

MAS-ESS Essay Competition 2026

Singapore's AI-Driven Economic Future: How can artificial intelligence reshape our industries, workforce, and competitive advantage while ensuring inclusive growth and managing disruption?

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## TABLE OF CONTENTS

|                                                         |           |
|---------------------------------------------------------|-----------|
| <b>EXECUTIVE SUMMARY.....</b>                           | <b>4</b>  |
| <b>I. INTRODUCTION.....</b>                             | <b>6</b>  |
| 1. Definition of Artificial Intelligence.....           | 6         |
| 2. AI in the Singaporean Context.....                   | 7         |
| <b>II. ANALYSIS.....</b>                                | <b>8</b>  |
| 1. Economic Opportunities.....                          | 8         |
| a. Increased Efficiency.....                            | 8         |
| a.i. Aiding Workers.....                                | 8         |
| a.ii. Aiding Industry.....                              | 12        |
| b. Competitive Advantage.....                           | 15        |
| 2. Implementation Challenges.....                       | 18        |
| a. Disparity in Adoption.....                           | 18        |
| b. Psychological Resistance and Skill Obsolescence..... | 21        |
| b.i. Resistance to AI.....                              | 21        |
| b.ii. Cognitive De-skilling.....                        | 23        |
| c. Governance of Autonomous AI.....                     | 24        |
| <b>III. POLICY STRATEGY.....</b>                        | <b>27</b> |

|                                                    |           |
|----------------------------------------------------|-----------|
| 1. Overarching Policy Goals.....                   | 27        |
| 2. Strategic Solutions.....                        | 28        |
| a. Nurturing Next-Generation Expertise.....        | 28        |
| a.i. Expanding Training.....                       | 28        |
| a.ii. Formalising Credentials.....                 | 30        |
| a.iii. Furthering Existing Policy.....             | 32        |
| b. Legislative Frameworks.....                     | 34        |
| b.i. Guidelines on AI Governance.....              | 34        |
| b.ii. Improving Existing Governance.....           | 36        |
| c. Tailoring R&D.....                              | 38        |
| c.i. Solving Resource Inefficiency.....            | 38        |
| c.ii. Addressing AI’s Blackbox.....                | 40        |
| c.iii. Overcoming AI Developmental Roadblocks..... | 41        |
| <b>IV. CONCLUSION.....</b>                         | <b>43</b> |

# EXECUTIVE SUMMARY

In recent years, Artificial Intelligence (AI) has taken the world by storm, from the rise of agentic AI being rolled out across industries, to individual LLM chatbots accessible by the average individual. Singapore, a country endowed with vast amounts of capital and a workforce high up the value chain, is uniquely primed to take on the role of a global AI nexus, to bring out the boons and balance the banes of AI.

In **Chapter I**, we briefly discuss the scope of contemporary AI and its role in the Singaporean context.

In **Chapter II**, we outline both the economic opportunities and implementation hurdles of AI inherent to the present AI deployment in Singapore. Specifically, we analyse the efficiency AI brings that furthers Singapore's competitive advantage, and the drawbacks stemming from disparities in AI adoption, psychological resistance to implementation, and lacking governance of autonomous AI.

In **Chapter III**, we discuss various tailored solutions in light of Singapore's unique issues, to best divorce the benefits of AI from their present challenges. First, we encourage an increase in workforce training, to integrate AI at every level in the workplace and maintain "human-in-the-loop" accountability. Second, we suggest targeted AI legislation, with scaling regulations according to risk assessment frameworks, extending on and concretising existing

guidelines into legislation. Third, Singapore should further research in AI in areas presently underexplored worldwide, to solve resource inefficiency and specific problems inherent to the physics of AI research.

Overall, Singapore is able to distinguish itself through furthering development into the AI market, abetted by present measures that the government and MAS have outlined. Its priorities should lie not only in technological advancement, but in ensuring equity of access and safety of implementation, to emerge a bastion of AI excellence and regulation.

# I. INTRODUCTION

## 1. Definition of Artificial Intelligence

Artificial Intelligence (AI) represents the capability of non-human entities to perform tasks, solve problems, and communicate with human-like logic (Gil de Zúñiga et al., 2024).

In recent years, AI has become ubiquitous across the globe, encompassing Large Language Models (LLMs), Generative AI and more recent developments like Agentic AI<sup>1</sup>. AI is unique in its ability to outsource decision-making and agency to a machine. Unlike technological milestones of the past, which were about automation of labour or information, AI industrialises human cognition. Over 1000 AI-related policy initiatives have been implemented across 69 countries (OECD.AI, 2025), highlighting its importance.

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<sup>1</sup> Within the span of half a decade, deployment of Generative AI, LLMs and more recently, Agentic AI, has exploded around the world (MIT Sloan, 2026).

## 2. AI in the Singaporean Context

Singapore's economic success has always been built on relentless optimisation of our limited natural resources through human capital. Yet, with flattening population growth, our traditional model of growth through workers is reaching its limit. For us, AI is no longer a mere technological trend, but a demographic necessity.

Singapore currently adopts a structured approach to best employ AI:

- **National AI Strategy (NAIS 2.0)**<sup>2</sup> piloted AI projects in areas like education, healthcare, and safety & security.
- Committed **S\$1 billion to AI Research and Development (R&D)** from 2025-2030, building on the S\$500 million from 2019 to 2023.
- **Model AI Governance Frameworks**<sup>3</sup> for Generative, Agentic, and Traditional AI outline steps for industry and individual adoption of AI.

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<sup>2</sup> Launched in late 2023, the National AI strategy 2.0 (NAIS 2.0) focuses on empowering the workforce with AI literacy and supporting industry-wide adoption (targeting 10,000 enterprises by 2029).

<sup>3</sup> The Model AI Governance Framework is a living document published by Singapore's IMDA and PDPC. It provides guidance for organisations to deploy AI responsibly by focusing on four key pillars: internal governance, human-centricity in decision-making, operations management, and stakeholder communication. As of 2026, the framework has evolved into three distinct iterations: the Traditional AI Framework (focusing on explainability and fairness), the Generative AI Framework (addressing content provenance and hallucination), and the world-first Agentic AI Framework (launched in early 2026 to manage autonomous planning and multi-agent coordination). These frameworks are supported by AI Verify, an open-source testing toolkit, and Project Moonshot, a specialised tool for red-teaming and benchmarking Large Language Models (LLMs).

