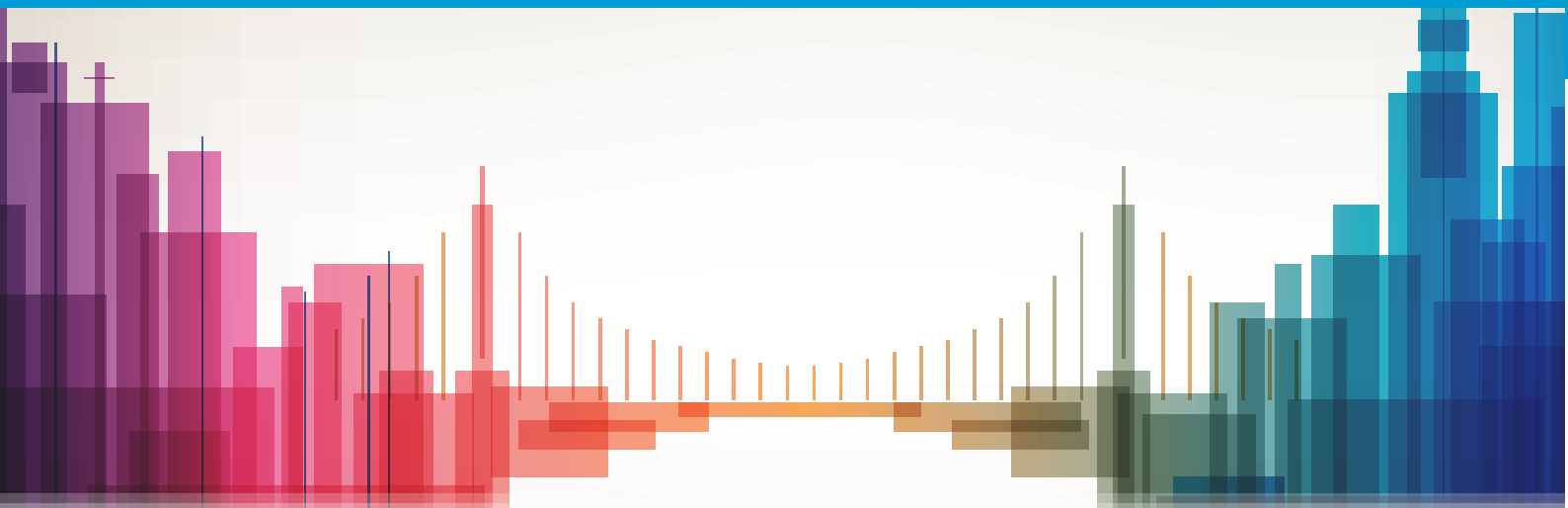


Singapore

Case study of the U4SSC Guiding principles for artificial intelligence in cities



Convention on
Biological Diversity



UNITED NATIONS

ECLAC



Food and Agriculture Organization
of the United Nations



United Nations
Economic Commission for Africa



UNECE



United Nations
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Framework Convention on
Climate Change

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Economic and
Social Affairs

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WORLD
METEOROLOGICAL
ORGANIZATION



Singapore

**Case study of the U4SSC
Guiding principles for artificial
intelligence in cities**

Foreword

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Disclaimer

The opinions expressed in this publication are those of the authors and do not necessarily represent the views of their respective organizations or U4SSC members. In line with the U4SSC principles, this report does not promote the adoption and use of any smart city technology. It advocates for policies encouraging responsible use of ICTs that contribute to the economic, environmental, and social sustainability as well as the advancement of the 2030 Agenda for Sustainable Development. The study conducted in this report is based on extensive literature review and voluntary written contributions from stakeholders.

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1 Introduction

Singapore is a city-state located at the southern tip of the Malay Peninsula.¹ It is one of the world trade centres and has developed powerful financial and industrial sectors. As the digital era rapidly evolves, the country also aims to build a “Smart Nation” with endless possibilities in digital government, digital economy, and digital society.²

2 Background & context

Singapore launched its National AI strategy in 2019, to advance its smart nation journey.³ It aims to deepen the use of AI technologies, reap productivity gains and create new areas of growth.

