Malaysia's National Blockchain Roadmap: A Critical Discourse Analysis of Focus, Goals, and Challenges

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Abstract

This Critical Discourse Analysis (CDA) study examines Malaysia's National Blockchain Roadmap 2021-2025, assessing its focus, goals, future development plans, and challenges based on text and context analysis. The study reveals that the roadmap presents a comprehensive strategy aimed at leveraging blockchain technology to drive economic growth, foster innovation, and enhance Malaysia's competitiveness in the digital age. It emphasizes government adoption, regulatory clarity, industry collaboration, talent development, infrastructure investment, and use case exploration to lay the foundation for Malaysia to emerge as a global leader in blockchain innovation. Through strategic initiatives and partnerships, Malaysia aims to streamline administrative processes, enhance transparency, and optimize resource allocation within public agencies, showcasing its commitment to digital transformation and socioeconomic development. Additionally, the roadmap prioritizes the development of a robust regulatory framework to govern blockchain usage, fostering innovation while ensuring compliance. Industry engagement is underscored with initiatives aimed at catalyzing the development of industry-specific blockchain solutions tailored to address key challenges and opportunities. The roadmap anticipates further development and expansion driven by technological advances, evolving regulatory frameworks, and industry collaboration. Based on the context analysis, the roadmap faces several challenges, including regulatory uncertainty, interoperability issues, resource constraints, lack of trust, intellectual property concerns, and competing priorities. To overcome these challenges, Malaysia needs to advance in technology, regulatory frameworks, industry collaboration, education, talent development, infrastructure investment, and use further case exploration.

Keywords: Blockchain, Critical discourse analysis, textual analysis, context analysis, Malaysia

1. Introduction

Blockchain is a cryptographic technology first employed to facilitate online cryptocurrency transactions for platforms like Ethereum, Bitcoin, and others. The blockchain's history began in 2009 when it was included in the Bitcoin source code to address issues with actual cash. Blockchain may be considered a sequential distributed database where all previous transaction history is shared and kept in a public ledger in the form of a (block) chain. (Van Alstyne, 2014). New blocks are added continually, causing the chain to expand. Distributed consensus techniques and asymmetric cryptography are employed to provide user security. Blockchain technology has gained popularity since 2016. As of now, there are over 700 cryptocurrencies listed. Blockchain technology's emergence is primarily driven by its immutability, transparency, and lower total cost of ownership. As previously mentioned, blockchain technology was first used to manage various cryptocurrencies. However, these days, it can also be used in other fields, like smart contracts (Kosba et al., 2016), online payments and other financial services (Foroglou & Tsilidou, 2015), the Internet of Things (IOT) (Zhang & Wen, 2015), security, and digital identity, among others.

According to estimates, the blockchain market will be worth $163.83 billion by 2029, growing at an astounding compound annual growth rate of 56.3%. Moreover, it is anticipated that by 2024, worldwide spending on blockchain solutions will amount to $19 billion (Ruby, 2023). A poll revealed that 46% of respondents intended to invest in sensors, the Internet of Things (IoT), and blockchain technology to enhance logistic transparency and merge items' virtual and physical aspects in SCs (Placek, 2020). Initially, countries and regulating bodies viewed blockchain and cryptocurrencies with caution. Slowly, some countries started accepting them and developing regulations governing their use. In some countries (i.e., Switzerland, Malta, Estonia, Japan, South Korea, the Bahamas, Netherlands, Germany, Hong Kong, and Canada) cryptocurrencies were legalized. They became acceptable for public tender, and some other countries (i.e., Indonesia, Luxembourg, Argentina, Cyprus, Slovenia, and Turkey) started taxing these cryptocurrencies as they viewed them as assets.

Despite its success in other countries and sectors, Blockchain has not yet passed its infancy in Malaysia (Nazim et al., 2021). Malaysians are unfamiliar with Blockchain technology and lack applicable rules (Al-Shamori et al., 2023). Malaysians are more interested in Blockchain as the world pursues different technological breakthroughs. Despite lacking local laws, the government is open to using Blockchain in renewable energy, palm oil, and Islamic finance sectors (Nazim et al., 2021). Blockchain technology has also been applied in several domestic areas. Through the Ministry of Science, Technology, and Innovation, the Malaysian government developed Malaysia's National

Blockchain Roadmap 2021-2025[i]. This study examines Malaysia's National Blockchain Roadmap 2021-2025 from a critical discourse analysis (CDA) perspective to look into the areas of interest, challenges, and methods the Malaysian government intends to take to overcome these challenges.