## II. ANALYSIS

### 1. Economic Opportunities

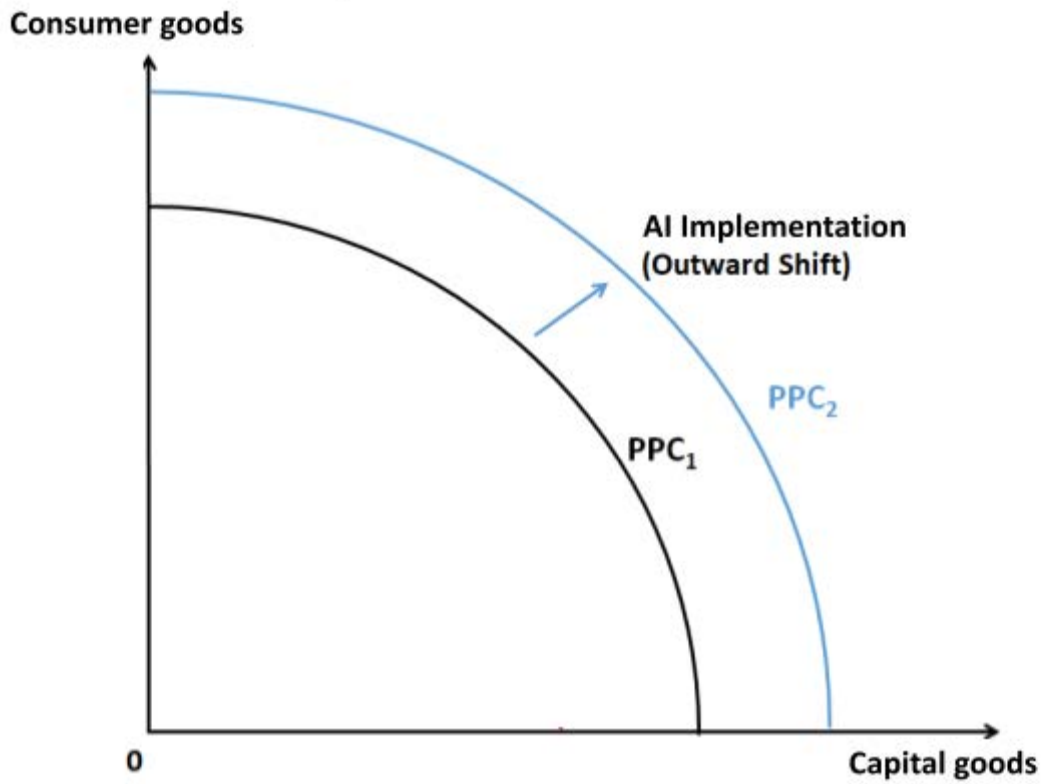
#### a. Increased Efficiency

##### *a.i. Aiding Workers*

Fundamentally, the central concern of any economy is its production possibility curve (PPC)<sup>4</sup>. AI offers the potential to create a great “**outward shift**” of this curve, through its ability to automate routine cognitive tasks and streamline processes (Aghion & Bunel, 2024).

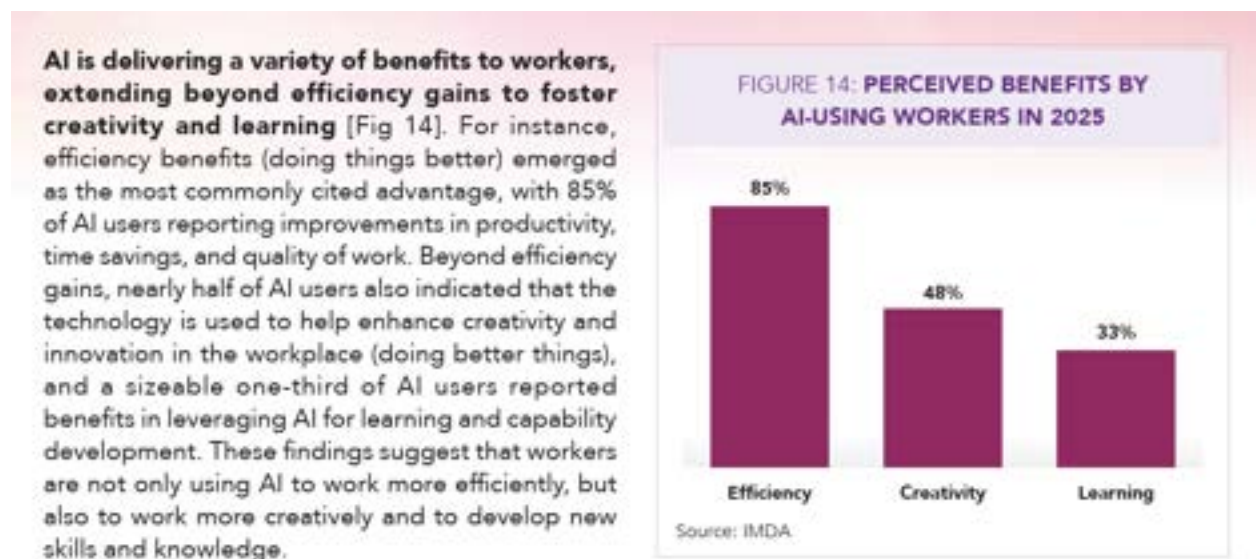
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<sup>4</sup> A Production Possibility Curve (PPC) is an economic model that illustrates the maximum possible output combinations of two goods an economy can produce given fixed resources and technology. Points on the curve represent productive efficiency, while the curve’s outward shift indicates long-term economic growth that can be caused by advancements in technology such as the implementation of AI.



*Fig. 1: AI shifts the PPC curve outwards, allowing greater maximum quantity of goods than it could have previously, increasing production capacity and standard of living. The ideal goal would be for this outward shift to benefit all sectors and industries.*

First, AI **eases burdens on workers**. Traditionally, significant portions of a working professional's day are consumed by routine tasks like data entry, preliminary research, or communication of information (Obadă et al., 2026). AI could contribute 0.6 percentage points of annual labor productivity growth on its own, acting as a “cognitive co-pilot” that **automates repetitive tasks**<sup>5</sup>. This frees up workers to focus on higher stakes decision-making, **moving up the value chain**. Crucially, AI enables automation of parts of roles rather than full replacement (Aghion et al., 2019).



*Fig. 2: 85% of surveyed AI users in Singapore reported improvements in productivity, time savings, and work quality (SGDE, 2025).*

<sup>5</sup> On average, about 25% of work time involves tasks that generative AI can directly assist with (McKinsey, 2023).

Besides the quantifiable increase in work volume, another significant impact of AI is **elevation of qualitative output**. Acting as a **high-fidelity sounding board** (Dell'Acqua et al., 2023), AI lets workers stress-test ideas and eliminate "human error" often associated with cognitive fatigue (Jarrahi, 2018). The skill gap between experienced or talented employees and those just starting out that is present in traditional task completion is similarly side-stepped<sup>6</sup>.

