

EDITORIAL TEAM

ADVISORS

Datuk Dr Mohd Yusoff Sulaiman
Rushdi Abdul Rahim

PROJECT TEAM

Mastura Ishak - Project Leader

Mohd Nurul Azammi Mohd Nudri
Ahmad Razif Mohamad
Amallia Ahmad Zaini
Azmil Mohd Amin
Farah Abu Bakar
Fatin Asmida Asman
Izzatul Huda Mohd Jalil
Megat Shahrul Azam Megat Burhainuddin
Mohamad Iqhmah Mohd Zaini
Mohd Hasan Mohd Saaid
Nadia Sullivan
Natrah Mohd Emran
Norhasrizam Hashim
Norsam Tasli Mohd Razali
Nur Amira Muhammad
Nur Shahirah Shaari
Sri Wiclias Tuti Asnam Rajo Intan
Tan Shu Ying, PhD
Zeti Akmar Tajudin

PUBLISHED BY

MIGHT
Malaysian Industry-Government Group
for High Technology

T: +603 83157888
W: www.might.org.my

© MALAYSIAN INDUSTRY-GOVERNMENT GROUP
FOR HIGH TECHNOLOGY (MIGHT), 2019

ISBN 978-967-15258-7-6



9 789671 525876



All rights reserved.

No part of this document may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior permission from MIGHT.



TABLE OF CONTENTS

ACKNOWLEDGEMENT

THOUGHTS FROM THE LEADERS

EXECUTIVE SUMMARY

CHAPTER 1 : INTRODUCTION

1.1 What is Blockchain & Distributed Ledger Technology (DLT)?

- Background
- Blockchain, DLT & the Internet
- Blockchain & DLT Differences
- Blockchain, DLT & Bitcoin / Cryptocurrencies
- Blockchain, DLT & the Programmable Economy

1.2 How Does Blockchain Work

- What is in a Block?
- Data Processing in Blockchain Transaction
- Consensus Mechanism
- The Blockchain Transaction

1.3 Why and When to Use Blockchain & DLT

1.4 Use Cases : Bitcoin, Cryptocurrencies and Digital Currencies

1.5 Use Cases : Industry

1.6 Use Cases : Government

i

iii

v

2

5

7

8

9

10

CHAPTER 2 : GLOBAL OUTLOOK

2.1 Overview : Growing Interest Beyond Cryptocurrencies

2.2 Policy & Regulation

- Increasing Global Collaborations Involving Governments
- Enhancing Standards
- Regulatory Standpoint on Cryptocurrencies by Countries
- Governance : The Increasing Regulation on Global Concerns to Impact Blockchain Development

2.3 Economics & Markets

- Emergence of New Sectors
- Emergence of New Markets
- Emergence of Blockchain Will Impact Businesses and Business Models
- Innovation in Fundraising

2.4 Social Impacts

- The Emergence of New Types of Organisations
- Blockchain Helping Financial Inclusion

12

13

19

24

2.5	Technology	27	3.4	Potential for Blockchain & DLT Adoption Under Current Policy Initiatives	54
	<ul style="list-style-type: none"> • Convergence of Technologies • Smart Contract • Cybersecurity • Intellectual Property (IP) 			<ul style="list-style-type: none"> • Mitigating Contamination Risk • Potential Under The Midterm Review (MTR) of 11th Malaysia Plan 2016 - 2020 • Government Fiscal Budget - Budget 2019 and Beyond • Capitalising the Strengths of Technology Hubs 	
2.6	Blockchain Talent in High Demand	34			
CHAPTER 3 : MALAYSIA'S LANDSCAPE					
3.1	Stakeholders in Malaysia's Blockchain Ecosystem	36			
	<ul style="list-style-type: none"> • Introducing Blockchain to Malaysia • Current Government Efforts • Associations / Communities 				
3.2	Malaysian Use Cases	44			
	<ul style="list-style-type: none"> • Energy • Mobility • Asset Tagging • Shariah Compliant Gold Trading • Financial 				
3.3	Identifying Potentials for Malaysia	48			
	<ul style="list-style-type: none"> • The Government Ecosystem • Areas of Interest for Malaysia • The Industry Ecosystem • Capitalising the Advantage of the Second Mover 				
				CHAPTER 4 : WAY FORWARD	
			4.1	Future Challenges	60
				<ul style="list-style-type: none"> • Global Challenges • Challenges for Malaysia 	
			4.2	Key Findings	62
				<ul style="list-style-type: none"> • Policy • Economics • Skills • Technology 	
			4.3	Next : Leapfrogging	64
				MOMENTS : STAKEHOLDERS' ENGAGEMENTS	66
				REFERENCES	68

ACKNOWLEDGEMENT

MIGHT was able to accomplish this exciting initiative successfully because of the commitment and support from numerous stakeholders in Malaysia as well as friends from the Global Blockchain Communities. Hence, we would like to thank everyone listed as contributors below for their helpful advice and feedback throughout the project. We would also like to thank Gartner, Inc. for the continuous engagements, insights and assistance in editing the flow of information for the publication. We are grateful to our Patron, Joint-Chairs and Management for the guidance, encouragement, pragmatism and the commitment to innovate towards excellence. Last but equally important, we thank the many individuals who have kindly agreed to be interviewed as part of this effort and many others who we might not have listed below.

EXTERNAL CONTRIBUTORS

Andrew Pal, CSO, Gibraltar Stock Exchange

Abang Suhaili Abang Hj Adris, CTO & Co-Founder, Vehicle Telematics Online Services Sdn Bhd

Abdul Fattah Mohd Yatim, Chairman, ISO TC/G/15

Colbert Low, Bitcoin Malaysia

Colin Charles, Managing Consultant, GrokOpen

Cris D. Tran, Asia Blockchain Review

Dave Appleton, Ethereum Malaysia

Harpreet Mann, CEO & Co-Founder, Blocklime Technologies Sdn Bhd

Hazlin Abdul Rani, Head, Cryptography Development Department, CyberSecurity Malaysia

Lee Kian Seng @ Ken, Innovation Strategy & Commercialisation Centre of Expertise – Innovation ICT Division Tenaga Nasional Berhad

Malik Khan Kotadia, CEO & Co-Founder, Finnovation Labs

Mark Smalley, Blockchain Embassy CEO, Neuroware.io

Muhammad Azam Mohd Razman, Access Malaysia

Ng Kwang Ming, Senior Director & Head IT, MIMOS

Rene Bernard, CEO & Co-Founder, Luxtag.io

Robin Lee, CEO & Co-Founder, Hellogold

Shunsuke Murasaki, CEO, EMURGO Indonesia

PANELISTS FOR WORKSHOP ENGAGEMENTS

Blockchain Workshop Series : Blockchain and Government - 10th August 2018

Abdul Fattah Mohd Yatim, Department of Standards Malaysia

Chan Zhong Yang, Securities Commission

Dato' Prof. Dr. Norbik Bin Idris, UIA

Malaysia Blockchain & DLT 2019 Report : Industry Consultative Session - 25th September 2018

Christine Yong, Head of innovation Orchestration, Tenaga Nasional Berhad

Matthew Tan, Etherscan

Andrew Pal, CSO APAC, Gibraltar Stock Exchange

Azizi Ngah, Advisor, Foodchain

Technomart : Adding Value Through Blockchain - Potential Areas for Malaysia - 24th October 2018

Datuk Fadilah Baharin, Director General, Department of Standards Malaysia

Adam Mashrique, Access Malaysia

Charlie Bussat, Infinito

Cris D. Tran, IBV

Harpreet Singh Maan, Blocklime

Harry Pham, Ginar

Husna Zakaria, University of Malaya

Nguyen Duc Phuong Nam, Fruitchain

Thang Nguyen, Infinito

Wong Phooi Hong, VTOS



EXPERT OPINION (WORKSHOP & SURVEY PARTICIPANTS)

Academy of Sciences Malaysia	:	IBM Malaysia	:	Caravan Trustees Berhad
Access Blockchain Association Malaysia	:	Independent Learners Studio Sdn Bhd	:	OK Blockchain Centre
Aegis Associates	:	Infinity Blockchain Ventures	:	Oracle Corporation Malaysia Sdn Bhd
AIISome Planet Sdn Bhd	:	Institut Kefahaman Islam Malaysia	:	Orion Strategic Solutions LLP
Asia Pacific University	:	Intellexpert Sdn Bhd	:	Perpustakaan Negara Malaysia
Bank Negara Malaysia	:	International Islamic University Malaysia	:	Pos Malaysia Berhad
Bank Pembangunan Malaysia Berhad	:	International Shari'ah Research Academy for Islamic Finance	:	PRIMA Asia Pacific Consulting
Bitcoin Malaysia	:	Intrabekal Sdn Bhd	:	QRC Group
Blockchain Embassy of Asia	:	Keretapi Tanah Melayu Berhad	:	R1 Dot My Sdn Bhd
Blockchain Planet Sdn Bhd	:	Kiizen IT Consulting Sdn Bhd	:	Redgrid - Tility
Blocklime Technologies Sdn Bhd	:	KryptoIA	:	Reewal Synergy
Blockzero Sdn Bhd	:	LUNO	:	Royal Malaysian Police
Blotex Sdn Bhd	:	Luxtag.io	:	Securities Commission Malaysia
BTM Blockchain Technology Sdn Bhd	:	Malaysia Debt Ventures Berhad	:	SOSV
Cardano	:	Malaysia Digital Economy Corporation	:	Sustainable Energy Development Authority
Celebrus Advisory	:	Malaysia Healthcare Travel Council	:	Technology Depository Agency Berhad
Chaintope Malaysia Sdn Bhd	:	Malaysia Petroleum Resources Corporation	:	Teknimuda (M) Sdn Bhd
Ciedge Technologies Sdn Bhd	:	Malaysian Administrative Modernisation and Management Planning Unit	:	Tenaga Nasional Berhad
CoinDesk	:	Malaysian Digital Economy Consumer Association	:	TIME dotCom
Crops For the Future	:	Malaysian Global Innovation & Creativity Centre	:	TruView Foundation
Crypto Hype	:	Malaysian Technical Standards Forum Bhd	:	Tulen
Crypto Valley Malaysia	:	Microsoft (Malaysia) Sdn Bhd	:	UniKL Business School
CyberSecurity Malaysia	:	MIMOS Berhad	:	Uniq Exchange Sdn Bhd
Data8 Sdn Bhd	:	Miner (Private)	:	Universiti Kebangsaan Malaysia
Department of Standards Malaysia	:	Ministry of Domestic Trade and Consumer Affairs	:	Universiti Malaysia Pahang
Education Performance and Delivery Unit	:	Ministry of Energy, Science, Technology, Environment and Climate Change	:	Universiti Sains Islam Malaysia
EMPOWER	:	Ministry of Health	:	Universiti Teknologi Malaysia
EMURGO	:	Ministry of International Trade and Industry	:	Universiti Tenaga Nasional
Energy Commission	:	National Standards Committee on Blockchain and Distributed Ledger Technologies (TC/G/15)	:	Universiti Utara Malaysia
EPC Blockchain Sdn Bhd	:	NEM Malaysia Sdn Bhd	:	Uzma Berhad
Etherscan	:	NEOSmart Economy Malaysia	:	Vehicle Telematics Online Services Sdn Bhd
Finnovation Labs	:	Neuroware.io	:	Wealth Resources Asia
Fortifex	:	Neutrinis Engineering	:	
Futurise Sdn Bhd	:	NEX Blockchain	:	
Gibraltar Stock Exchange	:	Octowill Sdn Bhd	:	
Global Entrepreneurship Movement Association	:		:	
Hellogold Sdn Bhd	:		:	
I2M Ventures Sdn Bhd	:		:	

SPECIAL THANKS

MIGHT would like to acknowledge the invaluable inputs by Gartner, Inc. during the final preparations of this document.

DISCLAIMER :

Information correct at the point of events in 2018.
Changes to status of companies including exchanges in 2019 are not incorporated in this list.



THOUGHTS FROM THE LEADERS

Since our inception in 1993, MIGHT has long promoted the use of technology as means to strengthen the nation's competitive advantage. Therefore, we are always on the lookout for technology development, conducting the necessary horizon scanning and foresight activities. It is hardly surprising then that blockchain, one of the most significant technology hypes to appear in a long time, would capture our interest and attention. This interest is based on the key features of the blockchain technology and what it could potentially represent. Blockchain has been hailed as revolutionary, providing new means of secure and transparent record keeping as well as data sharing, with potential to transform the function of numerous industries. These features will enable the increase of transparency and traceability of goods, data and financial assets, facilitate market access and improve the efficiency of transactions.

As we conduct multiple engagements with various parties, numerous ideas and examples were cited and captured on the potential use of blockchain in Malaysia for both the government and businesses. However, there are still technological and regulatory hurdles to overcome before some of these ideas can be implemented. To fulfil blockchain's potential will require an environment that allows innovation and experimentation, while also negating the risks of misuse. The Government therefore will have a significant role in creating a policy framework that will address the challenges presented by the deployment and adoption of blockchain.

We realise there is still a lack of awareness of the technology and a widespread lack of understanding of how it really works. Blockchain



technology is not going to solve every problem, or work in every context. We at MIGHT believe that there is a need to see blockchain as a much broader digital transformation enabler and concentrate on its potential business outcomes and benefits. It is imperative to understand that this technology, like many others before it, will undergo numerous iteration processes in its development. MIGHT will continue to observe and see how best to assist organisations both public and private that are interested to incorporate blockchain to improve their business process. In doing so, we are also on the lookout for a robust interoperable set of components meeting internationally approved standards for blockchain since the future of blockchain will consist of powerful composable blockchain layers that are combined from blockchains developed independently. It will be integrated and interoperable.

With the rate of technology progress, it has been a challenge to fit every development into this publication. While not exhaustive, we have attempted to provide an overview of the key concepts and terms intended to help people better understand this emerging technology and its growing impact. We hope you find this publication beneficial as we outline some of the potential benefits it brings and consider the risks and challenges it poses. Our intention is to provide you with an overview of what is being done today with blockchain and our opinion of what could be done with the technology.

We would also like to take the opportunity to thank those who have contributed inputs and ideas in creating this publication.



Tan Sri Dr.
Ahmad Tajuddin Ali, FASc., P.Eng.
Joint Chairman (Industry) | MIGHT



Datuk Dr.
Mohd Yusoff Sulaiman
President & CEO | MIGHT



EXECUTIVE SUMMARY



Blockchain and Distributed Ledger Technology have attracted increasing attention from both private and public entities since making their highly public debut as the main technologies underlying Bitcoin in 2009. This outlook report is a part of that increasing interest, specifically looking at blockchain and the associated Distributed Ledger Technology (hereafter DLT) from Malaysia's perspective as a nation. It seeks to develop an understanding among both public and private stakeholders about the technology, taking it outside the ambit of technology per se and into the public domain.

The World Economic Forum's (WEF) report of "Deep Shift Technology Tipping Points and Societal Impact 2015" first predicted that by 2025, blockchain and DLT would store 10% of global GDP as well as allow governments to start collecting tax via blockchain.

Beyond the hype surrounding '*blockchain*' in the past few years, in a nutshell, blockchain is a very specific data structure as well as a specific type of Distributed Ledger Technology (DLT). It is important for readers to understand that the key differences between blockchain and other DLTs in providing trust, particularly between '*append-only*' versus '*redactable*' platforms as well as public and private



blockchains, are the early questions in qualifying the need to adopt blockchain and DLT in the first place.

After ten years, blockchain and DLT have begun to be identified as 'trust verification/anchors' for digital transactions. This is achieved through smart contracts and other hybrid systems under the larger umbrella of DLT. In the past, all these systems were collectively known as 'blockchain'. However, the demarcation between blockchain and other kinds of DLT has become more nuanced and important to be acknowledged. Although we have included both in this report, it is recognised that the differences may redefine the way we look at this ecosystem in the future. Blockchain is still considered an emerging technology undergoing frequent iterations. There are many perspectives to blockchain, and this report has adopted the perspective of blockchain as used by **ISO/TC 307 – Blockchain and Distributed Ledger Technology**.

Beyond cryptocurrencies, knowledge on blockchain and DLT has the potential to primarily help Malaysia find solutions to unresolved challenges in society and business and second, learn about the impact of the decentralisation trend brought about by digitisation. In exploring these potentials, this report has been divided into four chapters.

The first chapter introduces blockchain as a technology, about what it is, its key characteristics and link to DLT. It also highlights how it works and how to determine if blockchain could be a potential platform to solve the problems at hand. This introductory chapter

also looks at cryptocurrencies—the first commercial use case for blockchain—and its positioning as money within the financial ecosystem.

In the following chapter, the report looks at the global outlook and shares major happenings involving the global blockchain ecosystem that could develop into major trends impacting Malaysia. It also highlights the cryptocurrencies ecosystem, which has created a number of 'new' innovations, particularly in the financial ecosystem such as the Initial Coin Offering and Tokenomics. It is of interest to monitor if the adoption by countries could yield further innovations, hence the chapter shares the map of countries that have been, or have expressed the intent to be, issuing cryptocurrencies. It also shares examples of use cases by industry and government ecosystems.

In chapter three, this publication shares the Malaysian outlook on blockchain. The chapter focuses on the current stakeholders involved in the blockchain ecosystem from both the public and private space. Major efforts from both sides are identified as well as the players. Some of the current use cases are also presented—attesting that blockchain adoption has existed in pockets of the industry.

Next, in identifying the challenges for Malaysia, we share the input collected from participants of a series of stakeholders' engagements conducted by MIGHT from June - November 2018 on blockchain and DLT. This report also looks at Gartner's Global Hype Cycle for

Blockchain Business 2018 in proposing Malaysia to go beyond just comparing and identifying various technologies and capitalise on its second mover advantage. Based on the inputs, we have mapped out the possible use cases of blockchain within the context of the 11th Malaysia Plan Midterm Review and the 2019 Budget.

Far from final, this report is more indicative than prescriptive in nature. It is targeted as inputs for further deliberation on developing a national framework on capitalising the technology for the nation, and as background reading on the state of blockchain and DLT in Malaysia.

In the final chapter, the report looks at the challenges and the key findings with regards to blockchain and DLT, and proposes the way forward in the conclusion based on the analysis of these strategic technology enablers both at global and national levels. It is proposed that a policy document to support specific industry development efforts be developed as a common reference for both public and private stakeholders. Malaysia is not starting from zero on blockchain, but as the rate of change for technology accelerates, Malaysia needs to find its niche to anticipate how the technology will impact the country in the longer term.

Within this framework, both Malaysian public and private entities are encouraged to collaborate on initiatives, taking advantage of the network effect arising from blockchain's open-source elements. This building block of social capital along with the potential inherent in ABCD-I (AI, Blockchain, Cloud, Data – IoT) could drive an industry-led initiative to discover new business models that add verifiability and transparency to their transactions, enabling a future with shared prosperity for all.

1.1 What is Blockchain & Distributed Ledger Technology (DLT)?

Background

Blockchain is an amalgamation of various existing technologies, particularly the ‘digital timestamp’, and is frequently attributed to the cypherpunk movement in the 90s—a movement that advocated widespread use of strong cryptography and privacy-enhancing technologies as a route to social and political change.

Blockchain has successfully shifted some of the trust that was previously reserved for people and institutions, towards technology. A type of Distributed Ledger Technology (DLT), it has been able to provide confidence through its consensus protocols in validating and verifying digital transactions. This technology is unique as it is created to be an open-source, neutral, decentralised, borderless and network-resilient ideology.

Also known as open blockchain, it was first deployed to create Bitcoin cryptocurrency, an improvised digital cash system meant to solve the double spending problem (as detailed in the white paper Bitcoin: A Peer-to-Peer Electronic Cash System by Satoshi Nakamoto in 2008). It became known as a counter model to centralised authorities and since its deployment, more than 2,000 cryptocurrencies have been issued—and the number is still growing.

The development of cryptocurrencies has allowed for live testing of Blockchain technology.

Ten years later, the decentralisation trend subscribed by blockchain has continued to challenge the weaknesses of the current system—whether in adopting new business processes and business models, or by pushing governments to re-examine their current practices. The impact expands as the use cases grow. With this growth, we witness the advancements in the relevance of blockchain and DLT.

Blockchain, DLT & the Internet

Blockchain and DLT are native internet technologies and are frequently compared to the internet as game-changing technologies. They both share some similarities, i.e. both are sets of software protocols (digital) that allow permissionless machine-to-machine communication (e.g. computer to computer, computer to smartphone, etc.). While the internet focuses on communicating data, blockchain and DLT focus on transactions or value exchange (e.g. digital assets such as cryptocurrencies).

Blockchain at a Glance

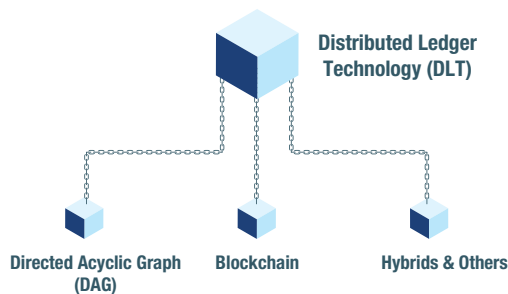
- Blockchain has been built to be used with the internet but there are early efforts to make it work offline, such as using mesh networks. One example is using the TxTenna device with Samurai wallet.
- Blockchain is the intermediary that allows the internet to store, move and transact values (e.g. identity), raising the term 'internet of values'.
- Blockchain is a meta technology because it affects other technologies, and is made up of several technologies itself.
- Blockchain comprises several elements : a database (value), a software application, connected computers, clients to access it, a software environment to develop on it, and tools to monitor it.

Blockchain & DLT Differences

Many of the early blockchain innovations started within the financial sphere. Technically, however, the new phase began as the Ethereum Project broke away from the original Bitcoin Blockchain Protocol, to launch their own blockchain and created the programmable transactions known as Smart Contracts.

The change continued as highly centralised and regulated institutions such as banks created permissioned blockchains that assigned validators from members of a consortium/ organisations. Some of the protocols are contrary to the open blockchain or the public blockchain. Open blockchain uses an append only protocol, meanwhile technologies such as Directed Acyclic Graph (DAG) and other hybrids, which are also types of DLT, may use other kinds of protocols. (Refer figure below)

BLOCKCHAIN IS A TYPE OF DLT



Source : What's the difference between blockchain and DLT?, nakamo.to

Blockchain is a specific kind of data structure of DLT, similar in the way 'electric engines' and 'hybrid engines' are different kinds of engines for vehicles. Although in the past years, the sometimes conflicting processes (e.g. can a blockchain be redacted or should it be an append-only system?) have all been loosely termed blockchain, there is now a clear movement to clarify and differentiate the specific blockchain from the more general definition of DLT. There are many kinds of DLTs and the following are some of the differences in their approaches.

Many financial institutions use private blockchains and below is the comparison between public versus private blockchains.

PUBLIC BLOCKCHAIN VS PRIVATE BLOCKCHAIN

	PUBLIC / OPEN BLOCKCHAIN	PRIVATE / FEDERATED / ENTERPRISE BLOCKCHAIN
Type of Blockchain	Open access to everyone	Limited access : 1. Consortium 2. Fully Private
Platforms	Bitcoin, Ethereum	Ripple, Hyperledger
Comparison	The Internet	Intranets & IT
Examples	Google, Amazon	ORACLE, IBM

Source : Understanding Blockchain: The Internet-Intranet Comparison, CoinDesk Research 2016

Bitcoin, the first use case for blockchain is a simple way to indicate and understand the basic differences between blockchain and other DLTs as detailed in the diagram below.

THE DIFFERENCE BETWEEN BLOCKCHAIN AND OTHER DLTs

CATEGORY	QUESTION	BITCOIN'S APPROACH	OTHER DLT
Data Storage	How should data be stored?	A blockchain	A database (could be replicated across multiple data centres)
Data Distribution	How should new data be distributed?	Peer-to-peer	Client-server, hierarchical
Consensus Mechanism	How should conflicts be resolved?	Longest Chain Rule	(Not needed in trusted networks) Trusted of super-nodes
Upgrade Mechanism	How are the rules changed?	BIP's (for writing the rules) Vote by hashing power (for implementing the rules) *BIP = Bitcoin Improvement Proposals sent by the community	Centralised upgrades Contractual obligations
Participation Criteria	Who can validate transactions and add blocks?	Pseudonymous Open	Trusted, pre-vetted participants

Source : Blockchains vs. DLTs, Coinmonks, 2018

Blockchain, DLT & Bitcoin / Cryptocurrencies

Often times there is a misperception that 'blockchain' and 'Bitcoin' (cryptocurrency) are interchangeable in meaning. A way to differentiate them is to think of blockchain as an 'operating system' and to think of Bitcoin as an 'application'.

A simpler way to understand this is by using a RM100 bill as an analogy, where 'blockchain' would be the paper technology with enhanced security features behind the bill, and Bitcoin would be parallel to the Ringgit denomination. The value of Bitcoin (Ringgit) would be dependent on those executing the transaction, while the blockchain (paper) technology itself could have a separate value determined by how it is being used, for example whether used as certificates, scrolls, etc.

BLOCKCHAIN VS BITCOIN USING RINGGIT ANALOGY



Source : MIGHT

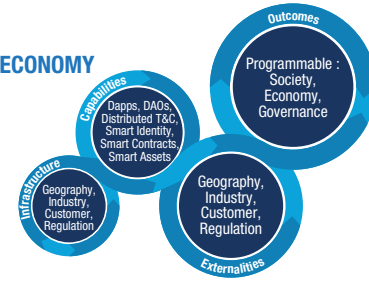
Blockchain, DLT & the Programmable Economy

Blockchain and DLT are often identified as the linchpin of the programmable economy—a term coined by Gartner in 2014—that is growing in leaps and bounds involving a confluence of technologies. Its endgame is to make direct transactions between people (peer to peer) become a norm, which is an ideology that is shared by blockchain, wherein the ideology is eliminating unnecessary intermediaries.

The platform may be digital but the impact will spillover and have a far reaching impact across the physical world. Although monetisation will be key to this economy, its definition is bound to change as we consider the new ways of valuing human, social and environmental capital for example, outside the commonly held financial principles.

This transition into digital value, frequently referred to as the Internet of Value, also translates into the germination of new ways of assessing value, as is increasingly demonstrated by blockchain through tokens and cryptocurrencies representing 'digital assets'. Examples of non-traditional assets being valued include creative content (e.g. Steemit, Superlilo), livestock for micro trade financing (Kommerce.com) or trade of users' data.

THE PROGRAMMABLE ECONOMY

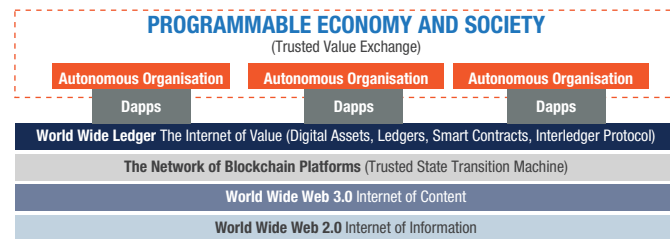


Source : The Reality of Blockchain, Gartner, Inc.

In a nutshell, the transition will manifest itself through blockchain related capabilities such as

- Decentralised autonomous organisational structures and operating systems
- Distributed applications (Dapps) that provide new access mechanisms into that value
- Monetised microtransactions involving a wide array of new types of digital assets
- Autonomous, delegated rights and decision making enabled by smart agents
- Self-sovereign identity management with granular privacy

As proposed by Gartner, these capabilities will combine on a World Wide Ledger that supports a programmable economic and societal model as we approach 2030.







Source : Understanding the Gartner Blockchain Spectrum and the Evolution of Technology Solutions, Gartner, Inc.

Another important factor in this context is the changing relationship between technology and governance. Data, the key commodity in this ecosystem, brings with it a double edged sword of vast opportunities as well as threats. The internet's vulnerabilities in managing the risks of access, ownership, ignorance and security of the networked data that can wreak havoc for people, businesses and governments through thefts, scams, hacks, etc. will require deployment of blockchain and DLT to undergo similar rigorous risk management processes to be truly effective.