2. Literature Review

Blockchain technology is a sophisticated database that distributes it over several computers, or "nodes," and does away with the need for middlemen or central authority. Because every node on the network has the same privileges, it fosters a peer-to-peer network where every transaction is safely signed by cryptographic techniques that guarantee consistency, immutability, and traceability (Ledger, 2022). Consensus, a validation procedure, is used to cryptographically connect each block of data to the one before it to add information to the database. Older blocks become harder to change when new ones are introduced. According to Yaga et al. (2019), the network replicates new blocks across copies of the ledger and automatically resolves disputes using its set of rules.

Some essential aspects of blockchain technology are derived from its structure, and these qualities can potentially transform a number of industries, including the built environment (Li et al., 2019). Immutability, or the inability to modify data once it has been put into the blockchain network, is the first noteworthy attribute. Each block holds transaction data, a timestamp, and a cryptographic hash of the block before it. Because changing one block would require changing every other block, so data saved in a block cannot be updated (Atlam et al., 2018). Consensus is another aspect that gives the blockchain network dependability. A consensus algorithm makes sure that all transaction data is the same between blocks; in the case of Bitcoin, this is Proof of Work. To put it simply, Proof of Work is a method that rewards financial incentives to nodes in the blockchain network in return for their ability to solve a challenging mathematical problem (Euromoney, 2023). Blockchain technology also includes additional aspects like data traceability and integrity. Users may easily track past transactions that have been verified and stored on the blockchain by gaining access to any node in the dispersed network of the blockchain (Perera et al., 2020). Additionally, every block is connected to the genesis block, the first block in the chain, guaranteeing the blockchain's integrity (Nofer et al., 2017).

However, even though these traits are common to all blockchain technologies, it's vital to remember that every blockchain network is unique and has unique properties. Generally speaking, there are two categories of blockchain technology: public and private, each with unique characteristics (Tasca & Tessone, 2019). Two of the most well-known public blockchains are Ethereum and Bitcoin. Anyone may access the public blockchain, commonly known as the permissionless blockchain. More peers may participate and validate the network transactions due to its broad accessibility, making the network more traceable, transparent, immutable, and downtime-free (Tapscott & Tapscott, 2016). Permissionless blockchain solutions also have drawbacks, such as being unsuitable in scenarios where nodes must keep transaction data secret from other users due to their complete transparency and accessibility. Blockchain technology is always developing, allowing it to acquire new features. With the introduction of smart contracts by Ethereum, peers on blockchain networks could now execute programs and enforce contract conditions without depending on a third party they could trust (Han et al., 2020).

Changes are performed to a private blockchain when most nodes (or all of them unanimously, depending on the network structure) achieve a consensus. This is in contrast to a public blockchain with many participants (authorized by the network owner) (Perera et al., 2020). One example of a private or permissioned blockchain platform is the Linux Foundation's Hyperledger Fabric platform. When consumers are hesitant to share data with other participants, a private blockchain is a useful solution since it allows them to regulate the openness of their data (Boucher, 2017). Furthermore, the small number of users creates a more controlled environment and speeds up this kind of blockchain (Haritonova, 2021). Nevertheless, in contrast to public blockchains, they cannot offer a completely decentralized system because of the small number of nodes in this form of blockchain. Few nodes can also increase the chance of database outages, which could cause interference with network operations.

Blockchain technology does not in and of itself cause regulatory problems; rather, it only establishes an infrastructure or platform that facilitates many uses. This contrasts with something like crypto-assets, which have the potential to upend established value-transfer systems and have governments everywhere frantically trying to figure out the legal ramifications. Most authorities have made positive remarks about blockchain technology, in contrast to crypto-assets. Many nations, led by the United Kingdom, have adopted or are investigating the concept of "regulatory sandboxes" for blockchain (and other forms of) innovation, including Australia, the United States, Hong Kong, Malaysia, Singapore, Switzerland, Thailand, and the UAE (Faden, 2019, p. 14). If an enterprise complies with specific consumer protection standards, it can test new business models in a regulatory sandbox without worrying about repercussions from the authorities. According to the Reserve Bank of India's Press Releases from 2016, the RBI's Report of the Working Group on FinTech and Digital Banking appears to suggest further that the RBI would consider regulatory sandboxes for India. Another idea included in the draft Payment and Settlement Systems Bill, 2018 is a regulatory sandbox. Separately, as previously noted, reports have indicated that the governments of Sweden, the Netherlands, the United Kingdom, China, Japan, India, Canada, and the United States are investigating the possibility of issuing digital copies of fiat money via blockchain technology (Ward & Rochemont, 2019).

Regulations change as we cross borders. The Internet has now blurred national borders: You can conduct a legal transaction within a country in which you are not physically located with the press of a button on your computer, although there is still uncertainty surrounding the regulatory environment and emerging technology (McCracken, 2019). Since our legal systems are founded on national boundaries, it is important to understand which laws apply and which governments can enforce them, particularly in the nations where any legal conduct has been carried out. Still, the law's real applicability is restricted (Naves et al., 2019). Since Blockchain technology is decentralized and each

legal jurisdiction establishes its conditions for applicability, it is impossible to identify which laws apply to Blockchain generally. Therefore, it makes sense that a Blockchain transaction would fall within the jurisdiction of a certain State's civil law and that State authorities could impose taxes on the same transaction. Depending on the situation, laws from several legal systems may apply to a blockchain (Bazel et al., 2023; Naves et al., 2019).