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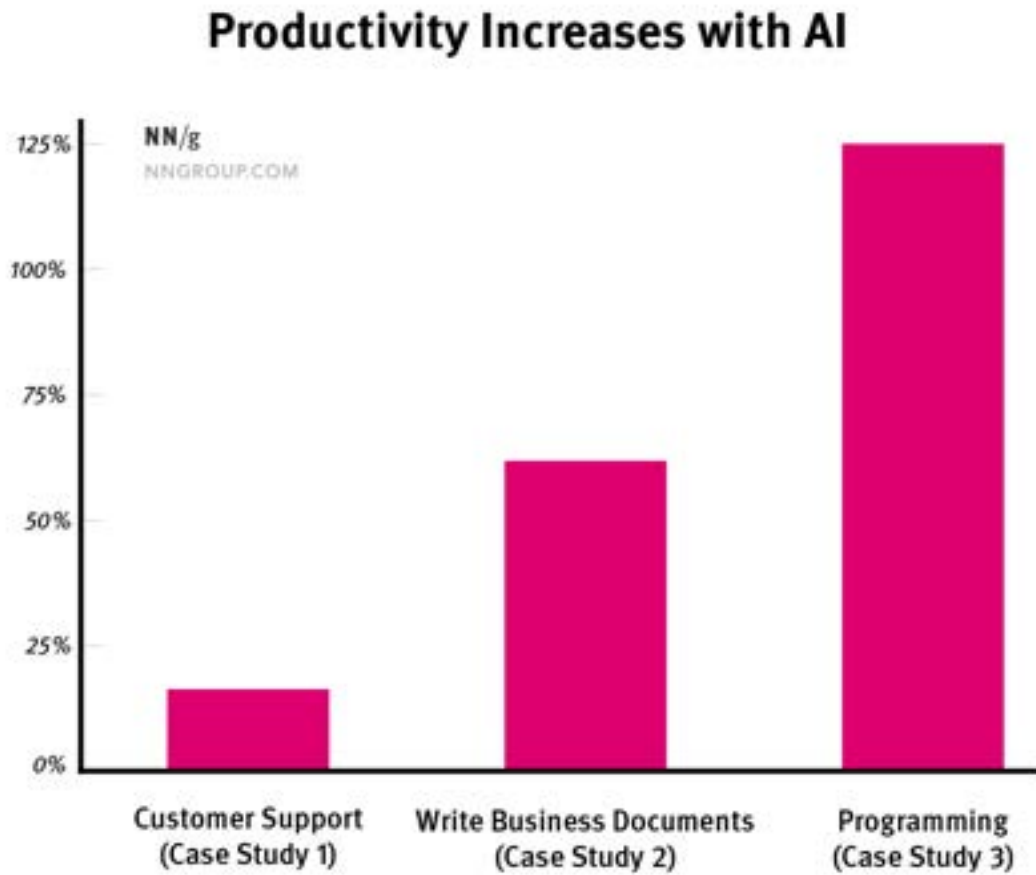
<sup>6</sup> This is evinced by the bottom quintile of agents improving their task output by 35% using AI, dwarfing that of an average agent (Brynjolfsson et al. 2023). Closure of this proficiency gap optimises industry quality and is likely to improve with continual development of LLM models.

### *a.ii. Aiding Industry*

Second, AI boosts **industry productivity**. Across sectors, workers with AI agent aides saw rapid efficiency gains due to more freedom for aforementioned higher-order tasks and machine automation from AI's predictive abilities. LLMs and agentic AI patch deficiencies in cognitive ability inherent to human labour<sup>7</sup>, and the wealth of data AI was trained on grants it immediate expert-level productivity without the years of on-the-job training typically necessary.

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<sup>7</sup> AI signal speeds are 2.5 million times faster than human nerve signals (Müller & Bostrom, 2014)



*Fig. 3: Research done across major sectors of customer service, business and programming show productivity increases across the board. In an hour, AI-powered customer support agents could handle 12.8% more inquiries, and business professionals could write 59% more business documents. In a week, programmers who used AI to code increased their project output by 126%.*

This is further demonstrated in AI employment in banking systems. DBS's CodeBuddy<sup>8</sup> drastically reduces time spent on data analysis and code generation, and implements extensive novice and practitioner training modules for seamless integration with employees<sup>9</sup>.

On automation, machine learning used for demand forecasting, robotics and advanced scheduling algorithms is a **scalable blueprint, increasing capacity**<sup>10</sup>. Overall, against the backdrop of Singapore's ageing population, AI looks to **alleviate labour constraints** by increasing productivity.

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<sup>8</sup> CodeBuddy is a generative AI coding assistant developed by DBS that merges LLM capabilities with ADA, DBS' centralised data platform that houses >5.3 petabytes of data, and DBS-specific coding knowledge to provide code assistance through code completion, generation, and debugging. (Mindforge, 2026)

<sup>9</sup> The success of the >2000 AI models deployed by DBS is evident in the S\$1 billion that AI initiatives generated in the 2025 financial year, a drastic increase from S\$370 million in 2023 (Mindforge, 2026).

<sup>10</sup> After AI employment at Coca-Cola Singapore Tuas Plant, labour productivity increased 70%, coupled with a 34% decrease in scope 2 emissions# (Straits Times, 2026).

## b. Competitive Advantage

Singapore's primary differentiator is our **marriage of innovation with institutional trust**<sup>11</sup> (Wong, 2023). While other regions offer larger markets, or relaxed regulations, Singapore's "trust" factor attracts MNCs. Given AI is the next big global phenomenon, Singapore's adoption of AI will **boost our value proposition**. With systems like the Model AI Governance Framework (IMDA, 2026) and AI Verify toolkit, Singapore becomes the preferred test-bed where AI can be deployed safely, ethically, and predictably. This is a major advantage, especially for high value industries like financial services and biomedical sciences which require the highest standards of safety and transparency (Kiseleva et al., 2022).

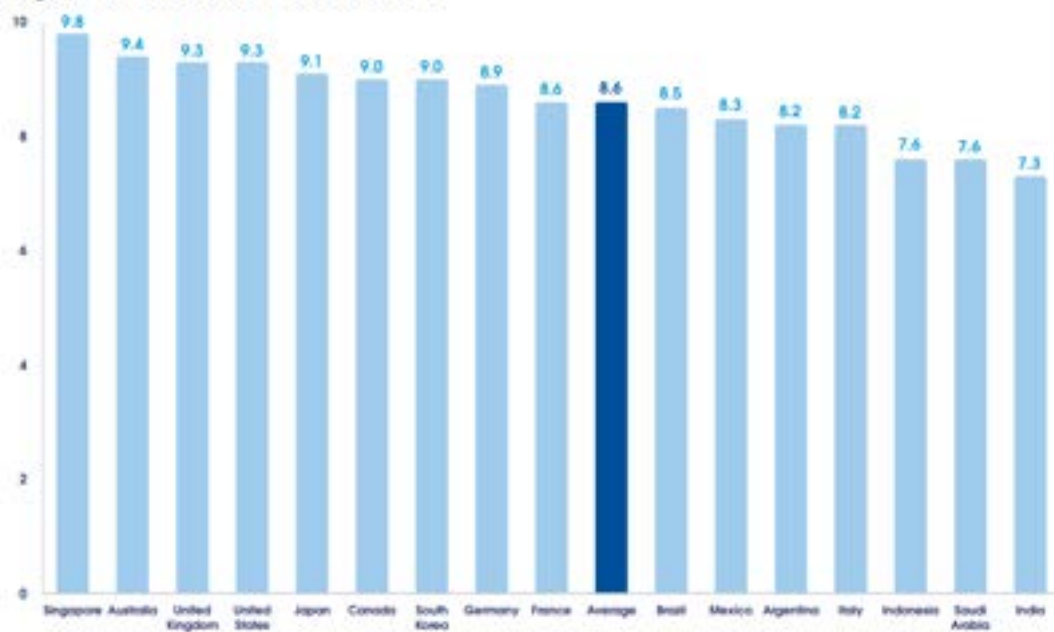
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<sup>11</sup> This is evidenced by Singapore's performance in the Edelman Trust Barometer, where the nation remains a global outlier for high institutional trust during periods of rapid technological change (Edelman, 2026)



*Fig. 4: AI Verify is an open-source governance testing framework and software toolkit developed by Singapore's IMDA and the AI Verify Foundation. It enables organisations to conduct technical tests and process checks, such as bias detection and explainability, to validate their AI systems against internationally recognised principles. By providing standardised performance reports, the toolkit helps build stakeholder trust by demonstrating that a specific AI model is both fair and accountable.*

Figure 3. Dimension 1 Index Score



Source: Access Partnership / AI Policy Lab research

Fig. 5: Singapore ranks number 1 in the Global AI Readiness Index 2025 in the category of “Enabling AI Regulatory Frameworks” (Oxford Insights, 2025)

## 2. Implementation Challenges

### a. Disparity in Adoption

The most immediate challenge is the **widening disparity** between Multi-National Corporations (MNCs) and Small-and-Medium Enterprises (SMEs)<sup>12</sup>, driven by a **lack of in-house technical expertise** and a struggle to demonstrate a clear Return on Investment (ROI). Without intervention, the "efficiency dividend" will accrue solely to global giants, hollowing out the local business ecosystem that employs the vast majority of Singaporeans (Priyono et al., 2020).