The accelerating changes are here and ignorance is not an option. What blockchain and DLT provide to the public, businesses and other stakeholders is an invaluable window of opportunity to learn primarily from the perspective of open-source wisdom shared among the network.

1.2 How Does Blockchain Work?

Blockchain and DLT use codes to enable machines (for example your computer) to talk to each other. The following details how blockchain works.

ELEMENT	DESCRIPTION
 <p>Consensus Mechanism</p>	Consensus mechanisms are ways to guarantee a mutual agreement among distributed processes or multi-agent systems.
 <p>Cryptographic Hash Function</p>	Code that allows information to be kept secret so that only those for whom they are intended can read and process them. Digital fingerprint of data using hashing allows for lightweight storing and any change to source data is to be reflected in change of fingerprints.
 <p>Peer-to-Peer (P2P) Network</p>	Computer networks that use a distributed architecture, i.e. all computers or devices (or peers) that share the workloads in the network. All peers of a peer-to-peer network are equal.
 <p>Distributed Ledger (Database System)</p>	A distributed ledger is a database held and updated independently by each participant (or node) in a large network.

Source : Blockchain, CyberSecurity Malaysia, 2018

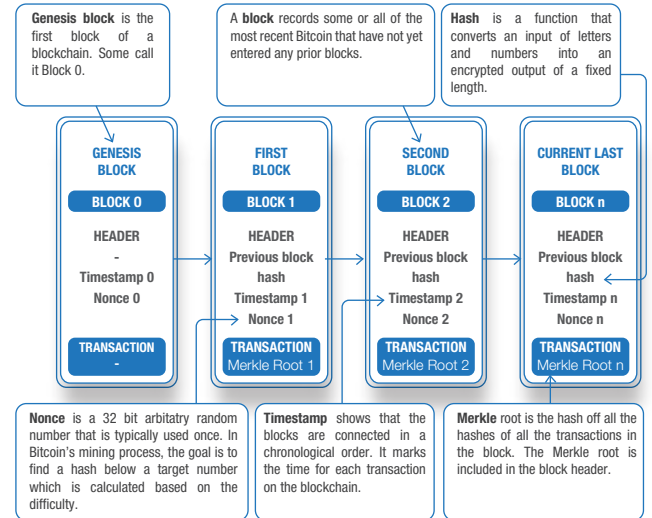
Another important element that has emerged as a native part of blockchain technology is Tokenisation, serving as a platform for identification and accessibility. Currently it is mainly used for digital assets that include cryptocurrencies.

What is in a Block?

Literally describing chains of blocks, blockchain links and synchronises blocks that are used to record transactions. A block in a blockchain is a permanent store of records which, once written, cannot be altered or removed.

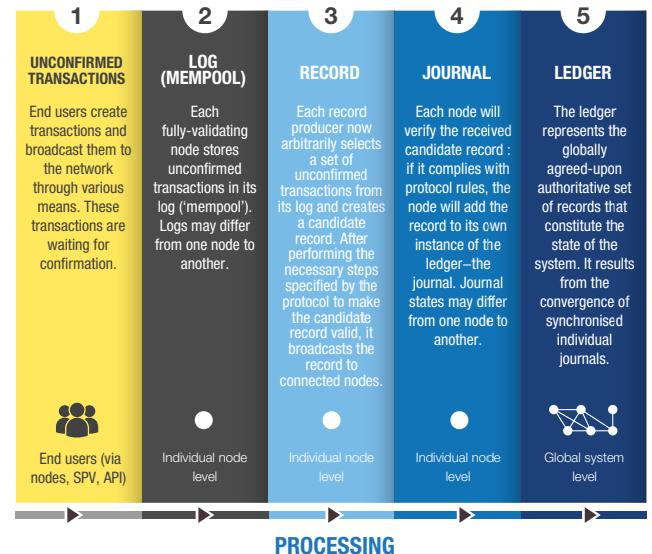
The connections and synchronisations when creating blocks are provided by block numbers and cryptographic hash values of blocks. The header section of each block contains a timestamp, a nonce and the cryptographic hash value of the previous block. The first block, called the Genesis block, is always entered manually, and is generally given the block number 0.

WHAT IS IN A BLOCK



Source : Blockchain, Race Next, 2018

HOW DATA IS PROCESSED IN A BLOCKCHAIN TRANSACTION

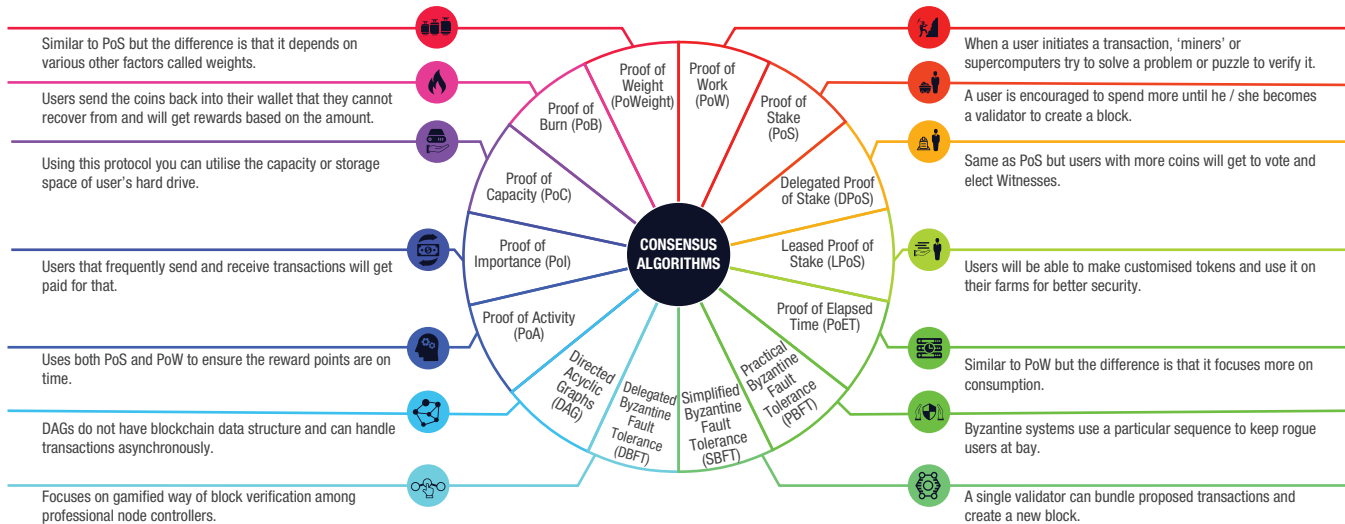


Source : Distributed Ledger Technology System : A Conceptual Framework, The Cambridge Centre for Alternative Finance, 2018

Consensus Mechanism

The blockchain system is firstly identified by the way its network reaches decisions known as the 'consensus mechanism' which determines how a blockchain works. Below are some examples of consensus protocols.

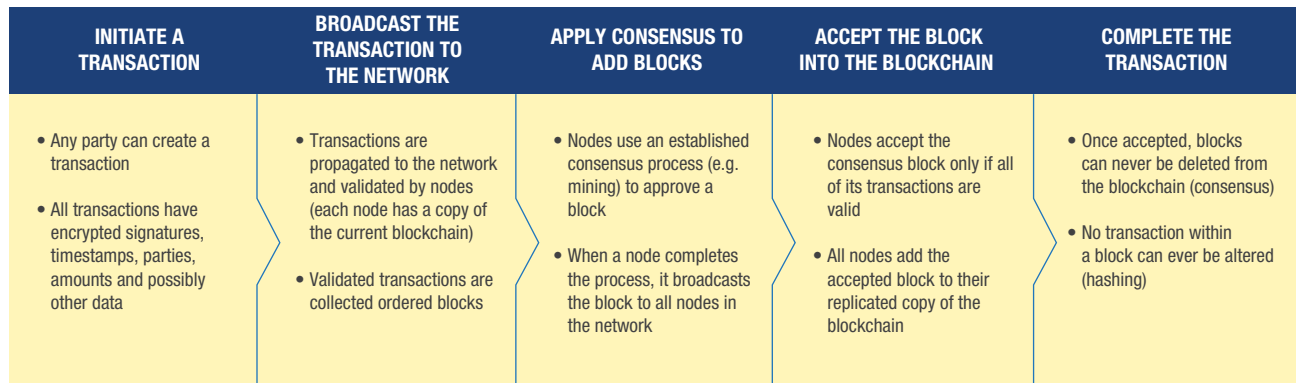
DIFFERENT TYPES OF CONSENSUS ALGORITHMS



Source : Consensus Algorithms: The Root of The Blockchain Technology, 101 Blockchains

The Blockchain Transaction

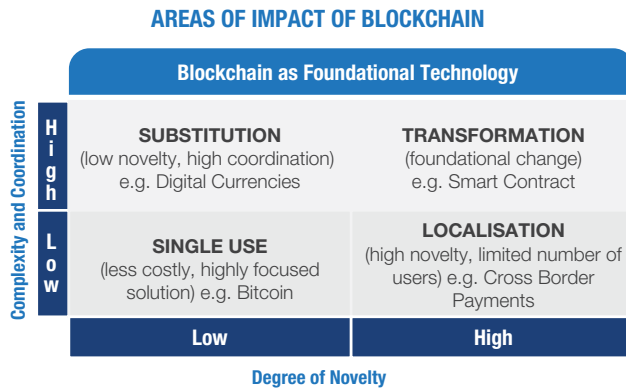
A blockchain is a network of computers that stores duplicate transactional data across every node (PCs, laptops, smartphones, etc.) in the system, known as a distributed ledger. The data is entered into the chain in intervals known as blocks. Each block is time-stamped to have its order and transactions verified. The following scheme is a simplified version of the blockchain transaction.



Source : Distributed Ledger Technology System : A Conceptual Framework, The Cambridge Centre for Alternative Finance

1.3 Why and When to Use Blockchain & DLT

In the book “The Truth About Blockchain” by M. Iansiti and K. Lakhani, blockchain is expected to develop as a foundational technology, with the potential to create new foundations for economic and social systems involving a gradual pattern of adoption as opposed to being a disruptive technology. The inescapable impact will affect both businesses and the public, and remains one of the strong reasons to understand and deploy the technology where relevant. Below are some of the areas where the impact would be evident.



Source : The Truth About Blockchain, Harvard Business Review

Blockchain is known for its capacity to create trust and validation, thus providing a number of advantages over traditional systems built around centralised databases. Applications where these trust factors are considered critical would be good candidates to explore its use.

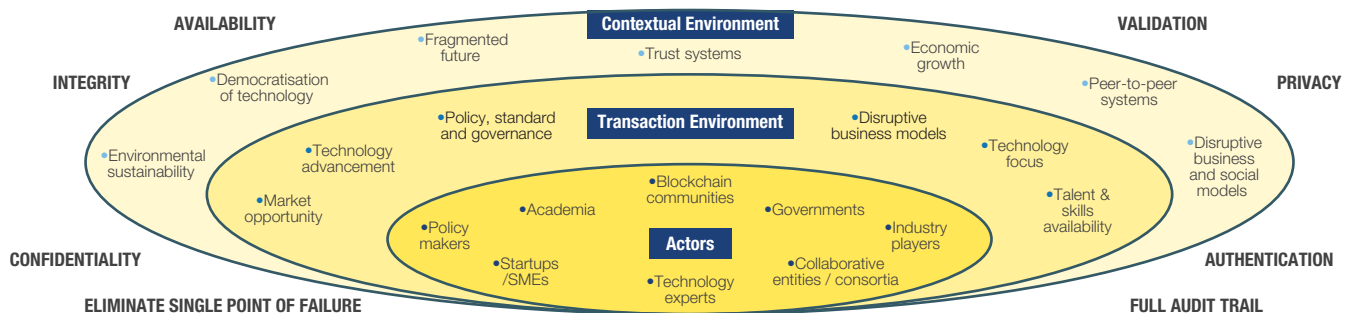
Both blockchain and DLT have been tested and deployed in many use cases, both in business and non-business environments. For business it has been used to add trust to payments and other financial transactions, including supply chain management. Some of the interesting use cases include its usage in the Pacific Islands’ tuna industry to certify sustainable and slave free tuna, while in non-commercial implementations it has helped the United Nations (UN) to establish identities of refugees for financial assistance.

The potential spectrum of use is expansive, and in many applications blockchain is one of the group of technologies that are used to make things happen. It needs reminding that the technology is still developing and its adoption should be looked at on a case-to-case basis, as blockchain is not necessarily suited for everything. When considering to use the technology, the problem statement(s) should take precedence in concluding whether blockchain could provide the most effective solutions for the stakeholders.

As with all IT projects, focus is on the desired business outcome rather than the technology. Gartner considers the following use cases to be promising because they represent difficult and complex problems for the government:

- Problems that have proved resistant to resolution by traditional technologies
- Problems that are uniquely digital in nature
- Problems that represent key barriers to scalability and digital transformation

BLOCKCHAIN : ABOUT ‘TRUST’ AT ARM’S LENGTH



Source : MIGHT, Blockchain : About ‘Trust’ at Arm’s Length Using Kees Van der Heijden Model

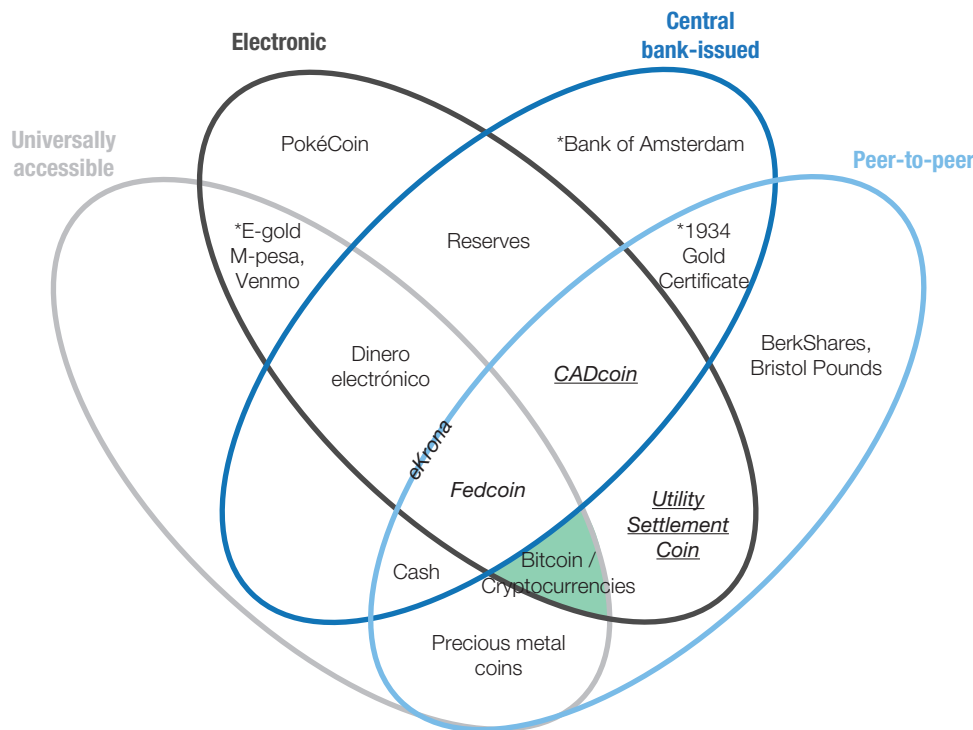
1.4 Use Cases : Bitcoin, Cryptocurrencies & Digital Currencies

The first use case for public blockchain was Bitcoin. The Bitcoin network was forked (developed into separate platforms) and updated to create other cryptocurrencies which became known as alternative coins (altcoins). Cryptocurrencies are a part of the digital currencies ecosystem.

The idea of bitcoin/ cryptocurrencies replacing fiat currency might have catalysed the hype about cryptocurrencies and tokens but history has recorded many efforts to innovate money by both public and private entities serving different purposes. The Venn Diagram on Taxonomy of Money from BIS below suggests that cryptocurrencies could add specific value within the money ecosystem. So far, it has helped catalyse efforts to innovate financial systems via fintech, and has opened up new opportunities for markets that were previously not captured by the traditional financial sector such as the unbanked and the extremely poor.

Going forward, it only means that there will be areas of overlap between these systems—between fiat and cryptocurrencies—and the connecting space could serve as an important support for liquidity. However these changes also come with risks—uncertainties and volatility in the value of transactions—and adopters should proceed with caution.

CRYPTOCURRENCY FROM THE PERSPECTIVE OF THE BANK FOR INTERNATIONAL SETTLEMENTS' (BIS) MONEY FLOWER



A standard font indicates that a system is in operation; *italic* = a proposal; *italic & underlines* = experimentation; * = defunct company or an abandoned project.

Source :The money flower with selected examples, Bank for International Settlements (BIS)

1.5 Use Cases : Industry

It is difficult to measure the actual extent of blockchain and DLT adoption at a global scale. However, the involvement of some of the largest global public companies as listed in Forbes 2000 indicates the pervasiveness of this technology in the business/ enterprise ecosystem. The areas covered by blockchain and DLT have extended way beyond fintech—and most importantly in some cases have gone beyond Proof of Concept/ pilot into actual use cases.

BIG BLOCKCHAIN : THE 50 LARGEST PUBLIC COMPANIES EXPLORING BLOCKCHAIN

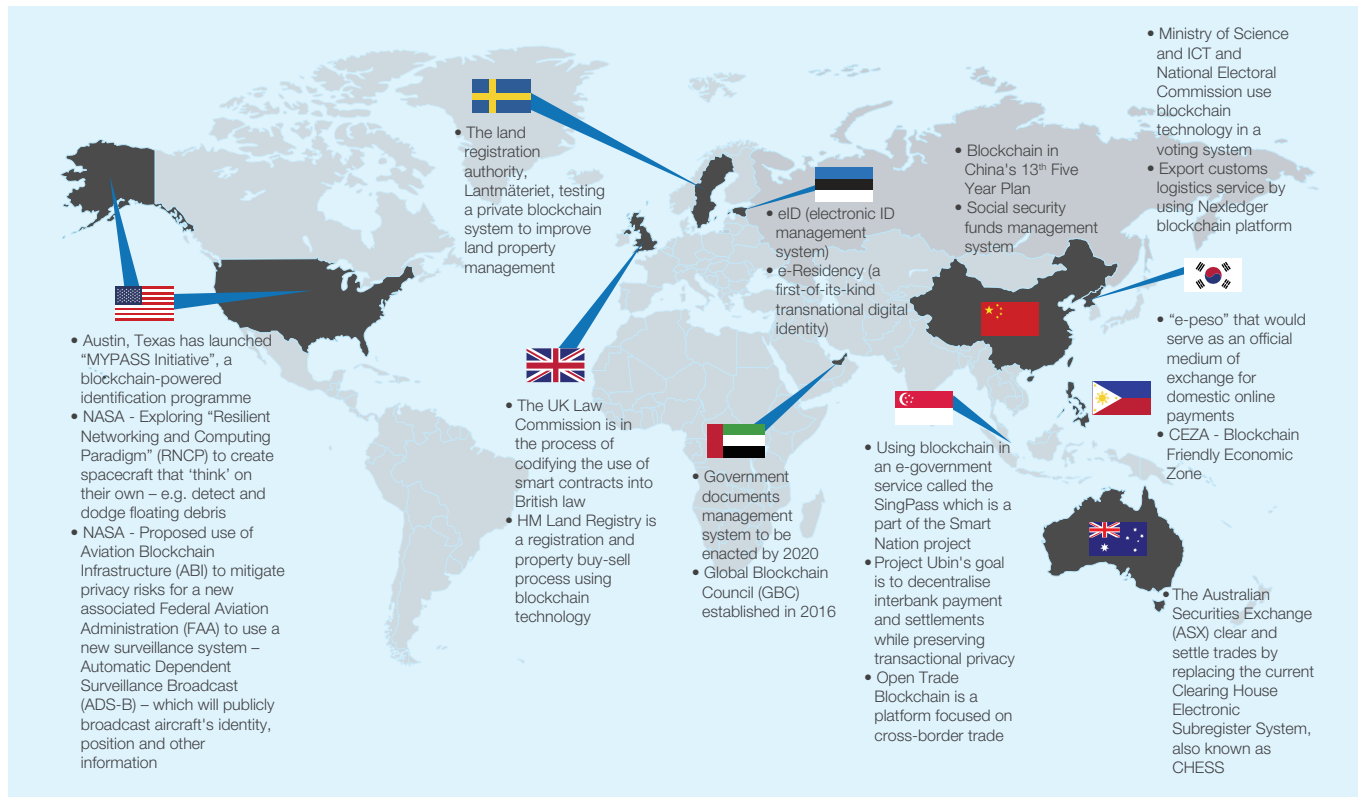


Source : Forbes July 3, 2018

1.6 Use Cases : Government

Individual government's approach to blockchain adoption differs widely throughout the world. In the US for example, the approach is through its General Services Administration (GSA) groupings to help identify potential areas. China's government has comprehensive interest in matters related to blockchain and has incorporated it as a part of their 13th Five Year Plan. Whether in testing or already in full involvement, many administrations are already trialing blockchain. What we are seeing is that the use cases vary according to the needs of the particular environment and expectations of the administration. Areas explored include appropriated funds, procurement, asset and supply chain management, patents, royalties, government credentials (passports and birth certificates), workforce data and funding aid delivery. The following are some of the examples of the use cases:

USE CASES OF BLOCKCHAIN IN VARIOUS GOVERNMENTS



Source: MIGHT, Compilation of Government Use Cases (Global)

According to Gartner, Inc., governments should consider adoption of blockchain for the following, when the requirements are;

- to evaluate blockchain as an option for storing data or records where the current controls to ensure immutability and manage access are expensive; or
- to explore data storage options for record-keeping use cases, particularly for those with retention policies, privacy implications or large data volumes.

2.1 Overview : Growing Interest Beyond Cryptocurrencies

Blockchain primarily champions decentralisation of transaction records. Ten years after the launch of the first use case, i.e. Bitcoin, blockchain and DLT have begun seeing mainstream interest beyond the financial sector. Sometimes, the perceived complexity discouraged acceptance, particularly as scammers capitalise on the ignorant to create get rich quick ‘investments’ and misleading claims.

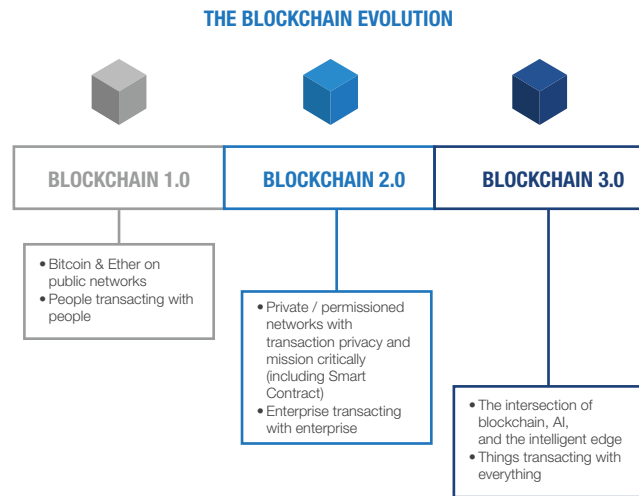
The entry of enterprise-grade interest into the sphere began with the financial sector, particularly in countries and areas known as financial centres affected by the development brought by fintech companies. The hype has also brought a new trend in the creation of industry consortia whereby competitors of the same industry cooperate in groupings to explore opportunities and mitigate threats brought by the potential changes.

Although the success of many emerging technologies are benchmarked in terms of their adoption at enterprise level alone, blockchain's technical development is still very much in the domain of the communities of developers who in many cases file the Intellectual Property (IP) as open-source, as opposed to the proprietary method commonly used by enterprises.

The Ethereum blockchain is an example of a platform that adopts this practice. An open-source IP will leave a big impact on decentralising the ownership of intellectual property. For emerging economies, open-source could lower the cost for SMEs and industries to adopt the technology.

Beyond cost and time savings, blockchain technology is seen as a viable platform to help verify digital identity and anchor trust for transaction verification. Interest in blockchain is set to grow, not because of blockchain per se, but the growing and inevitable programmable economy enveloping the world. This leaves the world with no option but to respond—starting from capitalising potentials and innovation to instituting governance and regulatory practices to mitigate risks.

In summary, blockchain and DLT are considered to be at a very early stage of exploration, and as proposed by Gartner Hype Cycle 2018, it will take five to 10 years for blockchain technology to become mainstream with crosscutting impact on industry sectors. Some view the current stage of the blockchain evolution as Blockchain 2.0, which is summarised below:



Source : Blockchain Taxonomy, Hewlett Packard Enterprise (HPE)

In the following sections, we highlight some of the key developments in the global blockchain ecosystem that have a big impact on blockchain adoption from the perspective of Political/ Policy, Economics/ Markets, Social and Technological (PEST) development of the technology. PEST are factors of macro-environment that are beyond a firm's control and could either create opportunities or threats for the firm.

2.2 Policy & Regulation

I. Increasing Global Collaborations Involving Governments

COMPILATION OF GLOBAL COLLABORATION INVOLVING GOVERNMENTS

PROJECT	KEY STAKEHOLDERS	TARGET
European Blockchain Partnership	European Commission (EC)	Establishment of a European Blockchain Services Infrastructure (EBSI) that will support the delivery of cross-border digital public services, with the highest standards of security and privacy.
U.S. Federal Blockchain	US General Services Administration	US Government employees and US Businesses.
International Association for Trusted Blockchain Applications (INATBA)	European Commission	Maintain a permanent and constructive dialogue with public authorities and regulators that will contribute to the convergence of regulatory approaches to blockchain and other distributed ledger technology globally.
Centre for the Fourth Industrial Revolution	World Economic Forum	The Network for Global Technology Governance.
International Association for Trusted Blockchain Applications (IATBA)	European Commission (EC)	Set-ups involving government-industry partnerships to help regions capitalise on the technological development.
Intelligent Tech & Trade Initiative	International Chamber of Commerce (ICC) Brazil & United Nations Conference on Trade and Development (UNCTAD)	Using technology to benefit SMEs in emerging markets in international trade.
SDG Impact Fund	United Nations cryptosphere foundation supporting Sustainable Development Goals (SDGs): e.g. PIVX, Celcius Foundation	Capital to frontier technology that supports the UN's Sustainable Development Goals.

Source : MIGHT

The emerging blockchain and DLT ecosystem is witnessing different levels of government response, including echoing calls from various stakeholders about the need to regulate the ecosystem, and to create an innovation-friendly environment. There is a marked increase in government regulations involving cryptocurrencies in the APAC region and Europe, although the initiatives vary according to local requirements. At the same time, there is also a more comprehensive engagement on blockchain involving multiple government stakeholders, either within a country such as the US, or those involving international collaboration such as the World Trade Organisation (WTO). (The table above shares some examples.)

However, one needs to take into account that these developments are still in infancy. The development of broad-spectrum frameworks may find challenges championed by interests of individual countries, trading blocks, trade tariffs as well as trade cartels within incumbent industries, as commonly found for similar initiatives in other technology ecosystems. The effectiveness of such initiatives will depend on successful negotiations among the countries affected.

The trend towards closer collaboration between governments and industry and the wider regulations will change the dynamics of the blockchain landscape.

MIGHT's Outlook

The overall framework is showing a strong confluence between blockchain and other technologies in the policy area—indicating pursuing international collaboration at policy level could help ease Malaysia's effort in its transition into the digital global ecosystem with the help of blockchain and DLT.

It is also possible to learn and collaborate with the ASEAN neighbours on blockchain-related initiatives to enhance its competitiveness in fields it is good at such as in halal ecosystem and shariah-compliance applications.

