisions about whether or not to visit the clinic in person" (Citizen 1).*

> *"They might even mimic the voice of your family member and accurately mention their name, hospital department, and the illness they are being treated for, tricking you into providing financial assistance. Therefore, I agree that the field of healthcare requires robust security measures" (Citizen 3).*

> *"Digitising patient information would be more convenient. Nevertheless, I do have concerns about information breaches…there may be individuals who do not want their specific medical conditions to be known. If their disease information is leaked, it could cause significant harm to the patient" (Citizen 6).*

To revisit Service Convenience in the decentralised context, responses highlight it as the intuitive recognition to employ blockchain applications. Such intuitive recognition not only is a trusted reliable perception, but also involves continuous self-improvement and promotion. Founder 2 emphasises market-driven dynamics within the blockchain healthcare ecosystem, highlighting the importance of aligning pricing, quality, and delivery speed to meet market demands. The emphasis is on creating a market-based condition for convenient services. Founder 3 proposes leveraging simplified, visual processes, such as animations, to educate users on the blockchain's ability to streamline insurance processes. This approach aims to enhance convenience by illustrating how blockchain eliminates negotiation hassles and ensures

a more tailored insurance experience. Founder 11 underscores the critical role of encryption in blockchain healthcare. Beyond robust password protection, the focus is on preventing internal manipulation. The interpretation centres on the necessity for a system that is not only resistant to external attacks but also resilient against internal vulnerabilities.

> *"For example, if I pay less in claims, I must be cheaper. If my quality is not as good as others or my delivery is not fast, we rely on being cheaper to attract people. In our system, I think it is necessary to establish a market-based condition and let all parties, all nodes, recognise whether the system is convenient to use" (Founder 2).*

> *"We can utilise animations or other visual aids to demonstrate how blockchain eliminates the need for negotiation and bargaining with insurance companies. By presenting this mechanism in a straightforward and intuitive way, we can introduce its convenience to the audience" (Founder 3).*

> *"When it comes to the encryption system in blockchain, the key aspect for its acceptance is not only the strength of the password encryption but also whether it can prevent the developers of the system from compromising its security…it should be resistant to both external attacks and internal vulnerabilities" (Founder 11).*

Founder 9 draws parallels between building trust in blockchain healthcare and the evolution of Alipay's trustworthiness. The emphasis is on starting from scratch, continuous improvement, and self-promotion to establish mutual trust. The analogy underscores the importance of gradual upgrades and service enhancement in deepening the social ties within the blockchain healthcare ecosystem, emphasising individuals' autonomy in prioritising their health concerns. Founder 12 highlights blockchain's role in ensuring traceability in the drug supply chain. By preventing counterfeit drugs through transparent tracking from production to consumer purchases, blockchain enhances Satisfaction. The interpretation emphasises the technology's capability to deepen the social ties by addressing critical issues in the healthcare system.

"It was achieved by starting from scratch, gradually upgrading its services, and engaging in continuous self-improvement and promotion. Essentially, individuals have the autonomy to determine the importance of their health concerns and decide whether or not to seek assistance" (Founder 9).

"Blockchain can enable reliable traceability of every step in the circulation of drugs, from the source of production to consumer purchases, enhancing the satisfaction by preventing counterfeit drugs" (Founder 12).

Citizen 1 emphasises the importance of simplicity and direct integration with medical insurance for a truly convenient healthcare system. The ideal scenario involves minimal data entry, facial recognition for automatic retrieval of medical history, and seamless processes without additional payment steps. The interpretation centres on reducing user effort, streamlining registration, and enhancing overall convenience through efficient technology integration. Citizen 2 underscores the importance of convenience in healthcare processes, envisioning an app or mini program that provides an overview of procedures, time estimates, and costs. The desire for structured plans akin to corporate reporting aims to alleviate the uncertainty and inconvenience often experienced in hospitals. The interpretation highlights the need for transparent, anticipatory information to empower patients in navigating and planning their healthcare journeys. Citizen 6 praises the shift from physical hospital visits to online appointment systems, emphasising the flexibility and time-saving advantages. The interpretation emphasises the convenience brought about by the ability to check specialist appointments remotely, make appointments in advance, and plan subsequent visits accordingly. The online system is seen as a cost and time-saving solution, enhancing the overall efficiency.

"Ideally, it would be directly linked to medical insurance. That way, I would not have to go through an additional payment process. For example, my personal information like name and age, I should not have to fill them in every time I register at a hospital. That would be truly convenient" (Citizen 1).

"If there was a way to anticipate and plan, knowing that a particular module requires three tests, one could schedule time off in advance. Currently, doctors may see a result and inform you that it's not within their department's scope, directing you to another department, which can be frustrating" (Citizen 2).

"Additionally, after making the appointment, you can plan your time accordingly because the actual medical visit might not happen on the same day. This online appointment system provides convenience in terms of time management. This not only saves money but also saves time for the patients" (Citizen 6).

Citizen 3 highlights the cost of time as a significant aspect in healthcare preferences, emphasising the need for flexible scheduling and fine-grained time control. The desire for online consultations and information access from diverse channels aligns with the aspiration for convenience through technology. The interpretation underscores the importance of time efficiency, spatial convenience, and information accessibility in meeting personal desires. Citizen 4 underscores the time-consuming nature of seeking medical treatment in large hospitals and expresses the practical importance of handling tasks at home to save both time and energy. The perspective on the cost of time as having a greater impact during a busy work life reflects the practical considerations of individuals with work commitments. The interpretation emphasises the value placed on time efficiency and reduced procedural hassles. Citizen 5 breaks down convenience into time and financial costs, acknowledging the necessity of finding a balance that meets personal needs. The interpretation emphasises the potential barriers in adopting new technology, with an inclination towards valuing time cost over financial cost. The desire for a technology that is easy to comprehend and use, reflects the practical considerations influencing the willingness to adopt innovative healthcare solutions.

"Having access to a variety of information would allow for more accurate judgments. In terms of technological innovation, if these conveniences can be achieved, it would align with what I personally desire" (Citizen 3).

"As I am currently in a stage of life where I have work commitments, the cost of time has a greater impact on me. If I were retired, I would prioritise cost savings" (Citizen 4).

"I understand that convenience is a subjective concept, it can be divided into two aspects: time cost and financial cost. What matters to me is finding a balance that meets my needs…it can act as a barrier and affect my willingness to adopt it" (Citizen 5).

8. Discussions of Study 2

The longitudinal research underscores the transformative potential of applying blockchain technology's decentralised principles in the healthcare system. From the standpoint of decentralised trust, this approach is crucial as it addresses the inherent challenges in centralised systems, particularly in healthcare where trust is paramount. By defining stakeholders as individual blockchain nodes and involving them in decision-making, this research highlights the potential to mitigate the risk of centralised control and power. The theoretical implications extend to fostering a decentralised trust approach that not only enhances Trust Shaping Capabilities but also ensures a more equitable distribution of decision-making processes, creating Incentive Dynamics for stakeholders to participate in blockchain decentralised ecosystems and fostering a Conducive Trustworthy Environment among stakeholders.

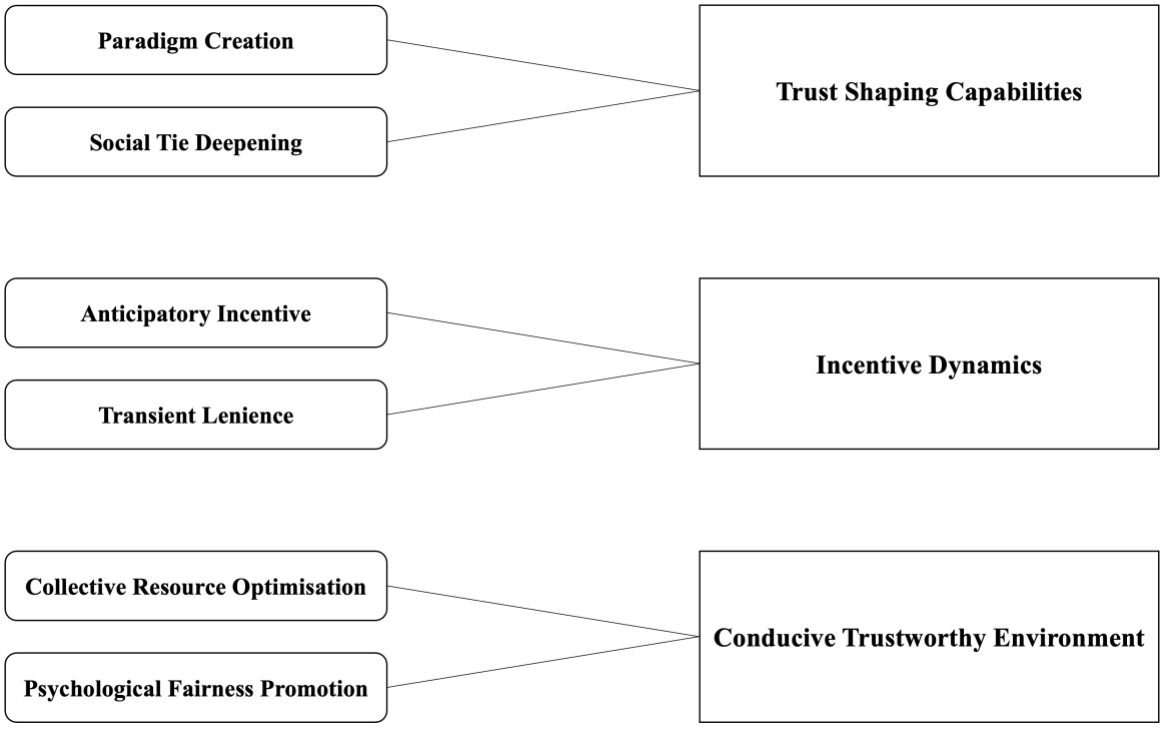

Figure 6: Aggregate Dimensions of Decentralised Trust

From the perspective of knowledge exchange, resource sharing, and value co-creation, it is assumed that decentralised stakeholder relationships could be strengthened through strengthening decentralised trust (see Figure 6). In section 8, revision of trust theory towards a

decentralised approach will be discussed around three aggregate dimensions: Trust Shaping Capabilities, Incentive Dynamics, and Conducive Trustworthy Environment. It deepens the understanding of blockchain decentralised ecosystems and provides a solid foundation for future research. The decentralised approach underlies the goal of Study 2 that draws on the stakeholders' belief in blockchain healthcare ecosystem. The findings and results of Study 2 aim to make continuous contributions to the understanding of the stakeholders' perceptions of blockchain healthcare ecosystem with respect to the construction of decentralised trust theory.

8.1. Trust Shaping Capabilities

According to the findings and results of Study 2, the aggregate dimension 'Trust Shaping Capabilities', underscores the crucial role of stakeholders' awareness of the needs for 'Paradigm Creation' and 'Social Tie Deepening' for fostering and sustaining decentralised trust. On the 14th of January 2024, a preliminary search was conducted via Google Scholar to ascertain whether there were existing scholarly works that paralleled the concepts being explored. The closest discovery was the discourse by Vaez-Alaei et al. (2024) on the notions of trust and trust capability. In their study, Vaez-Alaei et al. (2024) discern the effects that the similarity and complementarity of knowledge exert on trust among business partners. They broach the question of whether partners collectively possess the requisite knowledge for project completion, underscoring its pivotal role in determining the success of the project. Broadly speaking, the research of Vaez-Alaei et al. (2024) on trust and trust capabilities accentuates two primary aspects: the individual knowledge bases of business partners and the degree of innovation inherent in the project itself. In relation to the findings on Trust Shaping Capabilities, the knowledge bases of business partners in the context of blockchain decentralised ecosystems can be analogised to stakeholders' knowledge bases or cognitive abilities. This insight dovetails with this thesis's discovery of Paradigm Creation as the second order theme. However, the second aspect, the innovation level of the project itself, does not find a parallel conclusion in the findings and results of this thesis. Although it has been demonstrated that blockchain can emerge as an innovative and technological application within decentralised ecosystems, it is

not proven that the mere application of such innovative technologies like blockchain naturally enhances trust capabilities. In other words, the development of 'Trust Shaping Capabilities' in this thesis necessitates the integration of additional novel themes, such as Social Tie Deepening. Consequently, after conducting a thorough due diligence check for scholarly rigour, the conceptual originality of Trust Shaping Capabilities is asserted.