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<sup>12</sup> While 62.5% of large enterprises have integrated AI, only 14.5% of SMEs have done so (SGDE, 2025).

% of enterprises with 10 employees or more

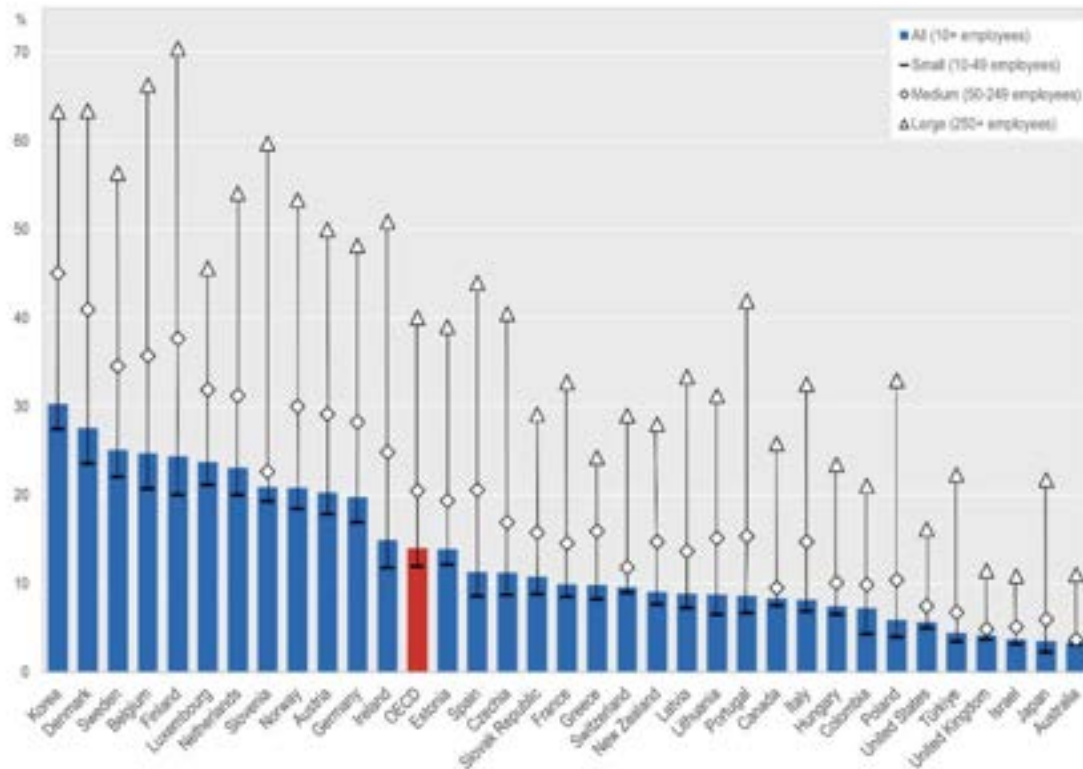


Fig. 6: Distinct gap between AI adoption by employees in large and small companies as seen consistently across all countries researched into (OECD, 2025)

Another fault line is found across diverging industries<sup>13</sup>. Most firms also prioritise **"back-office" safety**<sup>14</sup>, suggesting most use AI to **fix existing problems, neglecting innovation**.

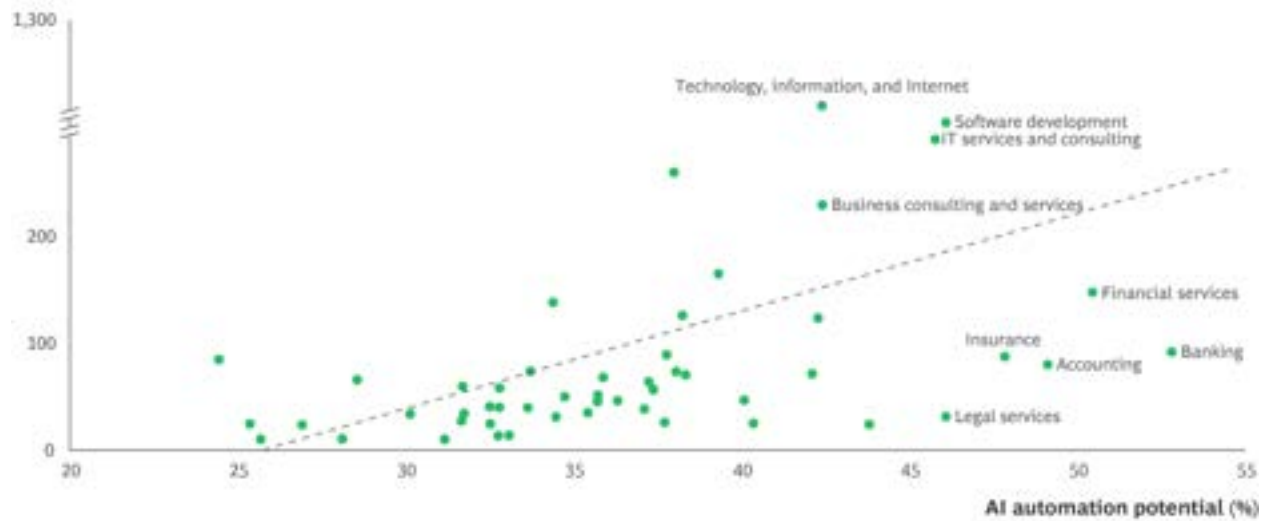
<sup>13</sup> This chasm is driven by a difference in core businesses, as those involving physical assets are far more complex to digitise than others. Even within companies that have started adopting AI, there is a clear imbalance in how the technology is used (Khan et al., 2022)

<sup>14</sup> 38% of firms use AI to bolster cybersecurity and risk management. Only roughly 3% use AI to iterate their products or transform customer interaction (BCG, 2026)

## EXHIBIT 8

### The Gap Between AI Potential and Scaled Adoption Varies Across Industries

AI adoption versus average (%)



Sources: Revelio Labs; O\*NET; HG Insights; BCG Henderson Institute analysis.