II. Enhancing Standards

Technical standards are critical for integration, particularly for digital transactions. The questions run from definition (which is only expected to reach a formal consensus in the next few years at the global level as the technology matures) to the interoperability of systems and standards to be accepted as default. International Organization for Standardization (ISO) has set up a standards committee monitoring the development of Standards for Blockchain and DLT in April 2017, named ISO/TC 307. Another international standards body, the ITU Telecommunication Standardization Sector (ITU-T) has also created a focus group in May 2017, named FG-DLT.

Global trade is expected to become one of the most affected by the development of the standards, and governments have been called upon by the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) to seek inputs from local stakeholders for the purpose of creating a common standard involving blockchain and DLT in global trade facilitation. In Malaysia, this effort is being led by the Ministry of International Trade and Industry (MITI).

There are also specific industry initiatives that are looking at adoption of blockchain and DLT standards from existing industry bodies. These adoptions include GS1 for barcodes, ACORD for insurance, BiTA for Transportation and Logistics, as well as the recent ISDA for derivatives standards. Progress by consortia, such as Enterprise Ethereum Alliance (EEA), Decentralized Identity Foundation and platform ecosystems (tokens, identity, privacy, security, etc.) would also contribute to this development.

COMPILATION OF INTERNATIONAL STANDARDS SETTING BODIES

COMMITTEE	SUBJECT
ISO/TC 307	International Organization for Standardization committee on Blockchain and Distributed Ledger Technology
International Securities Association for Institutional Trade Communication (ISITC) - Europe	Standards that are designed to enhance efficiencies in trade processing and related communications in capital markets.
GS1	Barcodes
ACORD	Insurance
ISDA	Derivative standards
Decentralised Identity Foundation (DIF)	An engineering-driven organisation focused on developing the foundational elements necessary to establish an open ecosystem for decentralised identity and ensure interoperability between all participants.
ITU-T Focus Group on Blockchain and DLT	Assessment framework for use cases.

Source : MIGHT

MIGHT's Outlook

Technical standards are important particularly for global trade. Malaysia needs to respond proactively to these efforts before they are determined by others, particularly in cross border trades and digital transactions, which could turn to technical barriers to trade—an unintended consequence that can be manifested by technological advantage at Malaysia's expense.

III. Regulatory Standpoint on Cryptocurrencies by Countries





















While countries with financial centres have become trailblazers by quickly responding to the existence of cryptocurrencies, many others have taken a wait-and-see attitude. However, in 2019 we began to witness a surge of responses from governments all over the world, particularly from European and Asia Pacific countries including Malaysia.

As 2019 advances, a new set of traditional global corporate giants enter the cryptocurrencies space, either through financial instruments such as derivatives, or through token offerings. With this background, the issue of recognition of it as 'legal tender' will remain a challenging issue worldwide.

Cryptocurrencies themselves have raised the issue of recognition as 'legal tender' and this has been the main focus in discussions on blockchain regulation. The absence of 'legal tender' means that responsibilities for crypto transactions lie with the users.

More governments including Malaysia are defining the transactions under digital assets and securities to provide clear regulations for the transactions. This brings up another common topic of discussion involving the regulation of crypto exchanges. For example, the following maps out Malaysia and selected export trading partners' positions on regulating cryptocurrencies and crypto exchanges.

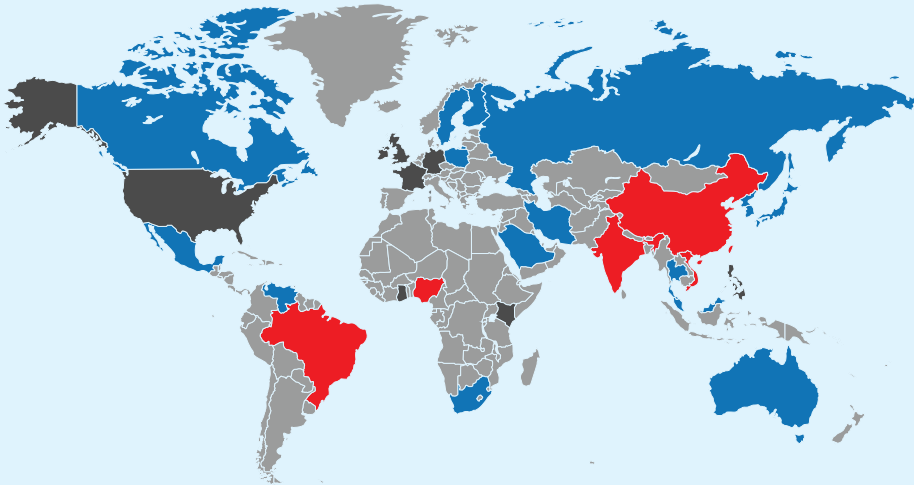
COMPILATION OF COUNTRIES' VIEW OF CRYPTOCURRENCIES

Country	View on Cryptocurrencies (Legal / Not Legal Tender)	Policy on Crypto Exchanges
Malaysia 		Regulation as planned for 2019 in Budget 2019.
China 		Illegal. In 2017, the government banned ICOs and shutdown domestic cryptocurrencies exchanges.
United Kingdom 		Financial Conduct Authority (FCA) guidance stresses that entities engaging in crypto-related activities which fall under existing financial regulations for derivatives (like futures and options) require authorisation.
Indonesia 		Regulation on cryptocurrencies exchanges. Indonesian Futures Exchange Supervisory Board (Bappebti), a commodities market regulator under the country's Ministry of Trade, has officially ruled that cryptocurrencies are commodities that could be traded on futures exchange of the country.
Japan 		Exchanges are legal if they are registered with the Japanese Financial Services Agency.
Singapore 		Legal, may fall under regulatory purview of the Monetary Authority of Singapore (2017) if the digital tokens fall within the definition of 'securities' regulated under the security laws.
Switzerland 		Legal, need to register with the Swiss Financial Market Supervisory Authority, Swiss regulators.
Thailand 		In March 2018, two Royal Decrees approved to regulate digital currencies, including cryptocurrencies, transactions, and Initial Coin Offerings (ICOs), and the other to amend the Revenue Code to collect capital gains taxes on cryptocurrencies.
United States 		Legal, depending on the state. Adhere to requirements of Financial Crimes Enforcement Network (FinCEN).
Vietnam 		Illegal. (Decree 101/2012/ND-CP and the Criminal Code). Currently outstanding proposal by Ministry of Justice on cryptoasset.

Source : MIGHT

The increased regulations on cryptocurrencies and digital assets have also brought focus to governments' interest to monitor and mitigate the risks of money laundering and terrorism funding. As the topic becomes highlighted in the public and crypto exchanges are becoming more concerned about governance and regulations, it is expected that a number of bigger crypto exchanges such as Coinbase will be deploying tools involving blockchain analytics to help identify the flow of transactions in the near future.

CRYPTOCURRENCIES IN 2018 : WHERE THE WORLD STANDS



Source : World Payments Report 2018, Capgemini

FRIENDLY

- Australia has been one of the first countries to introduce cryptocurrency regulations by bringing them into the purview of Anti-Money Laundering and Counter Financing of Terrorism (AML/CFT) guidelines.
- Similarly, Malaysia and UAE also have announced regulations.
- Russian federal law also regulates creation, issuance, storage, and circulation of digital financial assets, as well as smart contracts.
- Other countries including Canada, Denmark, Estonia, Iran, Italy, Japan, Mexico, Switzerland, Sweden, South Africa, and Saudi Arabia are emerging as cryptocurrency friendly.
- Venezuela is contemplating the release of an oil-backed 'Petro' cryptocurrency and has sought regulating cryptocurrency mining.
- Thailand has recently announced cryptoregulations legalising six cryptocurrencies.

NEUTRAL

- UK, France, and Germany do not have any concrete regulations currently, but are tending towards crypto-friendliness.
- In the US, if treated as securities, ICOs need to clear the 'Blue Sky Laws' on a state by state basis.
- APAC countries such as Singapore, Malaysia, Thailand and the Philippines have introduced crypto-regulations in varying degrees.
- While South Africa is crypto-friendly, other African countries, such as Ghana and Kenya, are in the consultation phase.

HOSTILE

- India was initially friendly towards cryptos, but changed its stance in early 2018 by restricting their use.
- Other countries to join the list of hostile countries include China and Vietnam.
- The Central Bank of Nigeria has also imposed a complete ban on Bitcoin and the likes, while Brazil has also banned cryptos.

MiGHT's Outlook

Although Malaysia does not recognise cryptocurrencies as legal tender, the country needs to keep its options open while monitoring this space. Cryptocurrencies and tokenisation as part of the 'Digital Asset' trend is still in the early stages of development and is expected to change in the future.



IV. Governance : The Increasing Regulation on Global Concerns to Impact Blockchain Development

When Bitcoin was first created, blockchain's bad reputation—which was often equated to Bitcoin—had the potential to become a platform to host rogue global transactions. This had preceded all its positive attributes.

The live environment within the open-source system however, has helped catalyse the frequent changes in the development of blockchain, as responses are almost immediate. In this case, Anti-Money Laundering (AML) and Anti Terrorist Funding (ATF) are the major concerns among other global concerns that have begun to play key roles in shaping the blockchain and DLT ecosystem.



MiGHT's Outlook

Malaysia has its own Personal Data Protection Act that may need to mitigate new challenges brought about by the advent of this technology and its impacts, intended and unintended. In the blockchain context, the threat of it being 'privacy poisoned' is real, especially when involving cross border transactions. The ownership of trade data, especially on trade finance that could affect companies' competitive advantage, may face serious challenges if captured in their competitors' systems. Meanwhile, taxes are an area that would be greatly impacted by decentralised digital asset transactions. Governments relying on taxes for the provision of public goods may need to study how to best capture this data and explore new mechanisms that could enhance it.

From the Financial Regulatory Perspective : Gibraltar Stock Exchange (GSX)

The GSX Group has a vision to build a Global Securities Protocol (GSP) to unite regulated stock exchanges, deal brokers and financial institutions under one platform that would allow them to unlock liquidity with the full benefits of tokenising securities.

Gibraltar is not alone in this co-operative venture. While there is a genuine call to foster protocol interoperability (i.e. to have just one global standard) as the ultimate goal, it is becoming increasingly evident that we first need to solve for operability. This latter alternative view proposes that we first need to solve for operability for listing security tokens (STOs) on the Gibraltar Stock Exchange (GSX), and a cohort of exchanges who want to implement a similar model to Gibraltar, with Distributed Ledger Technology (DLT). On this note there has been engaging discussions with existing and proposed exchanges from the Caribbean and within ASEAN++ (including Australia and New Zealand) by both government and private organisations.

Nonetheless, the end goal is interoperability of protocols, should the world be initially bifurcated between a US centric paradigm, based for example on previous legislation such as the Howey Test, and the rest of the world. Moreover, there is an agreement on the 'new normal' of STOs. However, will it initially be securitising private equity (US view), including launching products such as digital REITS or as in the Asian experience, bringing primary market capital to needy small to medium enterprises (SMEs) and infrastructure projects?

In regards to regulations, one view of the world is to follow US regulators, i.e. the Securities and Exchanges Commission (SEC) and the Commodity Futures Trading Commission (CFTC). A counter view is that Asia (ASEAN++) should have a regional regulatory framework, which can concurrently be developed, using the more mature markets of Malaysia, Singapore and Australia as benchmarks.

Malaysia's Green Initiative is to be applauded. Such environmental, social and governance (ESG) investment has natural markets as its cornerstone. It is estimated that global pension funds will need to allocate up to USD10 trillion in mandated ESG investments over the next decade. At a macro level, an increase of 4% in 'wood mass' of global forestry would neutralise current global carbon emissions; a 50% adherence would meet global Paris Climate Accord requirements. This optimal adherence requires an investment of 1.6% of global GDP (USD1.3 trillion) per annum. An allocation of pension funds to this cause of 1.5% of AUM equates to USD100 billion.

Norges Bank and CalPERS to name a few, have announced that they will divest from carbon producing assets and invest in Paris Climate Accord compliant friendly assets, potentially listed on the blockchain. The conundrum is that ESG investment fund structures are relatively scarce in the 'old world' and operationally non-scalable in the 'new world' as a portfolio manager would need to be trusted with the key to invest in the underlying natural market assets listed on DLT. A potential solution is to provide a 'SICAV' type investment vehicle to pool these natural market (crypto) assets to facilitate institutional investment, in addition to digital exchanges whereby natural market tokens are listed, indices created and traded on a secondary market with adequate liquidity.

The immediate future is very exciting and the potential for capital markets to bring about positive change to the world and its peoples is apparent. Now is the time for action, to which the call is being encouragingly nurtured in our region.

THE SECURITIES INDUSTRY CHALLENGE

Security Tokens – No recognised standards

Reputation : Institutional investors lack confidence

Liquidity : No investor participation

Fragmented trading landscape : No global market network

Traditional Securities – Inefficiencies

High latency : T+3 settlements

High costs : Intermediaries, Market Friction, Legal, Time to market

Limited market exposure : No global market network

THE TOP EXCHANGES TODAY WILL BE MOST LIKELY DIFFERENT IN 24 MONTHS

ANDREW PAL

Chief Strategy Officer

Gibraltar Stock Exchange (GSX)

2.3 Economics & Markets

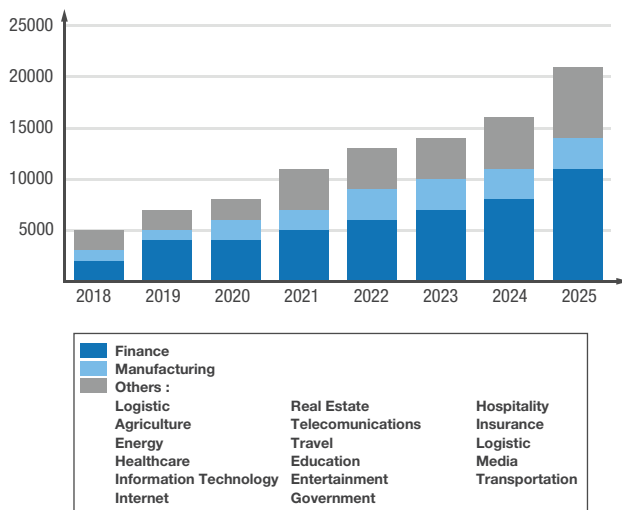
The blockchain and DLT market is expected to mature within five to 10 years, and the World Economic Forum (WEF) expects that blockchain and DLT could facilitate about USD1.1 trillion of new trade volumes globally by 2025—which is equivalent to 1.5% growth of global GDP, offsetting an otherwise growing 'trade finance gap' set to reach USD2.4 trillion. The following are some of the expected key developments contributing to this growth:

I. Emergence of New Sectors

The banking and finance industries do not need radical transformation of their processes in adopting the technology—a PwC report estimates that 77% of financial institutions are expected to adopt blockchain technology as part of an in-production system or process by 2020.

As blockchain matures, standardises, and eventually commoditises, its utility as a general-purpose technology will spread throughout the global economy with even greater impact. The manufacturing sectors in particular are expected to witness accelerated growth in years to come as below.

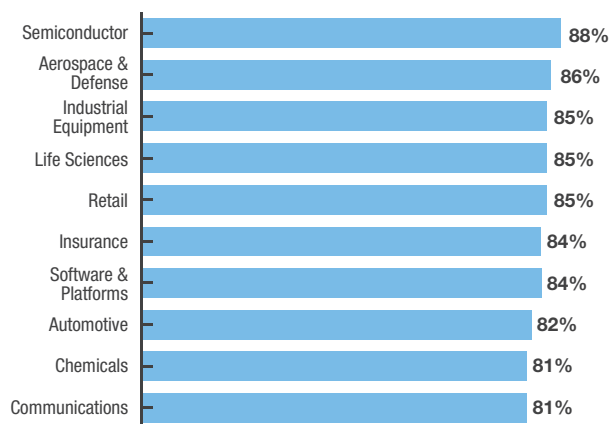
ESTIMATED BLOCKCHAIN REVENUE BY INDUSTRY, WORLD MARKETS : 2018-2025



Source: Tractica

Within the manufacturing sectors, the semiconductor industry is expected to be the most bullish when it comes to the integration of blockchain within their industry. This can be expected, as the technology's secure, tamper-evident, and decentralised features can help semiconductor companies improve supply chain efficiencies, enhance technology-based corporate collaborations, and lower operational costs.

TOP 10 SECTORS EXPECTING BLOCKCHAIN TO BE INTEGRATED INTO THEIR ORGANISATIONS SYSTEM WITHIN THE NEXT THREE YEARS



Source: Accenture Technology Vision 2018, N-6,310 Business and IT Executives

MiGHT's Outlook

As Malaysian businesses look at blockchain applications in industrial and social settings, manufacturing processes stand out as a high priority in this list. Changes in the processes of manufacturing will involve major decision-making and parameters. As part of the Industry 4.0 strategy, attractive incentives would interest companies to take risks in exploring the technology to improve their market share, or keep in compliance with new regulations by target markets, such as the requirements for palm oil in the European Union, etc.

II. Emergence of New Markets

Trade financing is expected to be the main contributor in emerging markets with SMEs being the expected main beneficiaries. Currently, Europe and North America are known to be the big markets of blockchain, while Asia, Africa and the Middle East—which have already seen big interest in this technology—are set to grow.

According to a PwC survey, respondents believe that within three to five years, China will surpass the US to lead on blockchain and DLT. China is known for its government led race to lead the world on the many digital technologies with blockchain considered one of the gamechanger in its 13th Five Year Plan (2016-2020).

MiGHT's Outlook

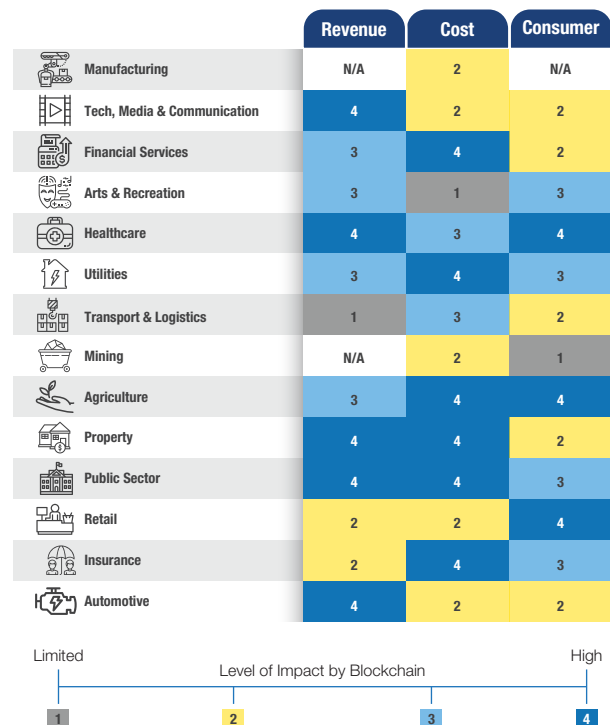
Comparable to other emerging countries exploring the use of the technology within the context of their economic setting, there are opportunities for Malaysia to participate in similar strategic collaborations with its partners.

As a key global market, China's market movements on blockchain would impact Malaysia, and it is to Malaysia's advantage to understand the market trends in China and other emerging markets.

III. Emergence of Blockchain Will Impact Businesses & Business Models

The emergence of blockchain and DLT has brought into focus the need for organisations impacted by it to re-examine if their current business model remains the most competitive among the many models available. This has been the burning question for the financial industry as fintech innovation (some capitalising on blockchain) aggressively proposes changes in the ecosystem. This could be an early indication and benchmark for other industries (and social spheres) to learn about the impact of digitisation, whereby blockchain and DLT are one of the major supporting technologies. One way to identify how businesses will be impacted by the technologies is to look at the strategic business value for a particular industry, as detailed by McKinsey below.

BLOCKCHAIN IMPACTS ON INDUSTRIES



Source : The Business Value of the Blockchain, Visual Capitalist

BLOCKCHAIN - EMERGING BUSINESS MODELS

		SINGLE CHAIN		CROSS CHAIN		
OFF-CHAIN APPLICATION LOGIC + UTILITY/ CRYPTO EQUITY TOKEN	DECENTRALISED APPLICATIONS PROVIDERS	Services Binders	Merged Services	FINANCIAL PLATFORM PROVIDERS	Liquidity Providers	Membership-based P2P Lending
		Crowd Aggregator	Distributed Assets as a Service			Fly Liquidity
		Marketplace Enablers	Light Intermediation		Exchanges	Wallet to Wallet
		Prediction Market Orchestrators	Collective Oracle			Centralised Exchange
		Attention Monetisators	Prosumer Platform			
Three Sided Markets						
OFF-CHAIN APPLICATION LOGIC + BASIC INFRASTRUCTURE	PROTOCOLS PROVIDERS	Miners	Solo Mining	PROTOCOLS INNOVATORS	Blockchain Connectors	Cross-chain Atomic Swaps
			Pool Mining			Smart Bridges
			Cloud Mining			Cross-chain Messaging
			Mining Marketplace			Decentralised Exchange
		Turnkey Technical Developers	ICO as a Service		Scalability Providers	Trusted Off-chain Transactions

Source : Business Models for Blockchain-based Ventures, ISMB

Beyond this challenge, among the more interesting developments from the perspective of the blockchain structure is the creation of many new and innovative opportunities from the technology ecosystem expanding in complexity and forking into specialisation. At this early stage, many of these would be newly created formats, digital knowledge-based opportunities and conversely would require a high degree of technical knowledge about the digital ecosystem. It is expected to inspire further innovation, similar to the innovation witnessed in the fundraising environment, particularly if the market considers the applications as 'low hanging fruit' with good returns.

MiGHT's Outlook

The impact of blockchain businesses will depend on the rate of blockchain adoption in the use cases. The new opportunities presented by the technology itself could be a good area for Malaysian startups to explore, especially in niche areas. Meanwhile, incumbent businesses including manufacturing and funding organisations could explore new opportunities by working with local solution providers to explore use cases relevant to their industries, particularly under the Industry 4.0 initiative.

IV. Innovation in Fundraising

Cryptocurrencies and tokens have opened up a new space in fundraising for projects beginning with Initial Coin Offering (ICO) which became very popular in 2017. It is similar to the Kickstarter Project that allows teams to receive funding to develop ideas into real projects by promoting the projects' white papers. According to token data, in 2017 startups raised USD5.6 billion from ICO compared to USD1 billion from traditional VC funding.

One example of a successful ICO is Binance where it achieved unicorn status of more than USD1 billion valuation in less than six months. It is one of the best cases powered by blockchain technology that have inspired flexibility of funding mechanism and change of business model.

Volatility and risks mark the cryptocurrencies sphere, the returns vary greatly from massive returns to massive losses. The potential also attracted misleading claims and scams. However, the extended 'Crypto Winter' that started at the end of 2018 had led to deep cuts of more than half for most crypto prices, including Bitcoin, and with it the end of ICO popularity. As crypto prices start to climb up again in 2019, new players are coming in and variations of fund raising methods have started to be introduced into the market.

Blockchain demonstrated its resilience with 'fail fast, move forward faster' ethos. The fast changing sphere soon added more control measures with the introduction of the Initial Exchange Offering (IEO) in 2017 and Securities Token Offering (STO), in response to the market condition calling for better investor protection. The innovation also includes the lessons learned from the previous iteration process. The following table is a simple comparison between the three common fundraising methods created in this ecosystem.

COMPARISON BETWEEN ICO, IEO AND STO

	ICO (Initial Coin Offering)	IEO (Initial Exchange Offering)	STO (Security Token Offering)
Definition	Crowdfunding by issuing utility token / coin	Crowdfunding by issuing utility token / coin via cryptocurrency exchange	Crowdfunding via issuing asset-backed token / coin
Difficulty to Set Up	Easy	Medium	Hard
Fundraising Cost	Low	Medium	High
Investor Protection	Low	Medium	High
Investor Accessibility	Low	Medium	Low
Regulation Level	Low	Medium	High
Governance Level	Loose	Medium	Tight
Liquidity	Medium	Medium	Low

Source: A Comprehensive Guide To The Next Generation Of Crypto Funding | (M)ICO | IEO | DAICO | ETO | STO | Hacker Noon

There are other innovations that have come out in this space such as Decentralised Autonomous ICO (DAICO) that matches the DAO and ICO principles to allow investors to release funding in more controlled tranches (tap). Under STO, a subcategory of Equity Token Offering (ETO) is also making its debut in December 2018 that supports tokenisation of assets in the traditional markets (e.g. bonds, real estate, public assets, shares, etc.). The later improvements are pointing towards a more regulated space with better protection for the investors and also the rise of innovative funding methods.

MiGHT's Outlook

The blockchain economy has introduced new ways of doing business. Malaysia needs to explore how to increase awareness and develop talent among its businesses, of which 98.5% are SMEs. Industry is encouraged to seek out new opportunities in fundraising structure. This could also help Malaysia weather the challenges in efforts to expand its funding base for the industry.

Beyond Today's Finance - Key Trends Shaping the Financial Services Industry

Fintech is changing the way consumers engage and consume financial products and services. While fintech is a rather loosely used term, it can be broadly categorised into the following buckets :

1. Payments : E-payments, P2P payments
2. Alternative lending : P2P lending, platform lending, SME trade finance lending, etc.
3. Wealth and markets : Robo advisory, algorithmic trading, production markets, etc.
4. Regtech and Sup-tech
5. Key enablers : Big data, AI, blockchain

If fintech 1.0 (2008-2015) was about fintechs eating the banks' lunch, then fintech 2.0 is about emerging collaboration between banks and fintechs. Instead of taking banks headlong, fintechs are moving into domains and customer segments hitherto not serviced by banks—either for commercial reasons, or the Know Your Customer (KYC) challenges.

Given how fintech has evolved in the past decade, we can see some key trends emerging:

- 3Fs : Faster, frictionless, freemium (speed, transparency and cost). While banks are hamstrung by legacy platforms and processes, fintechs, powered by the cloud, are able to deliver faster, cheaper and easier transactions.
- Growing relevance of P2P : The Millennials and un(der)banked segments see banking as something that should fulfil a need in the simplest possible way, yet can be fun. Successful models from across the globe—Venmo (US), Paytm (India), Wechat Pay and Alipay (China)—showcase how customers are increasingly dealing with fintech platforms for P2P transactions. For the millennials, banking ought to be woven into their 'digital lifestyle', much like texting, messengers and social media applications.
- Greater focus on controls and compliance : In this context, it is interesting to see the growth of blockchain emerge in the same period as fintech, driven by the same key trends—P2P, greater transparency and decentralisation. Therefore blockchain is finding progressive resonance in banking, both for consumers and institutional banking.

MALIKKHAN KOTADIA

Co-Founder & CEO
Finnovation Labs

2.4 Social Impacts

I. The Emergence of New Types of Organisations

Decentralised Autonomous Organisation (DAO)

At the centre of blockchain is the idea of network and 'community' that democratise power and access for members of the network. The bigger and the more complex the network, the more effective the systems.

Blockchain developers have created Decentralised Autonomous Organisation (DAO) to eliminate human errors and manipulations. Unlike traditional companies, the DAO makes decisions for groups of 'communities' based on rules written as automated systems and incentivised by tokens.

The DAO, created by Ethereum, utilises the smart contract for this purpose. It is expected that many new communities will continue to be created based on decentralisation of power and decision-making capitalising on the strength of blockchain—bringing change to the world through projects that involve identity, access to funding and technology, facilitating trade and building the capacity of people through peer-to-peer digital connections that will have huge impacts on social environment.

Industry Consortia

Blockchain has helped the proliferation of consortia—not only for enterprise use, but for government and society as well. In such settings the groups join together, typically to set standards to enable development of new infrastructure and testing. What is interesting for blockchain is that it is very common for competitors within an industry to band together in such efforts. Blockchain consortia, especially industry specific consortium such as the Energy Web Foundation, would help industry buy into the mainstreaming of the technology.

There are also consortia that are purpose/ initiative-based such as Blockchain for Social Impact Coalition (BSIC) which bands together like minded groups from different backgrounds for a common purpose. The new way of collaborating is expanding, and in the collaboration, fusing the principles of business and social good to solve problems.