Trust Shaping Capabilities in this thesis highlights the importance of concepts such as building Ability (Coulter & Coulter, 2003) and supporting Mass Education (Vargo & Lusch, 2017). From the sociological perspective, stakeholders' cognitive processes, perceptions, and reasoning abilities influence their willingness to trust and their intention to participate in blockchain decentralised ecosystems. In contrast, Paradigm Creation involves trust shaping processes in selecting and presenting case studies that represent the practical applications of blockchain technology and tangible evidence of their feasibility. To be specific, it is found that awareness of blockchain technology could be promoted through Mass Education so that the competence to accomplish applications of blockchain technology could be enhanced. Therefore, it can be seen as a paradigmatic way to shape decentralised trust. Paradigm Creation as a second order theme redefines the importance of Ability and Mass Education for fostering decentralised trust within Commitment-Trust Theory. It fundamentally contributes to the evolution of competence by creating representative examples for different stakeholders to particularly acknowledge the transformative shift in the deployment of blockchain decentralised ecosystems. By extension, Paradigm Creation relates to the conceptual model of a trust-based viable paradigm for public sector implementation success proposed by Nyhan (2000), leading to increased interpersonal trust between leaders and employees and between leaders and the public. This theme focuses on the evolution of new paradigms, influencing how decentralised trust is shaped within decentralised ecosystems.

Conversely, Social Tie Deepening involves trust-shaping processes that comprise heightening patient satisfaction by providing more convenient services and reducing the risks associated with sharing sensitive information within the blockchain healthcare ecosystems, compared to centralised healthcare systems. Its conceptual connection to Trust Shaping Capabilities is

pronounced through enhanced mutual satisfaction and shared values, achieved by promoting transparent processes and decentralised decision-making, allowing stakeholders to have a clearer view of each other's operations. To deepen stakeholders' social tie closeness and, consequently, enhance their levels of decentralised trust, blockchain decentralised ecosystems must foster a culture of openness and collaboration through open-source development practices and cross-sector partnerships that integrate diverse expertise and perspectives. Furthermore, it is also discovered that stakeholders will proactively participate in and trust blockchain decentralised ecosystems after their social ties are deepened. Such engagement is gradually established through ongoing educational programs, which keep stakeholders informed and competent, thereby advancing their technological and social cognitions. Social Tie Deepening aims to capture the importance of Satisfaction, Privacy and Security, and Service Convenience for formulating decentralised trust within Social Capital Theory. It fundamentally contributes to deepening stakeholders' social ties through enhanced mutual satisfaction and shared values in the employment of blockchain technology. Social Tie Deepening finds its conceptual roots in the principles of reciprocal relationships (Ray, Nyberg, & Maltarich, 2023), emphasising that blockchain decentralised ecosystems not only keep stakeholders informed but also foster a culture of openness and collaborative problem-solving. This theme is about deepening the social ties in shaping trust within decentralised ecosystems.

In summary, the emergence of Trust Shaping Capabilities as an aggregate dimension is intricately justified through the detailed exploration of Paradigm Creation and Social Tie Deepening from the perspective of Commitment-Trust Theory and Social Capital Theory, respectively. Paradigm Creation addresses the crucial role of Ability and Mass Education in fostering decentralised trust by enhancing stakeholders' understanding and competence in the utilisation of blockchain technology. This not only promotes a shift in operational paradigms but also builds a foundation of decentralised trust through increased competency and understanding of technological innovations. On the other hand, Social Tie Deepening focuses on the enhancement of Satisfaction, Privacy and Security, and Service Convenience, which deepens stakeholders' social ties and mutual trust within blockchain decentralised ecosystems. By improving service delivery, stakeholders feel more secure and satisfied, thereby fostering a

closer committed relationship. Together, these two themes demonstrate how decentralised trust is not only a by-product of technological innovation but also a result of deliberate educational and social initiatives that cultivate an understanding and deepened social connections among stakeholders. This interplay underscores the multifaceted approach required to effectively develop Trust Shaping Capabilities in decentralised ecosystems.

8.2. Incentive Dynamics

According to the findings and results of Study 2, the aggregate dimension 'Incentive Dynamics', underscores the relevance of concepts related to 'Anticipatory Incentive' and 'Transient Lenience' in establishing and maintaining decentralised trust. On the 14th of January 2024, a targeted search was undertaken via Google Scholar to ascertain whether scholarly discussions on analogous concepts had previously been conducted. The most relevant work encountered was that of Deng et al. (2024), who engaged in a detailed examination of dynamic reward and punishment mechanism. Deng et al. (2024) in their study, underscored that incentive mechanisms should not solely focus on monetary or nonmonetary rewards. In other words, it is not only reward mechanisms that can motivate; rational punishment mechanisms can also provide incentives. Furthermore, Deng et al. (2024) validated that rational reward and punishment mechanisms should be dynamic rather than static, as static reward and punishment mechanisms overlook three key aspects. The first aspect is the own competency of the decision-makers designing these mechanisms. The second aspect concerns the potential high-quality enterprises that might be eliminated by a static punishment mechanism, thereby losing opportunities for retraining or turnaround. The third aspect is the indirect impact on other stakeholders, such as the government and residents, as mentioned by Deng et al. (2024), if a business is constrained by a static reward and punishment mechanism. It is believed that Deng et al. (2024)'s discussion and simulation of dynamic reward and punishment mechanisms closely align with the definition of Incentive Dynamics in this thesis. However, a fundamental difference exists in this thesis, not only emphasising that dynamic reward and punishment mechanisms are more rational compared to static ones but also introducing a new conceptual

position. This position empirically suggests that both reward and punishment mechanisms should have a reasonable lag. These lagged reward and punishment mechanisms correspond to the concepts of Anticipative Incentive and Transient Lenience that will be discussed later in the text. Consequently, after a due diligence check for rigorous research, the conceptual originality of Incentive Dynamics is claimed.

Anticipatory Incentive is defined as the attainable benefits that are realised in the near future, and it does not need to be monetary incentive only. For example, regarding the future proposals' exposure, more opportunities of being adopted also count as nonmonetary incentive. Anticipatory Incentive explains the importance of Mutuality and Credibility for stimulating decentralised trust within Commitment-Trust Theory. It fundamentally contributes to the design of reward mechanism by particularly providing predicated benefits rather than immediate benefits to different stakeholders based on their credible involvement. Anticipatory Incentive can be taken to imply the concept of identity-based trust for public sector implementation success put forward by Kramer and Tyler (1996), emphasising that the parties are more likely to trust and act mutually for each other based on their identities. This theme involves creating motivations that are forward-looking, encouraging behaviours that contribute to the establishment and reinforcement of decentralised trust.

Transient Lenience is defined as the tolerant elimination mechanism to justify the stakeholder activities within the blockchain decentralised ecosystems. Such elimination mechanism has been emphasised in the early implementation stages of blockchain technology as well as the particular cases when a weighted index of evaluating the performance of different nodes has not been derived. This indicates that stimulating specific reward and elimination mechanisms can amplify stakeholders' trust in blockchain decentralised ecosystems, potentially by nurturing Credibility (Ryu, Park, & Min, 2007) and Integrity (Willis, Jai, & Lauderdale, 2021) within trust theory. To be specific, viewing potential challenges as opportunities for blockchain-based innovative solutions rather than immediately eliminating certain blockchain nodes can serve as an incentive for constructing decentralised trust in the long run. Transient Lenience highlights the importance of Efficiency and Integrity for sustaining decentralised

trust within Commitment-Trust Theory. It fundamentally contributes to the layout of elimination mechanism in blockchain decentralised ecosystems by particularly granting integrous leeway in the short term for most stakeholders to make relatively efficient decisions in the early stages. Transient Lenience, being analogous to the concept of short-term bearing capacity (Laeequddin et al., 2012), can be inferred from Mohr and Spekman (1994) that if short-term disparities could be reconciled, long-term commitment to trust would be accomplished. This theme explores the dynamics of flexibility and leniency in punishments, recognising that trust-building processes might undergo transient phases.

In summary, the aggregate dimension of Incentive Dynamics within decentralised trust emerges from the thematic underpinnings of Anticipatory Incentive and Transient Lenience as conceptualised in Commitment-Trust Theory. Anticipatory Incentive leverages the concepts of Mutuality and Credibility to foster trust through a forward-looking incentive structure that promises tangible and intangible benefits, underscoring the role of future-oriented rewards that foster mutual actions and enhance credibility among stakeholders. This facet of the theory encourages stakeholders to engage more deeply with blockchain decentralised ecosystems by aligning their interests with the anticipated rewards, thereby cultivating a proactive commitment to the ecosystem. Meanwhile, Transient Lenience draws on Efficiency and Integrity to craft a trust-enhancing incentive through adaptable and lenient punishment mechanisms. This approach allows stakeholders the necessary latitude to adjust and innovate without the immediate threat of harsh penalties, promoting decentralised trust through understanding and tolerance during initial and uncertain phases. By integrating these two themes, Incentive Dynamics not only rationalises dynamic rewards and punishments but also embeds flexibility and foresight into the trust architecture of decentralised ecosystems, thereby ensuring a robust framework for sustaining decentralised trust over time.

8.3. Conducive Trustworthy Environment

According to the findings and results of Study 2, the aggregate dimension ‘Conducive

Trustworthy Environment' highlights the criticality of cultivating an inclusive and diverse trustworthy environment within blockchain decentralised ecosystems. On the 14th of January 2024, a focused exploration was conducted using Google Scholar to determine if there had been any prior academic conversations on similar topics. The key piece of literature discovered was by Habbal, Mohamed, and Abuzaraida (2024), who investigated the reliability and trustworthiness of AI-based systems. Habbal, Mohamed, and Abuzaraida (2024) highlighted the interactive potential between the proposed system and practical applications of blockchain technology, specifically in domains such as smart healthcare, smart manufacturing, and the Metaverse. They particularly elaborated on smart healthcare, emphasising that stakeholders can achieve consistent decision makings through measures such as access controls and encryption techniques. In essence, this ensures the data storage, transmission, and processing of sensitive healthcare information, thereby reducing the psychological uncertainty. Additionally, smart healthcare entails the validation and auditing of AI models used in healthcare applications, ensuring their accuracy, reliability, and compliance with regulations and standards. This validation process is crucial for minimising the risk of biased or incorrect predictions, especially in critical areas like diagnostics or treatment planning. Simultaneously, while recognising the transformative potential of AI in healthcare, Habbal, Mohamed, and Abuzaraida (2024) also acknowledge the emergence of ethical dilemmas necessitating meticulous resolution. To address risks such as human deskilling and widespread surveillance, conducting ethical analysis is vital. This approach aligns with the concept of Psychological Fairness Promotion, aimed at addressing fairness concerns that may arise in advanced technology-based systems. However, Habbal, Mohamed, and Abuzaraida (2024) seem to overlook the importance of Collective Resource Optimisation. In this thesis, Collective Resource Optimisation through appropriate algorithms and management is crucial for establishing a robust Conducive Trustworthy Environment, a key concern for stakeholders. Consequently, following a rigorous research and due diligence check, the conceptual originality of Conducive Trustworthy Environment is asserted, emphasising its importance in the broader context of smart healthcare and technology applications.

Adapted from Yarberry and Sims (2021), the thematic analysis of Collective Resource

Optimisation within Social Learning Theory highlights three pivotal aspects: Communication, Benevolence, and Synergy, which collectively contribute to establishing a Conducive Trustworthy Environment. Communication is redefined beyond traditional meanings, focusing on improving process transparency and stakeholder inclusivity. This dynamic adjustment of roles and influence ensures that the system remains adaptive and open to evolving needs and perspectives, which is crucial for Collective Resource Optimisation. For instance, aligning the voting weights according to stakeholder contribution and market dynamics encourages a more equitable and responsive system, facilitating continuous improvement. Benevolence reflects a deliberate collaboration and altruism among stakeholders, aiming to achieve mutual benefits. This is evident in efforts to balance resource allocation, such as making healthcare access more equitable across different regions and populations. By ensuring that systems serve broad and diverse needs rather than the interests of a few, a benevolent approach supports a sustainable and trusting environment where all participants feel valued and inclusively treated. Synergy involves the strategic coordination and integration of various stakeholder efforts to enhance system efficiency and effectiveness. In the blockchain healthcare ecosystem, this is manifested through initiatives that align technological capabilities with operational needs, such as streamlining consultations or optimising duty schedules for healthcare providers. These efforts ensure that resources are used efficiently, reducing waste, and enhancing service delivery across the board. Together, these first order concepts under the theme of Collective Resource Optimisation contribute to building a Conducive Trustworthy Environment by ensuring that Communication is effective and equitable, Benevolence guides stakeholder interactions, and Synergy enhances the operational capabilities of the ecosystem. This environment promotes trust among users and stakeholders, which is pivotal for the success and scalability of decentralised ecosystems like those in blockchain healthcare. Such a Conducive Trustworthy Environment not only supports current operational needs but also adapts to future challenges.

Psychological Fairness Promotion, as a second order theme within Psychological Safety Theory, is integral to establishing a Conducive Trustworthy Environment. The first order concepts of Reputation, Consistency, and Voluntary Responsibility collectively contribute to this theme, enhancing decentralised trust and supporting a fair and transparent ecosystem.

