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At the Horizon of Quantum: The Case of Malaysia | Clarissa Ai Ling Lee

Malaysia's policy discussions on security and science have evolved from AI to quantum technologies as the Ministry of Defense recognised quantum's impact on privacy, national security, and data protection. While nuclear technology was shaped by colonial influences and later integrated into development policies, quantum technology remains less visible. Quantum's dual-use nature has raised security concerns but the safeguard regulations in place respond more to socio-economic-political-legal conditions. Currently, Malaysia's approach to acquire quantum computational infrastructure relies on vendor-supplier model, a practice that would likely continue given present constraints in expertise, labour force, and budget.

Introduction

Security and science were largely absent from policy discussions in Malaysia until interest in artificial intelligence (AI) governance began to grow in Southeast Asia. This has as much to do with the structure of Malaysia's governance system – such as the organisation of Ministries and their communication of plans and priorities – as with the realpolitik that has rendered science and technology invisible to political actors. Moreover, references to security were made mostly in the context of sustainable development goals: food security, energy security, health, and environmental conservation.

With the advent of quantum 2.0 and the subsequent surge of interest in quantum technologies within Southeast Asia, Malaysia's Ministry of Defense started recognising how the translation of basic science into technological capability would affect other forms of security, such as privacy, national security (physical and cyber defence), and data protection (with the latter tightly correlated to the former two).
In newly independent Malaya, one of the first science departments to be established back then was the physics department at the University of Malaya, known today as Universiti Malaya. This was because physics, at its applied level, contributed to the needs of a colonial technological landscape that required technicians and operators to maintain and service sectors such as medical, agriculture, mining, communication, logistics, and transportation. The educational, developmental, and technological impetus for the early growth of physics in Malaya has been detailed elsewhere, and

such factors coincided with the rise of nuclear and its ancillary industry in Southeast Asia and Malaysia.

Intersecting nuclear with quantum, with AI in-between

How nuclear progressed as technology and infrastructure in Southeast Asia had a higher correlation with domestic than the foreign policies of the states. In Malaysia, there were obvious influences from the British in the early stages of nuclear development, exemplified by visits from luminaries of the field such as P.M.S. Blackett, who gave a lecture on cosmic rays in Singapore in 1953.

Blackett was one of the stalwarts advocating for the development of the nuclear programme in newly independent colonies like India, where he was primarily stationed at that time. He actively promoted the deployment of nuclear energy in these emerging states, including Malaya. This marked the first stage of nuclear engagement in Malaya.

In the second stage, domestic policies were developed around the implementation of nuclear knowledge to development goals, which also provided the requisite funding. Furthermore, nuclear diplomacy was channelled through the Atom for Peace programme, which allowed access to ‘lower-tier’ nuclear technologies. Although there were plans to bring nuclear energy to Malaysia, it currently only has a low-wattage research reactor (1MW), consequently minimising security threats related to dual-use technology in the context of Malaysia.

Although it would appear that politics had an effect on how nuclear technology was, and was not, embraced in the Malaysian context, it is much less clear cut when it came to how seeds of interest were sown around quantum technology. Physics as a field of research and development had been fairly lowkey despite the presence of some activity at the nation’s public universities. While Malaysia’s relationship with nuclear technology remains ambivalent due to uncertainty about public acceptance, quantum technology has yet to reach that level of public visibility.

Obviously, silence over the matter of risk does not translate readily into acceptance, but more the consequence of ignorance over what the technology is about. The present attitude towards quantum technology may also be influenced by the ubiquity of AI in society. This kind of ubiquity does not necessarily equate to better understanding of the technology, only awareness of its everyday impact.

While quantum and nuclear technologies are similarly abstract in the public eye, nuclear technology has a more tangible presence, whether through the images of a nuclear power plant (and the disasters associated with these plants) or radioactive materials (and anxieties over their potential mismanagement and unwitting exposure to members of the public). Conversely, quantum technology is often represented as an image of a quantum computer that surpasses classical supercomputers, or as an element of science fiction. But when it comes to the more mundane forms of these technologies, quantum sensing is as similarly invisible as the use of radionuclides in non-destructive testing.

From Safeguard to Security

Ever since AI went mainstream in Southeast Asia, the gap between science and security has narrowed considerably, especially with the emergence of new forms of scams and insecurities due to the accelerated pace of technological advancement. Realising AI's potential to destabilise socio-economic and political security even as it opens up new possibilities for delivering services in a way that could transform the way we live, Malaysia's Ministry of Defence has intensified its focus on AI for defence purposes.[1]

Concerns over dual-use were more explicit in the case of both nuclear and quantum technologies, with safeguard regulations used to limit the export of enriched uranium in the manner that the Wassenaar Arrangement exerts export controls by prohibiting quantum computers with more than 34 qubits and error rates below a certain threshold from being exported out of their originating countries.

However, the same discourse did not quite extend to the case of AI, stemming primarily from less preventative regulations around AI until fairly recently. Even then, these regulations were responding more to socio-economic-political-legal conditions than about anticipating future developments.

Malaysia's present approach to acquiring quantum computational infrastructure relies on a vendor-supplier model, such as procuring access to quantum cloud computing.[2] This practice continues the tradition of technical assistance, where expertise is bundled with equipment and materials. Initially offered as technoscientific diplomacy through gift-giving, recipients interested in continuing with the programme are expected to procure the necessary equipment upgrades, or fresh material stock, from the suppliers. This practice is likely to continue with quantum technology given current constraints in expertise, labour force, and budget necessary for developing infrastructures from the bottom up.

Conclusion

Malaysia's digital transformation involving national-level initiatives such as MyDigital and 4iR contains six specific clusters under the Ministries and their chief secretaries, with the three main pillars being regulation, cybersecurity, as well as inclusivity and sustainability.

Cybersecurity has been a top concern over the past few years, and post-quantum cryptography contributed to a sense of urgency, especially with the realisation that the coupling of AI and quantum technologies will completely reconfigure present

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[1] BERNAMA. (2024). *Malaysia considers, studies use of AI technology in national defence sector*. Thesun.My. Retrieved December 15, 2024, from https://thesun.my/malaysia-news/malaysia-considers-studies-use-of-ai-technology-in-national-defence-sector-OC12981807

[2] Choucair, C. (2024, November 13). *Malaysia's First Quantum Computing Centre Launched Through SDT Inc. And MIMOS Partnership*. The Quantum Insider. https://thequantuminsider.com/2024/11/13/malaysias-first-quantum-computing-centre-launched-through-sdt-inc-and-mimos-partnership/

practices in cybersecurity across sectors like finance, information, energy, and defence.

Nevertheless, one could surmise that the model of research and development quantum technologies would take in Malaysia is more likely to follow the approach that the country has developed for AI in the arena of technological security (with an emphasis on digital security), while the practice of procurement and localisation of the requisite infrastructure would more likely parallel how nuclear technologies had developed.

About the Author

Clarissa Ai Ling Lee is a lecturer at Monash University Malaysia, and was previously a postdoctoral fellow at Multimedia University, Malaysia. She holds a Bachelor of Science (Honours) in Physics and Master of Arts in English Literature from Universiti Malaya (University of Malaya), and a PhD in Literature from Duke University. Her research interests revolve around innovation, technologies of media, ArtScience, narratives, and futures studies.

S. Rajaratnam School of International Studies, NTU Singapore
Block S4, Level B3, 50 Nanyang Avenue, Singapore 639798
T: +65 6790 6982 | E: rsispublications@ntu.edu.sg | W: www.rsis.edu.sg