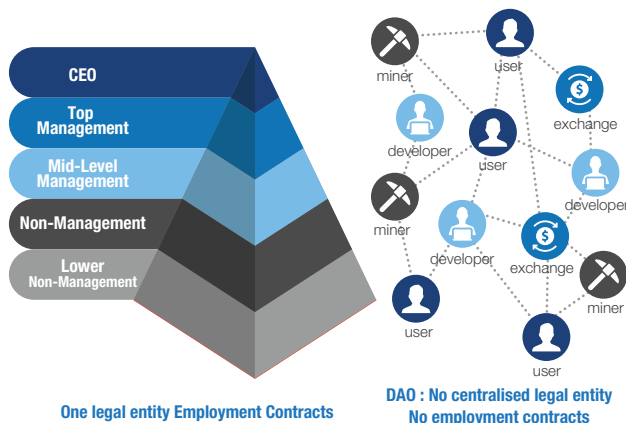
MiGHT's Outlook

It is encouraged for Malaysian companies to explore how these types of organisations could help industry explore and access global markets.

Meanwhile, the open-source and collaborative nature of blockchain that has given rise to social capital as highlighted next could provide a new avenue for Malaysia as a novel source of income by leveraging on the strengths that are ubiquitous in this bazaar-style culture.

There is also the possibility of 'groupthink' arising in this organisation that could lead to monopolies, an unfair advantage that could adversely affect Malaysian players.

TRADITIONAL ORGANISATIONS VS. DECENTRALISED AUTONOMOUS ORGANISATION



Source : What is DAO, Blockchain Hub

Cultural Capital - Why Malaysia is Uniquely Suited to an Open-Source Blockchain World

The blockchain industry is truly global. Unlike its forebears in personal computing or Web 2.0, there is no clear locus of activity in the Silicon Valley. Nowhere is this more clearly seen than at the annual Consensus conference in New York, organised by CoinDesk. More than half of the 9,000 attendees were from outside the United States. Innovation, and capital, in this space is distributed globally.

Where does Malaysia sit in this global blockchain landscape? At the infrastructure layer of miners, wallets, or exchanges—much of that activity has been ceded to startups in China, the UK, continental Europe, and the US. The enterprise applications conversation appears to have passed Malaysia by—Singapore, China, and the Gulf states in particular are actively applying distributed ledger technologies to central bank digital currencies, trade financing, and Islamic finance.

Where does this leave Malaysia? There is one exception to the rule in the country, and that is the major ethereum block explorer Etherscan, founded by Matthew Tan (and largely coded by him). It is a critical part of the ethereum ecosystem, and Tan continues to operate it with a small team in Malaysia.

Etherscan's success gives us a clue about where to direct Malaysia's energies: Open-source contributions with a global impact. The sociologist Pierre Bourdieu described the 'cultural capital', or the social assets that an individual might possess to gain social mobility. Malaysians possess rich stores of cultural capital to navigate the Anglophone world, which remains the foundation of open-source projects.

One way to encourage open-source contributions is by offering bounties. Crucially, these bounties should reward a broad range of contributions, from translating codebases, interfaces, and documentation to Bahasa Malaysia, to fixing bugs, to participating in testing.

It should not be limited to GitHub commits, for instance, so that a broad-based open-source ecosystem can be fostered. A system similar to Launchpad's karma points might work. The platform could be funded by major open-source foundations in the blockchain world, from public chains to enterprise efforts, but it would require a central agency—perhaps one of the tech-focused government bodies—to coordinate, promote, and maintain the bounty platform.

The bounty platform should also support companies like Harpreet Singh's BlockLime, which offers coding workshops on major blockchains. Creating an incentives scheme for open-source contributions creates demand, and supporting software education creates supply. This should generate a virtuous cycle and a healthy ecosystem in the medium-term.

Malaysia already has a track record of producing successful open-source contributors. My co-author, Colin Charles, was an early MySQL contributor and co-founder of MariaDB, and continues to be an influential global figure in the open-source database scene. Others include Azrul Rahim, who developed the JomSocial plug-in for the open-source Joomla content management system, and Dinesh Nair, who is well known for his work on FreeBSD.

Malaysia has a shot at being part of the global blockchain conversation by embracing its core feature: collaborative, open-source, software development.

WONG JOON IAN

Managing Director Europe and Asia
CoinDesk

COLIN CHARLES

Managing Consultant
GrokOpen

CoinDesk is a news site specialising in bitcoin and digital currencies. The site was founded by Shakil Khan and was subsequently acquired by Digital Currency Group.

II. Blockchain Helping Financial Inclusion

The IDC's (International Data Corporation) report "IDC FutureScape: Worldwide IT Industry 2019 Predictions", warns that more than 1.5 billion of the world's population lack access to financial services, healthcare services, government services, and more because they lack any documentation that would establish their identity. Blockchain will assist in the verification process and projects that by 2022, 150 million people across the world will have blockchain-based digital identities.

Blockchain enables the support system through technology enhancements. In many cases blockchain is used in a cluster of technologies, with artificial intelligence, big data and IoT, for example, to enable digital identity and transactions. Below are some of the current initiatives:

The Rohingya Project

The Rohingya Project is a project developed in Malaysia to provide Rohingya refugees with digital identities via blockchain that could provide access to banking, education and healthcare. It could help refugees—normally living at the peripheries of a host country's society—to participate in mainstream global economy, and avoid subsequent generations from slipping into poverty.

Incitement

Incitement was co-founded in 2011 by Zikry Kholil and Daniel de Gruijter in Malaysia. The organisation works with underprivileged societies in Malaysia and abroad—e.g. bringing electricity through their 'Liter of Light' network—and helping brands to improve monitoring their social corporate responsibility using technologies via Inpactor, a blockchain-based social network.

Union Bank Philippines / Bangko Sentral NG Pilipinas

Union Bank launched the i2i blockchain project to onboard rural banks into a blockchain platform called Kaerdo and connect them to the main banking network. It has trained hundreds of developers to become a part of the blockchain talent pool. In championing financial inclusion, the Philippines Central Bank in March 2019 launched the Governor Nestor A. Espenilla, Jr. Institute for Growth and National Inclusion, Transformation and Empowerment (IGNITE).

Value-Based Intermediation (VBI) by Bank Negara Malaysia

BNM is championing the VBI framework to help shariah-compliant financial institutions assess how they create value and impact in response to changing economic, social and environmental conditions. Blockchain was explored as one of the platforms that could help create a common platform in setting shariah-compliant parameters between the different regions of the world.

MiGHT's Outlook

Blockchain could help government in its delivery of financial inclusion programmes in enhancing the lives of the people.

Malaysia could also explore how VBI, with the potential to be enhanced by blockchain and espoused by BNM, could also provide a new way for shariah-compliant businesses to connect worldwide and provide a new window of opportunities for improving local industry's competitiveness, especially in facing the challenges of increasing sustainability requirements for businesses worldwide.

2.5 Technology

I. Convergence of Technologies

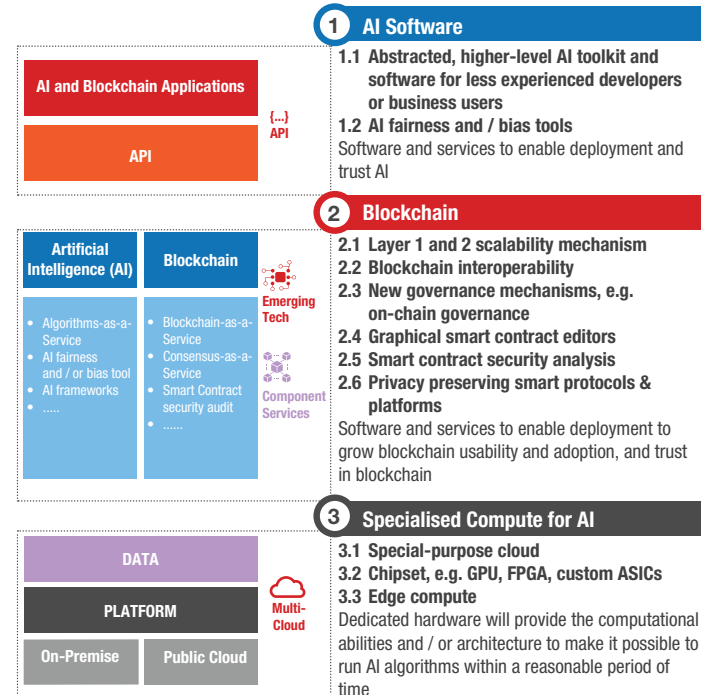
Gartner estimates that there could be over 20 billion IoT connected devices by the end of 2020, and by 2030 there could be 500 billion or more. The report by the International Data Corporation (IDC) says that by 2019, 20% of all IoT firms will inherit the basic level of blockchain technology. This development is particularly relevant based on the current trend of the confluence of technologies coming to dominate 2019 and the next few years—i.e. AI, Blockchain (& DLT), Cloud and Data Analytics and IoT, also known as ABCD-I.

Convergence of these complex technologies will require a lot of effort, investment, time and may require major innovation involving blockchain. Blockchain will need to coexist with other likely competing principles, for example reversible transactions in the financial sector which have resulted in the more permissible DLT. In other requisite for other use cases, such technical innovation should be expected to be launched in blockchain space in the future.

What we are seeing is that some areas, such as the EU and a number of advanced countries, have been agile in providing blockchain specific policy guidance—while other countries, for instance Singapore, are looking at it as a group of technologies working together to achieve 'use cases' targets.

As a benchmark, Singapore has ascertained the need to establish a Cloud Native Architecture involving ABCD as a part of its technology roadmap as a way to improve access to emerging technologies among the stakeholders and assure Services 4.0.

BENCHMARKING SINGAPORE: AI, DATA AND BLOCKCHAIN CONTRIBUTION TO CLOUD NATIVE ARCHITECTURE



Source: Future Services, Infocomm Media Development Authority (IMDA), Singapore

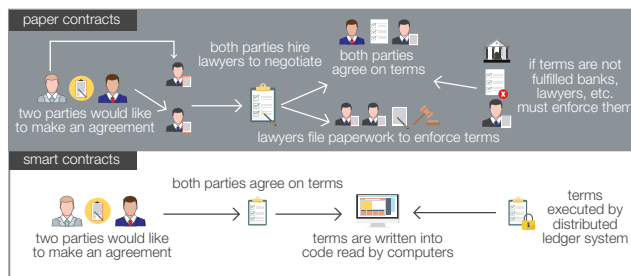
MiGHT's Outlook

There is no single solution for all the countries that are pursuing blockchain policies. Some would find a group policy such as the one adopted by the European Union (EU) to be appropriate, alternatively some will find the route taken by Singapore, for example, which is to look at blockchain as one of a group of technologies to achieve 'use cases' targets is best. These benchmarks could help Malaysia explore how the convergence of technologies, particularly ABCD-I could be tailor-made to best benefit its economy.

II. Smart Contract

Smart contracts have been one of the main factors driving the enthusiasm for blockchain. They are being explored as a way to facilitate arm's length transactions, for local and international exchanges, by saving time and cost as well as improving the visibility of trade. Maersk and other industry giants have tested smart contracts in trade finance and supply chain management. The challenge arises on the sharing of proprietary data and costs. However, smart contracts can also be used for simpler transactions that may need a digital platform.

SMART CONTRACTS VS PAPER CONTRACTS



Source : Faizod.

Traditional Contracts

- 1-3 Days
- Manual remittance
- Escrow necessary
- Expensive
- Physical presence (wet signature)
- Lawyers necessary

Smart Contracts

- Minutes
- Automatic remittance
- Escrow may not be necessary
- Fraction of the cost
- Virtual presence (digital signature)
- Lawyers may not be necessary

Source : PwC

Although the use of computerised systems to enforce contracts has been in existence before the blockchain smart contract, an added advantage to the pre-existing concept is that it allows for electronic contracts to use autonomous execution by computers. The second difference, which is becoming increasingly more important, is its enforceability, as a computer code (technology) and in terms of traditional legal perspective.

In terms of technology, the term 'the law of cyberspace will be how cyberspace codes it' also known as 'code is law' was first coined by Harvard Professor Lawrence Lessig. One of the best known examples of this has been the hacking of the DAO on Ethereum network involving USD55 million. Smart contracts themselves are not

fully secure whereby their security depends on how their code was programmed. Programmes with unknown 'bugs' might carry the risk of theft, which was what happened in the hacking of the DAO. As the hack followed the coding principles within the DAO, it was allowed to run to completion. It also resulted in the 'fork' (breakaway) of the Ethereum network.

The opposing nature of Law (intentionally ambiguous) versus code (strict intrusive) will present a huge challenge in setting up legal provisions involving smart contracts, as 'Code is Law to Law is Code' is still being discussed at international standards setting bodies.

However, while smart contracts are decentralised and are not regulated by any authority, they do not exist in a vacuum. But what should parties do in case of any disagreement? Participants of smart contracts usually agree to be bound by regulations, but the complexity increases when disputes appear between parties from different countries. For now, it is unclear how contractual disputes should be settled. Thus, the rule of law should be enforced into smart contracts in the near future for resolving any disputes between the parties involved.

In the long term trend towards digitisation, smart contracts technologies could serve as the platform for transforming contracts from paper documents to self executing code agreements.

Far from simple, the development is currently in its early stages. Inevitably, it will also require lengthy formal legal discussions at the global level, particularly when it involves global trade facilitation and finance, industry supply chains and other platforms involved in the programmable economy.

MiGHT's Outlook

The discussion on smart contracts revolves around both technicalities and legal definition. Malaysia is involved in the discussion directly through ISO/TC 307. Once the definition and standards are set, it is expected to impact Malaysia particularly in terms of global trade facilitation.

III. Cybersecurity

Similar to other digital technologies, security is key in enabling the adoption of blockchain and DLT. It faces security threats from internal and external sources. The earlier mention of the DAO attack demonstrates the importance of fixing 'bugs' or internal weakness of the programme to improve its robustness. For instance, Microsoft has developed Kinakuta, a smart contract audit and research working group to solve the challenges. Other consideration threats are highlighted below.

Blockchain Security Features

Blockchain technology has the potential to address confidentiality, integrity and availability (CIA) of Information Security. Using the appropriate cryptographic algorithms and key management, it could ensure the confidentiality of information. Integrity of data is achieved through the 'chains of block' itself and the consensus algorithm, whereby being a distributed system, blockchain provides high availability of the transaction data.

Each blockchain node has a cryptographic module to conduct cryptographic operations as specified in the underlying protocol. Still, protecting each node is an essential part in securing the entire blockchain based system.

To ensure authenticity, integrity of properties and order of events, cryptographic primitive (cryptographic algorithm) is being used in a blockchain. For example, Bitcoin blockchain uses ECDSA digital signature scheme for authenticity and integrity, while SHA-2 hash function is used for integrity and order of event. Hash function is also used for proof-of-work consensus mechanism in Bitcoin.

In order to destroy or corrupt a blockchain, a hacker would have to destroy the data stored on every node in the blockchain network. This could be millions of computers, mobile phones or servers with each one storing a copy of some or all the data. Unless the hacker could simultaneously bring down an entire network, the unaffected nodes would continue running to verify and keep record of all the data on the network.

The following general security elements should be taken into consideration to ensure the security of blockchain and its relevant application:

Network Security

This includes authentication and authorisation mechanism for users, access control mechanism to grant access to informational asset, intrusion prevention/ detection mechanism and a mechanism to resist targeted attacks.

Configuration of Cryptographic Algorithms & Protocols

Blockchain and DLT are based on several cryptographic algorithms and protocols such as digital signature, hash function and zero-knowledge proofs. Cryptographic algorithms and protocols need to be chosen correctly and implemented in the right way.

Cryptographic Key Management

Private keys for symmetric cryptography and asymmetric cryptography need to be kept secret. Key data must be stored in a tamper-resistant device, and cryptographic operations which require the private key need to be conducted inside the tamper-resistant device. The lifecycle of the key should be properly managed.

Security Management Process

Conducting a design and implementing process that aligns to security management system such as Information Security Management System (ISMS) from the earlier stage of development is also important to ensure security. The security management system includes risk analysis, threat modelling and mitigation and audit.

Secure Implementation & Certification

In general, bugs in implementation/ application are the source of attack surfacing. Hence, using a hardware/ software implementation that is certified by certification programmes such as FIPS 140 and CMVP is recommended.

Availability

The source of security for a blockchain network is the number of nodes in the network. Thus, it is essential to maintain the availability of each node to ensure security on blockchain.

Transaction Security

Information assets in a transaction should not be able to be modified, such as the sender information, the recipient information and the value. These information must be encrypted using public key infrastructure (PKI) so that the information will not be revealed to unintended parties.

Contract Security

Smart contracts are lines of programming codes with the ability to self-execute certain implementation or agreements involving applications, nodes and blockchain. To ensure that the smart contracts do not contain a flawed programme (intentional or unintentional by programmers), they should be thoroughly audited and evaluated for flaws/ vulnerabilities before their deployment.

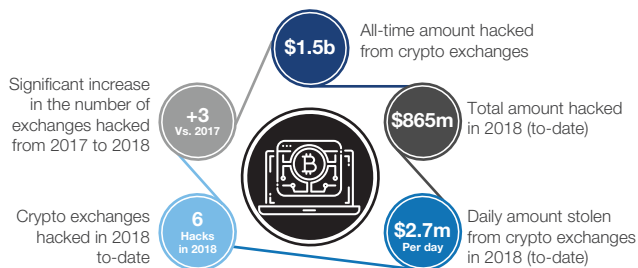
HAZLIN ABDUL RANI

Head, Cryptography Development Department
Cyber Security Proactive Services Division
CyberSecurity Malaysia

Despite being known as a decentralised system, in practice—in the current environment—many elements involved in the blockchain process may be centralised (i.e. wallets and crypto exchanges). The potential for centralisation to creep into the system, either through social or economic factors presents a systemic risk and has an impact on the security of the blockchain system. Examples of this would be the existence of a few dominant exchanges globally and the concentrated number of producers of cryptomining equipment—that include Bitmain and its competitor Ebang—which may concentrate power in a few stakeholders and allow for manipulation of markets.

Major exchanges that involve billions in deposits are also very attractive to hackers, who have upped the sophistication of their hacking tools to include social engineering, such as using stolen identities. This trend requires for both exchanges and the users to deploy the best cybersecurity measures in protecting their critical digital assets, especially as the definition of digital assets continues to expand in the near future.

CRYPTO EXCHANGE HACKS IN 2018

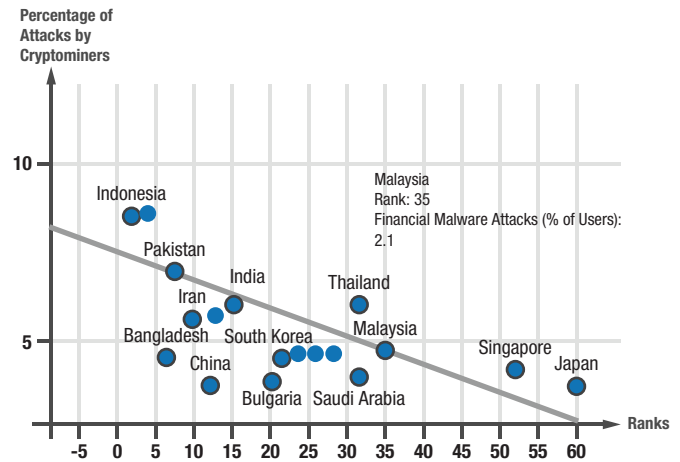


Source: 2018 A Record-Breaking Year for Crypto Exchange Hacks, CoinDesk

On a longer term, security development in the blockchain space is expected to have an impact on other related digital technologies, particularly the ABCD mentioned earlier. TechRepublic announced that cryptojacking was ‘the runaway security problem in 2018’ and the increased connectivity through the Internet of Things (IoT) is likely to heighten the impact.

COUNTRY CYBER SAFETY RANKINGS AND CRYPTOMINER ATTACKS

Percentage of users impacted by cryptominers and country cyber safety rankings



Source: Which countries have the worst (and best) cybersecurity?, Comparitech

Beyond system vulnerability, Blockchain and DLT, including cryptocurrencies, have also attracted a growing number of digital crimes and scams associated with capitalising on ‘human’ weaknesses—ignorance and negligence—of their victims. Pyramid schemes and bogus ICOs feed on this. Some other common crimes involve phishing, password guessing and stealing private keys by getting control of digital equipment such as handphones and laptops. In the case of cryptocurrencies, the common advice for safekeeping is to keep a copy of record of assets on an off-internet platform, such as a cold wallet, or keeping hardcopies in a safe place or appointing lawyers, etc. Generally speaking, digitisation puts an added responsibility on users to keep updated on the latest scam trends, particularly as the speed of execution can be instantaneous. Similar to physical life, risk management is important.

On the positive side, blockchain is also being considered as a way to help mitigate risks of some of the current cybersecurity challenges in the world. In sabotage situations that seek to obliterate information about transactions, blockchain might offer a surprising option of keeping information available by nodes. The difficulty of taking down the whole chain increases with the increase of users on the network. This is the concept used by platforms such as Guardtime in protecting data. Blockstream provides the option for fully decentralised DNS to mitigate the risk of DDOS attacks.



However, these features may be primarily enhanced in a public blockchain, and different challenges could add to the complexity of these cautions—particularly as the newer platforms are created, including hybrids, which might have mitigated the known risks, but could also open up new risk factors. Continuous security monitoring is a prerequisite in this sphere, both for commercial and government deployments.

Meanwhile, blockchain is also being explored together with other technologies to assist in solving challenges in the complex Cyber Threat Intelligence (CTI) environment by companies such as Polyswarm.

The growing threats are expected to continue for blockchain and DLT as the level of understanding and complexity increases along with time.

Security issues will take centre stage in the blockchain ecosystem. This is also reflected in the local scenario which has been plagued by scams—particularly pyramids and Multi Level Marketing schemes—preceded actual business and social use cases to promise quick riches using 'Bitcoin' mining and bogus token launches.

MiGHT's Outlook

Expanding the ability of authorities to study and act on dubious 'marketing plans' and pyramid schemes will send a strong signal to the public about government's intention to attract serious blockchain projects and provide clear guidelines for business processes such as registration and banking as well as qualification for government incentives. These could be some of the considerations in regulating the local market.

IV. Intellectual Property (IP)

Moving forward from its 'open-source' and p2p beginnings, blockchain and DLT are witnessing a rush to file blockchain and DLT patent applications. This is not surprising as patents are seen as critical in protecting business operations and securing investments. However, this may create a unique issue for the ecosystem, as enforcing patent rights for applications developed under an open-source license may be challenging. An open-source license promotes collaboration by allowing anyone to view, use and modify the source code of a computer programme as long as they in turn allow others to do the same for their derivative work.

As the technology entered the public space through fintech development, it is only expected that as late as 2017, the blockchain and DLT patent space was dominated by the financial industry. However, moving towards the end of 2018, not only have the types of industries rushing for the patents expanded, but China based companies dominated more than 50% of the top 100 global patent holders, led by Alibaba. Considering China's ban on cryptocurrencies activities, it is a strong indication that the works on the technology itself is booming in China.

It is expected for technology companies such as IBM and Fujitsu to be some of the top patent holders as they work to improve technology processes, as well as the IP holding companies that may seek patents to monetise them. Interestingly, the People's Bank of China (PBOC) holds the fourth position with 44 patents revolving around their efforts to create a Central Bank Digital Currency. This could become a benchmark and inspire other governments to invest in innovation and R&D in developing their nations' interests.

For Malaysia, although currently the number of blockchain patents may not qualify to be in the top global list, there are efforts being made to develop IPs, and one of the established efforts is MyDNATM by VTOS Malaysia—an internationally patented insurance telematics solution that combines service oriented architecture (SOE) and blockchain.

The US Patent and Trademark Office (USPTO) databases recorded an exponential increase of 'blockchain' patent filing in the past few years. There were 382 patent applications in 2017—up from 90 in 2016, 24 in 2015, and two in 2014. It is likely that there are a significant number of recently filed, but yet unreported, blockchain-related patent applications currently in the pipeline. The following lists the current IP holders and the race is expected to intensify as the technology moves towards maturity in 2019.

ENTITIES, INDUSTRIES & THE NUMBER OF BLOCKCHAIN PATENTS

Highlight : 2018 Global Blockchain Patent Enterprise Top 100 Ranking (selected)	
Entity	No of Blockchain Patents
Alibaba	90
IBM	90
Mastercard	80
Bank of America	53
People's Bank of China (PBOC)	44
Nchain	43
Coinplug	41
Guardtime	25
Intel	25
Visa	24
Sony	23
British Telecom	23
Google	22
Toronto-Dominion Bank	21
Walmart	21
Microsoft	20
Cognitive Scale	20
Digital Asset	20
Fujitsu	20
Shapeshift	20
RWE	20
SkuChain	20
402 Technologies S.A.	20
PayPal	20
Nasdaq	20
Coinbase	20
Dell	20
Nokia	20
Tyco Integrated Securities	20
Barclays Bank Delaware	20
Thomson Reuters	20
JP Morgan Chase Bank	20
Facebook	20

Source : IPR Daily Chinese Network, August 2018

MiGHT's Outlook

In moving forward, IP development is probably one of the most important factors for Malaysia. As more than 98% of its businesses are SMEs, the open-source system could allow a lower cost for technology adoption than the traditional proprietary IP system. This would place SMEs in a better position to seek new opportunities.

Blockchain as an Open-Source Technology : Learning from Cardano

What is Cardano?

Cardano is a fully open-sourced decentralised public blockchain and cryptocurrency project. It is currently developing a smart contracts platform which seeks to deliver more advanced features, and would be the first blockchain platform to evolve out of a scientific philosophy and a research-first driven approach. The development team (IOHK) consists of a large global collective of expert engineers and researchers.

IOHK focuses on practical, peer-reviewed research to create live protocols, and the technological underpinnings to next-generation cryptocurrencies. Also, Cardano development will use formal verification methods to basically confirm the correctness of software, ensuring the risk of bugs is minimised.

The Research department is headed by Professor Aggelos Kiayias of the University of Edinburgh as Chief Scientist. He will continue to do research and teach courses in cyber security and cryptography at the university.

EMURGO

EMURGO was founded in 2017 in Japan. EMURGO develops, supports, and incubates commercial ventures and helps integrate these businesses into Cardano's decentralised blockchain ecosystem. EMURGO is investment focused and invests in two ways: through direct investment into startup ventures; and by developing commercial partners who want to use blockchain technology to revolutionise their industries.

SOSV acceleration programme EMURGO, the commercial development arm of Cardano, the leading third-generation blockchain ecosystem and SOSV, the early-stage VC that runs leading deep-tech startup accelerators such as HAX (hardware), IndieBio (life sciences), and Food-X (food tech), announce their partnership to launch dLab::emurgo, a new startup accelerator and venture studio. The New York City-based programme will focus on distributed ledger technologies including DLT protocols, blockchain infrastructure, decentralised applications, and distributed ledger technologies.

Initiatives of Cardano

Africa operations IOHK has signed an MoU with the Ethiopian government to train and hire junior software developers and use Cardano in its agriculture industry, a step towards this promise being realised.

Indonesian operations EMURGO has launched a joint venture with a consortium of Hero Group, Senada Group and Kilau Group led by the founding family of the HERO Group, one of Indonesia's leading operators of retail stores including Hero Supermarket that believes that with the consortium's expertise on supply chain management and logistic, financial sector and energy sector, the partnership can bring a revolutionary enterprise solution into Indonesia through various applications of Cardano's blockchain technology.