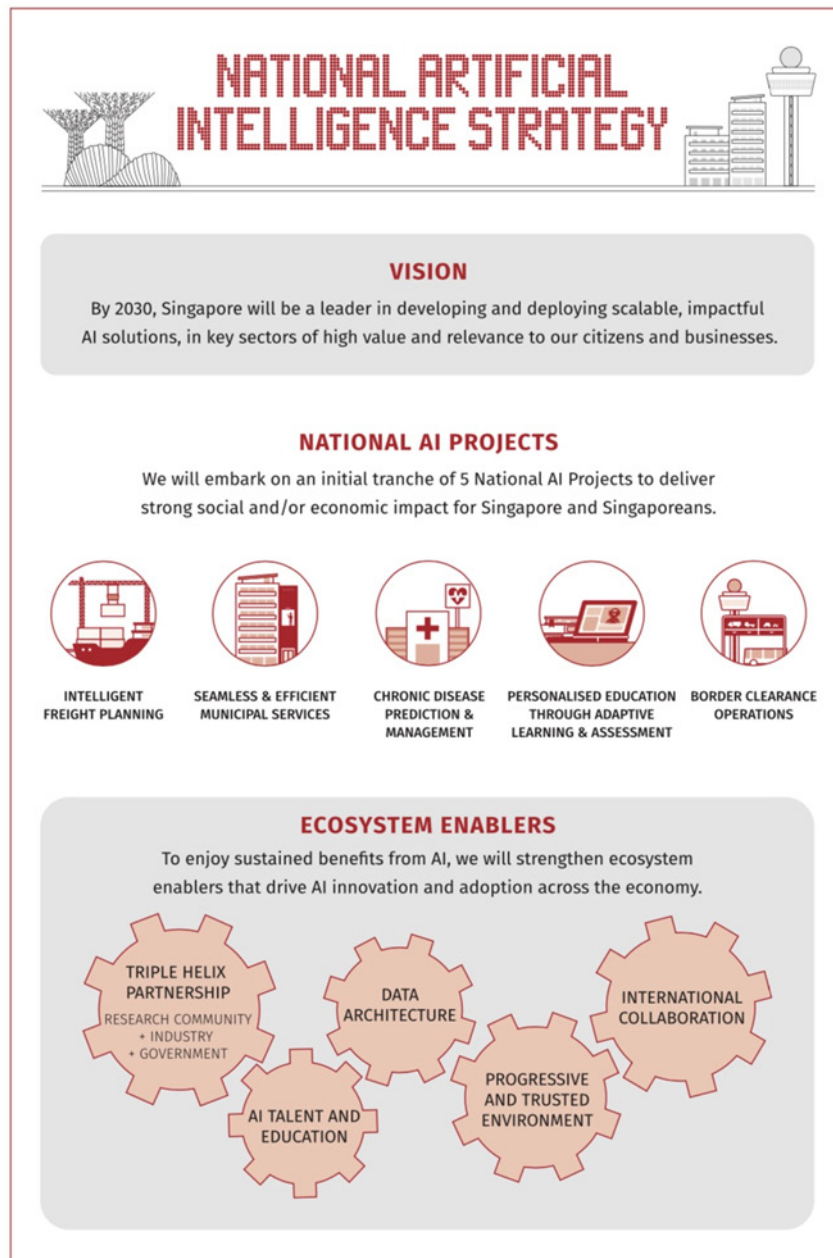
As shown in Figure 3, the strategy consists of five national projects: Intelligent Freight Planning; Seamless and Efficient Municipal Services; Chronic Disease Prediction and Management; Personalised Education through Adaptive Learning; and Assessment and Border Clearance Operations. Additionally, it identifies five ecosystem enablers, which are in the form of a Triple Helix Partnership between the Research Community, Industry and Government, AI Talent and Education, Data Architecture, Progressive and Trusted Environment and International Collaboration. To support the implementation of the strategy, the country has established a National AI Office to facilitate cooperation and collaboration between various stakeholders and ensure sustainable success.

¹ <https://www.britannica.com/place/Singapore/History>

² <https://www.smartnation.gov.sg/about-smart-nation/transforming-singapore>

³ National AI Strategy, <https://www.smartnation.gov.sg/media-hub/publications/national-ai-strategy>

Figure 1: National AI strategy in Singapore



3 AI principles in the city

3.1 AI principles (adopted by the city)

Along with the policy documents in advancing the development of AI, Singapore has also put efforts into AI governance. The country issued the second edition of the Model Artificial Intelligence

Governance Framework in 2020.⁴ The framework indicated two high-level guiding principles, which are:

- Organizations using AI in decision-making should ensure that the decision-making process is explainable, transparent and fair; and
- AI solutions should be human-centric.

