UNLOCKING BLOCKCHAIN

This paper summarises key findings from a panel discussion hosted by the Social & Economic Research Initiative, on 18th November 2020. Panelists were as follows:

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For access to the session recording, please visit: http://bit.ly/seri-blockchain

Summary

While Blockchain is the underlying distributed ledger technology that powers Bitcoin and other digital currencies, it is far more than a platform or tool for cryptocurrency. Over time, blockchain technology has evolved to be of use by any enterprise seeking a decentralised substitute for traditional system architecture. Blockchain is creating a paradigm shift in how individuals, businesses, and governments interact, enabling secure and trusted transactions.

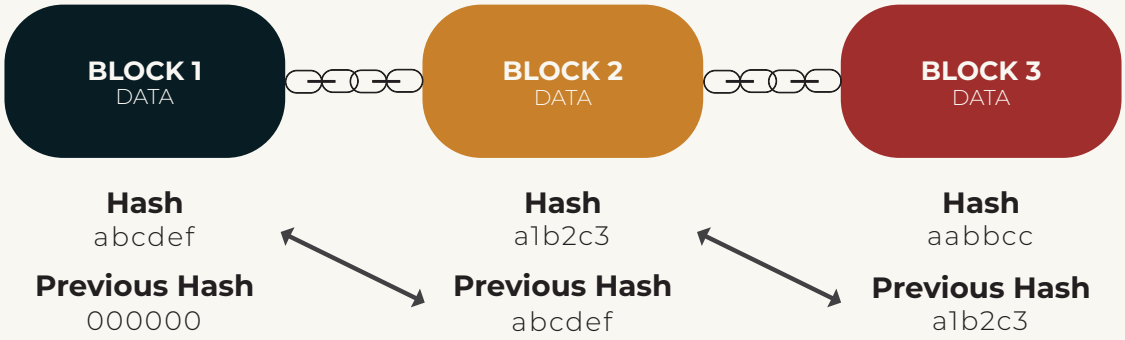
While blockchain technology is still in its infancy, there have been several applications, especially in financial services and public sector which evidences that blockchain technology is revolutionary. Undeniably, with developments in the digital sector, adoption of this technology has become necessary for Malaysia to grow as an accountable and transparent digital economy.

Current Landscape

Blockchain is game-changing in a sense that it allows for a distributed ledger, self-sovereignty and platform that is transparent and trusted. A fundamental element that blockchain adopted was cryptography, a digital asset designed to work as a medium of exchange. The underlying blockchain technology allows transactions to be validated in a decentralized way, without the need for any intermediary. Data is secure and immutable. Alterations cannot be made without the knowledge nor the consent of the other users within the ledger through a consensus protocol.

What is Blockchain ?

What is Blockchain? It is a distributed ledger technology with a specific set of features. It is a shared database or, a log of records, shared by means of blocks that form a chain. Once a transaction is recorded, its authenticity must be verified by the blockchain network. After a computer has validated the transaction, it is added to the block. The blocks are closed by a type of cryptographic signature called a 'hash' and the next block begins with that same 'hash'.



When the information on a block is edited, that block's hash code changes. However, the hash code on the block after it would not. This discrepancy makes it difficult for information to be doctored or changed without notice or consent, thus ensuring secure transactions. This is how the technology verifies that the encrypted information has not been nor can it be manipulated. Essentially, the technology exists as a shared database comprised of entries that must be verified by peer-to-peer networks and encrypted.

Academics are of the belief that the distributed ledger technology can significantly impact different areas within the financial sector. Banks manage a large amount of data under strict regulations, and distributed registries, whether it be blockchain or otherwise could help reduce costs and the elimination of inefficiencies. A study by Accenture asserts that investment banks can reduce their compliance costs between 30% and 50% by 2025 using distributed ledger technology or blockchain.[1]

However, Bitcoin illustrates the possible inefficiencies of blockchain, particularly in relation to speed and scalability. Although blockchain technology continues to develop, with some blockchains surpassing 30,000 transactions per second, it is estimated that most blockchain networks can only manage about seven transactions per second (TPS).

For example, previously, in NEC blockchain technology every node must process the chain. The redesigned technology however allows for the creation of satellite chains. The architecture comprises of satellite chains that privately run different consensus protocols in parallel, boosting the scalability of the system, and allows a regulator to oversee the entire network and enforce specific policies via smart contracts.[2] Additionally, the private interconnected satellite chains ensure user privacy and transactional privacy.