SHUNSUKE MURASAKI

CEO

EMURGO Indonesia

2.6 Blockchain Talent in High Demand

In 2017, Financial Times alerted the lopsided market for qualified blockchain talents, where demand exceeded supply and growing at 40% per quarter. It is felt globally, and has not been resolved. By December 2018, IBM and Mastercard filed more than 80 patents on blockchain related technology, but was reported to be 'struggling to find sufficient talents to develop their initiatives'. The rising demand continues as legacy enterprises, regulators and startups begin to build upon this emerging technology in an economy that is shifting from manufacturing into service-based.

In response to the demand for talents, many universities worldwide are adding blockchain to their course list including in Malaysia. As a country, China, which have 263 active blockchain projects and accounts for 25% of total blockchain project worldwide in December 2018 as reported by China based Blockdata, leads the world in academic talent development efforts with 14 universities, followed by the US.

Massive Online Open Courses (MOOC) platforms like Coursera are offering courses in blockchain basics, due partially to high demand. Companies such as IBM is also partnering with 1,000 universities to establish a series of grants and provide open resources to train the next generation of talents.

Platforms like CodementorX are allowing businesses to hire freelance blockchain developers with greater ease. The blockchain community is also getting more robust, so it is easier to find a recommendation or a referral through the communities to hire a full-time blockchain developer. Companies are also using 'bounties' to find people who have real experience in solving problems.

MiGHT's Outlook

The shortage of blockchain talent is shared globally. In order to be a main player in this environment, Malaysia could look at innovative talent planning to encourage talents to deep dive into the technology. There are opportunities in deploying newer methods such as hackatons and bounties as a means to identify talent, capitalising on social capital to develop niche areas, develop talent programmes for Intensified Priority Areas, as well as endorse bonafide training programmes to keep unverified scammers out of the sphere.

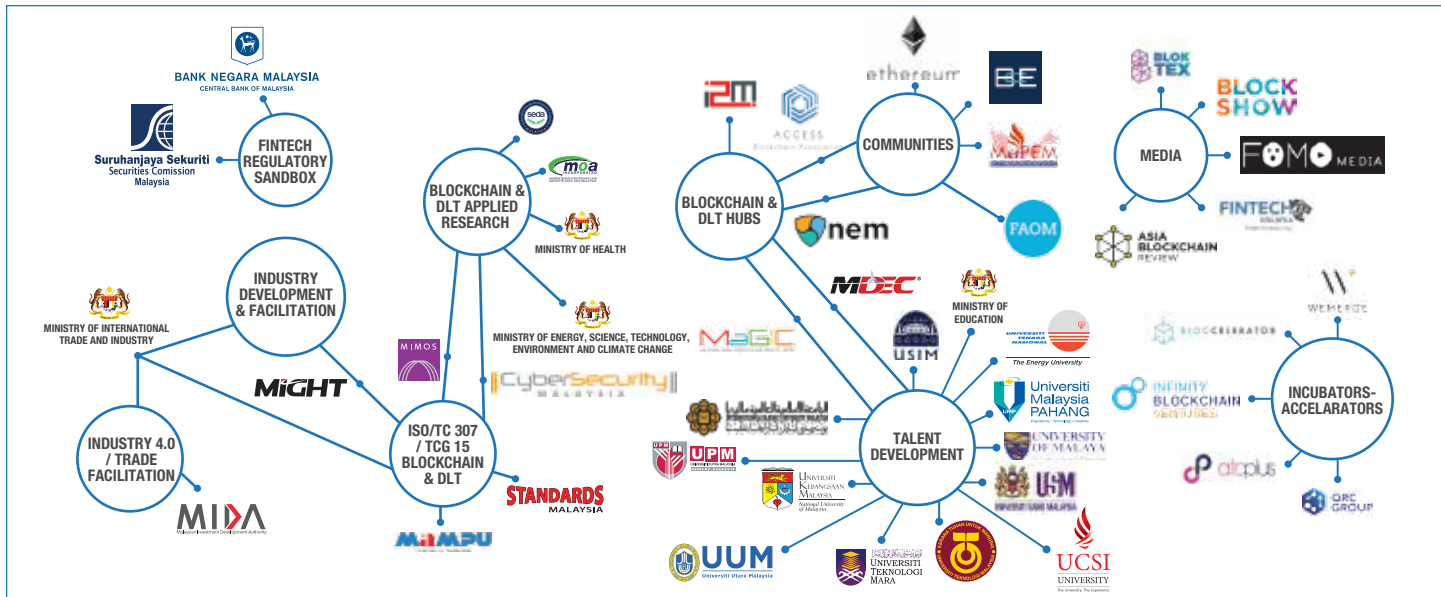
Chapter 3 :

MALAYSIA'S LANDSCAPE



3.1 Stakeholders in Malaysia's Blockchain Ecosystem

EARLY BLOCKCHAIN PLAYERS IN MALAYSIA



Source : MIGHT

I. Introducing Blockchain to Malaysia

The level of awareness about blockchain and DLT in Malaysia is siloed. In other words, the awareness among the public is low. Among the uninitiated, it is common to find the misconception that 'blockchain is Bitcoin and equals to scam'. Unsurprisingly, many of the public have been cheated by 'Bitcoin mining' scams, some of which have been listed in the Bank Negara Malaysia (BNM) watchlist.

On the contrary, those who are directly impacted and involved in blockchain-related activities are usually equivalent in terms of knowledge to their peers in other countries. Blockchain communities and some of the Malaysian businesses, have presence in Malaysia and other countries to become pioneers in this ecosystem, such as Etherscan, Hellogold, CoinGecko and VTOS Sdn. Bhd.

While many might think the 'mainstreaming' of the awareness efforts started in early 2018—MIGHT's record shows that blockchain events in Malaysia leapfrogged in 2017—the number of blockchain events recorded jumped from 3 in 2016, to 49 in 2017, and 89 in 2018.

Blockchain events, an extension of the original blockchain community meet-ups, have become an important platform to share and improve technical knowledge at the leading edge, promote ideas, experiences and ICOs, as well as catering for networking. Internationally, besides becoming the centre of knowledge sharing, blockchain events have played an important role in popularising the technology and incentivising innovation through funding, especially involving Initial Coin Offering (ICO) showcase and pitching and the subsequent funding innovation (such as STO, etc.). In 2018, Malaysia joined other neighbouring countries in the efforts to provide a focus point for the market to better understand blockchain and DLT with the launch of the first KL Blockchain Week.

A lot of awareness efforts are needed from both industry and the government to ensure that the public is comfortable with the technology, particularly in terms of how it can potentially contribute to the wellbeing of the people and businesses.

II. Current Government Efforts



Source : Malaysia Blockchain Regulatory Report (UM), Utusan Biz, GovInsider

The involvement of the Malaysian government in creating awareness about blockchain to the public had started as early as 2015. MIGHT was one of the early introducers of the topic during its event “The Digital Economy : Opportunities for Malaysian Technopreneurs & the Role of Malaysia Software Testing Hub 2016”. MIGHT began to look at the subject matter as a part of the potential game-changing impact of converging emerging digital technologies under the 4th Industrial Revolution cluster identified by the World Economic Forum (WEF).

While MIGHT was looking at the subject from an industrial development perspective, particularly use cases for industries, the Malaysian Global Innovation and Creativity Centre (MaGIC) has continuously engaged startups and explored blockchain and DLT as part of the topics for their listed meet-ups. These efforts complemented the Malaysian Digital Economy Corporation (MDEC)’s efforts to explore the fintech scene for Malaysia, which in some cases involve blockchain and DLT. MIMOS meanwhile has steadily

improved its applied research on blockchain and DLT, leading to the creation of a Blockchain Hub under its purview.

In a nutshell, Malaysia started its initiatives for blockchain from the perspective of promoting innovation. The early interest in financial sector focusing on fintech is reflected by Malaysia’s Securities Commission (SC) pioneering the regulatory sandbox for capital markets called ‘AFINity@SC’, short for ‘Alliance of FinTech Community’.

From 2nd January to 30th March 2018, SC ran the ‘SC Innovation Lab’ for the purpose of compiling inputs in formulating the regulatory framework for the Alternative Trading System (ATS) that was announced in Budget 2018. One of the products included in this system is digital currencies.



BANK NEGARA MALAYSIA
CENTRAL BANK OF MALAYSIA

Scope :

- Legal Tender, Moneygame

Initiatives :

- Fintech Regulatory Sandbox – 2016
- BNM alert and update list
- Anti-Money Laundering and Counter Financing of Terrorism Policy for Digital Currencies (Sector 6)
- Anti-Money Laundering and Counter Financing of Terrorism (AML/CFT) - Money Services Business (Sector 3) (Supplementary Document No. 1)

Impacts :

- Financial system stability
- Scam list
- Reporting Institutions
- E-KYC



MINISTRY OF DOMESTIC TRADE AND CONSUMER AFFAIRS

Scope :

- Consumer Protection

Initiatives :

- Consumer Protection (Electronic Trade Transactions) Regulations 2012
- National Consumer Protection Policy 2002
- Trade Description Act 2011

Impacts :

- E-Commerce
- MLM
- Scams



Suruhanjaya Sekuriti
Securities Commission
Malaysia

Scope :

- Digital Assets Exchanges, Securities, Fundraising

Initiatives :

- The Capital Markets and Services Act 2007 (CMSA)
- Affinity Innovation Lab - Over The Counter
- International Organisation of Securities Commissions (IOSCO) on ICOs
- Industry Consultation on the introduction of Alternative Trading System (ATS) in the Malaysian capital market Jan-Mar 2018
- "Capital Market Architecture Blueprint in Decentralised World" report Nov 2018
- The Project Castor for Over the Counter Market (OTC)
- 31st Jan 2019, The Securities Commission Malaysia (SC) amended its Guidelines on Recognised Markets to introduce new requirements for electronic platforms that facilitate the trading of digital assets
- Under the revised guidelines, any person who is interested in operating a digital asset platform is required to apply to the SC to be registered as a Recognised Market Operator

Impacts :

- Transparent securities based transactions
- Industry engagement for policy on capital markets



MINISTRY OF FINANCE

Scope :

- Financial and Legal Monitoring of Digital Assets Ecosystem

Initiatives :

- Budget 2018
- Budget 2019 - The Capital Markets and Services (Prescription of Securities) Order to be gazetted in 2019 to set up a regulatory framework to approve and monitor Digital Coin and Token Exchange

Impact :

- Market stability



MINISTRY OF INTERNATIONAL TRADE AND INDUSTRY MALAYSIA

Scope :

- Trade Facilitation Smart Manufacturing

Initiatives :

- UN/CEFACT initiative
- Industry 4.0

Impacts :

- National trade interests
- Inputs to mitigate possibilities of Technical Barriers to Trade (TBT)



Scope :

- Cyber security

Initiatives :

- National Cyber Security Policy (NCSP)
- MS ISO/IEC 27001 Information Security Management System (ISMS) Implementation
- MyCC Evaluation and Certification services
- Technology Security Assurance (TSA) Service
- National Trusted Cryptographic Algorithm List (MySEAL)

Impact :

- Computer security
- Information technology security (IT security)



Scope :

- Use Cases for National Competitiveness

Initiatives :

- Industry engagements Proof of Concept projects
- Facilitating role in developing use cases in support of Industry development efforts

Impacts :

- National trade Interests
- National competitiveness



Scope :

- Legal Definitions of Technology

Initiatives :

- National Mirror Committee for Blockchain and DLT T/C/G 15
- One of Founding members for the global ISO committee for Blockchain and DLT ISO/TC 307 Blockchain & DLT

Impacts :

- National trade Interests
- Inputs to mitigate possibilities of Technical Barriers to Trade (TBT)
- Technology interoperability



MINISTRY OF EDUCATION MALAYSIA

Scope :

- Education

Initiatives :

- E-scroll system

Impact :

- Simplifying authentication and verification of university diplomas

Source : MIGHT



During its annual Synergistic Collaboration by SC (SCxSC) event in November 2018, the Securities Commission unveiled a report titled “Capital Market Architecture Blueprint in a Decentralised World” that outlined the recently completed Project Castor and its vision for a 'multi-tiered market environment' that contained both centralised and decentralised markets, with the latter underpinned by DLT. Project Castor was run in collaboration with a local solution provider Neuroware.io.

Bank Negara Malaysia has also created the Regulatory Sandbox in 2016, which allowed financial institutions and fintech players to experiment their solutions in a live controlled environment, with the appropriate safeguards. This was followed by the creation of the Financial Technology Enabler Group (FTEG) in 2016, a platform for Malaysia to explore several critical enablers in supporting infrastructure and framework development for the financial industry. Among the targets is facilitating the adoption of DLT to allow for secure and efficient offering of financial services, particularly in addressing counterparty risks.

BNM has issued the 'Anti-Money Laundering and Counter Financing of Terrorism (AML/CFT) - Digital Currencies (Sector 6)' policy document on 27th February 2018 as part of its efforts to promote greater transparency surrounding digital currency activities in Malaysia. Members of the public are reminded that this list is not a licence or an indication of the Central Bank's validation of the accuracy and completeness of information declared by Reporting Institutions (RI).

In Budget 2019, the Minister of Finance announced that the Capital Markets and Services (Prescription of Securities) Order would be gazetted to set up a new regulatory framework to approve and monitor Digital Coin and Token Exchanges in early 2019. It was gazetted on 15th January 2019, defining crypto assets as 'Digital Assets'. On 31st January 2019, the SC amended its Guidelines To Recognised Markets requiring those operating a digital asset platform to be registered as Recognised Market Operator (RMO).

Malaysia's early approach to promote industry innovation with less regulation has led to some early business cases as well as proliferation of scams and pyramid schemes. The issuance of a clear regulation for digital assets and its exchanges (DAX) under 'Guidelines for Recognised Market' in January 2019 has been beneficial to help the market identify serious players. 'Blockchain based Tokens' and crypto related pyramid scams are common, with some identified by Bank Negara Malaysia's (BNM) Consumer Financial Alert list. The difference is that the BNM's list puts the burden of proof on regulatory bodies, while under the new regulation, the onus is on the market player to prove the legitimacy of its business.

Applied Technology On Blockchain

As one of the research components in MIMOS, we are investigating ways and means of technology adoption into existing applications and software systems for blockchain and DLT's benefits to be realised. This is a critical step in applied research to integrate and to realise its technology benefits for the government and local industry.

Our initial integration work has been to enhance MIMOS' product/ process traceability solution with an enterprise blockchain to track the sources of palm oil (plantation) for sustainable practice compliance. Future work will include DLT integration into product/ data certification for manufacturing and services industry.

NG KWANG MING

Senior Director & Head IT,
Systems, Infostructure & Deployment Engineering
MIMOS

Digital Infrastructure for Blockchain

Blockchain is a technology born on the internet and the key aspects of what it offers are resistance to attack and immutability. For this reason, the internet and the digital infrastructure that it runs on are critical success factors.

Two potential use cases for blockchain technology, digital identity and supply chain management, highlight the need for a robust and ubiquitous broadband infrastructure.

Digital identity will require every Malaysian to have connectivity and that means rural connectivity must be significantly improved. Current infrastructure, which are operator centric, needs to be replaced with a shared infrastructure where costs shall be shared by all operators in an equitable manner.

The other use case, supply chain management, will require a massive increase of IoT adoption at all points of entry into Malaysia—such as ports, airports, rail and road border crossings—by the Malaysian industries. It is only a matter of time when the UN/CEFACT proposal to explore blockchain for trade facilitation will become a reality. When that happens Malaysia must already be prepared. But for it to happen, the broadband connection for all industrial, agricultural and raw materials production facilities must have the right digital infrastructure. Again, the operator centric infrastructure deployment model needs to be replaced with a shared infrastructure model.

TAN TZE MENG

Head of Data Cloud Department
Malaysia Digital Economy Corporation

Blockchain Cybersecurity National Landscape Involving Blockchain

The standards and regulations in the security aspect of blockchain technology are still lacking in Malaysia and many of the studies as well as the possible case scenarios still need to be tested. In this sense, Malaysia could leverage on some of the existing national cyber security policies and services available as follows:

National Cyber Security Policy (NCSP)

The National Cyber Security Policy (NCSP) requires the Critical National Information Infrastructure (CNII) to implement adequate security measures to ensure that the delivery of their critical services and products are not disrupted—due to problems with the information assets and information systems that are used to manage, control or deliver such services and products.

Blockchain could leverage on this policy since it offers several security measures that could compliment an existing system and solve some of the security issues faced by CNII in delivering critical services or products. For example, blockchain may be applied to ensure that the operating system and firmware used in critical infrastructure have not been tampered with.

MS ISO/IEC 27001 Information Security Management System (ISMS) Implementation

The Malaysian Government has decided on 24th February 2010 through their memorandum stating that the CNII entities of Malaysia are to be MS ISO/IEC 27001 Information Security Management System (ISMS) certified. This includes all Ministries, Central Agencies and Regulatory Bodies. CyberSecurity Malaysia has been selected as one of the certification bodies for MS ISO/IEC 27001.

ISMS can be used as a tool to preserve the confidentiality, integrity and availability of information assets on a blockchain and its relevant applications/ services. Apart from the blockchain application itself, any infrastructure surrounding the technology should also be secured (e.g. currency exchange servers & systems). By implementing ISMS, risks and threats to the blockchain are systematically analysed and documented to maintain the user's confidence and to prevent major incidents to the applications/ services.

MyCC Evaluation and Certification Services

Malaysian Common Criteria Evaluation and Certification (MyCC) Scheme is a systematic process for evaluating and certifying the security functionality of ICT products against ISO/IEC 15408 standard which is known as Common Criteria (CC). The methodology used in the evaluation is also a recognised standard known as Common Evaluation Methodology (CEM) or ISO/IEC 18045. It is important to have a scheme that ensures high standards of competence and impartiality are maintained, and that consistency is achieved. MyCC Scheme can be used to verify the security functions of an application connected to a blockchain are performed at high and consistent standards. Attaining MyCC certification will also increase the user's confidence level in using the technology.

Technology Security Assurance (TSA) Service

TSA is a national scheme that provides evaluation and certification services for local ICT products via CyberSecurity Malaysia's Malaysian Security Evaluation Facility (CSM MySEF). The evaluation is based on Mandatory Security Functional Requirements (MSFRs) developed by the Information Security Certification Body (ISCB). CSM MySEF will also perform Security Functionality Testing and Penetration Testing to identify vulnerabilities and assist organisations in improving the security requirement of their ICT products.

TSA can be applied in evaluating and assessing the security functions of a blockchain and any applications running on a blockchain.

National Trusted Cryptographic Algorithm List (MySEAL)

National Trusted Cryptographic Algorithm List (MySEAL) is a project to develop a portfolio of national trusted cryptographic algorithms, managed by CyberSecurity Malaysia. It is a project specifically designed to provide a list of cryptographic algorithms suitable for implementation within the Malaysian context that supports the National Cryptography Policy (NCP).

With the emergence of blockchain technology, it is crucial for any locally developed blockchain system and its connected applications to adopt trusted cryptographic algorithms recommended by MySEAL to ensure the system's security.

Cryptography training

CyberSecurity Malaysia also offered several trainings on cryptography as follows:

- i) Cryptography for Beginners
- ii) Cryptography for Security Professionals

HAZLIN ABDUL RANI

Head, Cryptography Development Department
Cyber Security Proactive Services Division
CyberSecurity Malaysia

Standards & Regulation

Malaysia's Standards Committee on Blockchain and Distributed Ledger Technologies or DLT (codenamed TC/G/15) under the authority of the Department of Standards Malaysia, comprises representatives from Government, Regulators, Industry/ NGOs and Academia/ Research entities. TC/G/15 mirrors and participates at the international level in the ISO Standards Committee on Blockchain and DLT (codenamed ISO/TC 307). The ISO/TC 307 committee started off with only 16 participating countries in early 2017. This has since grown to 39 member countries today (and increasing), reflecting the increasing awareness of the importance of blockchain globally. Malaysia through TC/G/15 has been a member of ISO/TC 307 from day one.

Standards are developed by consensus involving stakeholders (manufacturers, suppliers, consumers, service and solution providers, regulators, government, testers, intermediaries, researchers, etc.) as applicable. Generally technologies are allowed to mature and stabilise before standards committees are formed. IoT for example, has been around since the late 1990s but the standards committee at the ISO level was only formed in 2017.

In the case of blockchain and DLT however, while the technology is still evolving, countries see a need to initiate standards development early and hence ISO/TC 307 was formed two years ago because of the foreseen global impact of blockchain and the need to incorporate interoperability requirements upfront. This is clearly reflected in ISO/TC 307's Business Strategic Plan which states one of its objectives as to *"produce a set of International Standards and reports that will encourage adoption of blockchain and DLT and support innovation, governance and development in the industry. These International Standards and reports will include topics that support both cross-organisation, cross-border usage scenarios. The committee aims to have these International Standards and reports available no later than 2021."*

The ISO/TC 307's Business Strategic Plan further states that *"though no ISO standards currently exist for blockchain and DLT, a number of related standards have been identified that the group will need to be conscious of in development of standards for blockchain and DLT."* Indeed blockchain standards are not developed from scratch and they are built on existing established standards.

Hence solution providers as well as user organisations must be guided and make reference to existing standards available in the implementation of solutions. The standards include Risk Management (ISO 31000 series), Information Security (ISO/IEC 27000 series), Governance of IT (ISO/IEC 38500 series) and Identity Management and Privacy (ISO 29000 series) and several others.

Compliance to standards is voluntary. However compliance to standards can be enforced or made compulsory through self-regulation by member organisations within a sector, or by a country's regulation, or by world organisation agreements e.g. via the World Trade Organization (WTO). Moving through 2019 and beyond, organisations should not wait for standards to be finalised and they will not go wrong as long as they keep in view and make reference to existing established standards—that ensure governance, risk management and information security management at least—in their solution development and implementation.

ABDUL FATTAH MOHD YATIM

Chairman

Malaysia's National Standards Technical Committee on Blockchain and Distributed Ledger Technologies (TC/G/15)



III. Associations / Communities

Communities are the backbone of the blockchain and DLT ecosystem. There are many blockchain related organisations in Malaysia, and below are some of the active communities (non exhaustive) representing business, media, cryptocurrencies and technology platforms.

Blockchain Embassy

The Blockchain Embassy of Asia is a registered non-profit society, which was established as Asia's first blockchain consortium. Instead of educating the general public, its goal is to educate large organisations and institutions that are in a position to make major infrastructural changes, so it is comprised of companies rather than individuals. Its founding members include financial institutions such as Maybank, RHB and crowdfunding platform Ata Plus.

The embassy is also used to conduct collaborative research within specific areas that are of interest to multiple members of the consortium since 2017.

Asia Blockchain Review

Asia Blockchain Review (ABR) is the largest initiative for media and community building in Asia for blockchain technology.

It aims to connect all blockchain enthusiasts on a regional scale and facilitate the technological foundation of blockchain through a range of group discussions, technical workshops, conferences, and consulting programmes.

The goal is to cultivate and encourage a collaborative community through events in Vietnam, Thailand and Malaysia.

Ethereum Malaysia Community

With a community of 749, Ethereum Malaysia, which debuted in 2018, organises meet-ups as a meeting place to learn about the blockchain technology powering some of today's most interesting projects. It is led by companies associated with the Ethereum platform, including Etherscan and Hellogold.

ACCESS Blockchain Association Malaysia

ACCESS Blockchain Association Malaysia was registered in 2017 as an effort to bring together local blockchain industry players as a group. It is home to individuals, startups, businesses, and organisations utilising and exploring blockchain technology in Malaysia. They are platform-agnostic and welcome both financial and non-financial use cases of blockchain technology.

From the beginning, ACCESS Malaysia has worked together with ACCESS Singapore, with the aim to forge a synergy between the ASEAN industry players. ACCESS Malaysia first started working towards this end by engaging different groups from industry, the public as well as government organisations in awareness programmes and discussions along with providing collective inputs for policy making.

ACCESS is working on increasing awareness, opening access to businesses and getting involved in human capital development efforts. There are many opportunities for Malaysian research institutions to contribute to impactful open-source projects.

ACCESS welcomes universities and their students looking for research topics and can provide guidance in the blockchain space from local industry experts.

Bitcoin Malaysia

Bitcoin Malaysia is the largest local private membership club for Bitcoin since 2013. It aims to be the locally endorsed authority for legitimate blockchain projects through rigorous due diligence and transparent community feedback as well as to create a safe and friendly platform for new entrants to learn about Bitcoin, cryptocurrencies and blockchain use cases—for Malaysia to increase its knowledge standing and enhance its reputation in the international arena.

Bitcoin Malaysia has engaged over 10,000 people by running 8 community events and participating in talks at more than 28 events in 2018.

3.2 Malaysian Use Cases

The following use cases represent some of the pioneering efforts involving blockchain technology beyond cryptocurrencies by Malaysian industry players. They look at solving different levels of pain points and complexity in the relevant industries involved. Beyond this, Malaysia has also a number of world renowned players in the cryptocurrencies ecosystem, which include Etherscan and CoinGecko.

I. ENERGY

TENAGA NASIONAL PROOF OF CONCEPT (POC) ON RENEWABLE ENERGY CERTIFICATE (REC)

Tenaga Nasional's ICT Innovation Department had undertaken several activities in order to advance the blockchain initiative.

- Endorsement from ICT Division Management Committee : to provide a general overview of blockchain, its potential in the energy sector as well as to state their intent to be the epicentre of blockchain within the ASEAN region.
- Blockchain workshop : to instil awareness among TNB business units regarding the subject matter as well as uncovering potential use cases via workshop cum facilitation led by ICT Innovation.
- Blockchain prioritisation : working with our vendor community to leverage the appropriate methodologies in order to narrow down top use cases to be considered for Proof of Concept (POC).
- Securing early adopter : syndication sessions with identified potential early adopters within the business in order to jointly collaborate on POC and explore potential business model innovation that may arise upon realising the POC scope and objectives.

By collaborating with our early adopters, we decided to embark on leveraging the inherent qualities of blockchain to issue and record RECs that were generated from solar energy via the existing Feed-in Tariff (FiT) and Net Energy Metering (NEM) programmes made available by the Energy Commission.

The final REC Platform is a web-based application that consists of a REC exchange platform for customers and an admin portal for system administrators and regulators.

REC is issued based on energy generation data received, extracted from the billing system and processed on a monthly basis. Once processed, new REC issued were added to the REC balance.

As the main users for REC platform were companies, each company was assigned a user ID and password to access the REC platform. Using the REC platform, users may choose the type of REC to purchase :

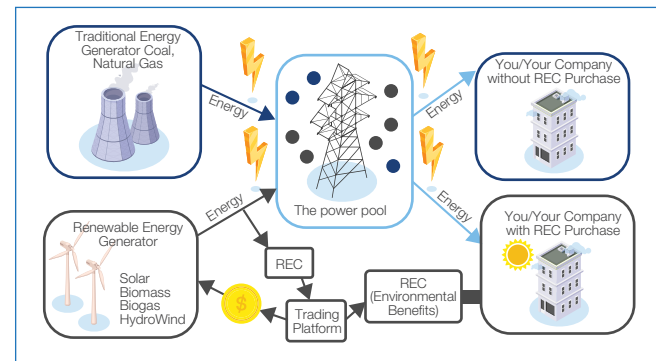
1. Offset – to offset past usage of non-renewable energy based on selected REC amount equivalent to energy used.
2. Contract – to purchase in advance for a duration of 1, 3 or 5 years based on the trends of their non-renewable energy usage.

Upon selection of type, date/ duration (if any) and REC amount, users may proceed with payment, and complete the purchase. However, the processing of each order is subject to availability of REC balance.

We consider that the POC is successful in satisfying the objectives defined by TNB at the commencement of the project. The application of this technology to other types of potential use cases such as peer-to-peer (P2P) energy exchange, grid settlement, electric vehicle (EV) charging, and ultimately how it can play a role in the RE push offers terrific potential for the future.

WHAT IS A RENEWABLE ENERGY CERTIFICATE (REC)?

A Renewable Energy Certificate (REC) represents delivery of 1 MWh of renewable energy to the grid and all associated environmental benefits of displacing 1MWh of conventional power.