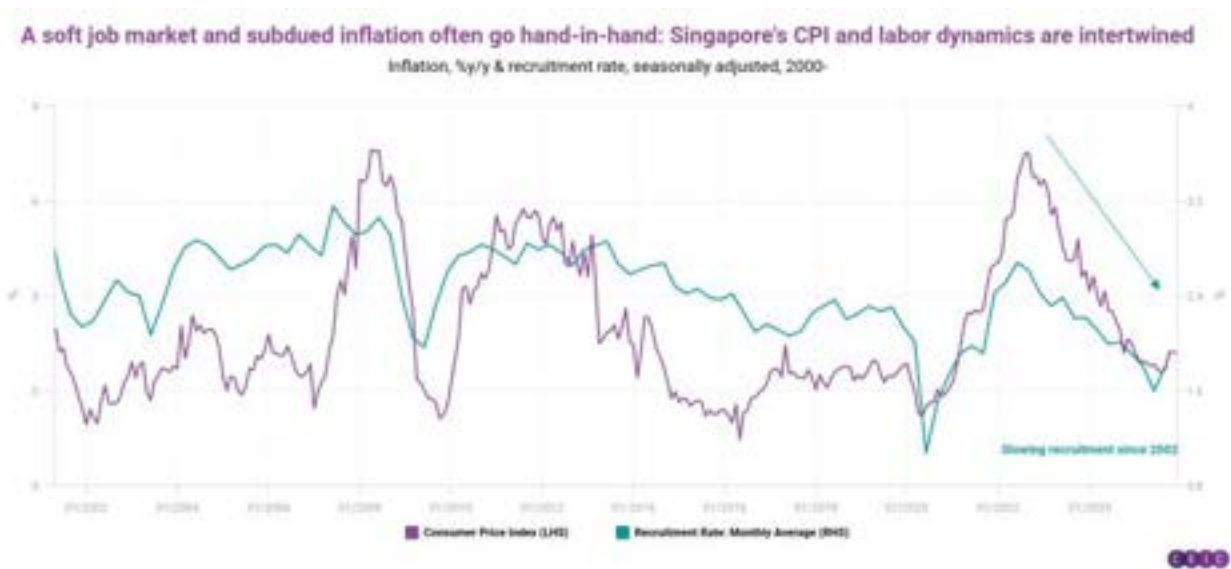
Note: AI adoption is indexed to the weighted average across all US employees; it is measured using the share of employees with AI skills, the share of AI-related positions, the share of AI job postings, and the number of AI technology vendors used by the company.

*Fig. 7: Telecommunications and financial services lead with high AI adoption while sectors like real estate and industrials spend less than 1% of their revenue on AI integration (BCG, 2026)*

## b. Psychological Resistance and Skill Obsolescence

### *b.i. Resistance to AI*

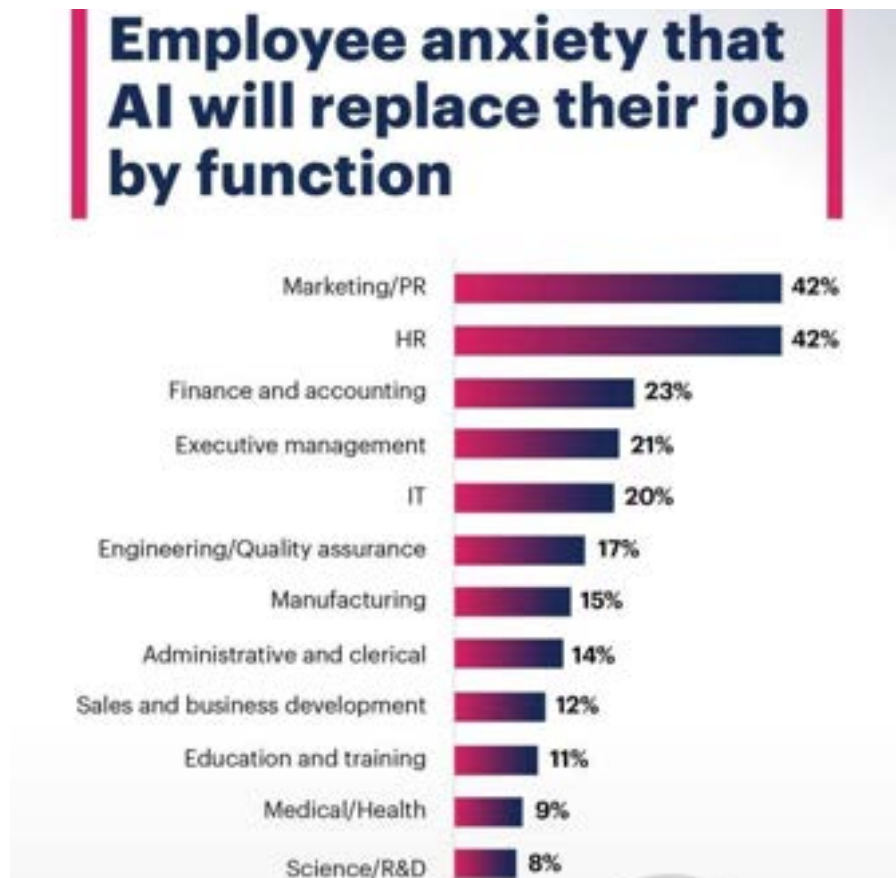
For 34% of companies, the primary barrier to AI adoption is not technology itself, but the **“human friction”** (SBF, 2025). This resistance is rooted in a simple but warranted **fear of job loss**<sup>15</sup>.



*Fig. 8: The figure shows that the slowing down in recruitment rate of employees post 2022 corresponds to the invention, and hence implementation of LLMs in the workplace.*

<sup>15</sup> While employment grew for 17 consecutive quarters, retrenchments rose to 14,490 in 2025 (MOM, 2026).

Workers perceive AI as a tool for replacement, and seeing their lifelong professional identity be easily automated results in low morale and worse, resistance to adoption, hence neutralising efficiency gains due to disengagement. This sentiment is underscored by a **persistent lack of readiness**<sup>16</sup>.



*Fig. 9: Across industries, employees fear that AI will replace their jobs, particularly for middle management workers like those in marketing or HR, where AI agents are more easily implemented*

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<sup>16</sup> Only 16% of employees have achieved a high "Artificial Intelligence Quotient" (AIQ), with pervasive anxiety about job loss cited as a primary factor stunting the adoption of these tools. (Forrester, 2026)

### *b.ii. Cognitive De-skilling*

Another issue is the risk of **cognitive de-skilling** and **loss of human expertise**. When AI systems consistently produce high-quality outputs, workers develop **overreliance on machine suggestions**, leading to declining critical scrutiny and independent verification<sup>17</sup>. This creates a long-term expertise gap, where the next generation of leaders may **lack the foundational "tacit knowledge"** required to audit or overrule the very AI systems they are meant to orchestrate, eroding the basic principle of human accountability (MDPI, 2026).

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<sup>17</sup> In sectors like law, where core competencies like entry-level data synthesis or preliminary legal drafting are outsourced to algorithms, the "learning ladder" for junior professionals is dismantled (Singapore Law Watch, 2026).

### c. Governance of Autonomous AI

A presently unsolvable issue undermining AI implementation is the AI blackbox, which means a **lack of fundamental understanding of AI** (Gryz & Rojszczak, 2021). The blame for an autonomous agent causing harm<sup>18</sup> is similarly challenging to pinpoint when **actus reus<sup>19</sup> and mens rea<sup>20</sup> do not hold**: the mistake an AI agent commits is not a “voluntary act” by developer nor user, and AI lacks sentience to have the intention of harm, and cannot be held accountable regardless (Tham, 2026). Holding developers or users criminally liable is equally problematic, given **AI’s thinking pathways are unpredictable**. This is further abetted by the present **lack of comprehensive legislation** similar to the EU AI Act<sup>21</sup> in Singapore, leaving a lacuna in AI-specific governance.