Psychological Fairness Promotion can be derived from Washburn et al. (2020) to investigate subsequent reliance on different levels of automation. It facilitates the refinement of parameters examined by Tayal and Bharathi (2021) relating to users' perceptions of trust, accentuating the distinct characteristic of traceability in blockchain. The establishment of consensus-building behaviours, alongside the implementation of transparent and consistent decision-making processes, serves as a means to augment Reputation (Xu et al., 2019) within Psychological Safety Theory. Reputation in the blockchain healthcare ecosystem significantly influences Psychological Fairness Promotion by fostering a Conducive Trustworthy Environment where trust is built on the visibility and transparency of actions. By establishing a dedicated oversight team, the system ensures that decisions are made consistently and fairly, which enhances the perceived reputation. This directly promotes broader participation and engagement from various stakeholders who rely on the perceived reputation to mitigate risks associated with decentralised interactions. Additionally, the emphasis on reputation mitigating conflicts underscores its role in maintaining harmonious relationships within the ecosystem, essential for sustained cooperation and growth. Consistency is crucial for Psychological Fairness Promotion as it provides a Conducive Trustworthy Environment within which all interactions occur. Through the tiered diagnosis approach, such consistency in treatment and decision-making processes removes ambiguity and potential bias, thereby enhancing decentralised trust. Moreover, the emphasis on consistency from the outset of medical interactions further reinforces trust between patients and healthcare providers, essential for a successful blockchain healthcare ecosystem. Voluntary Responsibility within the theme of Psychological Fairness Promotion allows stakeholders to engage with the system based on informed consent and personal choice, promoting a sense of ownership and accountability. The approach of tailoring solutions based on individual patient data illustrates how personalised interventions encourage patients to take responsibility for their healthcare outcomes. This empowerment is a cornerstone of decentralised trust, as stakeholders who feel they have control over their interactions are more likely to trust and support it. Furthermore, the point-based system for data sharing incentivises stakeholders to contribute to the ecosystem, fostering a community-based approach to healthcare that relies on the voluntary and active participation of its members. Together, these first order concepts reinforce the second order theme of Psychological Fairness

Promotion, leading to the development of a Conducive Trustworthy Environment. This environment is vital for fostering decentralised trust, ensuring all participants feel psychologically safe and fairly treated. Such an environment not only supports the effective operation of the healthcare system but also encourages ongoing engagement and investment from all stakeholders, crucial for the system's long-term viability and success.

In summary, the emergence of the aggregate dimension Conducive Trustworthy Environment is elucidated through the integration of Collective Resource Optimisation and Psychological Fairness Promotion, grounded in the perspectives of Social Learning Theory and Psychological Safety Theory, respectively. The theme of Collective Resource Optimisation leverages the first order concepts of Communication, Benevolence, and Synergy to foster a collaborative environment that optimises the use of resources through clear, altruistic, and coordinated efforts among stakeholders. This establishes a shared commitment to the blockchain decentralised ecosystem, thereby cultivating a foundation of decentralised trust. On the other hand, Psychological Fairness Promotion addresses the crucial aspects of Reputation, Consistency, and Voluntary Responsibility, ensuring that stakeholders perceive the blockchain decentralised ecosystem as fair. This perception is pivotal in mitigating risks associated with decentralised interactions and fostering a sense of psychological safety, which is essential for maintaining a healthy, trust-based relationship among users. Together, these themes create a Conducive Trustworthy Environment that not only supports the immediate operational needs of blockchain decentralised ecosystems, such as in healthcare, but also adapts to future challenges and changes, ensuring sustainable growth and the continued development of trust. This dual approach, by nurturing both resource optimisation and psychological fairness, provides a robust framework for the evolution of trust dynamics within decentralised ecosystems.

9. Implications

After conducting the process of coding, merging, and selection, each second order theme is accompanied by representative quotes that exemplify its essence. This systematic approach, following Gioia (2021), enhances the comprehension and interpretation of the research outcomes, contributing to a decentralised trust approach. Drawing upon the identified themes, this thesis aims to contribute to the development of a robust framework that could illuminate the nature of decentralised trust, thereby advancing public sector entrepreneurship and marketing success for participating in blockchain decentralised ecosystems. This endeavour holds the potential to deepen insights into implications for decentralised trust theory, decentralised trust practice, and decentralised trust policy.

9.1. Implications for Decentralised Trust Theory

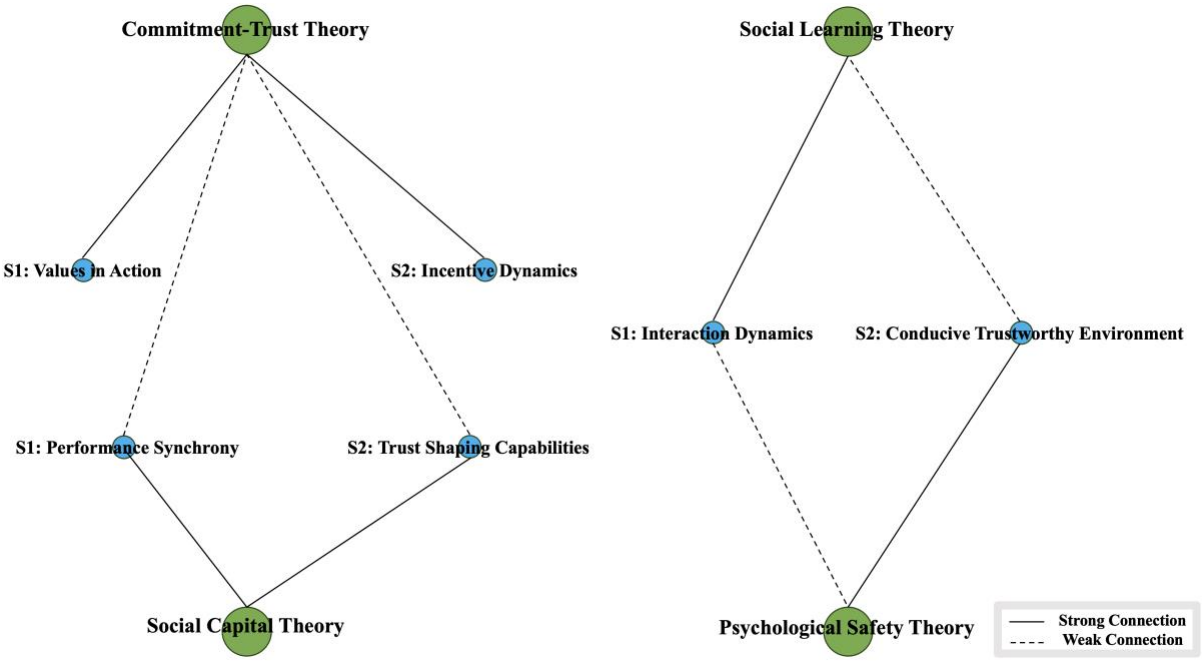

Figure 7: Decentralised Trust Framework: Interwoven Facets

In the light of the theories reviewed in section 3.1, discussions from Study 1 in section 6 and Study 2 in section 8 will be synthesised, elucidating how the framework (see Figure 7)

contributes to the advancement of decentralised trust theory. Regarding Figure 7, some explanations are as follows. Firstly, 'S1' is an abbreviation for Study 1, indicating that the dimensions following S1 originate from Study 1. Similarly, 'S2' denotes Study 2, meaning that the dimensions following S2 are derived from Study 2. It is essential to emphasise that, within Figure 7, neither the placement of the theories and dimensions, nor the lengths of the lines connecting them or the distances between various dimensions and theories, hold any specific meanings. The dispersion of these dimensions is merely to facilitate a clearer presentation of Figure 7. Lastly, the potential strength of the connections will be determined based on the empirical data. These preliminary determinations of the strengths of the connections also lay the groundwork for future research concerning the quantitative aspects of scale development.

Establishing decentralised trust encompasses a multifaceted interplay of four theories, consisting of Commitment-Trust Theory, Social Learning Theory, Psychological Safety Theory, and Social Capital Theory. These four theories, integral to the fabric of decentralised trust, are influenced and shaped by an array of thematic aspects. Values in Action is paramount, embodying the core principles and ethics driving stakeholder behaviours. Interaction Dynamics, reflecting the nature of stakeholder engagements, plays a significant role. Performance Synchrony is essential for aligning actions and goals within the blockchain decentralised ecosystems, while Trust Shaping Capabilities is crucial for creating a paradigmatic way to deepen the social ties among stakeholders. Additionally, Incentive Dynamics is fundamental in motivating and aligning stakeholder's interests with the collective objectives of the ecosystem. The establishment of a Conducive Trustworthy Environment is a cornerstone, creating the necessary conditions for decentralised trust to flourish. Each of these thematic aspects is indispensable in cultivating a resilient decentralised ecosystem, where decentralised trust is not merely a by-product but a critical outcome of the decentralised ecosystem's successful operations. Based on the empirical data and discussions around Figure 4 in section 5.2 and Figure 6 in section 8, this intricate web of aspects in Figure 7 collectively contributes to a robust foundation for decentralised trust theory.

9.1.1. Values in Action and Incentive Dynamics for Commitment

Section 9.1.1 delves into how Values in Action is conceptually related to Commitment, exploring the characteristics and underlying reasons for this relationship. Commitment, within the decentralised trust theory, is fundamentally intertwined with the enactment of Values in Action by stakeholders. The blockchain decentralised ecosystems, which are inherently grounded in principles of decentralisation and autonomy, critically depend on the steadfast commitment of their stakeholders (Hashim & Tan, 2015). This commitment is pivotal in ensuring the ecosystem resilience (Roundy, Brockman, & Bradshaw, 2017). It is often initially formalised through mechanisms like smart contracts and consensus protocols. These technological instruments serve as foundational pillars, ensuring that all stakeholders within the ecosystem adhere to a universally accepted set of values and operational norms (Hazée, Delcourt, & Van Vaerenbergh, 2017; Martin, 2016). In the decentralised context, committing to Values in Action may be exemplified through the active comprehension of market demands, leading to appropriate strategic deployments. This approach reflects a unique form of benevolent value. Concurrently, stakeholders, functioning as blockchain nodes, ought to maintain Integrity towards other participating entities. This represents a distinct aspect of integrous value, as truthful data entry significantly streamlines the auditing process on the blockchain. In the context of blockchain decentralised ecosystems, committing to Values in Action can further be demonstrated by managing the smart pharmaceutical inventories among different regions or cities, representing a specific communal value aimed at optimising medical resource based on the dynamic needs.

Within the decentralised trust framework, Values in Action functions as guiding beacons, shaping the nature of blockchain decentralised ecosystems, and fortifying the reservoir of decentralised trust. Benevolence, manifested through selfless acts and a genuine concern for others, contributes to the strengthening of stakeholder commitment. Integrity acts as a linchpin for decentralised trust, permeating Values in Action with integrous initiatives. Then, the proactive engagement in the blockchain decentralised ecosystems becomes a manifestation of shared stakeholder commitment, fostering reciprocity and reinforcing the fabric of

decentralised trust. Values in Action transcends theoretical postulations, offering a blueprint for ethical conduct within blockchain decentralised ecosystems. The conscientious application of these values becomes a dynamic force, catalysing the construction and resilience of trusted social networks. As individuals collectively uphold principles of Benevolence and Integrity, and engage in proactive and cooperation efforts, the decentralised mechanisms become enriched. This thematic exploration thus provides a nuanced understanding of how Values in Action is integral to the perpetuations of Commitment.

Based on the empirical data provided, Values in Action, as exemplified by the leaders, influences Commitment within the decentralised trust theory. $\text{Leader}_{\text{P1}}$ discusses making strategic deployments based on demands, highlighting a commitment to adaptability and market responsiveness (*"based on different demands, we should do the corresponding deployments to cope with the emergency situations"* - $\text{Leader}_{\text{P1}}$). $\text{Leader}_{\text{H2}}$ emphasises the importance of transparency and reciprocity in data sharing, reflecting a commitment to building a trustworthy and effective blockchain network (*"when we actively upload our data, we hope that other institutions can be honest to share their data and upload them as well"* - $\text{Leader}_{\text{H2}}$). $\text{Leader}_{\text{P2}}$ prioritises providing affordable and high-quality medicine, showing a commitment to integrity and public health (*"we also need to prioritise the affordable drugs"* - $\text{Leader}_{\text{P2}}$). Lastly, $\text{Leader}_{\text{H1}}$'s dedication to resource and knowledge sharing underscores a commitment to improving healthcare universally (*"we will devote ourselves to share our resources and knowledge"* - $\text{Leader}_{\text{H1}}$). These actions reflect core values driving a committed, coordinated effort within a decentralised ecosystem.