Source : Performance-based RECs, Solar Choice

LEE KIAN SENG @ KEN

Innovation Strategy & Commercialisation Centre of Expertise – Innovation ICT Division
Tenaga Nasional Berhad



II. MOBILITY

VEHICLE TELEMATICS ONLINE SERVICES SDN. BHD. (VTOS) TELEMATICS : MANAGING ENGINE DATA

VTOS provides Malaysian-developed and internationally patented insurance telematics solution 'MyDNA™ – Driving Nature Applied Risk' Profile pioneered real-time contextual based risk assessment in 2010 and is the first insurance telematics product to launch commercially with The Malaysian Motor Insurance Pool (MMIP) in the South East Asia region in January 2016.

Under the purview of Bank Negara Malaysia, MMIP—commonly referred to as the insurer of last resort—helps ensure high risk vehicles like buses and heavy goods vehicles with difficulties in getting insurance from direct motor insurance providers, due to their poor claims experience, get to be insured.

For this purpose, The MyDNA™ solution combined Service Oriented Architecture (SOA) with blockchain to achieve these needs and at the same time assure data privacy compliance to PDPA, GDPR, etc.

There are over half a million traffic events with over 7,000 related fatalities on average on our roads every year. With a real-time driving measure being monitored live, the Ministry of Transport (MOT) is targeting to reduce 81% of driver-caused traffic events and with it achieve a zero related fatalities end goal. The insurance industry pays out over RM17 million daily for these traffic events and is looking for a reduction of similar quantum.

Thus MOT, via MIGHT, and the insurance industry need and indeed are assured that the data provided is tamper-free, impossible to compromise yet transparent and of course reliable. This provides for verifiable chain-of-evidence data for the government (legal and enforcement), the Central Bank (financial compliance) and industry (identity and verification).

It is equally important that this hybrid system will address MMIP and VTOS data integrity concerns with the current legacy system. Primarily the issues are due to initial compromised data entry and lack of authenticity verification protocols. Our hybrid blockchain will validate all related identity and insurance data and ensure accurate regulatory compliant insurance cover.

ABANG SUHALI ABANG HJ ADRIS

Co-Founder and Chief Technology Officer
Vehicle Telematics Online Services Sdn. Bhd.

III. ASSET TAGGING

LUXTAG.IO

LuxTag is an anti-counterfeit and anti-theft solution provider, incorporating track and trace systems to provide business intelligence to their clients. LuxTag provides blockchain-based applications that enhanced issuance of digitised certificates of authenticity for tangible products. Our solutions are Anti-Counterfeit which ensures the authenticity of assets using serial numbers registered in the blockchain, and Anti-Theft system which is a deterrent to theft. Track and Trace enables companies and final customers to follow the supply chain process of their assets, and Business Insights provides companies with business insights to support data driven marketing strategies.

LuxTag currently has 5 sub-brands which are FashionTag for the luxury fashion industry, FMCGTag for the fast moving consumer goods and supply chain industry, DocuTag for the documents and official papers industry, BijouxTag for the jewelry industry and Provenance Tracking for the art industry. LuxTag uses NEM Public Blockchain with Catapult Private Chain to provide a hybrid public-private blockchain solution, giving customers versatility, security and quality. Our projects include using blockchain on the Chronoswiss Watch Tagging, the Defeet Sock Tagging, verification of blood sampling and the verification of certificates being issued by local universities.

RENE BERNARD

CEO / Co-Founder
Luxtag.io

IV. SHARIAH-COMPLIANCE GOLD TRADING

HELLOGOLD – Shariah-compliant gold transactions on blockchain

HelloGold has launched a product to enable low to medium income customers to buy and sell gold anytime, anywhere. The system has customer mobile applications (native Android and iOS) communicating with a backend built with two parts, a core Central Web Service (Ruby) and Agent (Go). HelloGold is using the Ethereum private blockchain technology with a number of reconfigurable contracts to protect customer records in line with prevailing data protection regulation.

The development of GOLDX contract, the tokenisation of gold, was completed in 2017. This effort provides the latest way to represent our customers' proprietary interest in their gold—physical gold that has been specifically allocated to them and is held on their behalf. HelloGold also plans to develop this platform to provide HelloGold

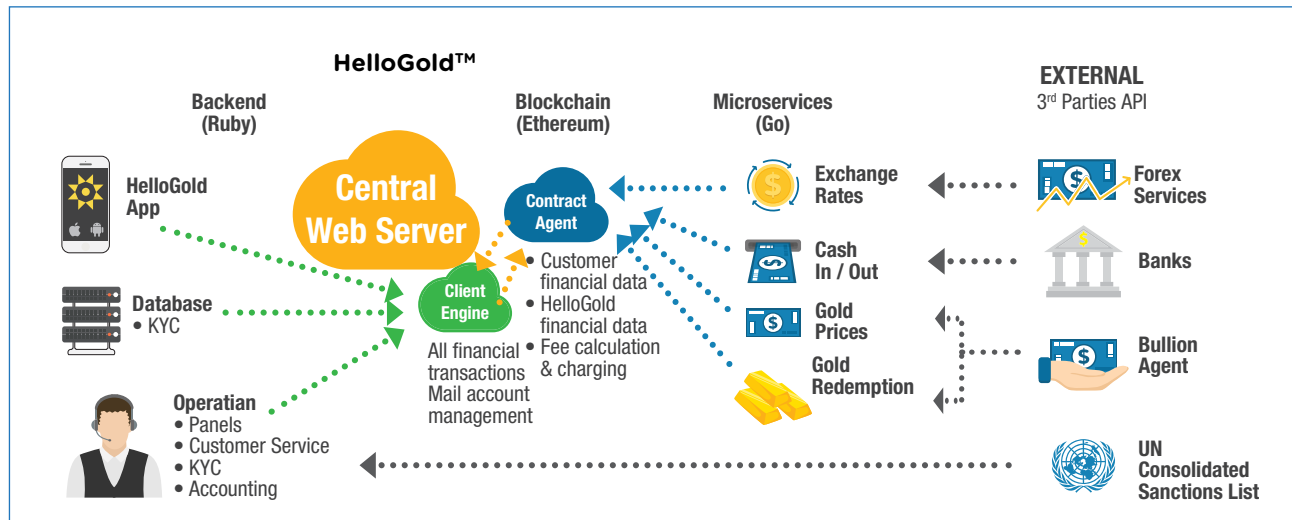
customers with the freedom to manage their savings either inside the HelloGold ecosystem or independently on their own digital wallets or with third party providers—customers will see their savings evidenced by GOLDX in the case of the latter.

GOLDX is based on Ethereum ERC20 token so they can complete the calculation features required and make the gold useable outside the HelloGold system. As each GOLDX token is fully backed by 1g of physical, investment grade (99.99%) gold, vaulted with HelloGold's vaulting provider, they should track the price of 1g of gold.

ROBIN LEE

CEO & Co-Founder
HelloGold

HELLOGOLD SYSTEM INCORPORATING BLOCKCHAIN





V. FINANCIAL

Neuroware.io : Over The Counter (OTC) Markets

R1 DOT MY is a technical training and consultancy group that was incorporated in Malaysia in 2012, where it has been working with public listed companies, government institutions and prominent startups from within the region. They help these organisations learn about how to benefit from and in turn adopt new technologies such as NoSQL data storage and blockchains.

Its most notable development to date has been Neuroware's Cortex product line. It was first established when selected to join Batch 9 of the 500 Startups accelerator programme in Silicon Valley in 2014.

Cortex provides a single unified interface for managing different blockchains and the various protocols being developed on them. By using private customised APIs it is able to offer a unique infrastructural foundation for enterprise clients—with one such client including the Securities Commission of Malaysia. Cortex recently concluded a pilot project named Project Castor, a project involving various stakeholders including regulators, trustees, operators, issuers and investors.

Blocklime Technologies : Financial Intelligence Solutions (FIU)

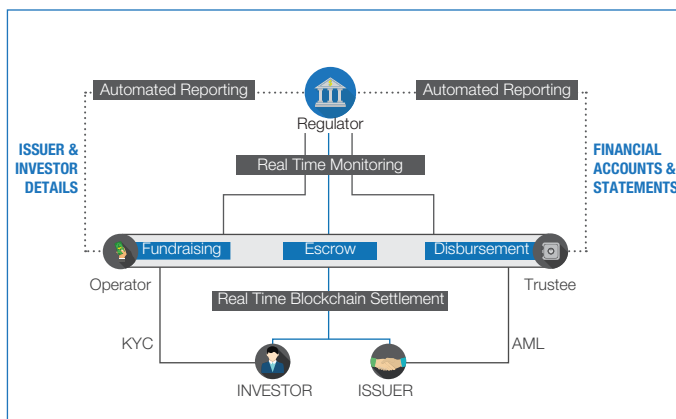
Blocklime is a Malaysian startup based in Cyberjaya. It is a training and solution provider company focusing on blockchain-related technology. Blocklime's blockchain footprint began with winning the inaugural International Financial Intelligence Unit (FIU) Codeathon 2017 held in conjunction with the 3rd Counter-Terrorism Financing Summit 2017 in Kuala Lumpur—the event was hosted by Bank Negara Malaysia (BNM) in partnership with Austrac and Indonesia's Pusat Pelaporan dan Analisis Transaksi Keuangan (PPATK).

Blocklime has continued to expand its work in this area, besides building talents by offering blockchain-related courses with partners.

HARPREET MANN

CEO / Co-Founder
Blocklime Technologies Sdn. Bhd.

PROJECT CASTOR BY CORTEX



Source : Project Castor, Securities Commission Malaysia

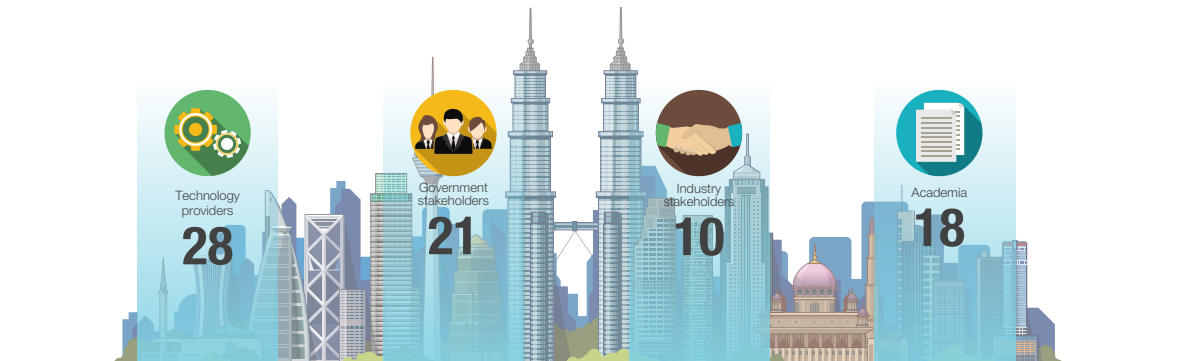
MARK SMALLEY

CEO
Neuroware.io

3.3 Identifying Potentials for Malaysia

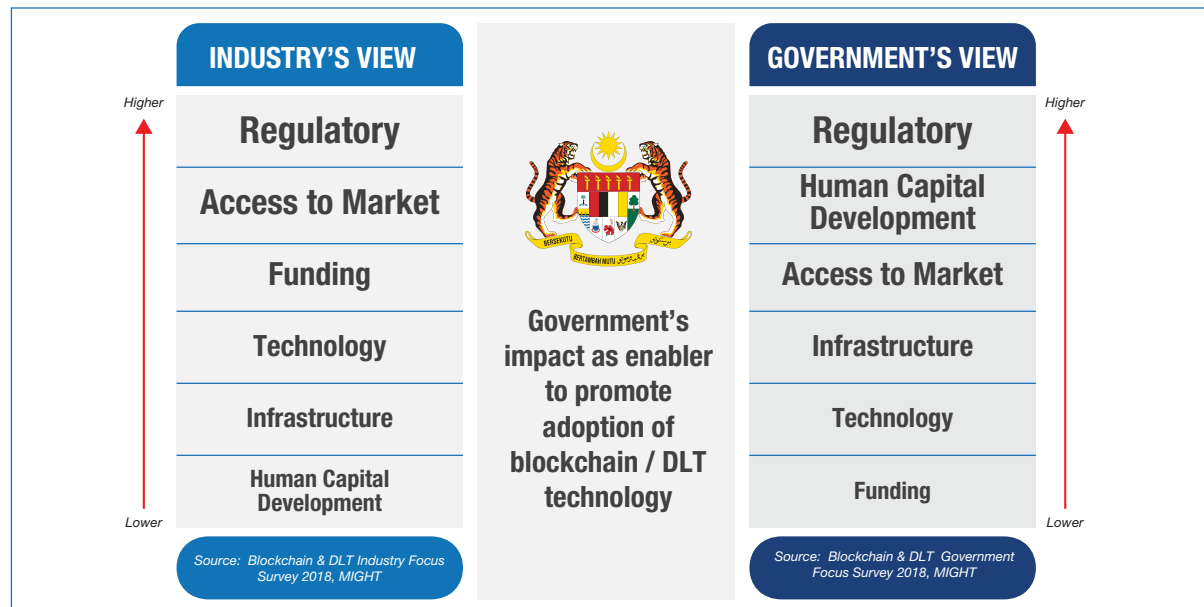
The previous chapter on current activities related to blockchain in Malaysia suggested that blockchain adoption is not something new for the various stakeholders—industry, government, academia and the public. However, the level of adoption can be diametrically different depending on 'community' knowledge and connections to the blockchain ecosystem. To understand the state of readiness of the Malaysian blockchain ecosystem, MIGHT has run a series of stakeholders' engagements based on foresight tools from June to November 2018 for expert opinions involving :

NUMBER OF EXPERT OPINIONS INVOLVED IN MIGHT'S STAKEHOLDER ENGAGEMENTS



Source: Blockchain & DLT Government Focus Survey 2018, MIGHT

I. The Government Ecosystem:



PROPOSED MEASURES TO ENCOURAGE TALENT IN BLOCKCHAIN ADOPTION

Development & Registry of talent 'pools'
Tertiary institutions to develop and train more specialisation in different areas of blockchain

Hands-on Training
Encourage Academic-Industry Collaboration (AIC) with ASEAN neighbours to create robust talent pool

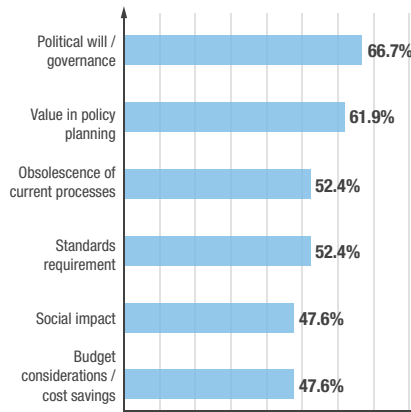
Social & Cultural Environment
Improve awareness and educate on impact of blockchain & DLT

Create Gender & Family Friendly Environment
To encourage long term career development, hubs/ specialised areas need to have sufficient infrastructure and housing

Standardised Certifications
Training and Research Centres to develop common standards of learning curriculum and blockchain based certificates

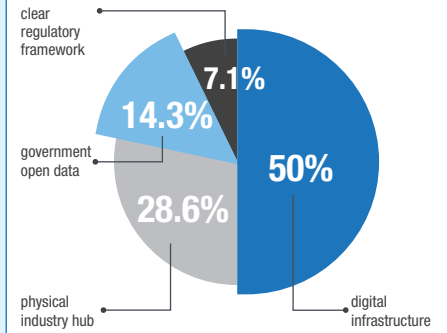
Source: Blockchain & DLT Government Focus Survey 2018, MIGHT

PRIORITY CONSIDERATIONS BY GOVERNMENT ORGANISATIONS IN ADOPTING BLOCKCHAIN & DLT TECHNOLOGY



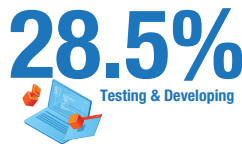
Source: Blockchain & DLT Government Focus Survey 2018, MIGHT

TO ENCOURAGE THE ADOPTION OF BLOCKCHAIN TECHNOLOGY, GOVERNMENT NEEDS TO ENHANCE THE INFRASTRUCTURE IN TERMS OF



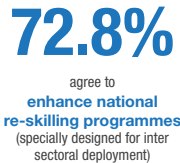
Source: Blockchain & DLT Government Focus Survey 2018, MIGHT

THE EXTENT OF BLOCKCHAIN AND DLT TECHNOLOGY ON GOVERNMENT ORGANISATIONS' AGENDA



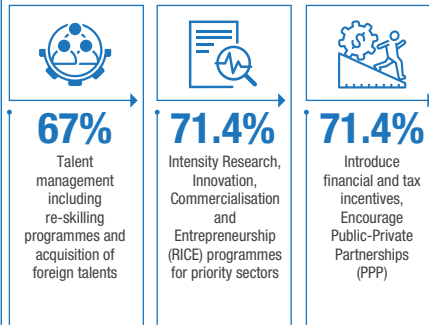
Source: Blockchain & DLT Government Focus Survey 2018, MIGHT

TALENT DEVELOPMENT FOR BLOCKCHAIN & DLT



Source: Blockchain & DLT Government Focus Survey 2018, MIGHT

TOP 3 INITIATIVES THAT GOVERNMENT COULD PROVIDE TO DEVELOP BLOCKCHAIN



Source: Blockchain & DLT Government Focus Survey 2018, MIGHT

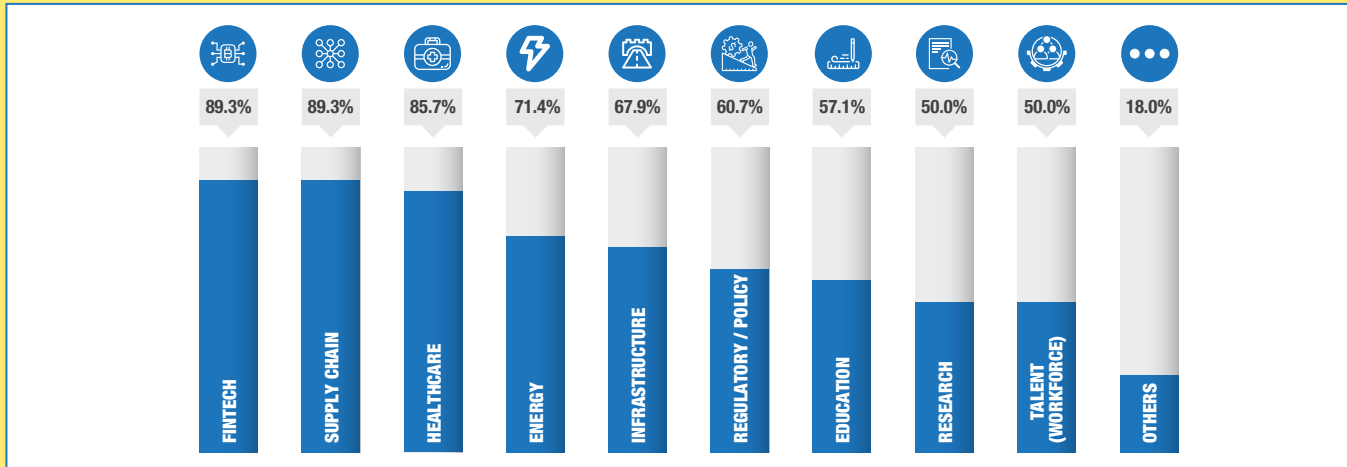
MIGHT's Outlook

To encourage the adoption of blockchain for government's organisations, the following factors should be considered in supporting these findings:

- Awareness, culture and mindset readiness of the organisation
- The business/ collaboration model between the related parties
- Technical competence of both supply and demand side
- Regulations and law on Data Privacy and Consumer Protection

II. Areas of Interest for Malaysia

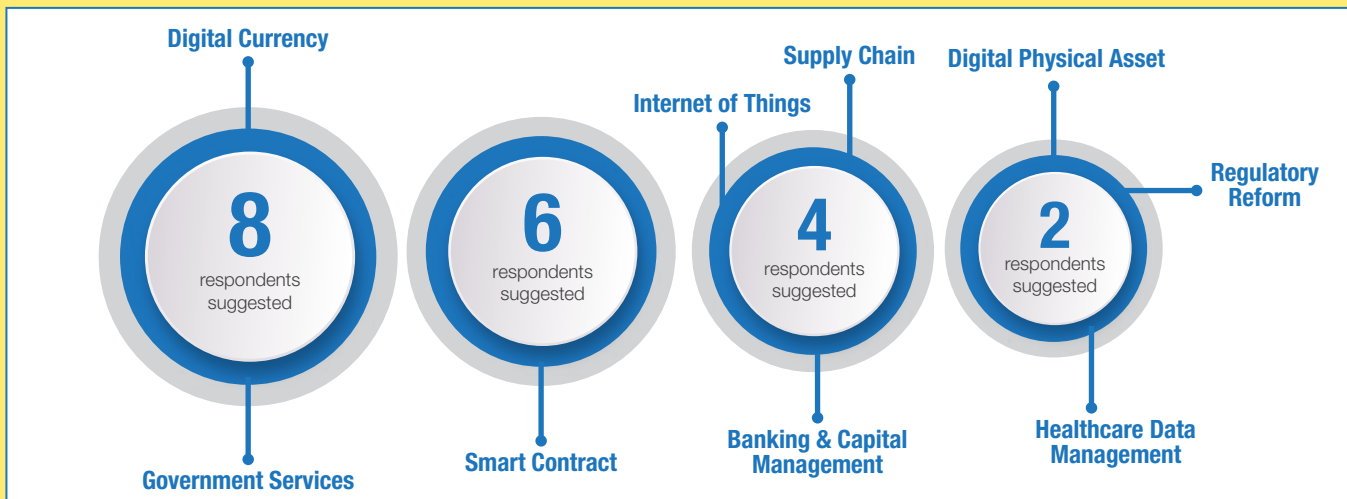
AREAS IN WHICH MALAYSIA WOULD BEST BENEFIT FROM ADOPTION OF BLOCKCHAIN / DLT



Source: Blockchain & DLT General Survey 2018, MIGHT

MIGHT General Survey finds two areas that greatly benefit Malaysia from blockchain adoption—fintech and supply chain with each standing at 89.3%. An earlier survey by MESTECC on blockchain based on Delphi survey has yielded the following results. MESTECC survey highlights digital currency and government services as the two most potential products and services based on blockchain.

*POTENTIAL PRODUCTS AND SERVICES BASED ON BLOCKCHAIN



Source: Ministry of Energy, Science, Technology, Environment and Climate Change, 2018

*Based on a survey with a group of subject matter experts on Blockchain, tapping into their knowledge and their prediction about blockchain potentials in Malaysia by 2040.

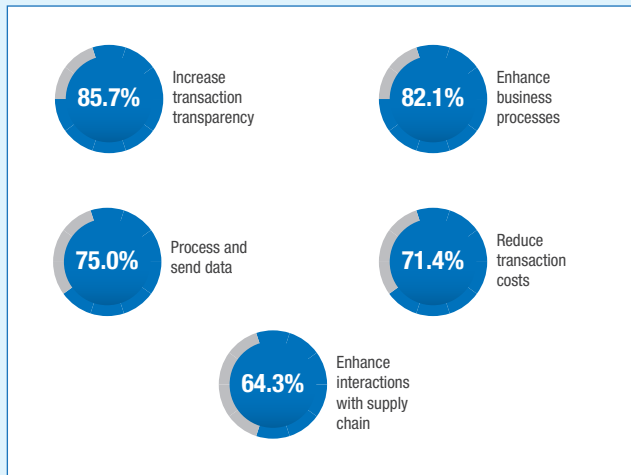
HO YUN SHIANG

Foresight Technology Division
Ministry of Energy, Science, Technology, Environment & Climate Change

III. The Industry Ecosystem :

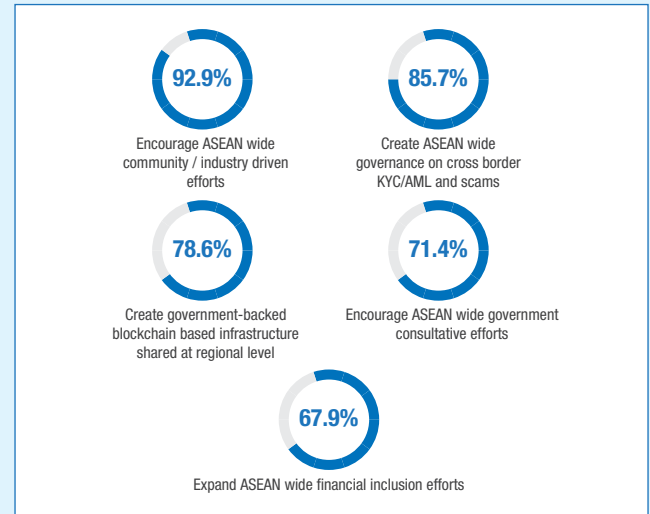
MIGHT's Tech Focus Survey has highlighted that blockchain and DLT as an industry is not constrained by national borders. More than 50% of the local players consider themselves to work at both local and international levels. Most of the blockchain communities include members from different nationalities. Further inputs from the industry on how to improve the local blockchain ecosystem are highlighted below.

