Annex A-4: AI, Data and Blockchain

1 Brief Introduction

Annex A-4: AI has consistently been cited as one of the key technology areas with the potential to affect every aspect of the digital world, and is also one of the four frontier technology focus areas identified by IMDA to lay a strong foundation for information communication media for Singapore. In Gartner's 2018 emerging technology hype cycle, which identifies 35 promising technologies which could unlock a competitive advantage for companies over the next 5 to 10 years, AI is prominent across the hype cycle, with predictions that AI technologies will virtually be everywhere over the next 10 years. Blockchain, on the other hand, is still in the early phase of adoption, and Gartner suggests that the technology is another 5 to 10 years away from mainstream.

2 Market Study

Global & Regional Trends

The global business value derived from AI is expected to total US$1.2 trillion in 2018, an increase of 70% from 2017, and AI-derived business value is forecast to reach US$3.9 trillion in 2022. In the longer term, AI is expected to add around 16% to global output by 2030, or about US$13 trillion. Blockchain's business value-add will grow to slightly over US$360 billion by 2026, then surge to more than US$3.1 trillion by 2030. In the long term, the global blockchain market is expected to grow from US$212 million 2016 to US$8,683 million by the end of 2024, at a Compound Annual Growth Rate of 59.04%.

Singaporean Trends

In Singapore, the AI market has the potential to become a US$960 million market in 2022 and US$16 billion by 2030 with a CAGR of 42.2%. This includes a wide range of technologies used to "analyse, organise, access and provide advisory services based on a range of unstructured information". The Singaporean blockchain market has the potential to achieve a range of market spending between US$201 million to US$272 million market in 2022 and US$1.9 billion to US$2.6 billion market by 2030 with a CAGR of 32.5%.

3 Technology Study

Contributions of AI, Data and Blockchain to Cloud Native Architecture

As a part of the overall technology roadmap recommendation, Singapore needs to establish a Cloud Native Architecture to improve access to emerging technologies amongst the stakeholders and assure Services 4.0. We believe that AI, Data and Blockchain technologies will play an important part in executing the Cloud Native Architecture as highlighted by the exhibit below. Exhibit 1, below shows how AI, Data and Blockchain technologies will contribute to various aspects of cloud native architecture.

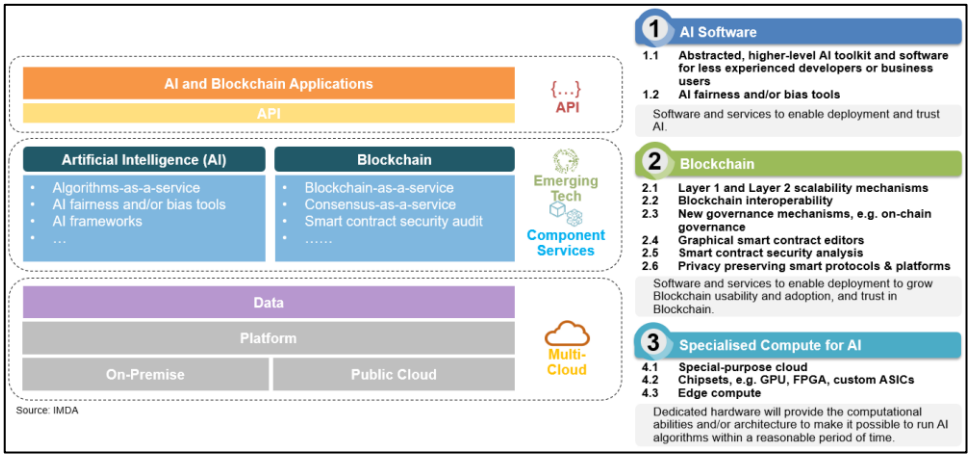

Exhibit 1: Contributions of AI, Data and Blockchain to Cloud Native Architecture

SWOT Analysis

Our study of the Singaporean landscape and the global market for AI, Data and Blockchain reveals specific strengths, weaknesses, opportunities and threats as discussed in the exhibit below.