> **Hypothesis 1**: *Within the decentralised trust theory, Values in Action positively influences Commitment, whereby the active demonstration of core organisational values leads to increased commitment among stakeholders to uphold and advance the integrity and efficacy of the decentralised ecosystem*.

Additionally, section 9.1.1 examines the complex relationship between Incentive Dynamics and Commitment, seeking to understand the intricacies of this conceptual connection. Within the decentralised trust theory, particularly as it applies to blockchain decentralised ecosystems,

Incentive Dynamics plays a pivotal role in enhancing Commitment. By aligning rewards with the collective goals, stakeholders feel secure in contributing to the decentralised ecosystems. The assurance that their inputs will be valued, and their efforts fairly compensated emboldens stakeholders to engage in open conversation and innovative thinking, which are critical for the ecosystem resilience. Before undertaking primary research, a scenario was posited: *Can decentralised ecosystems entirely eliminate control and power? If so, does decentralised trust naturally emerge?* The answer, however, is not straightforward. Decentralisation primarily eliminates unnecessary interactions between service providers and clients, yet as digital platforms, whether centralised or decentralised, they maintain the fundamental functions of a conduit or medium. In other words, control and power have not vanished completely but have been obscured. Rather than asserting the removal of control and power (Guo et al., 2020), it is more accurate to posit that control and power have become latent and hidden. Building upon this foundation and in conjunction with the decentralised trust theory, it is implied that decentralised trust necessitates latent control and power. Within the decentralised landscape, the intricate web of Incentive Dynamics weaves together Anticipatory Incentive and Transient Lenience, forming ecosystems where latent control and power manifest. Mutuality, as a cornerstone of Anticipatory Incentive, engenders a sense of shared benefit, subtly intertwining the interests of participants. Entities that can shape and dictate the terms of this shared benefit wield a form of latent control, guiding the decentralised interactions towards predetermined outcomes. Simultaneously, Credibility serves as a currency of influence, with those possessing a trusted credit exercising a nuanced power over the perceptions and decisions of participants. Actors that streamline processes and enhance Efficiency within Transient Lenience hold sway over the tempo of the social exchange, thus exerting a latent form of control. Additionally, Integrity within Transient Lenience is a subtle force shaping the ethical contours of interactions, and those who can define and maintain these ethical boundaries wield a hidden power within the decentralised ecosystems. In this symbiotic relationship, Incentive Dynamics emerges as a conduit through which Commitment influences the ecosystem resilience.

Incentive Dynamics plays a pivotal role in fostering Commitment within the decentralised trust theory, as demonstrated by various insights shared by the participants. Founder 2 describes a

system where *"by contributing such data, it enhances the capabilities of doctors, benefiting hospitals as well... individuals can accumulate points, which could result in significant discounts"*. This points-based incentive structure not only promotes continued engagement by providing tangible rewards but also builds a framework of trust and mutual benefits, essential in decentralised environments. Moreover, Founder 3's idea of points being *"traded among hospitals, similar to carbon credits"* further illustrates how Incentive Dynamic can enhance Commitment by fostering an environment of cooperation and resource sharing across organisations. Such trading mechanisms incentivise entities to participate actively and sustainably in the ecosystem. Founder 6 also underscores the importance of a sense of community and shared benefits: *"it creates a sense of community and credibility within the ecosystem...it emphasises a sense of altruism and win-win situation"*. This sense of community, driven by well-aligned incentives, enhances commitment among participants, ensuring a robust and reliable decentralised ecosystem. These examples highlight how well-structured incentives can significantly influence commitment levels within the decentralised trust theory, pointing to a symbiotic relationship where each reinforces the other, fostering a stable ecosystem.

> **Hypothesis 2**: *Within the decentralised trust theory, Incentive Dynamics significantly influences Commitment, where effective incentive mechanisms enhance long-term engagement and trust among participants*.

9.1.2. Performance Synchrony and Trust Shaping Capabilities for Social Capital and Commitment

Section 9.1.2 explores how and why Performance Synchrony is conceptually connected to Social Capital, delving into the underlying dynamics of this relationship, while also examining its less pronounced association with Commitment, seeking to understand the nuances of this conceptual connection. Performance Synchrony ensures a unified approach among stakeholders, guiding them towards common goals and objectives (Morgan & Hunt, 1994; Ybarra & Wiersema, 1999). In blockchain decentralised ecosystems, the cooperative behaviour necessary for achieving Performance Synchrony and establishing trust leans less on

interpersonal social networks (Lundy, 2016; Pazaitis, De Filippi, & Kostakis, 2017) and more on the adherence to the technical and procedural rigours of blockchain protocols and smart contracts (Babkin et al., 2018). Consequently, aspects like Performance Synchrony, though fundamentally tied to Social Capital, exhibit a more tenuous connection with Commitment.

In the decentralised context, Performance Synchrony strengthens Social Capital can be manifested in two main directions. Firstly, it involves the capability to achieve this synchronicity. For instance, district-level governments implementing decisions do not need to wait for city-level governments to take the lead and then imitate and learn from them. Similarly, hospitals with limited medical resources do not have to suggest patient transfers in the face of complex medical cases due to a lack of solutions. Through blockchain decentralised ecosystems, this synchronicity becomes visibly evident. It is not just a synchronisation of information but also a synchronisation of predictable outcomes. Considering the aforementioned examples, why did district-level governments previously wait for city-level implementation before daring to synchronise their actions? This hesitance was due to their lack of precision in the implementation process; in other words, their limited Ability in committing to Performance Synchrony. They needed to learn by imitation to compensate for their competence deficiencies. Similarly, hospitals with fewer medical resources, within traditional medical systems, could not quickly overcome complex medical cases, demonstrating their limited medical abilities, thus necessitating patient transfers. However, with the support of blockchain technology, district-level governments or hospitals with fewer resources can improve their synchronicity through real-time data sharing on the blockchain. Secondly, it is about how enhancing synchronicity can improve satisfaction. For end-users, increasing satisfaction involves several aspects. One is the timely improvement of medical conditions, and another is obtaining the desired medication quickly and at the best price. For corporate-level stakeholders, especially compared to provincial and city-level entities, improving synchronicity can significantly enhance the efficiency of policy implementation and public services. It also allows more flexible time to manage service quality, thereby increasing their Satisfaction. Overall, Performance Synchrony strengthens Social Capital can be understood as a macro concept in the real-world scenarios that have been listed above. The following

discussion will delve into Performance Synchrony from a more micro, theoretical perspective.

Performance Synchrony comprises critical concepts such as Ability and Satisfaction, collectively shaping the operational excellence that underpins decentralised trust. Ability showcases how collaborative prowess surpasses the sum of individual capacities. Satisfaction becomes a metric for the harmonious alignment between expectations and outcomes, resonating within the conceptual connection with Social Capital. Privacy and Security, as a capstone, accentuates the functionality of the decentralised trust framework. As blockchain nodes within the decentralised ecosystems perform in synchrony, the decentralised mechanisms are fortified, deepening the social ties where decentralised trust not only establishes but thrives through the optimised performance of each component. Service Convenience streamlines interactions, fortifying the effectiveness of the decentralised trust-building apparatus. This thematic exploration advances the discourse beyond abstract conceptual underpinnings, offering a lens through which the intricacies of Social Capital are vitalised and optimised for the establishment of decentralised trust.

Within the decentralised trust theory, Performance Synchrony is essential for developing Social Capital by ensuring transparent and timely operations based on shared data. $\text{Leader}_{\text{HI2}}$ highlights the benefit of a growing, precise database that fosters clear decision-making visible to all stakeholders (*"with the uploaded data become more and more, the database will be more completed and precise…our decision will be made in front of everyone to show why and how we make such a decision"* - $\text{Leader}_{\text{HI2}}$). $\text{Leader}_{\text{HI1}}$ further reinforces this connection by indicating that transparency in decision-making processes establishes trust and honesty with clients (*"establishing trust is to make our decision-making processes more transparent and be honest to our clients…let customers know that every decision is made with proper reasons"* - $\text{Leader}_{\text{HI1}}$). This openness is pivotal in building Social Capital within the decentralised trust theory by enhancing trust and cooperative interactions.

> **Hypothesis 3a**: *Within the decentralised trust theory, Performance Synchrony is positively associated with Social Capital, as effective synchrony in performance ensures transparency and builds trust among participants*.

Commitment, within the decentralised trust theory, emerges as a complex and multidimensional asset. This asset is defined by the intricate web of stakeholder relationships that exist among various stakeholders who actively engage in a specific domain (Ray, Nyberg, & Maltarich, 2023). In the context of blockchain decentralised ecosystems, which epitomises the essence of decentralisation, the role and importance of Commitment undergo a transformative shift. Unlike traditional digital platforms where trust is anchored in a centralised authority (Ranjan & Read, 2021), within the decentralised ecosystems, trust is diffused throughout the ecosystems. Furthermore, the development of Commitment in blockchain decentralised ecosystems confronts unique challenges. The primary challenge lies in fostering decentralised trust in an environment inherently less conducive to traditional interactions. In response to Agger and Jensen (2015) for emphasising the role of strong political institutions in building a sense of commitment, blockchain decentralised ecosystems resort to leveraging decentralised mechanisms. Such mechanisms facilitate the accumulation of committed stakeholder relationships. This shift towards trust reflects a novel approach in harnessing Commitment, where the traditional reliance on direct social interactions (Shiell, Hawe, & Kavanagh, 2020) is replaced by a reliance on collective adherence to decentralised assessments.

In the context of decentralised trust theory, the connection between Performance Synchrony and Commitment appears indirect and weaker. $\text{Leader}_{\text{P2}}$ discusses the practical aspect of adjusting operational tactics based on shared data to meet client demands efficiently (*"we need to satisfy the clients' demand by keeping the inventory at a reasonable level. We need to know the degree of operation to adjust the deploy rate according to the blockchain data sharing"* - $\text{Leader}_{\text{P2}}$). While this illustrates operational alignment, it speaks less to the deeper engagement or emotional commitment that might be expected in decentralised settings. This practical focus suggests that while Performance Synchrony facilitates strategic alignment, it may not necessarily deepen stakeholders' commitment.

> **Hypothesis 3b**: *Within the decentralised trust theory, Performance Synchrony is weakly associated with Commitment, where effective performance alignment influences, but does not strongly affect, the depth of stakeholders' commitment to*

decentralised initiatives.

Section 9.1.2 also explores how Trust Shaping Capabilities is conceptually related to Social Capital, examining the nature of this relationship, and understanding the reasons behind it. Simultaneously, it investigates the intricate association with Commitment, aiming to uncover the underlying aspects of this conceptual connection. In the decentralised context, Trust Shaping Capabilities is inextricably linked to the notion of Social Capital. Trust Shaping Capabilities provides stakeholders with the essential tools to cultivate a sense of allegiance towards the ecosystem through deepening their social ties. These capabilities are vital in building a sustainable and resilient blockchain community. However, deepening the social ties in the decentralised ecosystems presents inherent challenges. One significant challenge is the geographic dispersion of stakeholders, who often lack any form of personal connection or direct interaction with one another (Albinsson & Perera, 2012). This detachment poses a risk to the cohesion and collective mission of the decentralised ecosystems. To mitigate this risk, the blockchain decentralised ecosystems must devise and implement incentive structures that effectively align individual actions with the collective well-being of the entire ecosystem. These incentives are critical in ensuring that the deepened social ties can be sustained over time, particularly in the absence of traditional hierarchical or authoritative structures.

It is emphasised that the utilisation of decentralised approach to encourage individuals to actively share meaningful values. This holds the implications for Social Capital because in public services, like public healthcare, stakeholders tend to maintain more non-intimate stakeholder relationships, namely linking social capital (Fukuyama, 2001). The establishment of decentralised trust aims to instil a level of trust similar to that found in direct intimate relationships within these non-intimate stakeholder relationships. Essentially, the ultimate goal of blockchain decentralised ecosystems is to imbue citizens and public service providers within third-level and above relationship networks with the social attributes characteristic of bonding social capital (Agger & Jensen, 2015). Building on the theoretical foundations of Estrin, Mickiewicz, and Stephan (2013) and Gedajlovic et al. (2013), the core of decentralised trust lies in expanding the breadth of decentralised ecosystems while preserving the depth of Social

Capital. Trust Shaping Capabilities elucidates the paramount role played by Social Capital in the configuration of decentralised trust. It accentuates the indispensable nature of safeguarding information within these interactions, acknowledging the balance between openness and the imperative to preserve Privacy and Security. As a result, Trust Shaping Capabilities unveils a tapestry where decentralised trust is intricately woven through reciprocal engagements and meticulous protection of data. This thematic exploration not only elucidates the nature of Social Capital but also underscores the intricate dance required to navigate the decentralised trust. By effectively aligning individual stimulations with the broader objectives of the blockchain decentralised ecosystems, Trust Shaping Capabilities, plays a pivotal role in deepening the social ties and enduring committed relationships among the stakeholders.