WAYS FOR BLOCKCHAIN TO ASSIST ORGANISATIONS



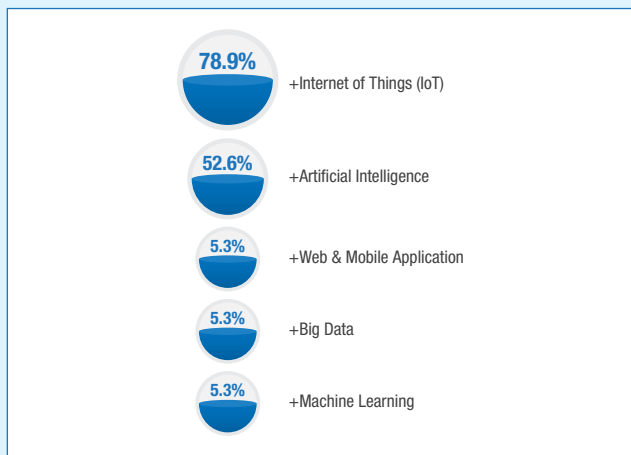
Source: Blockchain & DLT General Survey 2018, MIGHT

ASPIRATION ON ASEAN WIDE COMMUNITY EFFORTS TO ADDRESS BARRIERS IN ADOPTING BLOCKCHAIN & DLT:



Source: Blockchain & DLT General Survey 2018, MIGHT

FOR COMPANIES DEPLOYING BLOCKCHAIN AND DLT, OTHER DIGITAL TECHNOLOGIES APPLIED ALONGSIDE ARE :



Source: Blockchain & DLT General Survey 2018, MIGHT

MIGHT's Outlook

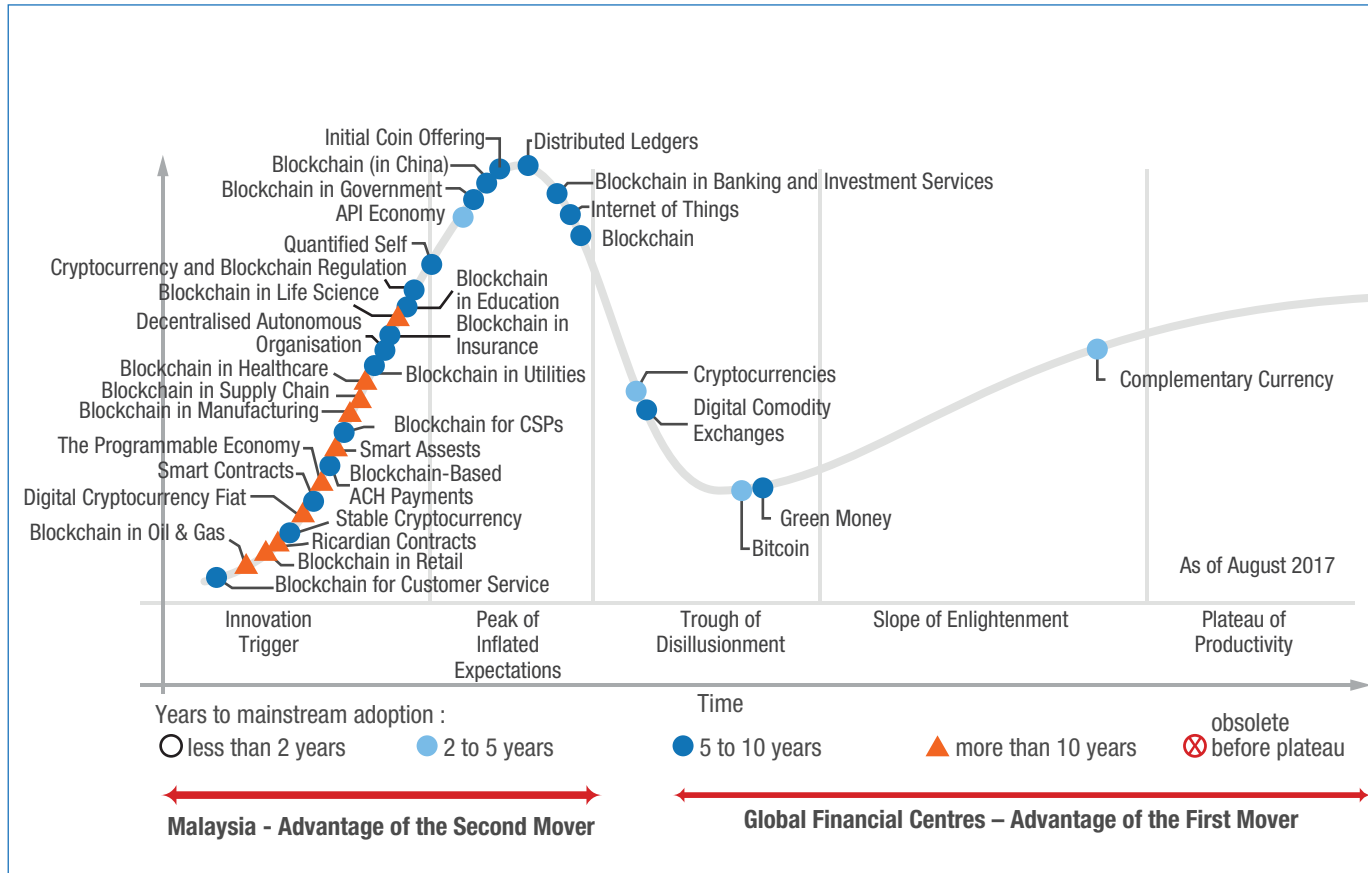
As the local blockchain industry ecosystem is closely connected and highly influenced by blockchain development worldwide, the players are aware of the importance of collaborating with their regional counterparts.

Many of the local blockchain players are also looking at other technologies in providing their services, with IoT being the most cited as being used with blockchain. Malaysia could capitalise on this awareness and develop capability of the industry within the cluster of digital technologies such as ABCD-I.

IV. Capitalising the Advantage of the Second Mover

Malaysia's exploration of Blockchain and DLT potentials can be traced to the 4th Industrial Revolution's assignment of the technology as one of the major shifts with the potential to become a game changer on many fronts. The Gartner Hype Cycle for Blockchain Business 2018 offers very interesting insights about the potential positioning of Malaysia in capitalising blockchain and DLT as an emerging technology.

MALAYSIA : THE ADVANTAGE OF THE SECOND MOVER



Source : MIGHT, adapted from The Gartner Hype Cycle for Blockchain Business 2018



At the forefront has been 14% of the government, or what PwC called the 'trailblazers'. Many of the early responses have focused on fintech and cryptocurrencies, which have created a strong response from the 'incumbents', both from key private and public stakeholders in the global financial ecosystem. On the government side, countries known as global financial centres with extremely high vested interests, including Singapore, the US, the UK, Japan, Hong Kong, Russia and Switzerland, were joined by known offshore centres such as Malta, Gibraltar, Bermuda and others. Malaysia took a different route by not recognising cryptocurrencies as legal tender and in 2019 regulated cryptos as 'digital assets' under the Securities Commission.

In this development, Malaysia has remained a supporting player, with its main strength developing from shariah-based interest-free finance.

The main advantage for Malaysia is developing its strengths in adding value to its resources, which according to the hype cycle is emerging. Malaysia should capitalise on the second mover advantage by learning the lessons from the first mover, mostly in the financial ecosystem and the iterations of the technology that could add value to use cases within the interest of Malaysia. This includes Healthcare, Oil and Gas, Agriculture, etc. Malaysia should also look at the technology as a means to create or identify new sources of economic opportunities by exploring the new business models created by the ecosystem.

As a developing country, Malaysia has put much focus on technology transfer and subsequently technology development to encourage innovation. Government-linked institutions such as SMECorp, MIGHT, MDEC, MaGIC, SIRIM, AIM and others were created as government arms to support the industries' efforts either in funding, talent development, entrepreneurship, standards, etc.

Technology parks and hubs have been created such as Kulim Hi-Tech Park, Technology Park Malaysia, Futurise and Medini in Johor Bahru to anchor these efforts in terms of infrastructure.

Blockchain and DLT have the potential to enhance this support in terms of securing the Intellectual Property (IP) of inventions and innovation developed by local players. For startups and SMEs that find the cost of maintaining IP prohibitive, an alternative system to

record verified inventions by benchmarking the US patent system in recognising the first to invent by comprehending evidence documents similar to well-documented 'laboratory lab book' has the potential to provide a novel way to promote innovation by SMEs.

The recent announcements in the 11th Malaysia Plan Midterm Review and Budget 2019 revealed that the government has iterated on the immediate focus for Malaysia's economic management:

- Prudence and governance underlying government financial management
- Focusing on people centric projects
- Helping Small and Medium Enterprises (SMEs) to scale
- Focusing on infrastructure projects with high multiplier effects on the economy

3.4 Potential for Blockchain & DLT Adoption Under Current Policy Initiatives

I. Mitigating Contamination Risk

Blockchain and DLT are allies in the government's efforts to pursue structural reforms and greater governance within the new adage of 'data is the new gold'. Blockchain and DLT add 'trust' in managing transactions from behind the scene. Some of the potential use cases are identified in a section on the 11th Malaysia Plan Midterm Review and Budget 2019 in the following table.

The trust elements of blockchain could benefit SMEs in many ways in their effort to scale. Fundamentally, the way blockchain is SME-friendly originates from its thriving collaboration. It is an open-source, peer-to-peer network bolstered by a network effect that gives it the potential of offering more economical access to the technology. Enterprises could choose many different pathways to kick off their blockchains and DLT initiatives.

Blockchain could be a boon in Malaysia's effort to mitigate the risk of contamination of food, or other systems such as waterways through transparency of transaction data. This could encourage a change in the monitoring process that in the long run could improve Malaysia's ranking in terms of integrity.

Malaysia may find new ways to solve business and social challenges involving trust that have remained unresolved and create a niche for itself in the blockchain and DLT ecosystem.

Based on the inputs compiled through the stakeholders' engagement sessions by MIGHT from June 2018 to November 2018, MIGHT has mapped the outputs with the two policy documents that are referenced for planning purposes, i.e. the 11th Malaysia Plan Midterm Review and the Budget 2019 documents. These would be the use cases as aspired by all the stakeholders involved in the exercise.



Source : Minggu Malaysia and Rojak Daily, 2018



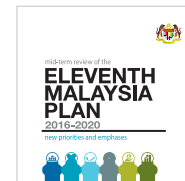
"Blockchain has the potential to help Malaysia manage its food supply chain and lessen the risks of food contamination such as the recent incident of canned sardines."

DATUK DR MOHD YUSOFF SULAIMAN
President and CEO, MIGHT



II. Potential Under The Midterm Review (MTR) of 11th Malaysia Plan 2016 - 2020

Blockchain and DLT have a natural fit to planned activities under the MTR which outlines government's effort based on six pillars. The following are some of the potential use cases involving blockchain and DLT based on the inputs from a series of stakeholders' engagements via surveys and discussions.



POTENTIAL BLOCKCHAIN USE UNDER THE MIDTERM REVIEW OF 11TH MALAYSIA PLAN 2016 - 2020

PILLAR I	PILLAR II	PILLAR III	PILLAR IV	PILLAR V	PILLAR VI
<p>Reforming governance towards greater transparency and enhancing efficiency of public service</p> <p>Blockchain could be deployed for government processes such as National Digital ID as access control (immigration, payment, voting, citizenship, identity & rights, refugees, etc.)</p> <p>Deploying blockchain and DLT for realtime financial statements could assist in securing realtime credit assessment which will help secure better investments for startups and SMEs</p> <p>Malaysia needs to monitor the progress of blockchain development in line with the United Nations effort to standardise blockchain definition for the UN/CEFACT platform on trade facilitation</p> <p>Authentication of certification from government agencies and academia using blockchain</p>	<p>Enhancing inclusive development and wellbeing</p> <p>Micro transaction & payment, distribution and accounting of Aid and Charity using blockchain technology</p> <p>Disbursement of government funds including zakat</p>	<p>Pursuing balanced regional development</p> <p>Standards and protocol – ISO standards, ensure common transactional standards that are globally compatible, consistency and interoperable</p> <p>Create alliance / consortium at ASEAN level involving public private entities to explore opportunities for new sources of economic growth leveraging on blockchain and DLT</p> <p>Renewable energy certification</p>	<p>Empowering human capital</p> <p>Blockchain technology transfer and development – skilling & reskilling through education system under relevant Ministries</p> <p>Develop blockchain talent pools through partnership with ASEAN</p> <p>Awareness for blockchain and DLT programme to start with school co-curriculum</p> <p>Set a certain number of students to be certified on blockchain</p> <p>Ensure that technology hubs are equipped with services for family and gender friendly services to attract and maintain talents</p> <p>Create awareness programmes about blockchain, DLT and other digital tech for public and government</p>	<p>Enhancing environmental sustainability through green growth</p> <p>Develop blockchain-based supply chain traceability to help identify and manage the nation's natural resources and food chain</p> <p>To have data integrity system, verification systems, watchdog system, ombudsman personnel on blockchain and DLT as a part of disaster recovery plan</p> <p>Automated settlement for energy consumption and distribution on blockchain and DLT system</p>	<p>Strengthening economic growth</p> <p>Creation of more sandbox / testbed on blockchain research & technologies for industries under academia - industry collaboration involving blockchain and DLT with other digital technologies such as telematics, AI, IoT etc.</p> <p>Encourage and facilitate innovation through blockchain based certification and reporting of intellectual property</p> <p>Create alliance / consortium on blockchain involving public private entities to explore opportunities for new sources of economic growth</p> <p>Develop industries competency about blockchain and DLT in order to become provider of technology as well as improve their agility</p>

Source : Mid-term review of the 11th Malaysian Plan 2016-2020, Ministry of Economics Affairs

III. Government Fiscal Budget - Budget 2019 and Beyond

Blockchain and DLT have the potential to assist government planned activities under the Budget 2019 towards better governance and supporting SMEs' development. The following are some of the potential use cases involving blockchain and DLT based on the inputs from a series of stakeholders' engagements via surveys and discussions.

POTENTIAL USE CASES INVOLVING BLOCKCHAIN & DLT



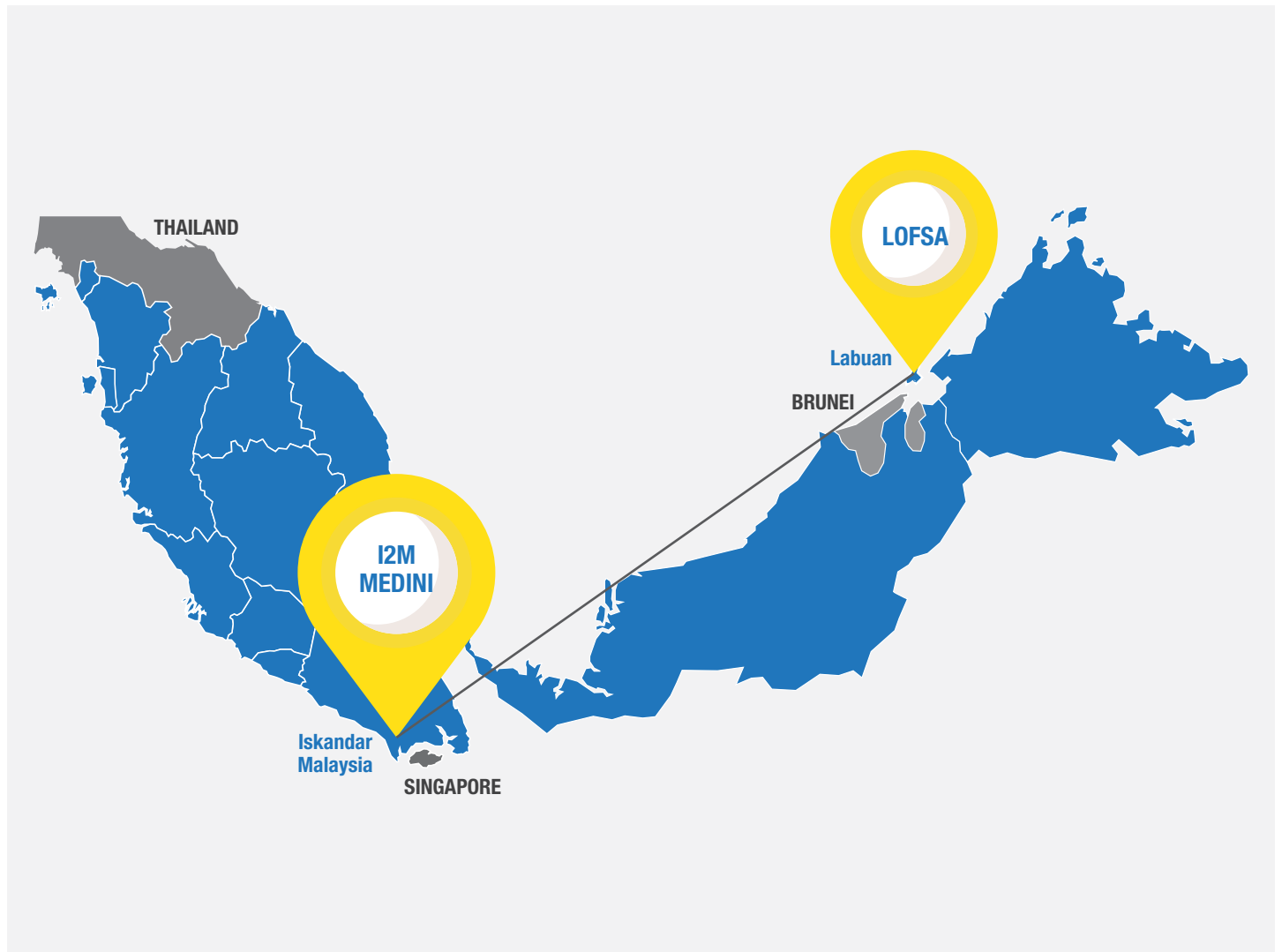
Source : Budget 2019, Ministry of Finance Malaysia



IV. Capitalising the Strengths of Technology Hubs

Two types of hubs in Malaysia could help stimulate efforts to encourage blockchain adoption in Malaysia:

1. Iskandar Malaysia - Singapore is one of the top spots in terms of blockchain innovation, and the position of Iskandar Malaysia with its emerging technology hub could become a nearshore centre for blockchain related businesses anchored in Singapore.
2. Labuan - Labuan Offshore Financial Services Authority (LOFSA) offers a suite of facilities for offshore compliant cryptocurrencies exchange.





4.1 Future Challenges

I. Global Challenges

According to the World Economic Forum, blockchain and DLT are expected to mature in five to 10 years. As an emerging technology, they are expected to undergo further developmental phases and in the near future to solve the challenges that include scalability, interoperability and security as highlighted in a report by The European Union Blockchain Observatory and Forum.

The scalability challenge is particularly key to be resolved for mass adoption of blockchain in industry applications, such as in the financial industry. In such environments, the speed allowed by consensus mechanisms would become one of the key metrics in the selection of blockchain to be used.

Interoperability, or the ability of different blockchains and DLTs to communicate and share data with each other will be a key factor in supporting the adoption of a particular blockchain protocol. The importance of this feature is reflected in the number of major initiatives in blockchain communities to solve this challenge, such as the build up of Polkadot and Cosmos blockchain to anchor the Web3 decentralised web, Cardano's Shelley for smart contracts and OmiseGo's work on the unbanked.

Any system, whether digital or otherwise, has some vulnerability. Blockchain and DLT are no exception. Some of the security threats that need monitoring throughout the system involve both network related issues and traditional scams.

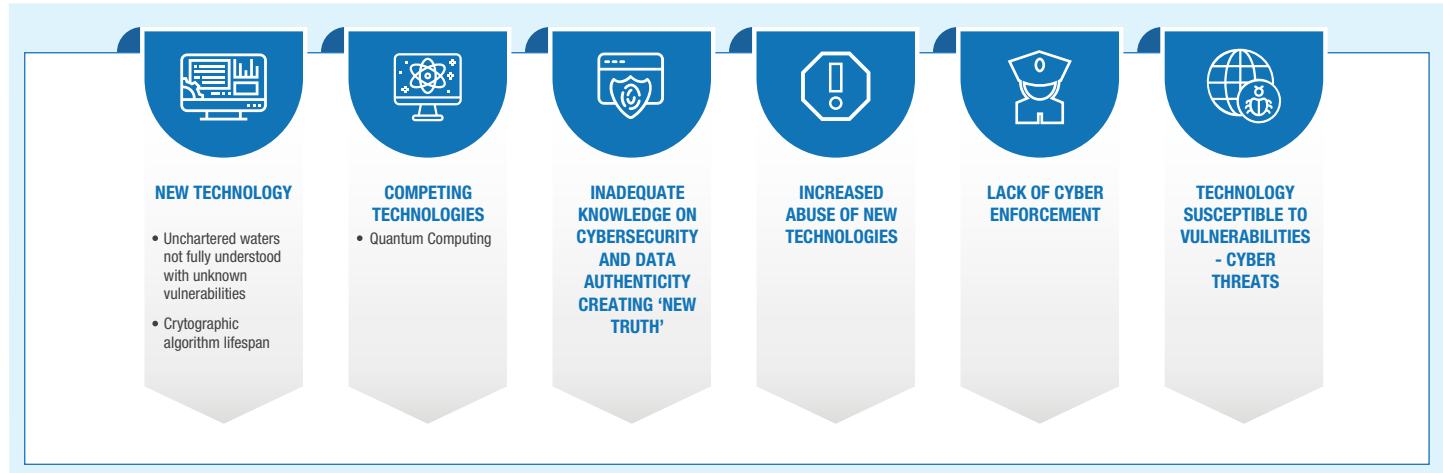
Security network related problems are some of the most important challenges for blockchain, such as the size of network, where a smaller sized network could be more vulnerable to attacks that could affect the outcome of transactions. Others include the security of public and private cryptographic keys and dependence on third party systems such as crypto exchanges that are vulnerable to theft by cybercriminals.

Traditional scams including pyramid schemes, unsubstantiated ICOs and other misleading fund raising activities for 'blockchain projects' have also led many to think that blockchain is a scam. Unfortunately, such scams feed on people's ignorance. The public is strongly advised to do thorough research on the team and technology involved before making their decision to invest.

II. Challenges for Malaysia

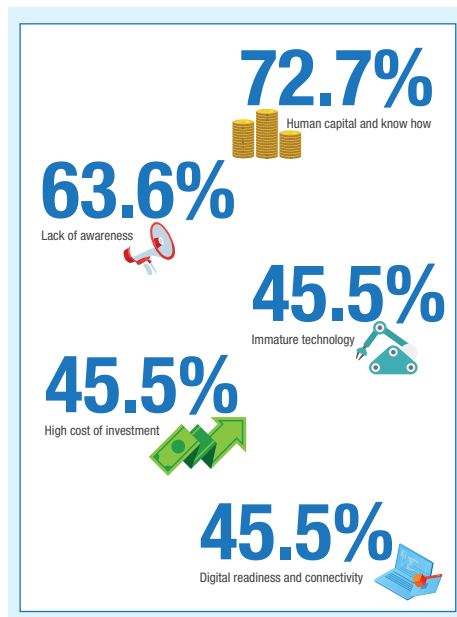
The following are some of the challenges that were highlighted by respondents in the MIGHT Stakeholder Engagement sessions conducted in the second half of 2018.

BLOCKCHAIN & DLT: CHALLENGES FOR MALAYSIA



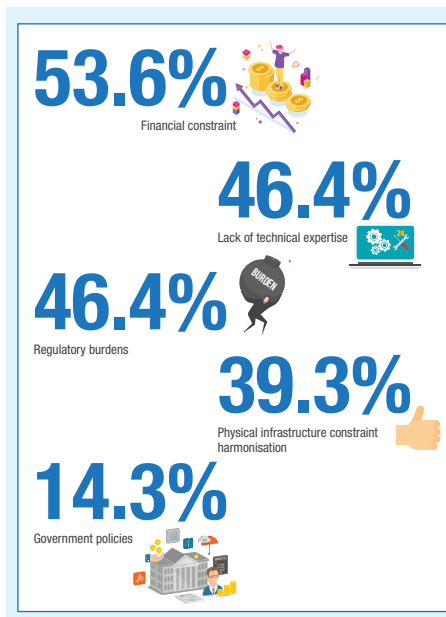
Source: MIGHT Stakeholder Engagement Sessions

CHALLENGES FOR ORGANISATIONS IN DEPLOYING BLOCKCHAIN TECHNOLOGY



Source: Blockchain & DLT Tech (Industry) Survey 2018, MIGHT

PARAMETER IMPACTING ORGANISATION'S READINESS IN ADOPTING BLOCKCHAIN / DLT



Source: Blockchain & DLT General Survey 2018, MIGHT

MIGHT's Outlook

A study to understand the full impact of these challenges on the local blockchain and DLT ecosystem could be timely for further policy planning on the matter, as well as becoming a reference and valuable tool to support the local industry in their search to adopt the moving technology.

4.2 Key Findings

Divided into PEST, the following are the key findings to support the use of blockchain technology and DLT in the Malaysian ecosystem:

POLICY

1. The emergence of blockchain and DLT as an ecosystem coincided with global financial uncertainties and perceived threats from cryptocurrencies. Unsurprisingly, countries that are anchors of the global financial system have led the pack in responding as trailblazing first movers. As blockchain continues to expand the impact of digitalisation and decentralisation affecting governments, businesses and society, countries including Malaysia need to respond as second movers, with the understanding that there is no one-size fits-all strategy. As the change within this ecosystem moves very rapidly, Malaysia could look at options in providing a more agile and flexible guide in terms of planning the adoption of the technology for the nation.

2. Malaysia needs to leapfrog in its effort to be a key player in the selected areas, with the government's roles being seen as critical in regulatory and policy aspects of industry development as well as in opening access to markets for the industry players.

3. Connecting or facilitating the connections between the supply and demand side would be much needed, and could be strengthened with the help of government-linked organisations that include infrastructure providers such as Futurise, I2M Medini in Johor Bahru and MDEC. Others, such as MIGHT on Industry Development facilitation, and SMECorp on SMEs interests could enhance the opportunities for the industry.

4. As the current poster child of decentralisation and peer-to-peer network culture with the potential to become a

game changer on global business and economic models, this would fit into the government's plan to migrate the country's economic model towards an industry led initiative with government in the support role.

5. As peer-to-peer (p2p) and open-source digital technologies, blockchain and DLT have the potential to provide affordable access to the technologies for Malaysian SMEs that constitute 98.5% of Malaysian businesses. In this sense the Malaysian regulatory framework needs to recognise, where possible, the importance of preferring open-source applications over proprietary networks.

6. There are thriving blockchain and DLT industry communities in Malaysia which are very much connected to the larger ASEAN network. They have continuously developed the ecosystem on p2p basis within the ASEAN region. Government intervention in terms of providing access to market through government to government (G2G) measures and smart partnerships would be an invaluable added value to the ecosystem.

7. Malaysia should encourage adoption of technology in the use cases relevant in policy planning documents. There are a number of major policy documents that should include blockchain and DLT development, including the 11th Malaysia Plan Review document, the Annual Budget (2019/2020), the 12th Malaysia Plan 2021-2025 and the New Industrial Malaysia Plan.



ECONOMICS



1. Based on global development and the benchmarking of other countries' efforts, Malaysia's main potential would be exploring the advantage of the second mover in key areas of strength such as shariah-compliance finance, Halal supply chain and embedding the technologies to enhance competitiveness of its resources, prioritising efforts more on non-financial applications.

2. For Malaysian industries, acknowledging how most of the top 50 corporations in the world are heavily involved and investing in the technology from many different angles should by itself incentivise the local industry to explore the full potential of this technology.

3. The stakeholders' engagements have also brought a very unique strength for Malaysia to build its value proposition in this ecosystem, which is the social capital. Blockchain is an open-source champion, with intelligence building feeding upon networks of open-source contributors and offers an excellent avenue for Malaysia to build its talents as proposed in the chapter in Malaysia. Not only that, open-source will help ensure that the costs of potential adoption for the 98.5% of Malaysian businesses that are in the form of SMEs are affordable.

4. A closer connection should be developed between financial institutions (banks, etc.) and the industry to encourage local companies to adopt the technology as a measure towards upgrading their efficiency and effectiveness towards digitisation.

5. As Malaysia develops a number of technology hubs, for blockchain and DLT, it should capitalise on the location of Iskandar Malaysia as nearshore for Singapore, Cyberjaya for its smart infrastructure and Labuan for its offshore facilitation to attract new investments and knowledge into Malaysia.

SKILLS



1. With the shortage of skills worldwide, industry could adopt measures into new methods of prospecting for talents, such as through bounties, hackathons, talent development groupings and special programmes to intensify research & development (R&D) and RICE (Reports, Interfaces, Conversions, Extensions).

2. Talent has been identified as one of the key challenges that must be addressed for Malaysia to become a key player in this area. Many of the local universities have started courses that are related to the technologies, and are looking into deep diving into the subject matter. With this in place, a tripartite effort involving academia, industry and government is needed to secure hands-on experience for the learners, and it has been proposed to expand the learning network to ASEAN level so as to allow those involved to learn from each others' experience and open the opportunities to work on live projects.

TECHNOLOGY



1. With the technology still undergoing major and multiple iteration processes, the government's supporting role in provisioning testbeds for the industry—some examples would be the regulatory sandboxes and proof of concepts—to deploy the technology with minimal risks, could galvanise the state of readiness of the whole local blockchain ecosystem and signal Malaysia's readiness for the next blockchain related development.

2. Scams and cyberthreats appearing prominently are key risks that need to be mitigated in this ecosystem. The lack of sufficient knowledge on cybersecurity, the inherent volatility of cryptocurrencies, the temptations of easy money and the limited empowerment of comprehensive inter-ministerial efforts to monitor and act on mitigating the scams have become a major risk for Malaysia's good name. A major awareness effort is needed, especially involving the public and industry.

3. Malaysia should study how the IP system could benefit its businesses, especially SMEs, in terms of reducing the cost of accessing technology and improving their competitiveness.



4.3 Next : Leapfrogging

Malaysia is not starting from zero on blockchain but as the rate of change for technology accelerates, Malaysia needs to find its niche to anticipate how the technology will impact the country in the longer term.

The trend towards the confluence of **ABCD-I (AI, Blockchain, Cloud, Data – IoT)** in solving global challenges beyond the tech scene is evidenced in use cases involving businesses (such as supply chain management) crossing into social (financial inclusion efforts). Not only is the convergence blurring the distinction between business and private spheres, it is also happening at increasing speed in the count of months and weeks.