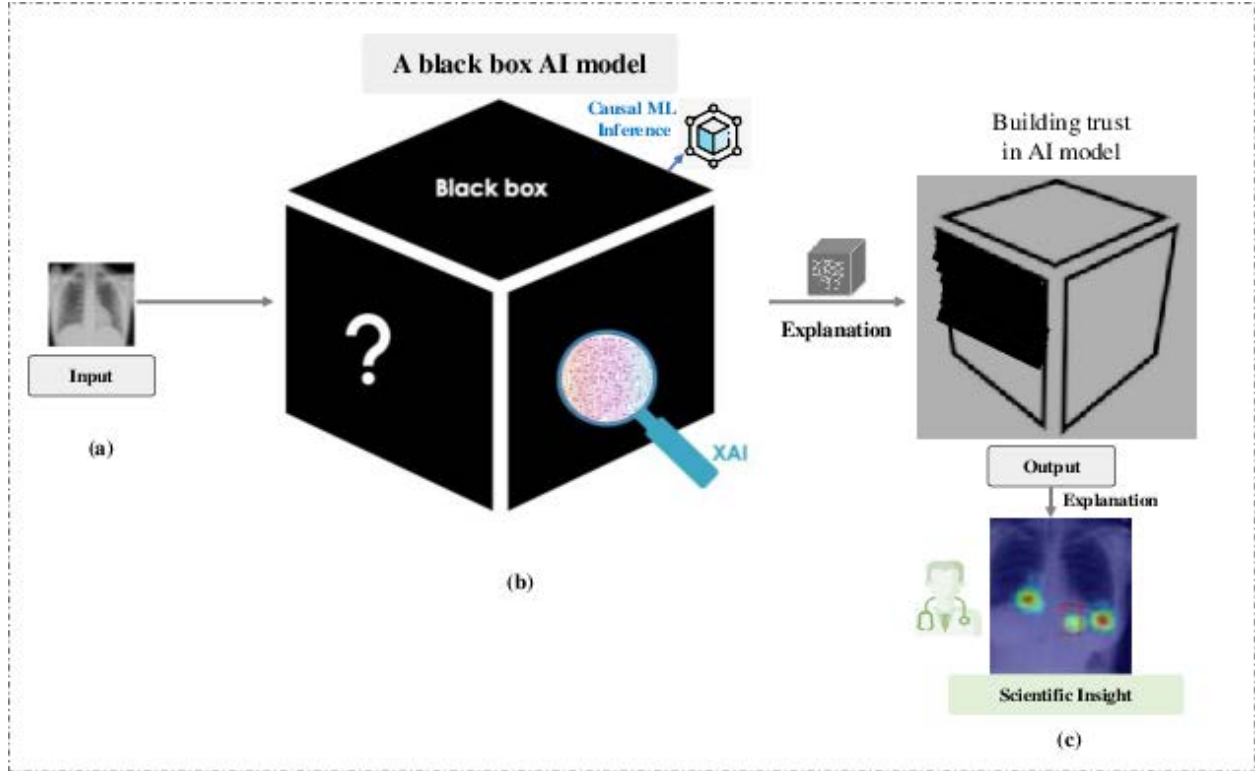
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<sup>18</sup> The various harms caused by autonomous AI have seen a 50% year-over-year increase from 2022 to 2024. For instance, Open AI’s ChatGPT chatbot has pushed children to commit suicide and fuelled delusions to cause murder. AI also has encoded biases and racism that lead to unfair treatment of individuals. In the healthcare industry, a medical algorithm used in US hospitals favoured white patients even while black ones were sicker. The COMPAS system meant to predict recidivism was found to incorrectly flag black defendants as future criminals at twice the rate of white defendants.

<sup>19</sup> Actus reus: Latin for “guilty act”, refers to the physical element of a crime.

<sup>20</sup> Mens rea: “Guilty mind”; the intention of wrongdoing.

<sup>21</sup> The EU AI Act is the world’s first comprehensive AI law that regulates AI based on the amount of risk posed to society, including a risk-based classification system that outlines different requirements for regulation.



*Fig. 10: Crucially, while we have access to AI's inputs and output, the AI's internal decision-making process is opaque to users and even developers, referred to as the "AI Black Box". When AI makes mistakes, the black box renders tracing the reason and debugging the systems nearly impossible (Kaur & Singh, 2025).*

Present mitigatory measures to minimise errors in autonomous AI similarly fall short. Present Human-In-The-Loop (HITL) oversight<sup>22</sup>, to review AI decisions before they are executed, is **infeasible to scale** — the processing speeds of modern AI emerges a double-edged sword, given no human can conceivably check hundreds of decisions per second.



*Fig. 11: Simplified model of Human-in-the-Loop (HITL). HITL is a collaborative process where AI handles the heavy data processing while a person provides oversight, corrections, and nuanced judgment. This feedback cycle ensures the technology remains accurate and ethically grounded by allowing the machine to learn directly from human expertise.*

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<sup>22</sup> Human-in-the-Loop (HITL) requires human intervention to validate or override AI outputs before they are executed. It ensures system alignment with human intent and provides a safety buffer in high-stakes environments. (Ballerini, 2026)

# III. POLICY STRATEGY

## 1. Overarching Policy Goals

Against this backdrop, Singapore should adopt a strategic suite of policies designed to fulfil three overarching goals:

- First, Singapore should **empower workers to make the most out of AI**. Policy should extend further, training workers to supervise, audit, and improve AI-generated work. This marks a transition from experimental "pilot projects" to full-scale deployment, democratising AI across the SME landscape.
- Second, Singapore should **bridge the present gap in hard AI legislation**. Clearly outlining scaling AI regulation increases direct accountability, ensuring inclusive implementations of AI. This builds on Singapore's present reputation as a safe and stable business hub.
- Third, Singapore should **further AI R&D and infrastructure** to create a robust, globally competitive ecosystem. This involves moving beyond being a mere consumer of the technology to becoming a primary architect of AI development.