The connection between Trust Shaping Capabilities and Social Capital within the decentralised trust theory is evident through the emphasis on data authenticity and security as pivotal for building trust. According to Founder 12, decentralised trust requires assurance of data authenticity before its immutability can be established (*"Blockchain addresses the issue of trust in data, but it cannot guarantee the authenticity of the data itself"* - Founder 12). This indicates that the satisfaction of initial data inputs forms a critical trust shaping capability, which is essential for fostering Social Capital within decentralised ecosystems. Furthermore, the process of building trust is described by Founder 9 as a gradual accumulation of mutual trust, which is aligned with the ongoing promotion of user-recognised values (*"The foundation for gaining trust from unfamiliar audiences lies in the following steps: establishing a basic level of mutual trust, gradually building upon that trust, and continually promoting values that are recognised by the users"* - Founder 9). This approach to building trust directly contributes to the strengthening of social bonds and communal trust, which are core aspects of Social Capital.

> **Hypothesis 4a**: *Trust Shaping Capabilities, such as ensuring data authenticity and implementing gradual trust-building measures, is positively associated with the enhancement of Social Capital within the decentralised trust theory*.

Examining the empirical data suggests that Trust Shaping Capabilities within the decentralised trust theory may only weakly influence Commitment, due to the essential but not exclusive

role of these capabilities in maintaining long-term engagement. For instance, Founder 6 stresses the importance of maintaining privacy and ethical standards in data sharing as a method to foster trust (*"By implementing transparent and secure data sharing protocols, maintaining the privacy and confidentiality of sensitive information, and ensuring that all parties involved adhere to ethical and legal standards, trust can be fostered"* - Founder 6). While these measures are crucial for initial trust, they don't inherently secure a user's lasting commitment, which might also require additional ongoing engagement or benefits. Additionally, Founder 7 discusses the importance of data verification and regulatory oversight in building trust ("Trust is primarily built upon the foundation of authenticity in data or service provision. This requires the blockchain platform to provide thorough data verification. Additionally, third-party oversight is necessary to ensure that all parties are subject to regulation, thereby enhancing trust" - Founder 7). This commentary suggests that while these trust shaping mechanisms are vital for initial trust formation, they might not directly translate into sustained user commitment unless paired with continuous satisfactions that directly impact the user's ongoing experience.

> **Hypothesis 4b**: *Trust Shaping Capabilities, such as implementing secure data sharing protocols and thorough data verification, is weakly associated with Commitment within the decentralised trust theory. While these capabilities are fundamental for establishing initial trust, they do not necessarily ensure ongoing user commitment unless coupled with continuous engagement strategies and direct benefits*.

9.1.3. Interaction Dynamics and Conducive Trustworthy Environment for Social Learning and Psychological Safety

Section 9.1.3 investigates how Interaction Dynamics influences Social Learning, delving into the nature of this relationship and exploring the underlying mechanisms through which Interaction Dynamics shapes and impacts Social Learning. Due to the altered breadth of the resultant network structure and the heightened depth of interactions (Bedi, Alpaslan, & Green, 2016), transformative learning processes undergo substantive changes under the influence of Interaction Dynamics. Blockchain decentralised ecosystems are fertile grounds for experiential

learning due to their transparent and immutable transaction ledgers. As stakeholders engage with the decentralised ecosystems, they continuously learn from the collective actions recorded on the blockchain. This ongoing learning process is critical for the ecosystem evolution, ensuring that it adapts to new challenges and opportunities (Chia et al., 2021).

In the decentralised context, the impact of Interaction Dynamics on Social Learning, which in turn facilitates cooperative actions, can be elucidated through three practical examples. The first example illustrates the importance of understanding how to leverage the theoretical underpinnings of Interaction Dynamics for Social Learning to sustain committed stakeholder relationships. From the perspective of healthcare insurance and patients, synchronising the alignment of the insurance company's offerings with the patients' perception of credible healthcare insurance is crucial. Insurance companies need to learn to use simplified claim settlement procedures and employ blockchain technology to make the reimbursement process transparent and traceable. This enables patients to make informed decisions about their claims by comparing eligible reimbursement pathways. Consequently, this approach effectively maintains the committed stakeholder relationships between healthcare insurance companies and patients. The second example involves using the theoretical foundation of Social Learning to facilitate interactions on the blockchain or, in other words, fostering pleasant communication within specific social networks. From the viewpoint of entrepreneurs seeking consensus readiness or collectively resolving conflicts, pleasant communication can be established based on effectively finding the greatest common denominators in intersecting opinions, perspectives, or solutions. Blockchain technology can also facilitate more clever forms of interaction, eliminating distractions and focusing communication on resolving the actual issues at hand. The third example concerns using the theoretical basis of Social Learning as how to become reputational social resources, touching on the practical issue of Psychological Fairness. This includes, for instance, the allocation of responsibility or accountability in doctor-patient relationships. From the perspective of Social Learning, the relationship between doctors and patients is significantly shaped by the dynamics within the social network structure that fosters frequent interactions, as indicated by Chiu, Hsu, and Wang (2006). Although patients trust doctors, this does not mean that in the event of medical malpractice, they will initially blame

themselves rather than doubt the doctor's competence. In this situation, the transparency and continuity of interactions on the blockchain become significant. Trust between doctors and patients is not innate but needs to be gradually established through Interaction Dynamics. Building on these three practical examples, the following discussion will delve deeper into the connections between Interaction Dynamics and Social Learning.

Interaction Dynamics, typically influential in shaping Social Learning, assumes a diminished role in the blockchain sphere. This reduction in influence is primarily due to the nature of interactions within blockchain decentralised ecosystems, which are often pseudonymous. Such interactions, while facilitating Credibility, inadvertently create barriers to forming deep, trust-based social connections. To elaborate, Social Learning predominantly relies on transformative learning processes (Bandura, 1977; Shum & Ferguson, 2012). Individuals initially identify influential figures within their social groups and subsequently, through connections among individuals and the resultant network structure, acquire and adopt behaviours, values, and competencies (Harvey et al., 2010). This form of connection, facilitated by a process of observations and replications, is perceived as a distinct type of interaction, wherein knowledge is shared among communities (Bond & Blevins, 2020). As decentralised trust is established, the cost of identifying blockchain nodes with greater weights is significantly lower than identifying influential figures. Moreover, stakeholders within blockchain decentralised ecosystems find it easier to engage in interactions. This facilitates more efficient learning since a shared vision strengthens social ties and enables cooperative actions, emphasised by Nadeem et al. (2020). Communication forms the linchpin of this dynamic, fostering a shared understanding among diverse nodes within the blockchain decentralised ecosystems. Reputation emerges as a dynamic currency that accrues through consistent interactions. Within the Interaction Dynamics, the cornerstone is its fusion of breadth in decentralised ecosystems and depth in Social Learning. Characterised by the conceptual connections across a diverse spectrum and the preservation of Social Learning within these connections, Interaction Dynamics for Social Learning establishes the foundation for the decentralised trust theory.

Interaction Dynamics, as evidenced by the data, plays a crucial role in fostering Social Learning

within the decentralised trust theory. $\text{Leader}_{\text{HI1}}$ highlights the benefit of blockchain in *"giving out the best premiums with the best prices"* and simplifying *"claim settlement procedures to let our clients believe that they have made the right choices"* ($\text{Leader}_{\text{HI1}}$). This underscores the interactive element where clients learn and gain confidence through transparent, direct interactions facilitated by the technology. Furthermore, $\text{Leader}_{\text{HA1}}$ stresses the importance of having *"an entrepreneurial mind to set up long-term direction and responsibility mechanism"* under the blockchain field ($\text{Leader}_{\text{HA1}}$), which suggests a learning environment where iterative interactions lead to enhanced understanding and trust among participants. These examples illustrate how Interaction Dynamics in a blockchain decentralised ecosystem is integral to Social Learning, whereby stakeholders actively engage and learn from each other's responses and the technology itself.

> **Hypothesis 5a**: *Within the decentralised trust theory, enhanced Interaction Dynamics positively influences Social Learning, as stakeholders engage more deeply with blockchain technology, leading to improved understanding and adoption*.

The connection between Interaction Dynamics and Psychological Safety within the decentralised trust theory, though present, appears to be weaker. $\text{Leader}_{\text{HI2}}$'s mention of using *"a smart contract mechanism"* to minimise *"the claim settlement period"* ($\text{Leader}_{\text{HI2}}$) introduces a system of efficiency and reliability, which indirectly contributes to a sense of safety among users. However, the direct impact on Psychological Safety—defined as the feeling of being able to show and employ oneself without fear of negative consequences—is less emphasised. While $\text{Leader}_{\text{HI1}}$ discusses how *"blockchain solutions allow customers to verify the fairness of decisions"* ($\text{Leader}_{\text{HI1}}$), this transparency supports psychological safety but does not directly address the interpersonal trust dynamics or mitigate the fear of vulnerability among users, suggesting a more indirect relationship.

> **Hypothesis 5b**: *In the context of decentralised trust theory, Interaction Dynamics has a weaker, though significant, impact on Psychological Safety, primarily through mechanisms of transparency and efficiency that indirectly foster a secure decentralised ecosystem*.

Section 9.1.3 also explores how the creation of Conducive Trustworthy Environment contributes to Psychological Safety, examining the underlying dynamics behind this relationship to understand the processes involved. Conducive Trustworthy Environment in the blockchain is often derived from the cryptographic and algorithmic foundations that underpin the technology, rather than interpersonal trust. Nonetheless, Conducive Trustworthy Environment can augment Psychological Safety by providing a stable backdrop against which risks can be taken without fear of technological failure. The challenge in the decentralised context is to maintain Psychological Safety amidst an environment that is anonymous and lacks the hierarchical structures that might enforce accountability. Blockchain decentralised ecosystems must, therefore, implement mechanisms such as transparent governance protocols and effective dispute resolution methods that preserve the Psychological Fairness while promoting Reputation among its stakeholders. Conducive Trustworthy Environment could further strengthen Psychological Safety by providing resilient ecosystems that are predictable yet flexible enough to accommodate technological innovation. Stakeholders in blockchain decentralised ecosystems are more likely to invest in new protocols or developing innovative applications when they trust the underlying digital infrastructure. The decentralised nature of blockchain inherently supports a psychologically safe environment. As each node or stakeholder operates both independently and as part of a larger system, the continuous process of adaptation and improvement is essential for maintaining the health or resilience of the whole ecosystems. Furthermore, the theoretical assumption concerning control and power (Bachmann, 2001; Luhmann, 2017) receives further validation within Psychological Safety. It posits that advocators possessing a high proactive personality are more likely to garner favour from their followers (Liang, Farh, & Farh, 2012). If extrapolating this concept to the blockchain decentralised ecosystems, advocators are akin to early participants, while followers represent the prospective participants of the future. The role of control and power operates by involving a selected few initially, subsequently catalysing the engagement of the community. And decentralised trust can serve as the linchpin aligning the tendencies of advocators and followers, facilitating cohesive and participatory ecosystems.

Conducive Trustworthy Environment significantly impacting Psychological Safety within the

decentralised trust theory is evident from several quotes. Founder 6 emphasises, *"By fostering a strong benevolent culture and establishing effective cooperative channels among stakeholders, we can ensure that everyone is aligned towards the same goals and objectives of optimising collective resources to deliver better healthcare solutions"*. This statement highlights how trust and cooperation foster an environment where individuals feel safe to contribute meaningfully. Similarly, Founder 3's notion of using collective conflicts to reach a final resolution through effective communication (*"For instance, among the 100 entrepreneurs, we can form a unified opinion by finding out the common grounds, the maximum common denominator, or the representatives to reflect the collective conflicts and reach a final resolution through effective communication"* – Founder 3) suggests that trust among entrepreneurs enhances Psychological Safety, allowing open discussions without fear of negative repercussions. These contributions exemplify how trust enables stakeholders to feel psychologically safe, willing to engage and share in decision-making processes.

> **Hypothesis 6a**: *Within the decentralised trust theory, Conducive Trustworthy Environment positively influences Psychological Safety, enhancing stakeholders' willingness to engage and express concerns openly without fear of negative consequences*.