Blockchain provides an alternative perspective on the existing judicial system. This does not imply that there are no significant legal framework-related concerns raised by blockchain technology (Salmon & Myers, 2019). Applying blockchain technology, distributed autonomous organizations, or DAOs for short, and smart contracts poses important and thought-provoking legal issues, the answers to which are not always clear-cut. According to Balboni (2019), three laws can be applied to blockchain: Contract Law, Intellectual property law, and Personal data protection law. Therefore, countries need to look into all possibilities before implanting blockchain as they need to regulate the usage, the challenges, and the possibilities. Malaysia did this in Malaysia's National Blockchain Roadmap 2021-2025. Using critical discourse analysis, this study examines this roadmap to examine the topics of interest, the difficulties, and the approaches the Malaysian government plans to use to solve these difficulties.

Van Dijk (1998) defined critical discourse analysis as studying and examining written and spoken texts in social, cultural, historical, or political settings to highlight discursive features, including prejudice, inequality, dominance, and power. Nonetheless, one of the pioneers of critical discourse analysis, Fairclough (1993), asserts that the field aims to investigate the relationship between discourse practices and the broader social and cultural context. It also investigates how language conventions mirror power relations. Therefore, critical discourse analysis is "not a homogeneous method, nor school, or paradigm, but at most a shared perspective on doing linguistic, semiotic, or discourse analysis" (Van Dijk, 1993. P. 131) rather than a simple subject of study or a conceptually limited idea. Critical discourse analysis was used in several studies to investigate public speeches (AlAfnan, 2022a, 2022b, AlAfnan & Dishari, 2024) and written documents (AlAfnan & Oshchepkova, 2022). It also investigated several linguistics and pragmatic features (AlAfnan, 2024).

Instead of using the term Critical Discourse Analysis (CDA), Van Dijk prefers the term Critical Discourse Studies (CDS). He argues that Critical Discourse Studies incorporate various methods and concepts from psychology, critical linguistics, social sciences, and humanities, making it more than just a method (van Dijk, 2009, p.62). To facilitate further discussion, van Dijk introduces and defines key notions related to cognition, such as cognition, cognitive processes, and ideology, in his books (van Dijk, 2009, p.64-65). However, it is important to note that the Social Cognition Approach is not limited to social and cognitive studies. Specifically, it also examines the mental representation of discourse users, the production and comprehension processes of discourse, and the ideologies shared by society. For instance, in van Dijk's studies on racism (1984, 1987, 1991) and ideology (1998), both social and mental phenomena are analyzed through his approach.

3. Methodology

The study critically examines Malaysia's National Blockchain Roadmap 2021-2025 to survey the areas of interest and challenges presented using CDA. As mentioned earlier, CDA is not a single paradigm for examining discourse analysis (AlAfnan, 2021). It examines social, cultural, historical, and/or political texts to highlight discursive features. This study examines the discursive features in the text by examining the social, cultural, and political perspectives. This includes inferences (AlAfnan & Jovic, 2024) about implicature and explicature.

The use of CDA examines the text in context (See Figure 1). CDA is employed to critically examine texts for traces of power, dominance, inequality, and bias. This analysis focuses on exploring how discursive practices are maintained and reproduced within specific socio-political and historical contexts (van Dijk, 1998). The exploration is systematic, dissecting the opaque discursive relationships of causality and determination within socio-cultural textual processes (Fairclough, 1993). Fairclough proposes a three-part framework for critically analyzing communicative acts, encompassing text (micro level), discourse (meso level), and sociocultural (macro level) interpretation (Fairclough, 1995). He views text from multifunctional perspectives, analyzing its functions in terms of representation, relations, and identities. Discourse practices refer to the processes through which a text takes its final shape, whether through production or changes brought by consumption. In this regard, the context includes the progress in achieving the goals in the roadmap based on recent outcomes of academic research based on empirical studies in several areas and industries. This includes work published on identity management, supply chain, real estate, halal industry, land registration, infrastructure, education, and government development.