## 2. Strategic Solutions

### a. Nurturing Next-Generation Expertise

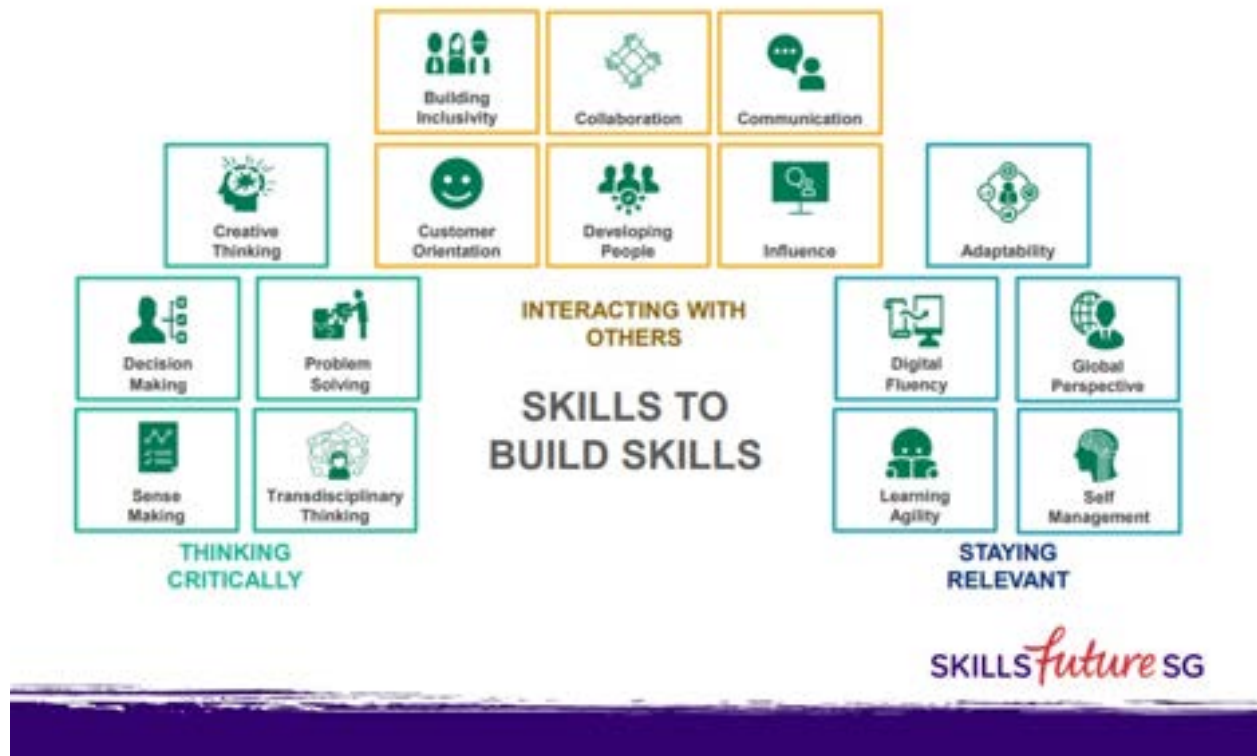
#### *a.i. Expanding Training*

To mitigate skill obsolescence, the government should **expand the SkillsFuture framework** to include targeted, sector-specific subsidies for AI-integrated training. Rather than focusing on general literacy, these courses must emphasise **"human-in-the-loop" auditing**<sup>23</sup>, ensuring the foundational domain expertise of the Singaporean professional remains the final, reliable check.

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<sup>23</sup> HITL entails training workers to identify AI hallucinations and verify technical accuracy of automated outputs (MDPI, 2026)

## Critical Core Skills (CCS)



*Fig. 12: Critical Core Skills presently included in SkillsFutureSG. Skills should be expanded to include AI literacy and usage as a core competency under “Digital Fluency”, to ensure individuals know how to oversee AI, ensuring HITL accountability in the industry.*

### *a.ii. Formalising Credentials*

To formalise this, a **national AI competency certification** should be launched, **standardising the value of AI-literate roles** within the labor market. With such incentives, coupled with deeper knowledge of the AI systems they are working with through these courses, workers likely turn **less averse toward AI adoption**, especially given they take on new managerial roles to police AI, broadening present jobscopes.

Beyond basic usage, the state must strengthen local talent pipelines by **incentivising firms to establish AI-specialist residencies**. By focusing on deep-skilling<sup>24</sup> local talent, Singapore can reduce reliance on external consultants<sup>25</sup>.

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<sup>24</sup> Deep-skilling refers to the intensive acquisition of advanced, specialised expertise in a niche domain to meet the demands of a high-value economy. Unlike broad "upskilling," it focuses on achieving mastery in complex technical or cognitive tasks such as AI architecture or specialised legal reasoning that are more resilient to automation (IMDA, 2026).

<sup>25</sup> As of 2026, 87% of IT leaders leverage outsourcing to accelerate AI adoption—the highest rate among core business functions. This surge is driven by a widespread inability to develop internal talent and infrastructure at the pace required by the market (Deloitte, 2026).



*Fig. 13: Existing AI literacy courses conducted by GovTech and IMDA, among other state-sanctioned vendors, cater to professionals of all levels, but they are largely scattered and unstructured. Centralisation and implementation of a certification system will certainly help these courses gain more traction and reach more workers.*

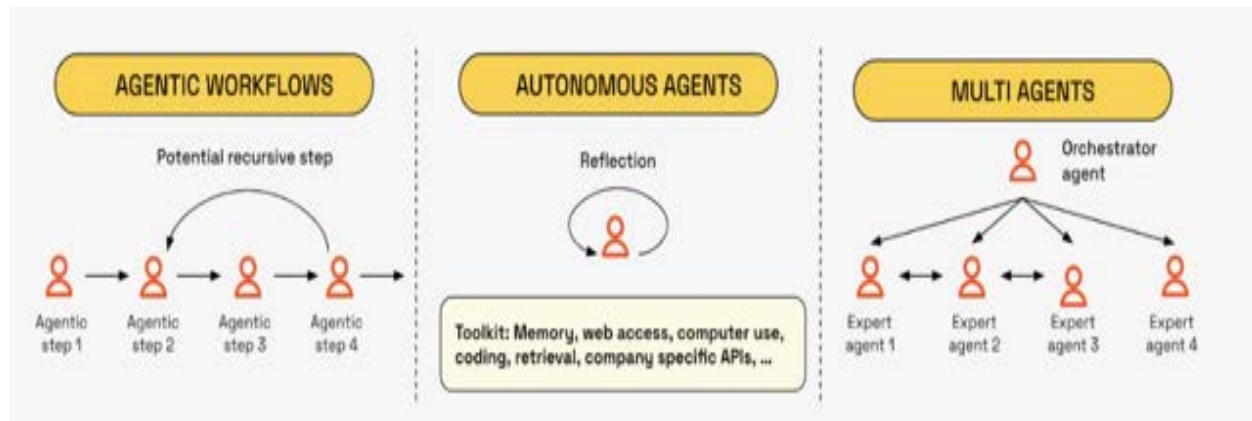
*a.iii. Furthering Existing Policy*

These policies would aim to complement existing government strategies of AI education across schools and higher education institutes, ensuring entrants into the workforce have **base levels of AI expertise**, regardless of the company or industry they enter.



*Fig. 14: Brochure for NTU's AI Literacy Course. Singapore's Ministry of Education (MOE) has institutionalised AI as a foundational requirement across autonomous universities through the AI-Enabled Education framework. Every undergraduate in any field of study must complete mandatory modules on AI applications and ethics under this policy.*

Analogous efforts have been launched in Singapore, a prominent example being the National AI Impact Programme<sup>26</sup>, which uses AI to augment existing workflows, addressing immediate industrial needs. However, as Generative AI matures into Agentic AI, the bottleneck will not be the ability to use it as a tool, but the **ability to govern and integrate AI into autonomous systems**. Singapore should hence focus on **high-level multi-agent systems** and maintaining **human accountability**.



*Fig. 15: In multi-agent systems, an orchestrator or agent coordinator manages the workflow while specialised agents individually collaborate. This combination of agents with different specific skillsets helps to exceed the capabilities of any single agent, particularly for problem-solving that requires parallel task execution or multiple levels of decision making.*

<sup>26</sup> The National AI Impact Programme (NAIIP), launched in early 2026, aims to develop an "AI Bilingual" workforce of 100,000 individuals by 2029. Managed by IMDA in partnership with professional bodies like ISCA and SAL, the program moves beyond general digital literacy to provide sector-specific certifications in AI-augmented workflows, beginning with the legal and accounting sectors. This is supported by the Unified AI Literacy Framework, which emphasises critical judgment and ethical oversight alongside technical proficiency.