The Ministry of Science, Technology, and Innovation (MOSTI) is establishing a blockchain roadmap for the country for priority areas over the next few years and how we can better utilize this technology for not just government, but also across industry, civil society, and academia in Malaysia.

This paper summarises the challenges and opportunities presented by blockchain technology as well as the importance of unlocking blockchain technology in Malaysia.

Key Issues and Challenges

Trust

- **The trust crisis**

  Blockchain emerged when people lost trust in central authorities. Somewhat paradoxically, if appropriately deployed, it has the potential to restore lost trust in governments and central authorities. It needs to be clarified that blockchain is immutable and cannot be tampered with without the knowledge or consent of the parties involved. Where the audit trail is concerned, blockchain may be of use to anything requiring documentation or certification.

- **Blockchain as a trust machine**

  Before a transaction can occur, a vital requisite is trust. This is provided for by blockchain. One of the biggest use cases for blockchain is the smart contract. A smart contract is a computer code that can be built into the blockchain to facilitate, verify, or negotiate an agreement. Smart contracts operate under a set of conditions that have been agreed upon by the users. When those conditions are met, the terms of the agreement are automatically carried out. Hence, blockchain has been touted as a trust machine.

- **Transparency**

  People can view your transactions but your identity to a large extent is protected as it is pseudonymous but not anonymous. There are tools in place to ensure tracking occurs. With blockchain, tracking of anti-money laundering and terrorism financing activities are more efficient than current tracking mechanisms. Blockchain is being considered for cybersecurity use cases as well. Individuals can now peek into the engine and functionality of the system. They can see that they approve or deny access to information which is relevant to themselves. Therefore, inspiring trust and confidence in the technology.

  The Ministry of Education has decided to deploy blockchain technology in their effort to tackle fraudulent degrees in Malaysia. The 'e-Scroll system,' which is an issuance and verification system for university degrees was developed to address the increase of fake degrees, some of which are now rolled out online. Currently, universities in Malaysia receive requests from across the world for the verification of educational certificates. Prior to the e-Scroll system, the process was conducted via email or over the telephone. However, this blockchain-based e-Scroll system will enable transparency and ensure an efficient, and reliable verification process.

- **Traceability**

  COVID-19 Vaccines: The government is working to create a blockchain-enabled traceable system where we would be able to determine exactly which dose and which vial an individual was vaccinated with. Following that, a health passport or certificate will be created. The certificate will be based on blockchain as well.

  Countries like Australia are adopting a 'portfolio approach' to the vaccine.[3] The portfolio is deliberately diverse, composed of different types of vaccine candidates including mRNA and DNA vaccines to recombinant protein vaccines and viral vectors.[4] The technology used for these platforms are not necessarily the same either. Most vaccines have 2 doses. So, tracking and implementation monitoring is necessary to ensure that if Individual A takes a particular vaccine, he or she obtains a second dose of the same vaccine.

  In addition to use cases involving the customs department, e.g. utilization of blockchain for custom clearance and trade facilitation, there are also various blockchain applications for healthcare and land records. With suitable safeguards and clarifications, the public may also trust a blockchain-enabled voting system.

Below are some examples of blockchain applications in different sectors :

Healthcare

Healthcare providers across public and private institutions can leverage blockchain to securely store their patients' medical records. When a medical record is generated and signed, it can be encoded and stored on the blockchain with a private key that is only accessible by certain people, thereby ensuring privacy. This provides patients with the evidence and confidence that the record cannot be changed.

Property Ownership

Where property is concerned, the processes that come with it can be tedious and riddled with human error, where each inaccuracy makes tracking property ownership more difficult and less efficient. The process can be costly and time-consuming. Blockchain may eliminate the need for scanning documents and tracking down physical files in the land office. If property ownership is stored and verified on the blockchain, owners can trust that their deed is accurate and permanently recorded.

Food safety

Companies like NESTLE and Walmart have already implemented blockchain technology in efforts of ensuring safety. IBM too has created its Food Trust blockchain to trace the journey that food products take to get to their destinations.[5] The food industry has seen countless outbreaks of e Coli, salmonella, listeria, and hazardous materials being accidentally introduced to food production. Blockchain allows for the tracking of the food product's route from its origin, through each stop it makes, and its delivery. These companies can also see everything else the product may have come in contact with which allows for sooner identification of potential problems.

Digital Identity (ID)

The digital ID is essentially the digitalization of the existing NRIC. Development of Digital ID will accelerate several other use cases and applications.