In the decentralised context, Social Learning also finds a less direct connection in Conducive Trustworthy Environment. Social Learning interlaces Psychological Safety with the ability to navigate and pacify disputes within the blockchain decentralised ecosystems. Entities adept at arbitrating conflicts subtly assert control, their decisions shaping the trajectory of interactions and alliances within the decentralised ecosystems. The autonomous and distributed structure demands that Social Learning is not only an individual social behaviour but also a collective one, as the knowledge and skills of each stakeholder would impact the ecosystems' overall performance. Then, the challenge lies in cultivating an environment that encourages and facilitates learning across a diverse and distributed set of stakeholders (Bai, Lin, & Liu, 2019). This requires the implementation of education programs, community forums, and collaborative tools that bridge the knowledge gap and empower all users to contribute meaningfully to the ecosystem's development. Moreover, Collective Resource Optimisation becomes a conduit for

hidden power dynamics. Those who master the art of resource allocation and optimisation hold sway over the vital elements that sustain the decentralised ecosystems. Whether it be the allocation of digital assets or technological infrastructure, those in control of optimising collective resources subtly influence the perceived Psychological Fairness. This influence is nuanced, operating in the background, yet impactful in steering the course of collaborations. The ability to shape Psychological Fairness is a form of latent control, as those entities fostering a sense of equity influence the perceptions and trust of participants. Psychological Fairness Promotion becomes a guiding principle, and those who champion it exercise a form of Psychological Safety that resonates in the decentralised context. Psychological Fairness Promotion is a currency of decentralised trust, and those who can maintain it accrue a form of Psychological Safety, as others come to rely on their contributions, solutions, or services. In the relationship between Conducive Trustworthy Environment and Psychological Safety, the ability to influence resource optimisation and psychological fairness guides the evolution of decentralised ecosystems. Mechanisms adept at navigating this nexus become architects of influence, steering the blockchain decentralised ecosystems towards desired outcomes.

The relationship between Conducive Trustworthy Environment and Social Learning within the decentralised trust theory appears to be more nuanced. Founder 7's insight on blockchain's role in enabling precise efforts in healthcare (*"With blockchain technology, it becomes possible to focus more precise efforts on specific areas, avoiding wastage in healthcare resources"* – Founder 7) hints at how trust in technology facilitates learning about resource optimisation. However, the connection is indirect, suggesting a weaker influence on Social Learning compared to Psychological Safety. Founder 11's statement about on-chain voting showcasing abilities and contributing to decision-making (*"Similar to the accumulation of experience through patient consultations, each on-chain vote becomes an opportunity for me to showcase my abilities and contribute to the decision-making process…on-chain voting becomes a force that influences my motivation and active participation"* – Founder 11) also suggests that while trust enhances participation, it does not directly facilitate the learning aspect but rather the engagement. These observations imply that while a trustworthy environment supports participation necessary for Social Learning, its direct influence on learning itself is limited.

Hypothesis 6b: *Within the decentralised trust theory, Conducive Trustworthy Environment is weakly associated with enhancing Social Learning, primarily influencing participation and engagement, which are prerequisite conditions for learning*.

9.2. Implications for Decentralised Trust Practice

This thesis primarily identifies four aspects of how a blockchain healthcare ecosystem can be presented to restore the public's confidence in Public Health. First, under decentralised circumstances, the establishment of decentralised trust needs to be more practical and feasible. This can be achieved through the implementation of transparent and traceable data sharing protocols, ensuring that all participants adhere to ethical and legal standards. With the support of blockchain technology, clear paths can be designed for decision-making through reliable algorithms. For example, a voting system can be established on blockchain nodes, ensuring that all participants could contribute to the decision-making process. Additionally, collaborating with regulatory authorities to ensure compliance with legal requirements can help mitigate potential trust risks.

Second, under decentralised circumstances, the segmentation of target customer groups, both online and offline, needs to be more precise. For instance, active smartphone users are more likely to be recommended to use online healthcare services. This initial separation and screening of online and offline user groups can provide maximum convenience for patients who may not have easy access to smartphones. Therefore, it is suggested that using the cognitive level of technological innovation and the risk level of the disease itself as the fundamental criteria.

Third, under decentralised circumstances, more public sector research is required to accomplish mass education. For example, starting with complex medical conditions, users might be more likely to experience the benefits of online consultations and multi-party

consultations in a timely manner. And then, service providers could gradually expand the range of diseases, penetrating various aspects of healthcare services. Cultivating awareness of DAO can be effective in setting differences in pricing, processing speed, participation level, service types, and target recipients, thereby endowing the new healthcare system with more advantages.

Finally, under decentralised circumstances, the issue of trust costs needs to be transformed from abstract concepts into more concrete means. At the outset, incorporating secure measures, such as smart contracts, can help ensure the accuracy and privacy of on-chain information. Additionally, leveraging blockchain technology, patients might be more likely to provide their personal healthcare data through private keys to earn healthcare credits, which can be exchanged for more healthcare services or resources. Doctors can also share healthcare cases through private keys, improving the healthcare standards of their respective hospitals, enabling doctors to work more effectively without being restricted by traditional hospital's administrative systems based on seniority, performance assessments, and career advancement.

Public sector research on trust is predominantly driven by socio-political concerns aimed at optimising public values (Boenigk & Möhlmann, 2016). Although the entrepreneurship and marketing disciplines originate from the private sector, public sector leaders start to recognise their importance, and that of publicity for governance (de Matos et al., 2020; Zaheer & Rashid, 2017). The blockchain technology can indeed help facilitate public sector research on trust via its three unique characteristics: irreversibility, traceability, and transparency (Tapscott & Tapscott, 2016). A key issue to solve is redefining and building trust in the blockchain decentralised ecosystems through public sector research, something this thesis intends to explore. In addition, it is argued that blockchain decentralised ecosystems may emerge as essential technical underpinnings for ensuring the benefits of stakeholders. Blockchain remains poorly understood and institutionalised in the public sector. This thesis indicates that traditional healthcare systems still face potential trust crises and imbalances in supply and demand. These issues can affect stakeholders' participation intention.

Decentralised trust practice in public sector entrepreneurship involves moving away from

traditional, top-down bureaucratic approach, and instead, enabling a more distributed, bottom-up approach where multiple stakeholders, consisting of government entities, public organisations, and citizens, collaboratively participate and make decisions. In the decentralised context, blockchain technology is instrumental, as it provides a secure and transparent way to record interactions, thereby building decentralised trust among all stakeholders. Decentralised trust practice in public sector entrepreneurship encourages a more dynamic and inclusive approach to problem-solving, where diverse ideas and solutions can be explored and implemented. This leads to more agile and responsive public services, driving innovation in public initiatives. In the Public Health domain, decentralised trust practice in public sector entrepreneurship involves creating resilient ecosystems where various healthcare entities, technology companies, and patient groups work together. For instance, in managing healthcare data via patient-centric healthcare apps, a decentralised trust approach ensures that data is not just in the control of a single healthcare authority but is managed on a distributed chain, respecting patient privacy and enhancing data security. This approach not only improves service delivery but also fosters decentralised ecosystem resilience, leading to better healthcare outcomes. In the wider context of the public sector, decentralised trust practice enables a more participatory form of governance, where public sector entrepreneurship thrives on the involvement of various stakeholders in decision-making process. In order to build smart cities, decentralised trust practice in public sector entrepreneurship can lead to the application of blockchain decentralised ecosystems where citizens, urban planners, and government officials could synergistically design and implement the public projects. This decision-making process can involve using blockchain technology for transparent budgeting and spending, ensuring accountability in collectively resolving the issues. In both Public Health and the general public sector, decentralised trust practices under the lens of public sector entrepreneurship foster a more innovative, inclusive, and transparent approach to smart governance. In addition, decentralised trust practice could interact with private sector entities in a partnership manner to leverage their expertise, resources, and networks, while sustaining public sector values. Adapted from Ghosh et al. (2021), such public service improvements through blockchain decentralised ecosystems can be tailored as Public-Private Blockchain.

Decentralised trust practice in public sector marketing refers to the approach that establish and maintain trust in public services and innovative initiatives through decentralised, community-driven methods, rather than solely relying on centralised authorities. However, the challenge of decentralised trust practices in public sector marketing, as compared to private sector marketing, lies in the enhancement of citizens' quality education and mental education. Although both public sector marketing and private sector marketing have begun to advocate a customer-centric philosophy, customers in the private sector are more likely to know what kind of products or services they want (Trein & Vagionaki, 2024). In contrast, in the public sector, citizens may not always be aware of the services they truly need (Zaheer & Rashid, 2017). This lack of understanding can lead to questioning or complaints about existing public services, ultimately resulting in distrust (de Matos et al., 2020). Therefore, it is proposed that in a Conducive Trustworthy Environment, decentralised trust should be bi-directional and multi-dimensional. Consequently, public sector marketing strategies should also be diversified, addressing different perspectives through various methods of advocacy, such as the community-driven methods mentioned earlier. Public sector entities could attempt to integrate educational programs into community engagement marketing channels, thereby enhancing public awareness of adopting the blockchain decentralised ecosystems.

9.3. Implications for Decentralised Trust Policy

This thesis utilised the public sector, specifically the Public Health in China, as a contextual backdrop for exploring the blockchain healthcare ecosystem and the role of decentralised trust within this ecosystem. This section represents a valuable implication to the entrepreneurship and marketing disciplines by pioneering a discussion on the potential feasibility of executing decentralised trust policy.

The first implication concerning decentralised trust policy is the discovery that stakeholders possessing entrepreneurial spirits show a greater tendency to embrace and become part of the blockchain decentralised ecosystems. This aligns with the assumptions in section 2.2.1, where

public sector entrepreneurship through decentralisation has been discussed, positing that more entrepreneurial individuals are more receptive to new concepts, such as value co-creation, compared to their less entrepreneurial counterparts. Similarly, those who are less entrepreneurial are still more adaptable than non-entrepreneurial individuals and are somewhat open to embracing uncertainty. From the entrepreneurship perspective, the process of establishing decentralised trust can also be seen as transforming non-entrepreneurial individuals into less entrepreneurial ones, and less entrepreneurial individuals into more entrepreneurial ones. Consequently, it is advantageous for a decentralised trust policy to facilitate stakeholders in becoming more entrepreneurial ones.

On this basis, it is believed that the determinants of entrepreneurship proposed by Miller (1983) are worthy of adaptable consideration. For instance, in the blockchain decentralised ecosystems, the role of leadership, as one of the entrepreneurial imperatives, warrants redefinition. In decentralised circumstances, leadership is not solely reliant on personality, power, and knowledge; it is more about acting as a blockchain node, contemplating how to autonomously influence other nodes. This could involve incorporating entrepreneurial orientations to stimulate the inherent entrepreneurial spirits of different stakeholders through executing decentralised trust policy. Ultimately, this would enable different stakeholders, or blockchain nodes, to possess entrepreneurial spirits, thereby generating a reliance on decentralised trust. It is notable that current public policies in China do not support the development of cryptocurrencies (Xiao, Xu, & Xue, 2024), so the incentives for stakeholders must be manifested in other forms, such as the Healthcare Contribution Points in this research. It is believed that if effectively utilised, regulated, and promoted, the Healthcare Contribution Points could play a vital role in the successful implementation of decentralised trust policy.

The second implication lies in the exploration of the prospect that the effectiveness of public policy execution may be influenced not only by the marketing efforts of policymakers but also, quite naturally, by the target audience at which the policy is directed. Traditionally, marketing functions in a unidirectional manner, with marketers initiating the propaganda process aimed at an audience, such as consumers, who passively receive messages and subsequently decide

whether to accept or reject them, possibly by taking practical actions, such as making a purchase. This unidirectional pattern also applies to the public sector, with policymakers initiating the political process aimed at the public, who are traditionally perceived as passive recipients of any messages disseminated by policymakers. The effectiveness of the policymaker's efforts largely hinges on the extent to which the public responds favourably to these initiatives. While this holds true for most conventional policy execution scenarios, the unique characteristics of blockchain technology may have transformed this unidirectional perspective into a more co-creative public choice decision-making process. The shift from unidirectional to bi-directional marketing is well-documented in the literature on interactive marketing and relationship marketing. For instance, Vargo and Lusch (2017) emphasises the importance of co-creation of value, where both the company and the consumer actively participate in the exchange process. In this thesis, it is claimed that the potential to conduct public sector marketing in a bi-directional way (company-oriented and consumer-oriented) could be empirically confirmed, leveraging the principles established by these foundational works in marketing theory.