Malaysia should be exploring and harnessing this technology for **shared prosperity** and understand how it will impact the current industry and create new opportunities. There is also a need to proceed with caution and to be aware of the risks associated with the technology. It is imperative for us to understand that this technology, which many consider as emerging, will undergo numerous iteration processes.

Blockchain and DLT will be one of the emerging digital technologies that will play the role of strategic enablers in the digital future. Blockchain itself, is expected to support a cluster of technologies, rather than remaining a standalone technology providing **added verifiability and transparency**.

Malaysia needs to work on increasing awareness and knowledge and the best way forward is to test it on a small scale and learn from others' experiences. The key findings have highlighted the need for close and continuous **collaboration between public and private entities** for Malaysia to create a niche for itself in the quick changing global blockchain and DLT ecosystem. In this spirit, we should welcome the increasing number of organisations that have set up centres of excellence for blockchain in Malaysia.

This win-win initiative will be an important move in building hands-on blockchain experience among the Malaysian talent pool. At the very foundation, industry development needs to be an **industry-led initiative** in order to benefit from the knowledge that proliferates from the communities. Beyond that, we look at these technology

champions to bring the learnings to the public by creating a simplified learning process for the uninitiated. In addition to this, the blockchain 'revolution' has spawned a number of strong innovations among blockchain startups that capitalise on the idea of **open-source, a building block of social capital**, joining other earlier efforts in this 'cultural capital' indicating that Malaysia should closely explore the idea of social capital to gain the most impact from this technology.

In parallel, Malaysia should be looking at enhancing the current delivery of its services by adopting this technology, in its areas of strength such as shariah-compliant finances, resource management as well as supply chain management. What blockchain development has highlighted is that the **business models** to fund such endeavours in the near future are changing, and Malaysia needs to be open to explore the next 'new' to survive the global turbulence. The new way of looking at intermediaries and trust could be a boon for a centralised government looking to improve its governance and accountability systems.

This outlook report has been written as an **indicative report** as opposed to definitive measures of policy. As such it is proposed that further deliberations be taken and an adaptable policy document to support specific industry development efforts be developed as a common reference for both public and private stakeholders.

Acknowledging the fast-changing nature of the technology and that touch points will spread among the industry, government and social sectors in a crosscutting manner, building a policy document for the technology needs a number of perspectives to help Malaysia mitigate risks associated with it. One way is for the plan to be categorised into an aggregate of foundational frameworks such as:

- Industrial Framework
- Competitive Framework
- Administrative and Regulatory Framework

It would be wise for Malaysia as an emerging nation, to continue to observe, learn and incorporate **blockchain as a part of the technology enabler on critical items** that could have the best impact in leapfrogging towards a high-income nation by 2024 and beyond.



MOMENTS : STAKEHOLDERS' ENGAGEMENTS





REFERENCES

EXECUTIVE SUMMARY

1. World Economic Forum. (September, 2015). Global Agenda Council on the Future of Software & Society : Deep Shift Technology Tipping Points and Societal Impact. Available at : http://www3.weforum.org/docs/WEF_GAC15_Technological_Tipping_Points_report_2015.pdf

CHAPTER 1: INTRODUCTION

1. Antonopoulos, A.M. (May 18, 2018). Why Open Blockchains Matter [Video file]. Available at : <https://www.youtube.com/watch?v=uZPlz3ArQww>
2. Anwar, H. (August 25, 2018). Consensus Algorithms: The Root Of The Blockchain Technology. Available at : <https://101blockchains.com/consensus-algorithms-blockchain>
3. Bank for International Settlements. (2017). The Money Flower with Selected Examples . Available at : https://www.bis.org/publ/qtrpdf/r_qt1709z.htm#Graph-B
4. The Cambridge Centre for Alternative Finance. (August, 2018). Distributed Ledger Technology System : A Conceptual Framework. Available at : https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2018-10-26-conceptualising-dlt-systems.pdf
5. CoinGecko. (May, 2019). Top 100 Coins by Market Capitalization. Available at : <https://www.coingecko.com/en>
6. CoinMarketCap. (May, 2019). Top 100 Cryptocurrencies by Market Capitalization. Available at : <https://coinmarketcap.com>
7. del Castillo, M. (July 3, 2018). Big Blockchain: The 50 Largest Public Companies Exploring Blockchain. Available at : <https://www.forbes.com/sites/michaeldelcastillo/2018/07/03/big-blockchain-the-50-largest-public-companies-exploring-blockchain/#37ca6df82b5bobal2000>
8. Dong, L. (January 11, 2018). What's the Future of Blockchain in China? Available at : <https://www.weforum.org/agenda/2018/01/what-s-the-future-of-blockchain-in-china>
9. Donnelly, J. (November 17, 2016). The Internet Intranet Comparison, slide 7 - State of Blockchain Q3 2016. Available at : <https://www.coindesk.com/research/state-of-blockchain-q3-2016>
10. Filiba, J. (December 14, 2014). Blockchain is the Internet's Legacy Through the Internet of Value. Available at : <https://news.coinsquare.com/blockchain/blockchain-internet-of-value>
11. Gartner. (May 8, 2019). Evaluate Promising and Maturing Blockchain Use Cases in Government. Available at : <https://www.weforum.org/agenda/2018/01/what-s-the-future-of-blockchain-in-china>
12. Gartner. (October 26, 2018). Understanding the Gartner Blockchain Spectrum and the Evolution of Technology Solutions.
13. General Service Administration (GSA). Emerging Citizen Technology : Blockchain Use Cases. Available at : <https://emerging.digital.gov/blockchain-federal>
14. Hegadekatti, K., & S. G., Y. (March 30, 2017). The Programmable Economy: Envisaging an Entire Planned Economic System as a Single Computer through Blockchain Networks. Available at : https://mpr.a.ub.uni-muenchen.de/82831/1/MPPRA_paper_82831.pdf
15. Iansiti, M. & Lakhani, K.R. (January – February 2017). The Truth About Blockchain. Available at : <https://hbr.org/2017/01/the-truth-about-blockchain>
16. Levy, H.P. (October 16, 2018). The Reality of Blockchain. Available at : <https://www.gartner.com/smarterwithgartner/the-reality-of-blockchain>
17. Mearian, L. (January 29, 2019). What Is Blockchain? The Complete Guide. Available at : <https://www.computerworld.com/article/3191077/what-is-blockchain-the-complete-guide.html>
18. MIGHT. Adapted from Kees Van der Heijden Model
19. MIGHT. Compilation of Government Use Cases (Global)
20. Nakamoto, S. Bitcoin: A Peer-to-Peer Electronic Cash System. Available at : <https://bitcoin.org/en/bitcoin-paper>
21. Panetta, K. (October 15, 2018). Gartner Top 10 Strategic Technology Trends for 2019. Available at : <https://www.gartner.com/smarterwithgartner/gartner-top-10-strategic-technology-trends-for-2019>
22. PwC. Blockchain in Government - Future Synergy. Available at : <https://itewb.gov.in/wp-content/uploads/2018/04/Blockchain-in-Govt-Future-Synergy.cleaned.pdf>
23. Revoredo, T. (July 9, 2018). Blockchains vs. DLTs. Available at : <https://medium.com/coinmonks/blockchains-vs-dlts-8fe03df39737>
24. Terlato, P. (August, 2018). Blockchain Technology at a Precarious and Demanding Stage of the 'Hype Cycle': Report. Available at : <https://www.finder.com/blockchain-technology-at-a-precarious-and-demanding-stage-of-the-hype-cycle-report>
25. Thake, M. (February 8, 2018). What's the difference between blockchain and DLT? Available at : <https://medium.com/nakamo-to/whats-the-difference-between-blockchain-and-dlt-e4b9312c75dd>
26. Verberne, J. (February 1, 2018). How Can Blockchain Serve Society? Available at : <https://www.weforum.org/agenda/2018/02/blockchain-ocean-fishing-sustainable-risk-environment>
27. World Bank Group. (2017). Distributed Ledger Technology (DLT) and Blockchain. Available at : <http://documents.worldbank.org/curated/en/134831513333483951/Distributed-Ledger-Technology-DLT-and-blockchain-Fintech-note-no-1>



28. Zerocrypted. (November 18, 2018). Bitcoin Offline Transactions Are Now Possible. Available at : <https://zerocrypted.com/bitcoin-offline-transactions-are-now-possible>

CHAPTER 2: GLOBAL OUTLOOK

1. 99Bitcoin. (January 13, 2019). Bitcoin Mining Hardware Reviews and Comparison. Available at : <https://99bitcoins.com/bitcoin-mining/bitcoin-mining-hardware/>
2. AngelList. Tech & Startup Jobs. Available at : <https://angel.co/jobs>
3. Arnold, A. (August 13, 2018). The 6 Major Blockchain Trends In 2018. Available at : <https://www.forbes.com/sites/andrewnarnold/2018/08/13/the-6-major-blockchain-trends-in-2018/#37a0c36e23f9>
4. Asia Blockchain Review. (August 7, 2018). Indonesian Regulator To Rule Crypto Trading on Futures Exchange. Available at : <https://www.asiablockchainreview.com/indonesian-regulator-to-rule-crypto-trading-on-futures-exchange>
5. Asterley, R. The Rise Of Big Data Analytics For Blockchains : Data Is Looking to Make Bitcoin Safer for Companies to Use. Available at : <https://channels.theinnovationenterprise.com/articles/the-rise-of-big-data-analytics-for-block-chains>
6. Bauerle, N. and Ryan, P. (February 7, 2018). CoinDesk Releases 2018 Blockchain Industry Report. Available at : <https://www.coindesk.com/coindesk-releases-2018-bitcoin-blockchain-industry-report>
7. Beedham, M. (April 2, 2019). China Takes Top Spot With 25% of World's Blockchain Projects . Available at : <https://thenextweb.com/hardfork/2019/04/02/china-blockchain-projects-top>
8. BiTA. Blockchain in Transport Alliance : Driving Standards and Enabling Technology Adoption. Available at : <https://www.bitstudio.com>
9. Blockchain for Social Impact Coalition (BSIC). (2019). Leveraging the Ethereum Blockchain for Social Impact Coalition. Available at : <https://blockchainforsocialimpact.com/>
10. Brandon, G. (April 4, 2017). Blockchain Trends for 2017. Available at : <https://blog.wavesplatform.com/blockchain-trends-for-2017-f48d6d405311>
11. CBInsights. (May 8, 2018). 8 Trends Shaping the Future Of Blockchain Technology. Available at : <https://www.cbinsights.com/research/blockchain-future-trends>
12. CCN. (May 28, 2018). Philippines' Banks to Pilot Ethereum-Based Blockchain for Retail Payments. Available at : <https://www.ccn.com/philippines-banks-to-pilot-ethereum-based-blockchain-for-retail-payments>
13. Chantanusornsiri, W. (November 5, 2018). Revenue Department to Use Blockchain for Probes. Available at : <https://www.bangkokpost.com/business/news/1570158/>
14. Cheng, E. (May 4, 2018). Cryptocurrencies and Blockchain Are Becoming a Hot Trend in the Job Market. Available at : <https://www.cnbc.com/2018/05/04/cryptocurrencies-and-blockchain-are-becoming-a-hot-trend-in-the-job-market.html>
15. CoinDesk. (February 10, 2018). 7 Trends Shaping the Evolving ICO Economy. Available at : <https://www.coindesk.com/7-trends-shaping-evolving-ico-economy>
16. CoinDesk. What is DAO? Available at : <https://www.coindesk.com/information/what-is-a-dao-ethereum>
17. Cointelegraph. Mt Gox News. Available at : https://cointelegraph.com/tags/mt_gox
18. Decentralised Identity Foundation (DIF). Together We're Building a New Identity Ecosystem. Available at : <https://identity.foundation/>
19. DiLabrien. (May 25, 2018). 3 New Trends Propelling Blockchain Development. Available at : https://www.ibm.com/developerworks/community/blogs/e3ec7365-1b09-44f2-906f-19826275860f/entry/3_New_Trends_Propelling_Blockchain_Development?lang=es&mhq=blockchain%20trends&mhsrc=ibmsearch_a
20. Duane Morris Vietnam. (November 23, 2018). ICO/STO: Is It Legal For Vietnamese To Participate? Available at : <https://blogs.duanemorris.com/vietnam/2018/11/23/ico-sto-legal-for-vietnamese-to-participate>
21. EU GDPR. EU General Data Protection Regulation. Available at : <https://eugdpr.org>
22. European Union Blockchain Observatory and Forum. (February 1, 2018). European Commission Launches the EU Blockchain Observatory Forum. Available at : http://europa.eu/rapid/press-release_IP-18-521_en.htm
23. Ferro, E. (July 18, 2018). Business Models for Blockchain-Based Ventures. Available at : <https://www.slideshare.net/s2pisco/business-models-for-blockchainbased-ventures-106439896>
24. Fifth Element Funds. (2018). Launching the SDG Impact Circle and SDG Impact Fund Moonshots to Deliver the Sustainable Development Goals. Available at : <https://sdgcircle.org/wp-content/uploads/2018/09/Fifth-Element-Fund-DAF-Overview-Website.pdf>
25. Financial Crimes Enforcement Network. (March 18, 2013). Application of FinCEN's Regulations to Persons Administering, Exchanging, or Using Virtual Currencies. Available at : <https://www.fincen.gov/sites/default/files/shared/FIN-2013-G001.pdf>
26. Ganne, E. Can Blockchain Revolutionize International Trade? Available at : https://www.wto.org/english/res_e/publications_e/blockchainrev18_e.htm
27. Global Islamic Finance Forum (GIFF). 2018. (October 3, 2018). Governor's Keynote Address - "Value Based Intermediation - Beyond Profit".
28. Global Islamic Finance Forum (GIFF). 2018. (October 3, 2018). Chris Skinner on Islamic Finance.

29. GS1. (October 17, 2018). GS1 Releases New Position Paper on the Future of Blockchain Technology. Available at : <https://www.gs1.org/articles/2463/gs1-releases-new-position-paper-future-blockchain-technology>
30. GSA. Blockchain. Available at : <https://www.gsa.gov/technology/government-it-initiatives/emerging-citizen-technology/blockchain>
31. Hewlett Packard Enterprise Technical Whitepaper. Blockchain Platforms: Today and Tomorrow, Evolution to Enterprise Ready Performance and Scale.
32. Holland & Knight LLP. (2019). Blockchain & Cryptocurrency Regulation 2019 | 05 Blockchain and Intellectual Property : A Case Study. Available at : <https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations/4-blockchain-and-intellectual-property-a-case-study>
33. IDC Report. IDC FutureScope: Worldwide IT Industry 2019 Predictions.
34. Incitement. For Brands With Purpose Beyond Profit. Available at : <https://www.theincitement.com/>
35. Insureblocks. (August 6, 2018). Ep.21 – ACORD: Data Standards for Blockchain in Insurance. Available at : <http://www.insureblocks.com/ep-21-acord-data-standards-for-blockchain-in-insurance/>
36. International Chamber of Commerce (ICC). (December 13, 2017). Panel Considers Ways of Boosting Trade Through Blockchain and AI . Available at : <https://iccwbo.org/media-wall/news-speeches/panel-considers-ways-boosting-trade-blockchain-ai/>
37. International Organization for Standardization. (2016). ISO/TC 307 Blockchain and Distributed Ledger Technologies. Available at : <https://www.iso.org/committee/6266604.html>
38. IPR Daily. (August, 2018). 2018 Global Blockchain Patent Enterprise Ranking (TOP 100). Available at : http://www.iprdaily.cn/news_19746.html
39. Ishak, M. (2016). Digitisation of Financial Transactions: Cashless Society and Bitcoin for Malaysia. Available at : <https://www.myforesight.my/2016/11/04/digitisation-of-financial-transactions-cashless-society-and-bitcoin-for-malaysia/>
40. Joseph-Grant, H. (January 14, 2018). Binance the Fastest Ever Startup to Achieve Profitable Tech Unicorn Status. Available at : <https://irishtechnews.ie/binance-the-fastest-ever-startup-to-to-achieve-profitable-tech-unicorn-status/>
41. Kulkarni, A. (February 28, 2018). Blockchain Industry Consortiums: When They Work and Why They Fail. Available at : <https://blog.chronicled.com/blockchain-industry-consortiums-when-they-work-and-why-they-fail-2e02851b651f>
42. Lago, C. (October 17, 2018). How Singapore Is Using Blockchain Outside of Cryptocurrencies. Available at : <https://www.cio.com/article/3291758/how-singapore-is-using-blockchain-outside-of-crypto-currencies.html>
43. Law Library of Congress. (June, 2018). Regulation of Cryptocurrency Around the World. Available at : <https://www.loc.gov/law/help/cryptocurrency/world-survey.php>
44. Madore, P.H. (October 30, 2018). Mainstream: 'Big Four' Auditor PwC Has 400 Crypto Specialists on Staff. Available at : <https://www.ccn.com/mainstream-big-four-auditor-pwc-has-400-crypto-specialists-on-staff>
45. Merre, R. A Comprehensive Guide to the Next Generation of Crypto Funding. Available at : <https://hackernoon.com/a-comprehensive-guide-to-the-next-generation-of-crypto-funding-v-ico-ieo-daico-eto-sto-939909782da6>
46. Merre, R. The Coming of Age of ICOs, Exploring the Next Steps In the Crypto Funding Revolution (Part II). Available at : <https://hackernoon.com/a-comprehensive-guide-to-the-next-generation-of-crypto-funding-v-ico-ieo-daico-eto-sto-939909782da6>
47. MIGHT. Compilation of Blockchain Global Collaboration Involving Governments.
48. MIGHT. Compilation of Countries' View of Cryptocurrencies as Legal Tender.
49. MIGHT. Compilation of International Standards Setting Bodies.
50. Miller, K. (October 4, 2017). Recruitment Trends: Blockchain Technology and Technologists. Available at : <https://www.forbes.com/sites/forbescommunicationscouncil/2017/10/04/recruitment-trends-blockchain-technology-and-technologists/#5d28179e7143>
51. Moore, M. (October 16, 2018). World Payment Report 2018. Available at : <https://www.capgemini.com/news/world-payments-report-2018>
52. Morris, N. (October, 2018). Deloitte Highlights Five Areas of Blockchain Progress. Available at : <https://www.ledgerinsights.com/deloitte-highlights-five-areas-of-blockchain-progress>
53. Noah, S. (July 13, 2018). Trends That Are Shaping the Future of Blockchain Technology. Available at : <https://coinedia.org/information/shaping-future-of-blockchain-technology>
54. Pash, C. (October 3, 2018). The Most in Demand Freelance Jobs in Australia. Available at : <https://www.businessinsider.com.au/the-most-in-demand-freelance-jobs-in-australia-2018-10>
55. PerkinsCoie. (May, 2019). Digital Currencies: International Actions and Regulations. Available at : <https://www.perkinscoie.com/en/news-insights/digital-currencies-international-actions-and-regulations.html>
56. Pikri, E. (September 25, 2018). 7 Cool Blockchain Projects Made Right Here in Malaysia. Available at : <https://fintechnews.my/18476/blockchain/blockchain-malaysia-projects>
57. Practical Law Finance. (October 26, 2017). Transitioning Derivatives onto the Blockchain: ISDA® Publishes Common Domain Model™ (CDM) 1.0. Available at : <https://content.next.westlaw.com/Document/I02cf0176b97211e79bef99c0ee06c731/View/FullText.html>
58. PwC. (2017). Blockchain, a Catalyst for New Approaches in Insurance. Available at : <https://www.pwc.com/gx/en/insurance/assets/blockchain-a-catalyst.pdf>
59. PwC. (2018). Blockchain Is Here. What's Your Next Move? Available at : <https://www.pwc.com/gx/en/issues/blockchain/blockchain-in-business.html>
60. Robins, R. The Rise of Islamic Finance. Available at : <https://thefinanser.com/2010/09/the-rise-of-islamic-finance.html/>



61. Roe, D. (June 25, 2018). 7 Trends Driving Blockchain Forward. Available at : <https://www.cmswire.com/information-management/7-trends-driving-blockchain-forward>
62. Rooney, K. (March 27, 2018). Your Guide to Cryptocurrency Regulations Around the World and Where They Are Headed. Available at : <https://www.cnbc.com/2018/03/27/a-complete-guide-to-cyprocurrency-regulations-around-the-world.html>
63. Scribani, J. (November 30, 2018). Strategic Business Value of the Blockchain. Available at : <https://www.visualcapitalist.com/business-value-blockchain>
64. Sharon, A. (January, 2019). Malaysian Government to Implement Concrete Laws on Digital Currencies. Available at : <https://www.opengovasia.com/malaysian-government-to-implement-concrete-laws-on-digital-currencies>
65. Smith, C. (September 6, 2018). Top 6 Trends to Expect in Blockchain Application Development. Available at : <https://knowtechie.com/top-6-trends-to-expect-in-blockchain-application-development>
66. TokenData. (June 5, 2018). Data, Analytics and Transparency on ICOS and Tokens. Available at : <https://medium.com/@tokendata>
67. Tractica. Blockchain for Enterprise Application. Available at : <https://www.tractica.com/research/blockchain-for-enterprise-applications>
68. UN Blockchain. (December 10, 2018). Blockchain Experts Invited to Highlight Use Cases to Benefit from Standards. Available at : <https://un-blockchain.org/category/itu>
69. UNECE. (April 26, 2018), UN Centre for Trade Facilitation and E-Business (UN/CEFACT). Available at : https://www.unece.org/31stuncefactforum_blockchain.html
70. Weinick, J.M. & Cheng, R.A. (September 12, 2018). An Outlook on the Blockchain Patent Arms Race. Available at : <https://www.law.com/njlawjournal/2018/09/12/ip1-0917-an-outlook-on-the-blockchain-patent-arms-race>
71. World Economic Forum. (June, 2017). Realizing the Potential of Blockchain, A Multistakeholder Approach to the Stewardship of Blockchain and Cryptocurrencies. Available at : http://www3.weforum.org/docs/WEF_Realizing_Potential_Blockchain.pdf
72. Vanham, P. (September 13, 2018). Blockchain Could Enable \$1 Trillion in Trade, Mostly for SMEs and Emerging Markets. Available at : <https://www.weforum.org/press/2018/09/blockchain-could-enable-1-trillion-in-trade-mostly-for-smes-and-emerging-markets>

CHAPTER 3: MALAYSIA'S LANDSCAPE

1. Adreena, I. (June 29, 2018). These Are the 8 Canned Sardine Brands That Are Contaminated With Worms. Available at : <http://www.rojakdaily.com/suudu/article/5291/these-are-the-8-canned-sardine-brands-that-are-contaminated-with-worms>
2. Bank Negara Malaysia. Anti-Money Laundering and Counter Financing of Terrorism (AML/CFT) - Digital Currencies (Sector 6). Available at : <http://www.bnm.gov.my/index.php?ch=57&pg=538&ac=680&bb=file>
3. Bank Negara Malaysia. Consumer Alert and Updates. Available at : http://www.bnm.gov.my/index.php?ch=en_financialconsumeralert
4. Financial Technology Enabler Group (FTEG). Available at : <https://www.myftcg.com>
5. FINNOVASIA. (March 20, 2017). FINNOVASIA | Kuala Lumpur 2017. Available at : <https://www.meetup.com/FINNOVASIA-KL/events/238163173/>
6. IBM. Executive Overview. Available at : <https://www.ibm.com/thought-leadership/institute-business-value/report/blockchain-for-government>
7. Kastelein, R. (February 2, 2017). Nine in Ten Governments Investing in Blockchain by 2018 Says IBM Study . Available at : <https://www.the-blockchain.com/2017/02/02/nine-ten-governments-investing-blockchain-2018-says-ibm-study/>
8. KL Blockchain Week. (September, 2018). Available at : <https://klblockchainweek.com>
9. Kocher, I. (January 15, 2018). How to Heal the Fractured World of 2018. Available at : <https://www.weforum.org/agenda/2018/01/how-to-heal-fractured-world-2018>
10. MaGIC. (August 16, 2017). Blockchain Disruptors. Available at : <https://mymagic.my/events/event/blockchain-disruptors/>
11. Medini Iskandar Malaysia. Available at : <http://www.medini.com.my>
12. MIGHT. (Note: Numbers do not include Multi-Level-Marketing events involving cryptocurrencies, or events by companies under Bank Negara Malaysia watchlist)
13. Mingguan Malaysia. (December 31, 2018). Laporan Liputan Media Harian. Available at : <http://www.moa.gov.my/documents/20182/127309/30-min.pdf/ad6c049a-6715-4ef3-9e3e-101160fcaf9b>
14. Pikri. E. (August 6, 2018). BNM's Newly Updated Watchlist Proves That Crypto-Scams Are Still a Threat. Available at : <https://fintechnews.my/18052/blockchain/bank-negara-consumer-watchlist-2018>
15. Securities Commission Malaysia. (December 21, 2017). The SC Initiates aFINity Innovation Lab for Alternative Trading System. Available at : <https://www.sc.com.my/news/media-releases-and-announcements/the-sc-initiates-afinity-innovation-lab-for-alternative-trading-system>
16. Securities Commission Malaysia. (November, 2018). Project Castor : Capital Market Architecture Blueprint in a Decentralised World. Available at : <https://castor.my/wp-content/themes/castor/assets/blueprint.pdf>
17. Securities Commission Malaysia. (January 31, 2019). SC Introduces Framework to Facilitate Trading of Digital Assets in Malaysia. Available at : <https://www.sc.com.my/news/media-releases-and-announcements/sc-introduces-framework-to-facilitate-trading-of-digital-assets-in-malaysia>
18. Sharon, A. (January, 2019). Malaysian Government to Implement Concrete Laws on Digital Currencies. Available at : <https://www.opengovasia.com/malaysian-government-to-implement-concrete-laws-on-digital-currencies>



19. Yee, L.H. (September 3, 2015). SC Launches aFINity@Sc to Spur Devt of Financial Technology. Available at : <https://www.thestar.com.my/business/business-news/2015/09/03/sc-spurs-devt-of-financial-technology/#gEZOdDWQq2k3XlxF.99>

CHAPTER 4: WAY FORWARD

1. Craft. Cosmos Network Competitors. Available at : <https://craft.co/cosmos-network/competitors>
2. EU Blockchain Reports. Available at : <https://www.eublockchainforum.eu/reports>
3. MIGHT. Blockchain & DLT General Survey 2018.
4. MIGHT. Blockchain & DLT Industry Survey 2018.
5. MIGHT. Blockchain & DLT Tech Survey 2018.
6. MIGHT. Blockchain Talent Discussion with Academia 2018.
7. MIGHT. Stakeholders Engagement Sessions June – November 2018.



MIGHT

*Malaysian Industry-Government Group
for High Technology*

The Malaysian Industry-Government Group for High Technology (MIGHT) was established as an independent, industry-driven non-profit organisation on 22nd February 1993 and was formally incorporated as a company limited by guarantee on 15th October 1994. It is an organisation built on the strength of public-private partnership with members representing both local and international, from industry, government and academia.

Under the patronage of YAB Prime Minister of Malaysia, MIGHT is governed by a Board of Directors. MIGHT is a consensus building platform for industry-government in the drive to advance high technology competency in Malaysia. Its core purpose is addressing the country's needs in response to the effects of globalisation and trade liberalisation on future economic growth through the accelerated use of high technology.

MIGHT also acts as a key interlocutor, bringing together policy and technology nurturing to advance high technology interests in Malaysia. Apart from that MIGHT also takes on the role of nurturing high tech industries via catalytic interventions programme when the need arises.

Programmes and activities will include building strategic partnerships and alliances, technology acquisition and nurturing capacity building as well as strengthening the growth of these sectors through policy interventions and flagship programmes.





**MALAYSIA INDUSTRY-GOVERNMENT
GROUP FOR HIGH TECHNOLOGY** (320059-P)
MIGHT Partnership Hub, Jalan Impact,
63000 Cyberjaya, Selangor, MALAYSIA.

www.might.org.my

Tel : +603.8315.7888



MIGHTmalaysia

ISBN 978-967-15258-7-6