For example, the e-KYC (electronic Know Your Customer) process that financial companies need to conduct can be laborious and time-consuming. Digital ID will allow the eKYC process to be instantaneous and it can then be linked to Lembaga Hasil Dalam Negeri (LHDN) and Kumpulan Wang Simpanan Pekerja (KWSP). However, this remains a matter of trust. Users must trust the applications provided, whether this is by public sector or private sector.

This has been illustrated by the deployment of MySejahtera which has seen great adoption but garnered much skepticism. It takes time to earn trust and change behavior. We need to look at new means to reach different demographics. Therefore, what the digital ID is and what exactly it entails needs to be communicated clearly. It will inevitably have applications within the travel, finance, and healthcare industries as well as government regulations and citizen service, but ultimately adoption will rely on trust.

Education

The education system must be reviewed especially where the fundamentals regarding blockchain technology are concerned. We have to ascertain whether it is future-proof and aligns to the inevitable growth of the digital economy. Malaysia has immense potential, but we certainly have a long journey ahead. While micro credentials or boot camps provide a partial solution, the critical issue of connectivity must be resolved, to ensure emerging technologies are not perceived as "elitist". There is also an opportunity to refresh our curriculum, and ensure students are able to develop communication, critical thinking, coding, and other skills of the 21st century.

- **Skills development**

  While Blockchain programmers and developers are largely self-taught through platforms such as GitHub, we must question the current ecosystem, and if learning opportunities are truly democratized. Self-taught opportunities rely on stable internet connectivity, and high-speed internet access to view videos, engage in discussions, and undergo online assessments.

  To address the need for skills development, the Ministry of Education has formed a consortium of blockchain experts from different universities within the country.[6] Training sessions are conducted by the consortium for academics and students alike on blockchain technology, aiding the development of skills and blockchain applications.

  In addition to technical skills for blockchain development, data analytical skills must be further developed so that individuals have a more comprehensive understanding of the data derived from the blockchain.

Talent development

- **MOSTI's National Technology and Innovation Sandbox (NTIS)**

  The sandbox enables experimentation in relation to proofs of concept (PoCs), regulations, and policy changes especially where blockchain is concerned.

An example use case scenario:

Durian exports to China have received skepticism as to its authenticity. One of the gold standards for durian is Musang King. When the durians land in China, vendors are often questioned as to whether the durian being offered is truly Musang King. If a blockchain solution were to be applied, the element of traceability that comes with it may resolve the issue. This use case may be replicated for other export cases.

Human nature

The greatest challenges to implementation have usually been non-technical in nature. These usually relate to human nature or more specifically, the resistance to change.

The challenges to implementation include:

- Difficulty to bring together the required stakeholders
- Unclear regulatory implications
- Level of awareness of the involved stakeholders
- Identifying and understanding the most relevant applications on blockchain
- Addressing governance issues

Case Study: NEC, IDB Lab and NGO Bitcoin Argentina deployed the Blockchain-based Digital Identity for Inclusion Project.

A socioeconomic program was introduced in Barrio 31 in Argentina where there is tremendous disparity between the social and economic status of the people within the area. The program aimed to improve the access to quality goods and services via a portable, safe, transparent and self-sovereign digital identity. The project sought to incorporate Blockchain technology and thus, enabling reliable and safe registration of information on one's activities, whilst preserving privacy and allowing oneself to control his or her own data. The digital identity was intended to enable a digital wallet for unbanked individuals, allowing them to access financial services, such as storing digital money, and making payments, transfers, and remittances while building a transaction history.[7]

It was deduced that there must be:

- Consistent effort
- A timeline and clear milestones
- The right persons for the job (skills and expertise)
- Clear communication to the people

Sustainability

The usage of Blockchain technology requires a large amount of energy for computing power. When blockchain was first created it used a lot of power, especially with regards to bitcoin. However, technology has since advanced to become more environmentally friendly. Servers operate faster without using as much electricity. Hardware too plays a major role.

Since 2008, computing power has become more efficient in terms of processing power. The overall architecture and the streamlining processes should also be observed. Today, delegation and the enforcement of smart contracts ensure a more efficient method of processing for blockchain.

A use case increasing sustainability and decreasing government spending on energy infrastructure is peer-to-peer energy trading, i.e. the buying and selling of energy between two or more grid-connected parties.[8]

Policy Recommendations

While technology has been developing rapidly, regulatory and societal development continue to play catch up with technological advancement. Therefore, regulatory and policy reform is required to better fit the requisites of the digital economy.