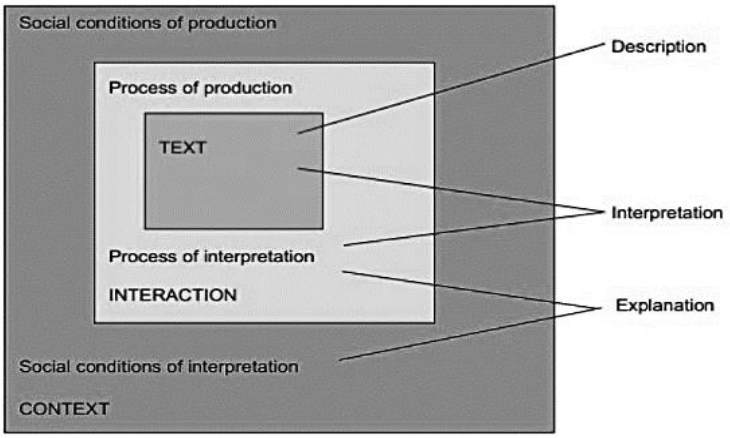

Figure 1. Discourse as text, interaction, and context (after Fairclough, 1989; Thompson, 2005)

From the discourse point of view, the study examines the organization of the document. This includes the number of chapters, the number of pages for every single chapter, the number of headings, and the number of tables and figures in these chapters. The discourse in these chapters will be analyzed based on the focus and provided goals.

Finally, based on the focus, the set goals, and the current development, this study provides possible future directions and development roadmaps based on context analysis based on recent research carried out by scholars and stakeholders directly involved in Malaysia's blockchain industry. All this is documented in published peer-reviewed articles indexed in reputable journals.

4. An Overview: Malaysia's National Blockchain Roadmap 2021-2025

Malaysia's National Blockchain Roadmap 2021-2025 is a government-based roadmap that the Ministry of Science, Technology, and Innovation publishes. The document is 46 pages and includes an executive summary and five chapters. The chapters are named (1) introduction, (2) Blockchain Technology Overview, (3) Use Cases for Blockchain Technology, (4) Strategic Areas for National Blockchain Development, and (5) Building Blockchain Ecosystem (See Table 1).

Table 1. Overview of Malaysia's National Blockchain Roadmap 2021-2025

Chapter Name	**Subheadings**	**No. of pages**
Executive Summary	Nil	4
1. Introduction	1.1. Background	1
2. Blockchain Technology Overview	2.1 Chapter Objective 2.2 Value Propositions 2.2.1 Trustlessness 2.2.2 Transparency 2.2.3 Immutability	1
3. Use Cases for Blockchain Technology	Iv. Privacy v. Security 3.1 Chapter Objective 3.2 Blockchain Global Trend Adoption of Blockchain 3.5 Malaysia Blockchain Adoption Scenario 3.5.1 Awareness Level 3.5.2 Perception towards Blockchain 3.5.3 Malaysia Blockchain Activities 3.5.4 Perceived Blockchain Adoption Barriers	12
4. Strategic Areas for National Blockchain Development	4.3 Strategic Areas 4.3.1 Asset tracking 4.3.2 Document management 4..3.3 Workflow management 4.3.4 Use Case Selection	4
5. Building Blockchain Ecosystem	Ecosystem Enablers Blockchain Acceleration Hub (BAH) 5.3.2.2 Malaysia Blockchain Infrastructure (MBI) 6.1.2 Malaysia's Position in World Trade and Trade Efficiency 6.3 Possible Scenarios for Blockchain in Malaysia Vaccine Management and Certification Ecosystem	14

The document (the roadmap) included many tables and figures. In total, the roadmap included 18 tables and 11 figures. These tables and figures were introduced to provide condensed information in a visual form to assist in digesting the information by readers. Interestingly, not

all tables and figures were named. Of the 18 tables, 12 only had names, and the remaining 6 did not have names. Out of the 11 figures, 9 figures had names and the remaining 2 figures did not have names. This does not include the figure on national policies, plans, and roadmaps, with contributions of blockchains (figure 4.1), presented in three separate figures on 2 different pages.

Table 2. Number of tables and figures in the roadmap

Chapter	No. of tables	Chapter	No. of figures
Excursive summary	0	Excursive summary	1
Chapter 1	0	Chapter 1	0
Chapter 2	0	Chapter 2	0
Chapter 3	9	Chapter 3	3
Chapter 4	0	Chapter 4	1
Chapter 5	3	Chapter 5	4

The distribution of tables and figures reveals that Chapter 3 and Chapter 5 had the highest number of tables and figures, which reflects the density of the information communicated in these chapters. The figure in the executive summary part communicates the strengthening of Malaysia's leadership position in Blockchain for economic competitiveness and Growth through cohesive strategic collaboration and synergistic. The placing of this figure in the executive summary reveals the position that the roadmap aims to achieve and its methods. The strategic planning focuses on 5 ecosystem building blocks, 20 strategic initiatives, economic sectors, and enabling technologies. The roadmap outlines the 5 ecosystem building blocks of collaboration, amplifier, talent, legal and governance, and enabler. In regards to the 20 strategic initiatives, the roadmap outlines 10 government-led core programs and 9 supporting programs. Regarding the economic sectors, the roadmap outlines trade facilitation, logistics and supply chain, halal tracking, vaccine tracking, and e-government. Regarding the enabling technologies, the road map outlines Malaysia's blockchain infrastructure, notification, and zero-knowledge proof mechanism.