3.2 AI principles enablers (adopted by the city)

To enable the adoption AI principles, the city has launched the Implementation and Self-Assessment Guide for Organisations, Compendium of Use Cases, and A Guide to Job Redesign in the Age of AI to build a trusted and progressive AI environment that benefits all.⁵

Implementation and Self-Assessment Guide for Organisations aims to help organizations assess their AI governance practices, and also provides various examples in the adoption of the Model AI Governance Framework.

Compendium contains use cases in how organizations across different sectors implemented their AI governance practices around the world to inspire local organizations to adopt the AI principles.

Under the guidance of the Advisory Council of the Ethical Use of AI and Data, the Infocomm Media Development Authority (IMDA), Singapore has launched the its first guide that helps organizations and employees understand how existing job roles can be redesigned to harness the potential of AI, including transforming jobs, charting clear pathways between jobs, clearing barriers to digital transformation and enabling effective communication between employers and employees.

3.3 AI principles governance mechanism (adopted by the city)

The Model Artificial Intelligence Governance Framework in Singapore not only sets the high-level guiding principles for AI, but also provides action guides from principles to practice. As shown in the below figure, the framework provides guidance and cases regarding internal governance structures and measures, determining the level of human involvement in AI-augmented decision making, operations management and stakeholder interaction and communication.

⁴ Model Artificial Intelligence Governance Framework, <https://www.pdpc.gov.sg/-/media/Files/PDPC/PDF-Files/Resource-for-Organisation/AI/SGModelAIGovFramework2.pdf>

⁵ Singapore's Approach to AI Governance, <https://www.pdpc.gov.sg/Help-and-Resources/2020/01/Model-AI-Governance-Framework>

Figure 2: Model AI governance framework

Guiding Principles



Decisions made by AI should be
EXPLAINABLE, TRANSPARENT & FAIR



AI systems should be
HUMAN-CENTRIC

From Principles to Practice



Internal Governance Structures and Measures

- Clear roles and responsibilities in your organisation
- SOPs to monitor and manage risks
- Staff training



Determining the Level of Human Involvement in AI-augmented Decision-making

- Appropriate degree of human involvement
- Minimise the risk of harm to individuals



Operations Management

- Minimise bias in data and model
- Risk-based approach to measures such as explainability, robustness and regular tuning



Stakeholder Interaction and Communication

- Make AI policies known to users
- Allow users to provide feedback, if possible
- Make communications easy to understand

4 Implementation of AI principles in the city

To support the implementation of AI principles, the city launched A.I. Verify in May 2022. It is an AI Governance Testing Framework and Toolkit to promote transparency between stakeholders.⁶

The AI Verify includes a set of open-source testing solutions to support AI application developers and owners to verify their AI systems through standardized tests. The test covers areas including transparency, safety and resilience of AI system, and accountability and oversight of AI system (As

⁶ AI governance testing framework and toolkit, <https://file.go.gov.sg/aiverify.pdf>

shown in the below figure). Several companies have already participated in this test, including AWS, DBS Bank, Google, Meta, Microsoft, Singapore Airlines and NCS.