Below are some recommendations:

Democratise access to information and skills development

- The blockchain roadmap being developed requires readily accessible information and educational materials. For example, there is insufficient indigenous material in Bahasa Malaysia on blockchain which prevents knowledge from being imparted to a significant number of citizens.

- Skills-based hiring, micro credentials, and opportunities to upskill and reskill should be democratized. For example, individual skills development efforts are often hampered due to challenges with connectivity. Addressing the digital divide would lower the barrier to entry, allowing all individuals with the interest and potential to enter into the blockchain industry.

Data governance to eliminate data silos

- Data silos prevent researchers and policymakers from turning data into actionable insights.

- There needs to be sharing of anonymized data not only within government departments but also across organizations, governments and the public to increase efficiency.

Education and Awareness

- COVID-19 has presented an opportunity to refresh our education system. Systemic reforms are required to ensure our students are not left behind, and life-long learning is cultivated and strengthened.

- Use cases must be transparent and accessible, and should be demonstrated on a pilot scale. For example, a pilot case on the governments' PRIHATIN or PERMAI assistance efforts. By implementing a pilot application leveraging blockchain and digital ID, the government can show with full transparency that all financial assistance is channelled to rightful recipients.

- Through clear communication and transparent implementation, trust can be built albeit slowly. The trust can be reinforced using this method on different applications of government services. This may allow sufficient trust to be developed, enabling blockchain to be used for cases on a larger scale such as e-voting.

Digital infrastructure

- Digital infrastructure refers to the systems connecting people to digital information, products, and services. It serves as the backbone of the digital economy and includes both hard (physical) and soft (non-physical) digital infrastructure comprising connectivity, devices, data storage and processing, services, and applications. Similar to the way cables, wires, and generators provide for the electricity needs of citizens, digital infrastructure enables transmission of information and data, underpinning our social and economic lives.

- While digital infrastructure once required large up-front investment in equipment such as fiber optics, satellites, and high-powered computing facilities, highly flexible and elastic on-demand cloud computing services have led to a shift from capital expenditure to operational expenditure, lowering the barrier to entry for individuals, businesses, and governments.

- As the backbone of the digital economy, there is a crucial need for better coverage, speed, increased accessibility, and lowered costs.

Regional blockchain protocols for interoperability

- Malaysia has an opportunity to take the lead and support the region in ascertaining a blockchain protocol that will advance interoperability.

- A standard protocol across ASEAN for example, will ensure that the exchange of data is more powerful and effective. For instance, jointly recognised protocols for health certificates that are backed by blockchain.

- This will create more efficient trade facilitations and customs clearances.

Digital voting

- We need to have the right infrastructure and the right framework. For instance, digital-native policies, the right platform, technology, and the right people and expertise.

- The nature of blockchains' immutability means that fraudulent voting would be far less possible.

- From a public policy perspective, it is not an issue of technology but rather, an issue of trust. Technology to vote via a blockchain platform is in existence, e.g. in Estonia. However, there is often a trust deficit where elections are concerned, and one could argue that trust would further decline if the elections were to be conducted online using digital IDs.

- Thus, the relevant infrastructure, framework and safeguards must be communicated clearly and transparently, and there must be a concerted effort to build trust via smaller scale blockchain implementations.

Malaysia has immense potential, but we certainly have a long way ahead. Governance, transparency, clear communication, and talent development must be at the center of efforts to develop a robust ecosystem to advance blockchain implementation.

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[2] *Features of NEC Blockchain <https://www.nec.com/en/global/solutions/blockchain/features-of-nec-blockchain.html>*

[3] *Ministers Department of Health, 24 December 2020, Contacts signed for rollout of Covid-19 vaccine <https://www.health.gov.au/ministers/the-hon-greg-hunt-mp/media/contracts-signed-for-rollout-of-covid-19-vaccine>*

[4] *Nick Jackson, 20 October 2020, Why we need a portfolio approach to COVID-19 vaccine development <https://www.gavi.org/vaccineswork/why-we-need-portfolio-approach-covid-19-vaccine-development>*

[5] *IBM Food Trust <https://www.ibm.com/products/food-trust>*

[6] *<https://opengovasia.com/malaysia-unveils-blockchain-based-certificate-verification/>*
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NEC, IDB Lab and NGO Bitcoin Argentina to deploy a Blockchain-based ID system in Buenos Aires, Argentina

[8] *Malaysia's 1st Pilot Run of Peer-to-Peer (P2P) Energy Trading – SEDA*