In the introduction chapter, the importance of blockchain and its development have been outlined. After that, the scope of the roadmap has been specified as providing “a generic conceptual schema for technology commonality and reusability” (NBR, 2021, P. 4). The roadmap also emphasizes that adaptation of blockchain does not only involve technology-based literacy and requirements, but also socio-economic transformation. The socio-economic transformation means were not explained and are not expected to be outlined in the introductory chapter. However, the technological aspects of blockchain were introduced in a way that emphasizes trustworthiness and integrity elements. Regarding technology, the roadmap outlines that blockchains are built upon well-known cryptography methods and, to a lesser extent, econometric game theory. These methods allow distributed computing systems to function without implicit trust in any specific server or operator, which is necessary to provide existing ICT services. With the practical results of process rationalization, acceleration, automation, and tamper-proofing, this idea of systemic trustlessness would propel the process of “trust re-intermediation” from current systems, producing results that exploit the technical characteristics of blockchain, namely information integrity, immutability, transparency, and completeness. This chapter establishes that blockchain technology is safe as it was previously tested, and its usage shall be encouraged.

The second chapter aims to provide an overview of blockchain technology while highlighting its applications in solving practical issues. This chapter aims to explain and give a non-technical exposition of the inherently technical aspects of blockchain technology. It's critical to remember that every technology has inherent restrictions and value propositions that make it appropriate for certain use cases but not others. In regards to value propositions, the roadmap stated that compared to a traditional single source of truth systems, which are often centered on a single service provider running a database that maintains the system's state and is assumed to be unchangeable, blockchain and distributed ledger systems are very different. A node consensus multiplicity is needed to decide on each subsequent stage of the system's growth since blockchain systems often contain numerous node servers competing over the system’s changing state. Therefore, the chapter outlines trustlessness, transparency, immutability, and privacy in terms of non-identifiability, non-traceability, and non-likability as blockchain characteristics. This chapter intends to establish trust in the usage of blockchain technology.

The third chapter examines blockchain use cases in a global setting, providing an overview and analysis of (1) the current status of blockchain technology, specific use cases from different industries, and the factors driving and impeding their adoption; (2) an estimate of potential new use cases and the speeds at which different industries are currently adopting blockchain technologies; (3) the structure of blockchain ecosystems and their parts. The roadmap outlines that the main blockchain market hotspots are the public sector, real estate, healthcare, finance services, and agriculture. The roadmap made use of a report by the Technology Association of Georgia, Deloitte, as it notes that industry-specific investment in blockchain varies, with professional services, financial services, energy and resources, and life science and health care ranking as the top 4 industries planning to boost their blockchain in the next 12 months. This chapter provides an overview of the adaptation of blockchain technology in various countries worldwide and outlines the sectors that use blockchain technology. After that, it looks into Malaysia’s blockchain adaptation scenarios regarding awareness levels, perception, activities, and barriers.

The fourth chapter outlines the Strategic Areas for National Blockchain Development in Malaysia. The chapter outlined several Malaysian policies and laws and looked into the ways of implementing these policies and laws in the implementation of blockchain in Malaysia. These plans and policies included the National Anticorruption Plan, the Malaysian Cyber Security Strategy, Industry 4WRD Policy, Pelan, Stretgik Pendigitalan Awam 2021-2025, Shared Prosperity 2030, Halal Industry Master Plan, and National loT Strategic Roadmap. The chapter looked at strategic areas such as assist tracking, document management, and workflow management. The examination looked into areas such as suitability in terms of applicability, impact in terms of case development, urgency about the commencement of timeframe, and leadership concerning government or corporate development.

Chapter Five examined the building of the blockchain ecosystem. The flexibility of a platform to support interdependent partner networks, where no single party is required to control or run every component of the blockchain solution, is what gives the ecosystem its strength. The ecosystem produces value across a broad range and has a multiplier effect that exceeds the total value that any participant could provide. Thus, five-dimensional building blocks are suggested to operationalize the National Blockchain Roadmap: The CATLE approach, which stands for Collaboration, Amplifier, Talent, Legality, and Enablers. For every blockchain ecosystem building block, the roadmap looked into the challenges and the key initiatives. After that, the roadmap presented Malaysia's position in world trade and trade efficiency. After that, the roadmap analyzed the possible scenarios for blockchain in Malaysia. This included growth, status quo, and decline.