This section reveals that the entrepreneurial spirits and viral marketing efforts remain integral to the performance of the blockchain decentralised ecosystems. Blockchain technology has garnered significant attention at the highest levels of political leadership, and the healthcare sector has been specifically singled out for optimisation. These top-level entrepreneurial spirits and marketing efforts have contributed to the successful launch and widespread media coverage of the blockchain healthcare ecosystem. However, discussions of Study 1 and Study 2 also demonstrate that the subsequent performance of the blockchain healthcare ecosystem can be influenced positively or negatively by its participants. A higher degree of trust and wholehearted embrace of the system by more participants leads to improved ecosystem resilience. Moreover, to ensure fairness within the decentralised ecosystems, a weighted voting system is suggested to be implemented, assigning greater voting weight to participants who make more substantial contributions to the system and vice versa. This weighted voting system promotes egalitarianism, which, in turn, is anticipated to enhance the public's attitudes across its cognitive, emotional, and behavioural dimensions. Consequently, satisfied participants

voluntarily engage in entrepreneurial spirits and viral marketing efforts, encouraging others to join, thus creating a positive feedback loop resembling what is envisioned in the theory of network externalities (Katz & Shapiro, 1985). Within the context of technology-enabled blockchain decentralised ecosystems, such as the one investigated in this research, public policy execution can be operated in two directions: policymakers' promotional endeavours (top-down approach); and stakeholders' entrepreneurial spirits and viral marketing efforts, which set in motion an escalating cycle of trust and attitude (bottom-up approach).

10. Limitations and Directions for Future Research

In this thesis, certain theoretical limitations have been recognised while exploring the concept of technology-mediated trust within the specific decentralised ecosystems. In contrast to the theoretical review in section 3.1, it is posited that trust, as a social construct, merits further theoretical investigations across various disciplinary frameworks. This is to assess their potential linkages to the formation of decentralised trust. In the domain of information technology, the application of Reputation System Theory by Zhou et al. (2021) could yield valuable insights into the interdependencies and intricate interactions among various stakeholders in decentralised ecosystems. This theoretical perspective is instrumental in elucidating the Interaction and Incentive Dynamics through which decentralised trust is established and sustained within these specified systems. Moving to the economic division, the utilisation of Game Theory by Esposito et al. (2020) is for examining the dynamics of decentralised trust in technology-based systems. Game Theory, with its focus on the strategic decision-making processes of individual entities and the resultant interdependent outcomes, is particularly pertinent. The concept of Prisoner's Dilemma, for instance, offers an understanding of trust dynamics in the decentralised context. It highlights how despite the potential for optimal collective outcomes through cooperation, the lure of individual gain can precipitate non-cooperative behaviours. In the political arena, an exploration of Public Choice Theory in the context of decentralised governance systems, such as those based on blockchain for public services, is adapted from Shughart and McChesney (2010). This theory, which applies economic principles to political processes, offers a novel conceptual perspective on the cultivation of decentralised trust. This approach underscores the role of governance structures in shaping trust dynamics in decentralised governance systems. These recommendations aim to address potential theoretical gaps in understanding and conceptualising decentralised trust, across various disciplinary lenses.

Building on the foundation of this thesis, it is essential to expand the scope of research to ascertain the generalisability of insights across diverse industries and global contexts. This

proposed extension aims to contribute to the broader understanding of blockchain technology's applicability beyond the healthcare sector and a specific geographic location. To realise this ambitious objective, it is imperative to replicate the research across various industries, including but not limited to finance, supply chain, and education. Each industry introduces unique challenges and opportunities that may significantly differ from those encountered in the healthcare domain. By conducting comparative analysis, researchers can pinpoint commonalities and distinctions in the obstacles and advantages of implementing blockchain decentralised ecosystems. For instance, the financial sector may present challenges related to transaction speed, while the supply chain industry may grapple with issues of traceability and transparency. Understanding these nuances is vital for formulating industry-specific strategies and best practices, contributing to a robust research framework for the broader adoption of blockchain technology. Moreover, expanding the research to consider different countries is paramount in unravelling the intricacies of blockchain implementation on a global scale. Variations in cultural norms, regulatory frameworks, and technological infrastructures might also impact the decentralised trust shaping processes. Investigating these applications in diverse countries will shed light on the contextual aspects that influence the acceptance and effectiveness of blockchain solutions. For instance, a comparative study between a technologically advanced economy and a developing nation can offer insights into the adaptability of blockchain technology in varied economic landscapes. By acknowledging and addressing these contextual aspects, the research can provide an understanding of the challenges and opportunities associated with global blockchain adoption, thereby contributing valuable knowledge to researchers, industry leaders, and policymakers worldwide.

As a critical avenue for future research, the exploration of targeting strategy within blockchain decentralised ecosystems should undergo further expansion across a spectrum of sectors and regions. By delving into diverse industries such as finance, manufacturing, and education, researchers can uncover insights into how varying technological landscapes and industry-specific challenges influence the targeting strategy within blockchain decentralised ecosystems. This multifaceted approach will not only enhance the granularity of the findings but also contribute to the development of universally applicable actions for resolving collective conflict

and optimising collective resource. For instance, in the finance sector, where rapid transactions are paramount, the emphasis on technological literacy and seamless user interfaces may be more pronounced. Conversely, in healthcare, considerations related to disease susceptibility and healthcare accessibility may take precedence. By conducting a sector-specific examination of targeting strategy, researchers can identify the unique aspects that shape stakeholder behaviour and preferences, thereby informing the design and implementation of blockchain decentralised ecosystems that align with the distinct requirements of each industry. Comparative analysis across regions can reveal patterns and trends that transcend specific industries, providing a holistic view of how cultural nuances and regional disparities impact the targeting strategy within blockchain decentralised ecosystems. This understanding will contribute to the formulation of actions that are adaptable across borders, fostering a more inclusive and globally relevant approach to collective resource allocation in blockchain decentralised ecosystems. In essence, this future research direction seeks to unravel the complexities of targeting strategy in the decentralised context, ensuring that the actions devised for resolving collective conflict and optimising collective resource are not only industry-specific but also adaptable to the diverse needs of stakeholders.

To address the impact of individuals' incentive levels on their willingness to participate in blockchain decentralised ecosystems, it is recommended to undertake cross-industry studies that span a spectrum of sectors. By examining the trust dimensions across diverse industries, researchers can identify both commonalities and distinctive features that influence stakeholders' attitudes and behaviours. This cross-industry research approach allows for a more nuanced understanding of how aspects, such as technological literacy and risk perception, manifest in different research contexts. Additionally, investigating industries with varying levels of familiarity and historical exposure to blockchain technology will contribute valuable insights into the adaptability of the proposed research frameworks across sectors. Furthermore, expanding the study to encompass cross-cultural dimensions is paramount. Cultural nuances significantly shape individuals' incentive responses to technological innovation. Therefore, an exploration of cognitive influences on blockchain participation should account for cultural variations, enabling the formulation of culturally sensitive strategies to foster engagement

across diverse social groups.

Moreover, the development of robust quantitative measurement scales to assess stakeholders' future intentions to participate in blockchain decentralised ecosystems necessitates thorough validation across industries and countries. This validation process should involve rigorous testing and calibration to ensure that the proposed scales maintain reliability and validity across diverse organisational and cultural contexts. Industry-specific nuances may influence the interpretation of intention indicators, and cultural aspects can impact the perceived value and trust associated with blockchain technology. Therefore, a systematic validation across industries will enhance the generalisability of the measurement scales. Similarly, the scales should be evaluated in different countries to account for variations in regulatory frameworks, technological infrastructures, and cultural predispositions. Validating the measurement scales internationally will contribute to the creation of a standardised toolset capable of capturing the diverse perspectives and expectations of stakeholders worldwide. This cross-industry and cross-cultural validation process is essential for building a solid foundation for future research, ensuring that the insights derived from the study are robust and could be applicable in a global context.

11. Conclusions

By focusing on Trust as a social construct, the blockchain decentralised ecosystems have been drawn parallelly to lay the groundwork for constructing the decentralised trust theory. Therefore, how decentralised trust can stimulate stakeholders' participation intention represents the major theoretical contribution of this thesis. Furthermore, centralised digital platforms have been contrasted with decentralised ecosystems, extending existing theories applicable in the centralised context to the decentralised one, followed by validation through longitudinal and empirical studies. This has deepened the discussion by Guo et al. (2020) on the contextual differences between centralised digital platforms and decentralised ecosystems. Moreover, considering the sensitivity of China's market volatility regarding cryptocurrencies in the private sector (Xiao, Xu, & Xue, 2024), the focus of blockchain applications has been shifted to the public sector, using Public Health as a starting point for primary data collection and analysis. Towards realising this objective, a two-stage investigation has been conducted that elucidates the potential of applying blockchain technology's decentralised principles to enhance the current healthcare system. In this research, stakeholders are likened to individual blockchain nodes, and a greater involvement of nodes in decision-making processes can effectively alleviate concerns regarding equity, a prevalent issue in centralised systems. However, insights gleaned from interviews have illuminated the fact that while a fully equitable voting mechanism is technically feasible, it does not inherently guarantee the desired level of collective objectivity or the optimal solution. This observation does not stem from a limitation of blockchain technology but rather underscores the necessity for a more refined decentralised mechanism. Such findings have also addressed the research gaps in public sector research on trust, represented by Boenigk and Möhlmann (2016). In essence, decentralisation's ultimate goal is to augment the comprehensiveness of the public service system rather than advocating for absolute deauthorisation. Under these circumstances, implications for decentralised trust theory, practice, and policy in public sector entrepreneurship and marketing have been extensively discussed, providing a clear future direction for researchers, practitioners, and policymakers. Lastly, the concept of Public-Private Blockchain mentioned in section 9.2 fills

an academic void on integrating the public and private sectors. As of the 16th of January 2024, although a conference paper submitted by Ghosh et al. (2021) in the information system domain has already mentioned the concept of Public-Private Blockchain, there has been no further authoritative exploration in academic papers. Furthermore, on the 3rd of January 2024, I submitted a paper titled *"A decentralized trust approach to a public-private blockchain decentralised ecosystems from the healthcare sector in China"* to the Academy of Management, aiming to make a continuous contribution to the emphasised research directions of this thesis in top journals. And this peer-reviewed paper, submission #13315 has been accepted for presentation at the 84th Annual Meeting of the Academy of Management taking place August 2024 in Chicago, Illinois and will be published in the AOM Annual Meeting Proceedings. On the 16th of March 2024, I submitted another paper titled *"The importance of trust in fostering a digital blockchain infrastructure in China's healthcare system"* to the Alan Turing Institute. And this peer-reviewed paper, submission #ICoTDI2\100007 has been accepted for presentation at the International Conference on Trustworthy Digital Infrastructure 2024 taking place May 2024 in Cape Town, South Africa and will be published by the Alan Turing Institute.

The following four feasible application suggestions have also been proposed particularly for blockchain healthcare. Primarily, the novel concept of Healthcare Computing Power has been introduced. Healthcare Computing Power draws parallels with the computational intensity seen in cryptocurrency transactions. For instance, Bitcoin transactions entail intricate calculations beyond the capacity of a single node. Blockchain technology's capability to distribute such computations and involve participants in decentralised computing is pivotal. Miners partaking in distributed computing receive compensation in Bitcoin corresponding to their contributions to these distributed calculations. In the implementation of a distributed computing framework within a blockchain healthcare ecosystem, it becomes evident that certain complex healthcare conditions may necessitate substantial contributions from individual hospitals, indicating varying degrees of Healthcare Computing Power. Hence, it is imperative to apportion voting weights based on distinct Healthcare Computing Power, thereby incentivising doctors, or hospitals in proportion to their healthcare contribution scores.

Secondly, with the introduction of Healthcare Computing Power, it is underscored that absolute egalitarianism does not ensure absolute fairness. The central objective of a blockchain healthcare ecosystem should be the attainment of collective objectivity in healthcare solutions, while concurrently safeguarding the privacy and security of each node throughout decentralised decision-making processes, thus mitigating the conformity bias among stakeholders. The incorporation of transparent voting and anonymous voting mechanisms can significantly enhance the collective objectivity of decision-making processes.

Thirdly, notwithstanding arguments that the distribution of voting weights may hint at centralised authority due to Healthcare Computing Power disparities, the collective goal of augmenting decentralisation within the healthcare system can be achieved through a three-step process. The initial step incorporates the adoption of a hierarchical diagnosis and treatment model, encouraging increased participation of secondary and community hospitals to effectively counter the information silo effect engendered by authoritative hospitals. The second step involves the implementation of decentralised representative selection, wherein representatives are elected through relatively equitable voting within each stakeholder group. Subsequently, voting weights may be evenly distributed among representatives of each stakeholder group or differentiated based on distinct healthcare service scenarios. The third step entails the optimisation of algorithms governing decentralised voting mechanisms, factoring in variables such as the challenges faced by each node in proposing or comprehending healthcare solutions. This facilitates the computation of a weighted index predicated on each node's consistency, efficiency, and synergy in decision-making processes, which can be employed to differentiate voting weights or evaluate Healthcare Computing Power.