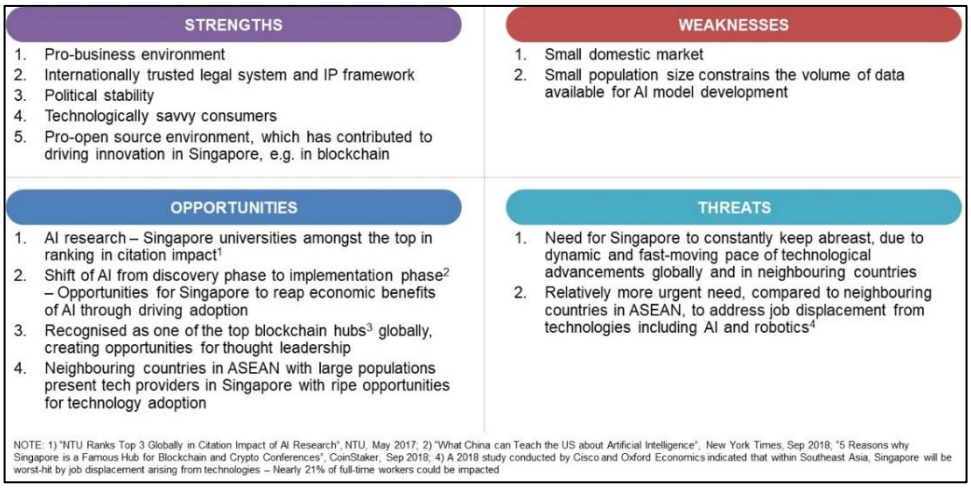

Exhibit 2: SWOT for AI, Data and Blockchain

AI and blockchain technologies require a focused set of strategies, with Singapore's unique strengths and weaknesses in mind. Firstly, interventions need to be devised to accelerate the adoption of AI and blockchain in Singapore. Singapore should leverage its pro-business, pro-open source environment and robust legal systems to make AI and blockchain ecosystem into a trusted ecosystem. Singapore should also double down its commitment in investing in specific AI and blockchain R&D opportunities to chalk out its niche in the global market. Specifically, it should have a multi-disciplinary R&D approach towards both

AI and blockchain given their unique pervasive impact in the society. Areas around technology convergence would be another topic for Singapore to focus on. Finally, Singapore should invest in capabilities that further technology convergence of AI and blockchain with other technologies.

4 Recommendations

Recommendations for AI:

1. For the enablement of AI deployment amongst enterprises and applications/ solutions developers in Singapore, Singapore should encourage potential AI services providers to productise their respective AI solutions as API services, so that AI can be more easily accessible to enterprises and consumers, augmenting on-premise deployments.
2. For the enablement of trust in AI, Singapore should also encourage the development of capabilities, tools and services to support responsible AI deployment amongst enterprises and applications/solutions developers.
3. For the algorithms and techniques of AI, Singapore should invest in multi-disciplinary AI research and develop AI capabilities that require smaller primary data sets to generate equivalent if not more AI generated insights and other benefits. This is to overcome the biggest challenge for Singapore when developing advanced AI systems, which is finding adequate data to train these systems.
4. For AI infrastructure, there could be a potential need to develop computational infrastructure in Singapore, in order to enable enterprises and research in Singapore to have easy access to such specialised compute capabilities and resources for AI. Singapore should examine the demand drivers for specialised compute and develop a roadmap for such computational infrastructure in Singapore.

Recommendations for Blockchain:

1. For the adoption of blockchain, Singapore should consider the formation of a multi-stakeholder 'Blockchain Governance Think Tank' with multi-disciplinary skillsets (e.g. technical, legal and regulatory expertise) to examine the legal and regulatory challenges and barriers. Singapore should also have regular engagements with international players driving such efforts globally to ensure that Singapore's approach remains in alignment with that of the international blockchain community.
2. For the adoption of blockchain, Singapore should also consider the formation of a business ecosystems to encourage collaboration amongst early adopters for their blockchain pilots and deployments, such as special interest groups, associations and/or professional bodies across applications and domains.
3. For R&D, Singapore should invest in multi-disciplinary blockchain research to build up Singapore's research and development capabilities in these areas. Examples include promoting research and development in token economy and design thinking, cryptoeconomics, blockchain and the law, etc.
4. For the enablement of blockchain deployment, Singapore should encourage ICT solutions providers to develop capabilities in blockchain security, and offer tools and/or services.

Recommendation for Technology Convergence:

1. Existing R&D efforts in Singapore tend to focus on specific technology pillars. Given the trend towards technological convergence, Singapore should also encourage the cross-pollination of multi-disciplinary research and development capabilities to strengthen Singapore's research and development efforts.