5. Focus in the Roadmap

The National Blockchain Roadmap for Malaysia from 2021 to 2025 represents a pivotal strategy to leverage blockchain technology to propel Malaysia into the forefront of digital innovation. At its core, the roadmap centers on fostering collaboration between the government, private sector, and academia to harness the transformative potential of blockchain across various sectors. With a keen emphasis on government adoption and integration, the roadmap seeks to streamline administrative processes, enhance transparency, and optimize resource allocation by deploying blockchain solutions within public agencies. This strategic focus aligns with Malaysia's broader agenda of digital transformation and underscores the government's commitment to leveraging emerging technologies for socioeconomic development.

The roadmap prioritizes the development of a robust regulatory framework to govern the use of blockchain technology. Recognizing the need for regulatory clarity to mitigate risks and promote investor confidence, Malaysia aims to establish guidelines and standards that strike a balance between fostering innovation and ensuring compliance with legal and security requirements. By providing regulatory certainty, the roadmap aims to create an enabling environment for blockchain adoption, thereby unlocking its full potential to drive economic growth and competitiveness.

The roadmap also underscores the importance of industry engagement and collaboration in driving blockchain innovation. Malaysia seeks to catalyze the development of industry-specific blockchain solutions tailored to address key challenges and opportunities by facilitating partnerships between the public and private sectors. The roadmap aims to foster a vibrant ecosystem of blockchain startups, enterprises, and academic institutions through pilot projects, research initiatives, and knowledge-sharing platforms, accelerating innovation and adoption across various sectors.

The roadmap also strongly emphasizes education and talent development to cultivate a skilled workforce capable of harnessing the potential of blockchain technology. Recognizing the critical role of human capital in driving technological advancement, Malaysia seeks to invest in education and training programs to equip individuals with the necessary skills and knowledge to thrive in the digital economy. By nurturing a pool of blockchain experts, developers, and innovators, the roadmap aims to build a sustainable ecosystem capable of sustaining Malaysia's competitive edge in the global marketplace.

Infrastructure development also features prominently in the roadmap, with investments directed towards building the necessary technological infrastructure to support blockchain implementation. This includes the development of blockchain platforms, interoperability solutions, and cybersecurity measures to ensure blockchain networks' reliability, scalability, and security. By investing in infrastructure, Malaysia aims to lay the foundation for widespread blockchain adoption, paving the way for the seamless integration of blockchain technology into existing systems and processes.

The roadmap emphasizes the importance of identifying and prioritizing use cases for blockchain technology to demonstrate its value and drive adoption. By focusing on specific applications across key sectors such as finance, supply chain, healthcare, and government services, Malaysia seeks to showcase the tangible benefits of blockchain in terms of efficiency, transparency, and cost savings. Through pilot projects and proof-of-concepts, the roadmap aims to validate the feasibility and scalability of blockchain solutions, thereby generating momentum for broader adoption and implementation.

International collaboration also emerges as a central theme in the roadmap, reflecting Malaysia's commitment to fostering partnerships and cooperation on the global stage. Recognizing the inherently borderless nature of blockchain technology, Malaysia seeks to engage with other countries and international organizations to share best practices, harmonize standards, and promote cross-border interoperability. By collaborating with international partners, Malaysia aims to leverage collective expertise and resources to address common challenges and unlock new opportunities in the realm of blockchain innovation.

In a nutshell, Malaysia's National Blockchain Roadmap for 2021-2025 represents a comprehensive strategy aimed at harnessing the transformative potential of blockchain technology to drive economic growth, foster innovation, and enhance the nation's competitiveness in the digital age. Through a holistic approach that encompasses government adoption, regulatory clarity, industry collaboration, talent development, infrastructure investment, use case development, and international cooperation, Malaysia seeks to position itself as a leading hub for blockchain innovation within the Southeast Asian region and beyond.

6. Critical Review of Goals

As Malaysia progresses through its National Blockchain Roadmap for the period of 2021-2025, an analysis may indicate both strides and challenges in the adoption and implementation of blockchain technology. At its inception, the roadmap set ambitious goals to leverage blockchain's transformative potential across sectors aiming to enhance efficiency, transparency, and collaboration. Government adoption emerged as a focal point, aiming to streamline administrative processes and enhance citizen services through blockchain solutions. Progress

in this area has been noticeable, with several government agencies initiating pilot projects and exploring blockchain applications in identity management, supply chain, and land registration (Aborujilah et al., 2021; Ali et al., 2021; Khat et al., 2022; Shuaib et al., 2022). However, challenges persist, including regulatory uncertainty, interoperability issues, and resource constraints, which have impeded widespread adoption and integration across government agencies (Anuar et al. 2023; Ravi & Chelliah, 2023; Sahalan et al., 2023)

Another significant aspect of the roadmap was the development of a robust regulatory framework to govern blockchain usage. While there has been some progress, particularly in sectors such as finance, where the Securities Commission Malaysia has introduced guidelines for digital asset offerings and exchanges, regulatory clarity remains a work in progress. Ambiguity persists in areas such as cryptocurrency regulation and smart contract enforcement, creating a barrier to investment and innovation. Despite efforts to provide regulatory guidance, the pace of development has been relatively slow compared to the rapid evolution of blockchain technology, leaving stakeholders uncertain (Urus & Mohamed, 2021).