Lastly, in the pursuit of a harmonious equilibrium between egalitarian principles and decentralised structures, it is imperative to acknowledge and prioritise the fundamental tenet of decentralised trust: consensus readiness. Patients, being the sole stakeholders with full awareness of the entire diagnosis and treatment process, essentially become the nodes within the blockchain healthcare ecosystem capable of evaluating the entire system based on their service experiences. Recognising cognitive disparities, decentralised ecosystems should not

merely transpose evaluation mechanisms from centralised contexts, such as those employed in user evaluations of e-commerce platforms. Instead, pragmatic mechanisms should be implemented to facilitate real-time user involvement throughout the treatment process. This ensures active engagement from diverse stakeholders while establishing clear roles within the healthcare service scenario. The proposed process unfolds in two developmental stages. The initial stage involves leveraging blockchain technology to render the healthcare chain traceable and publicly transparent within decentralised decision-making processes. Through decentralised representative selection, two to three practical and distinct solutions from numerous medical cases could receive ultimate approval. The second stage entails the implementation of the consensus readiness principle, wherein nodes with lower Healthcare Computing Power, irrespective of their institutional or individual status, partake in the final round of voting to further refine the remaining solutions. Additionally, public sector research efforts on trust should ensure that every node gains an understanding and once a fundamental consensus is reached, casts a vote to determine the collective interest.

It is posited that the implementation of the egalitarian decentralised trust approach, coupled with the harmonious integration of Values in Action, Interaction Dynamics, Performance Synchrony, Trust Shaping Capabilities, Incentive Dynamics, and Conducive Trustworthy Environment, can culminate in the establishment of a more sophisticated blockchain healthcare ecosystem. Ultimately, the attainment of decentralised trust within this ecosystem becomes a viable objective. Researchers should consider promoting decentralised approaches that involve multiple stakeholders in decision-making processes to address fairness concerns inherent in centralised healthcare systems. Policymakers and practitioners should explore the implementation of blockchain-based solutions to foster a more intelligent healthcare system. Furthermore, a comprehensive set of cryptographic algorithms should not solely focus on achieving absolute fairness through technical means but should also emphasise the importance of ensuring collective objectivity and the delivery of optimal healthcare solutions. By leveraging the collective benefit/interest exchanges, individuals are empowered to employ their private cryptographic keys to securely access and manage information. The integration of real-time traceability features further facilitates the active involvement in blockchain decentralised

ecosystems, thereby fostering enhanced synergy among the participating entities. This increases the consensus readiness of the whole decision-making process and fosters decentralised trust between citizens and public service providers.

Broadening the research scope to incorporate additional industries and countries presents an imperative future research direction, poised to yield a conceptual research framework for the efficacious implementation of blockchain technology. This cross-disciplinary and cross-cultural research approach promises to be a pivotal contribution to scholarly discourse, enriching the understanding of the intricate dynamics, e.g., Incentive Dynamics, involved in blockchain decentralised ecosystems. The insights derived from diverse sectors and global contexts will serve as a guiding beacon for researchers, practitioners, and policymakers alike, facilitating the cultivation of Conducive Trustworthy Environment across a spectrum of research domains and disciplines at a global scale. This expansion is not only a widening of the research landscape but also a strategic research method to cultivate an applicable knowledge base that could elevate blockchain applications across different borders and industries.

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Appendices

Appendix 1: Interview Guide (Study 1)

Introduction

Thank you for meeting with me today and offering to take part in this study. I would like first to outline the study so that you are able to decide whether you wish to proceed further (recap participant information sheet). Sign consent form *2 (one for participant and one for interviewer). I have a list of topics that I want to address, consisting of main questions and optional questions. Feel free to ask questions at any stage during the interview. I might make a few notes in case I want to come back to something later.

Questions

Question 1.1 (Q1.1): What does a blockchain healthcare ecosystem mean for you or your organisation?

Researcher's notes and prompts: The aim of this question is to reveal their perceptions of blockchain decentralised ecosystems, and to come up with a definition from this study. Prompts could include quotes from related definitions in secondary strategic documents or publications.

Question type: optional question at the strategic level

Question 1.2 (Q1.2): How could you or your organisation be able to establish trust in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to reveal their perceptions of Ability, and to come up with a definition in decentralised circumstances. Prompts could include quotes from related definitions in secondary strategic documents or publications.

Question type: main question at the strategic level

Question 1.3 (Q1.3): How could you or your organisation care for other involved parties in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to reveal their perceptions of

Benevolence, and to come up with a definition in decentralised circumstances. Prompts could include quotes from related definitions in secondary strategic documents or publications.

Question type: main question at the strategic level

Question 1.4 (Q1.4): How could you or your organisation be credible in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to reveal their perceptions of Credibility, and to come up with a definition in decentralised circumstances. Prompts could include quotes from related definitions in secondary strategic documents or publications.

Question type: main question at the strategic level

Question 1.5 (Q1.5): How could you or your organisation preserve its integrity in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to reveal their perceptions of Integrity, and to come up with a definition in decentralised circumstances. Prompts could include quotes from related definitions in secondary strategic documents or publications.

Question type: main question at the strategic level

Question 1.6 (Q1.6): How could you or your organisation communicate with other involved parties to put together a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to investigate the perceived pleasantness when organisation communicates with other parties in blockchain decentralised ecosystems, and to further justify Communication in decentralised circumstances. Prompts could include quotes from related definitions in secondary strategic documents or publications.

Question type: main question at the strategic level

Question 1.7 (Q1.7): How could the reputation of you or your organisation be affected in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to clarify the importance of Reputation for an organisation to build up trust with other parties in blockchain decentralised

ecosystems, and to further justify Reputation in decentralised circumstances. Prompts could include quotes from related definitions in secondary strategic documents or publications.

Question type: main question at the strategic level

Question 1.8 (Q1.8): How could you or your organisation enhance the level of satisfaction by other parties in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to seek the strategic methods of enhancing the perceived Satisfaction in blockchain decentralised ecosystems, and to further justify Satisfaction in decentralised circumstances. Prompts could include quotes from related definitions in secondary strategic documents or publications.

Question type: main question at the strategic level

Probes

-You mentioned ___, can you tell me more about that.

-What happened then?

-Can you describe what that felt like?

-Can you tell me how would typically go about doing ___, will you do something different in blockchain healthcare ecosystem?

-Is there anything else you would like to share about ___?

End of Interview

Anything else that the interviewee feels has been missed and anything that they have not got a chance to discuss fully. Anyone else that would be useful to speak to. Thank you for your participation.

Appendix 2: Interview Guide (Study 2)

Study 2.1 Entrepreneurs

Introduction

Thank you for meeting with me today and offering to take part in this study. I would like first to outline the study so that you are able to decide whether you wish to proceed further (recap participant information sheet). Sign consent form *2 (one for participant and one for interviewer). I have a list of topics that I want to address, consisting of main questions and optional questions. Feel free to ask questions at any stage during the interview. I might make a few notes in case I want to come back to something later.

Questions

Question 2.1 (Q2.1): What do you think about the decentralised nature of a blockchain ecosystem for the healthcare sector as an entrepreneurial opportunity?

Researcher's notes and prompts: The aim of this question is to highlight the necessity of positioning public sector entrepreneurship and marketing, and to further justify trust in blockchain decentralised ecosystems. Prompts could include quotes from related definitions in secondary strategic documents or publications as well as from results of Study 1.

Question type: optional question at the strategic level.

Question 2.2 (Q2.2): How could you or your organisation be able to establish trust in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit Ability in the decentralised context.

Question type: main question at the strategic level

Question 2.3 (Q2.3): How could you or your organisation care for other involved parties in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit Benevolence in the decentralised context.

Question type: main question at the strategic level

Question 2.4 (Q2.4): How could you or your organisation be credible in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit Credibility in the decentralised context.

Question type: main question at the strategic level

Question 2.5 (Q2.5): How could you or your organisation preserve its integrity in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit Integrity in the decentralised context.

Question type: main question at the strategic level

Question 2.6 (Q2.6): How could you or your organisation communicate with other involved parties to put together a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit Communication in the decentralised context.

Question type: main question at the strategic level

Question 2.7 (Q2.7): How could the reputation of you or your organisation be affected in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit Reputation in the decentralised context.

Question type: main question at the strategic level

Question 2.8 (Q2.8): How could you or your organisation enhance the level of satisfaction by other parties in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit Satisfaction in the decentralised context.

Question type: main question at the strategic level

Question 2.9 (Q2.9): How could the ability of working well together with other parties affect your participation intention to join a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Synergy in decentralised circumstances. It is seen as the empirical research to validate Synergy as an inductive code informed by results of Study 1.

Question type: main question at the strategic level.

Question 2.10 (Q2.10): How could practices of collective benefit/interest exchanges affect your participation intention to join a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Mutuality in decentralised circumstances. It is seen as the empirical research to validate Mutuality as an inductive code informed by results of Study 1.

Question type: main question at the strategic level.

Question 2.11 (Q2.11): How could efficient operations affect your participation intention to join a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Efficiency in decentralised circumstances. It is seen as the empirical research to validate Efficiency as an inductive code informed by results of Study 1.

Question type: main question at the strategic level.

Question 2.12 (Q2.12): How could consistent decision-making processes affect your participation intention to join a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Consistency in decentralised circumstances. It is seen as the empirical research to validate Consistency as an inductive code informed by results of Study 1.

Question type: main question at the strategic level.

Question 2.13 (Q2.13): How could privacy and security concerns affect your participation intention to join a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Privacy and Security in decentralised circumstances. It is seen as the empirical research to validate it as an inductive code informed by results of Study 1.

Question type: main question at the strategic level.

Question 2.14 (Q2.14): How could you or your organisation transmit information, channel organisational or media influence, and enable attitudinal or behavioural change differently in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to highlight the necessity of positioning public sector entrepreneurship and marketing, and to further justify trust in blockchain decentralised ecosystems. Prompts could include quotes from related definitions in secondary strategic documents or publications as well as from results of Study 1.

Question type: optional question at the strategic level if the respondents have explained how to minimise the concerns related to trust in answering **Question 2.1 (Q2.1)**.

Question 2.15 (Q2.15): What could be the potential costs, both monetary and nonmonetary, for you or your organisation to provide good and/or service in a blockchain healthcare ecosystem?

Researcher's notes and prompts: The aim of this question is to highlight the necessity of positioning public sector entrepreneurship and marketing, and to further justify trust in blockchain decentralised ecosystems. Prompts could include quotes from related definitions in secondary strategic documents or publications as well as from results of Study 1.

Question type: optional question at the strategic level if the respondents have explained how to minimise the concerns related to trust in answering **Question 2.1 (Q2.1)**.

Study 2.2 Patients

Introduction

Thank you for meeting with me today and offering to take part in this study. I would like first to outline the study so that you are able to decide whether you wish to proceed further (recap participant information sheet). Sign consent form *2 (one for participant and one for interviewer). I have a list of topics that I want to address, consisting of main questions and optional questions. Feel free to ask questions at any stage during the interview. I might make a few notes in case I want to come back to something later.

Questions

Question 2.16 (Q2.16): Do you think a new healthcare system should be centrally controlled or be more decentralised, and why?

Researcher's notes and prompts: The aim of this question is to highlight the necessity of positioning public sector entrepreneurship and marketing, and to further justify trust in blockchain decentralised ecosystems. Prompts could include quotes from related definitions in secondary strategic documents or publications as well as from results of Study 1.

Question type: optional question at the individual level.

Question 2.17 (Q2.17): How would you make sure you could understand technology innovations in a new healthcare system?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Mass Education in decentralised circumstances. It is seen as the empirical research to validate it as an inductive code informed by results of Study 1.

Question type: main question at the individual level.

Question 2.18 (Q2.18): Would you be voluntarily responsible for clarifying and fulfilling different duties in a blockchain healthcare ecosystem, and why?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Voluntary Responsibility in decentralised circumstances. It is seen as the

empirical research to validate it as an inductive code informed by results of Study 1.

Question type: main question at the individual level.

Question 2.19 (Q2.19): How important is the privacy and security of a new healthcare system regarding your personal data and healthcare services, and why?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Privacy and Security in decentralised circumstances. It is seen as the empirical research to validate it as an inductive code informed by results of Study 1.

Question type: main question at the individual level.

Question 2.20 (Q2.20): How would you assess the service convenience in using a new technology in the healthcare system?

Researcher's notes and prompts: The aim of this question is to revisit the conceptual importance of Service Convenience in decentralised circumstances. It is seen as the empirical research to validate it as an inductive code informed by results of Study 1.

Question type: main question at the individual level.

Probes

-You mentioned ___, can you tell me more about that.

-What happened then?

-Can you describe what that felt like?

-Can you tell me how would typically go about doing ___, will you do something different in blockchain healthcare ecosystem?

-Is there anything else you would like to share about ___?

End of Interview

Anything else that the interviewee feels has been missed and anything that they have not got a chance to discuss fully. Anyone else that would be useful to speak to. Thank you for your participation.