Figure 3: AI ethics principles

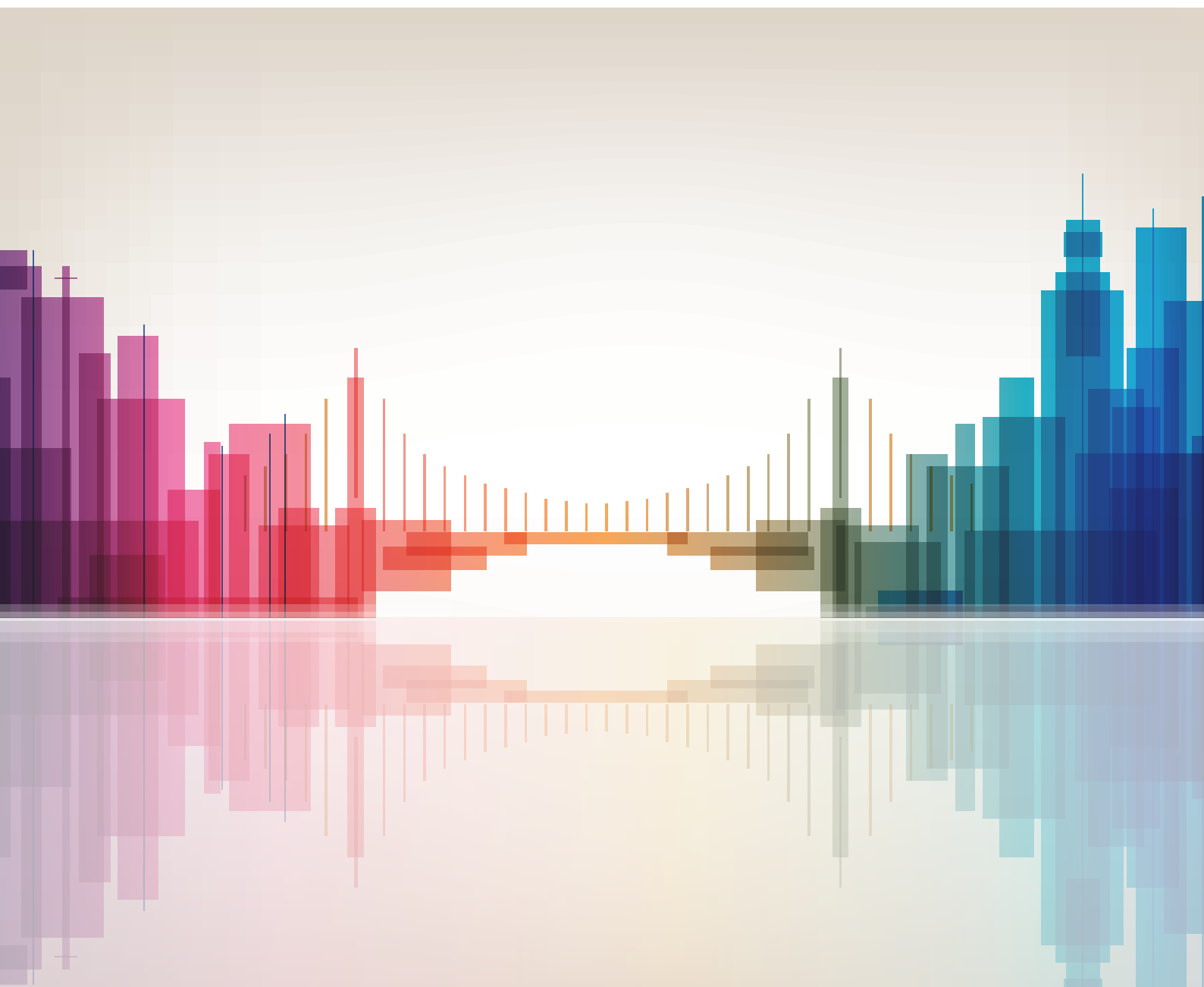
TRANSPARENCY ON USE OF AI AND AI SYSTEMS So that individual are aware and make informed decisions			
1. TRANSPARENCY Appropriate info is provided to individuals impacted by AI system			
UNDERSTANDING HOW AI MODEL REACHES DECISION Ensuring AI operation/results are explainable, accurate and consistent 2. EXPLAINABILITY Understand and interpret what the AI system is doing 3. REPEATABILITY / REPRODUCIBILITY AI results consistent: Be able to replicate an AI system's results by owner / 3 rd -party	SAFETY & RESILIENCE OF AI SYSTEMS Ensuring AI system is reliable and will not cause harm 4. SAFETY AI system safe: Conduct impact / risk assessment; Known risks have been identified/mitigated SECURITY Cybersecurity of AI systems 5. ROBUSTNESS AI system can still function despite unexpected inputs	FAIRNESS / NO UNINTENDED DISCRIMINATION Ensuring that use of AI does not unintentionally discriminate 6. FAIRNESS No unintended bias: AI system makes same decision even if an attribute is changed; Data used to train model is representative DATA GOVERNANCE Source and quality of data: Good data governance practices when training AI models	MANAGEMENT AND OVERSIGHT OF AI Ensuring human accountability and control 7. ACCOUNTABILITY Proper management oversight of AI system development 8. HUMAN AGENCY AND OVERSIGHT AI system designed in a way that will not decrease human ability to make decisions INCLUSIVE GROWTH, SOCIETAL & ENVIRONMENTAL WELL-BEING Beneficial outcomes for people and planet

5 Conclusion

Singapore stands at the forefront of the development and adoption of AI principles. It launched the National AI Strategy and Model AI Governance Framework in 2019 and 2020. Subsequently, the country has provided practical guidance to organizations and industries from use cases on international implementation to guide on job redesign.

A.I. Verify provides a unique opportunity for the country to align the AI applications and systems with the guiding principles in an objective and verifiable manner. This testing framework and toolkit provides a good example in turning the concepts of AI principles into practical applications.





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