Industry engagement and collaboration were also prioritized in the roadmap, with the aim of fostering partnerships between the public and private sectors to drive blockchain innovation. While there have been commendable efforts to promote collaboration through initiatives such as industry partnerships and innovation hubs, progress has been hindered by challenges such as a lack of trust, intellectual property concerns, and competing priorities. Additionally, the focus on collaboration has primarily centered around certain sectors, such as finance and supply chain, with limited attention given to emerging sectors with potential for blockchain disruption (Basel et al., 2023).

Education and talent development emerged as critical components of the roadmap, aiming to cultivate a skilled workforce capable of leveraging blockchain technology. Efforts to promote education and training programs in blockchain development and entrepreneurship have been observed, yet challenges persist in bridging the gap between industry demand and talent supply. Furthermore, the quality and relevance of existing educational programs vary widely, with some lacking practical, hands-on experience and real-world applications. Addressing these challenges will be essential to nurturing a pool of blockchain experts, developers, and innovators necessary for sustaining Malaysia's competitive edge in the global marketplace (Sahalan et al., 2023).

Infrastructure development has also been a key focus area, with investments directed towards building the necessary technological infrastructure to support blockchain implementation. While progress has been made in developing blockchain platforms and cybersecurity measures, challenges such as scalability, interoperability, and data privacy concerns persist. Additionally, the focus on building proprietary infrastructure solutions may hinder interoperability and collaboration between different blockchain platforms and ecosystems, necessitating a more inclusive approach to infrastructure development (Basel et al., 2023).

Use case identification and development have been integral to the roadmap, aiming to showcase the tangible benefits of blockchain technology across sectors. While progress has been made in exploring use cases in finance, supply chain, healthcare, and government services, challenges such as regulatory barriers, technological limitations, and lack of proven business models have slowed the pace of adoption. Moreover, the focus on improving existing processes rather than enabling entirely new business models and revenue streams has limited the transformative potential of blockchain technology (Basel et al., 2023).

International collaboration has been emphasized in the roadmap, reflecting Malaysia's commitment to fostering partnerships and cooperation on the global stage. Efforts to engage with other countries and international organizations have been observed, yet progress has been hindered by geopolitical tensions, regulatory differences, and competing interests. Despite these challenges, Malaysia remains committed to promoting knowledge sharing, capacity building, and joint research and development initiatives to advance blockchain innovation on the international stage (Azmi et al., 2023).

It can be said that Malaysia's National Blockchain Roadmap for 2021-2025 has seen notable progress in certain areas, including government adoption, regulatory clarity, and industry collaboration. However, challenges such as regulatory uncertainty, talent development, infrastructure limitations, and use case exploration persist, necessitating continued efforts and collaboration between government, industry, academia, and other stakeholders to realize the full potential of blockchain technology and position Malaysia as a global leader in digital innovation.

7. Possible Future Developments

Looking towards the future, several potential developments could shape Malaysia's National Blockchain Roadmap for 2021-2025, driving further progress and innovation in adopting and implementing blockchain technology. One of the key areas of focus for future development is the continued integration of blockchain into government processes and services. Building upon the initial pilot projects and initiatives, Malaysia could seek to scale up blockchain adoption across a broader range of government agencies and departments. This could involve the deployment of blockchain-based solutions for identity management, public procurement, voting systems, and healthcare records, among others, to enhance efficiency, transparency, and trust in government services. Moreover, Malaysia may explore opportunities to collaborate with other countries and international organizations to establish interoperable blockchain networks for cross-border transactions and data sharing, facilitating smoother trade, travel, and cooperation on a global scale.

Regulatory development (Ravi & Chelliah, 2023) is expected to remain a key focus area for Malaysia's blockchain roadmap in the coming years. As blockchain technology continues to evolve and mature, there will be a need for robust and adaptive regulatory frameworks to govern its usage effectively. Malaysia could prioritize efforts to provide clarity and guidance on various aspects of blockchain regulation, including cryptocurrency regulation, smart contract enforcement, data privacy, and consumer protection. Moreover, Malaysia may explore

innovative regulatory approaches, such as regulatory sandboxes and pilot programs, to encourage experimentation and innovation in blockchain-based solutions while managing associated risks.

Industry engagement and collaboration are likely to continue driving blockchain innovation in Malaysia, with a focus on fostering partnerships between the public and private sectors. Malaysia could explore opportunities to incentivize industry participation in blockchain initiatives through grants, tax incentives, and regulatory support. Additionally, Malaysia may establish industry-specific consortia or alliances to facilitate knowledge sharing, collaboration, and joint development of blockchain solutions in key sectors such as finance, supply chain, healthcare, and energy. Moreover, Malaysia could leverage emerging technologies such as artificial intelligence (AI), the Internet of Things (IoT), and big data analytics to complement blockchain technology and unlock new use cases and opportunities for innovation (Lam et al., 2023).

Education and talent development are expected to play a crucial role in Malaysia's future blockchain roadmap as the demand for skilled blockchain professionals continues to grow. Malaysia could expand and enhance existing education and training programs in blockchain development, cryptography, smart contracts, and decentralized applications (DApps) to meet industry demand for specialized talent. Additionally, Malaysia may collaborate with universities, research institutions, and industry partners to establish blockchain research centers, innovation labs, and incubators to support blockchain solutions' research, development, and commercialization (Eaganathan et al., 2019). Furthermore, Malaysia could promote lifelong learning and upskilling initiatives to enable professionals (AlAfnan, 2018) from diverse backgrounds to acquire blockchain-related skills and competencies, ensuring a steady supply of talent to drive blockchain innovation and adoption in the country.

Infrastructure development is likely to remain a priority for Malaysia's blockchain roadmap as the need for scalable, secure, and interoperable blockchain infrastructure continues to grow. Malaysia could invest in the development of blockchain platforms, protocols, and standards to support a wide range of applications and use cases across industries. Moreover, Malaysia may explore opportunities to leverage emerging technologies such as blockchain-as-a-service (BaaS), decentralized finance (DeFi), and non-fungible tokens (NFTs) to enhance the functionality and usability of blockchain networks. Additionally, Malaysia could collaborate with industry stakeholders to address challenges such as scalability, energy consumption, and environmental sustainability in blockchain infrastructure, paving the way for more efficient and eco-friendlier blockchain solutions (Anuar et al., 2023).

Use case exploration and development are expected to expand and diversify in Malaysia's future blockchain roadmap as the potential applications of blockchain technology continue to evolve. Malaysia could identify and prioritize use cases with high potential for impact and scalability, such as supply chain traceability, digital identity management, intellectual property rights management, and decentralized finance (DeFi). Moreover, Malaysia may collaborate with industry partners to pilot and deploy blockchain-based solutions in real-world settings, collecting data and feedback to assess their effectiveness, scalability, and sustainability. Additionally, Malaysia could explore opportunities to leverage blockchain technology for social and environmental impact, such as promoting financial inclusion, combating corruption, and addressing climate change, aligning blockchain innovation with broader national and global development goals.

In short, Malaysia’s National Blockchain Roadmap for 2021-2025 is poised for further development and expansion in the coming years, driven by advances in technology, evolving regulatory frameworks, industry collaboration, education and talent development, infrastructure investment, and use case exploration. By capitalizing on these opportunities and addressing challenges proactively, Malaysia can position itself as a leading hub for blockchain innovation and adoption, driving economic growth, enhancing efficiency, and fostering trust and transparency in the digital economy.

8. Conclusion

This study examined Malaysia’s National Blockchain Roadmap 2021-2025 from a critical discourse analysis perspective, looking at the focus, goals, and possible future development plans based on the text and the surrounding context provided by scholars and industry players.

It is apparent that Malaysia’s National Blockchain Roadmap for 2021-2025 represents a comprehensive strategy aimed at leveraging blockchain technology to drive economic growth, foster innovation, and enhance the nation's competitiveness in the digital age. With a focus on government adoption, regulatory clarity, industry collaboration, talent development, infrastructure investment, and use case exploration, the roadmap lays the foundation for Malaysia to emerge as a global leader in blockchain innovation.

Through strategic initiatives and partnerships, Malaysia aims to streamline administrative processes, enhance transparency, and optimize resource allocation within public agencies. This collaborative approach underscores Malaysia's commitment to digital transformation and socioeconomic development.

Moreover, the roadmap prioritizes the development of a robust regulatory framework to govern blockchain usage, providing clarity and guidance while fostering innovation and compliance. Industry engagement and collaboration are also emphasized, with initiatives aimed at catalyzing the development of industry-specific blockchain solutions tailored to address key challenges and opportunities.

Education and talent development play a critical role in Malaysia's blockchain roadmap, ensuring a skilled workforce capable of harnessing blockchain technology's potential. Infrastructure development, use case exploration, and international collaboration further reinforce Malaysia's commitment to driving blockchain innovation and adoption.

Malaysia's National Blockchain Roadmap is poised for further development and expansion, driven by technological advances, evolving regulatory frameworks, and industry collaboration. By capitalizing on these opportunities and addressing challenges proactively, Malaysia

can position itself as a leading hub for blockchain innovation, driving economic growth and fostering trust and transparency in the digital economy.

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