## b. Legislative Frameworks

### *b.i. Guidelines on AI Governance*



*Fig. 16: In late 2023, U.S. President Donald Trump announced Executive Order 14110. It established a set of comprehensive standards for AI safety and security. It also mandated that the developers of major AI systems share their results with the government to avoid risks to national security, public health and economic stability.*

Executive Order 14110 underscores AI regulation's importance to major superpowers around the world. Similarly, consumers of AI with cautious attitudes toward AI's risks are drawn to the highest levels of strict governance and reliability (PwC, 2026).

As AI transitions to a fundamental economic utility, Singapore must **establish a clear legislative framework** to govern Agentic AI deployment<sup>27</sup>. This requires shifting from voluntary guidelines to **hardcoded legal permissions** within autonomous systems to prevent rogue behaviour.

Critically, the law must **clearly define liability protocols**, determining who, developer or user, is held accountable when an autonomous agent makes a critical error.

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<sup>27</sup> The framework for governance could take inspiration from other aforementioned laws. Building on the EU AI act, companies could be required to follow risk assessment frameworks, scaling regulation based on risk. For instance, unacceptable AI risk, including cognitive behavioural manipulation of people, would constitute a hardline ban. (European Parliament, 2023)

### *b.ii. Improving Existing Governance*

Building on the existing Workplace Fairness Act<sup>28</sup>, the government should mandate that companies utilise standardised governance tools to **audit algorithms for fairness and hidden bias**. Holding employers directly accountable for the systems they deploy ensures AI adoption scales without compromising social equity.

Facilitating seamless transition, government legislation could build on present guidelines various companies presently enforce. This looks like Project MindForge<sup>29</sup>, where various partners have individually implemented checks against AI<sup>30</sup>.

These measures serve not as barriers; rather, they reinforce Singapore's reputation as a reliable, low-risk environment, providing the **institutional stability** necessary to attract **long-term global investment**.

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<sup>28</sup> The Workplace Fairness Act passed in 2025 aims to protect individuals from discrimination by employers, codifying the requirement that employers make decisions impartially. In the case of AI usage for recruitment, employers are required to ensure the AI system produces traceable outputs, and will be held accountable should AI recruitment be found to be discriminatory.

<sup>29</sup> Project Mindforge is a cross-industry initiative piloted by the Monetary Authority of Singapore. Its objectives are to examine the risks and opportunities that generative AI brings, as well as implement tailored guidelines for AI governance within multiple institutions.

<sup>30</sup> DBS employs preliminary risk materiality assessments for CodeBuddy to calibrate governance under its PURE framework (Purposeful, Unsurprising, Respectful, and Explainable), maintaining Human-in-the-loop (HITL) oversight to manage unintended consequences. Similarly, Prudential employs a Model Risk Framework that scales governance requirements proportionally to the risk incurred, with oversight provided by both Local and Group Solution Review Committees to ensure ethical compliance across its value chain.

Figure 11: Seven dimensions of generative AI technology consideration for enterprise-wide adoption



*Fig. 17: In conjunction with Project Mindforge, the MAS crafted a comprehensive Gen AI risk framework encompassing 7 risk dimensions, aiming to guide financial institutions to implement Gen AI technology responsibly. Writing this framework into hardcoded legislation allows for clearer adoption of similar frameworks across industries.*

### c. Tailoring R&D

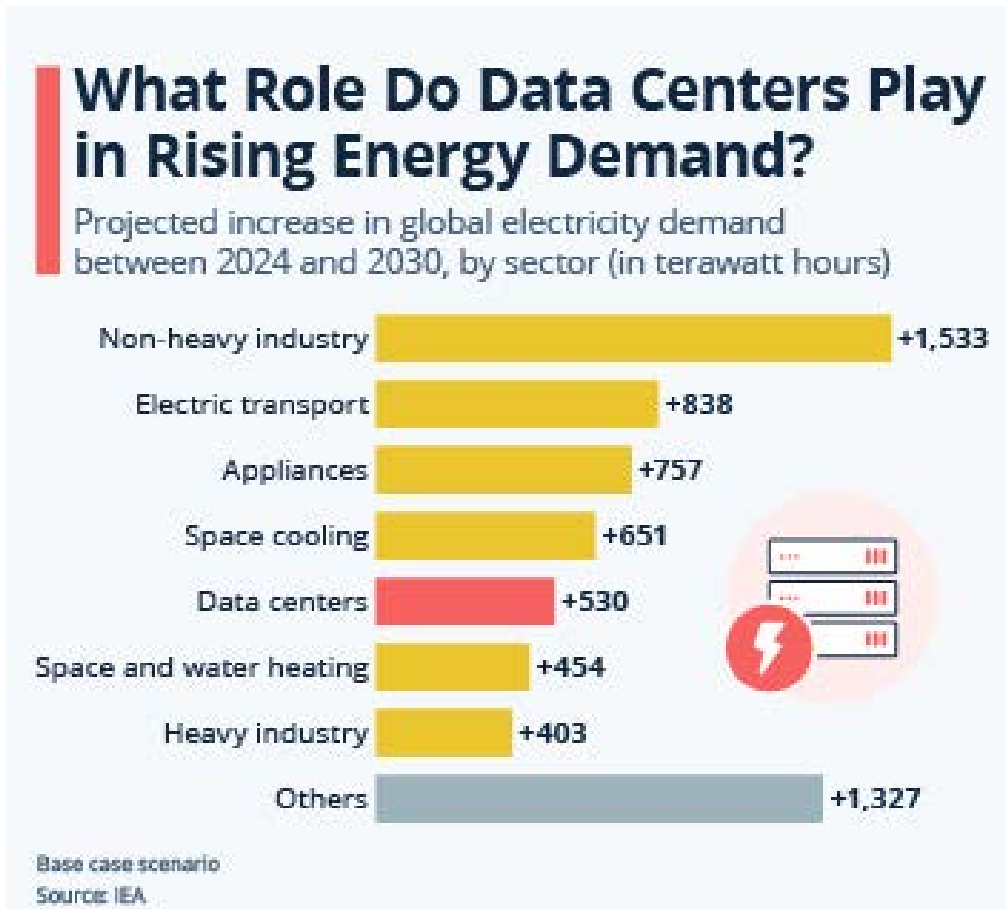
#### *c.i. Solving Resource Inefficiency*

The S\$1 billion allocated to the National AI Research and Development Plan (NAIRD) should **mitigate the supply-side constraints** inherent to Singapore's geography. Specifically, funding should prioritise development of **resource-efficient AI**. Unlike larger economies, Singapore lacks the land and power surplus required to sustain massive, high-energy data centers indefinitely<sup>31</sup>.

R&D must therefore focus on lowering marginal cost of compute and reducing electricity consumption of large-scale models, ensuring that AI remains as a viable utility for local industry without straining national power reserves.

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<sup>31</sup> In 2025, Singapore ranked as the second most expensive market globally to build a data centre (approx. US\$14.53 per watt), largely due to land costs and strict environmental planning controls (Turner & Townsend, 2025).



*Fig. 18: Data centres are projected to be one of the largest industries contributing to global electricity demand between 2024 and 2030. Given Singapore is a country heavily lacking in domestic energy sources, and there is rising uncertainty in the energy industry due to depleting natural resources, development of less energy intensive AI data-centres is critical.*

*c.ii. Addressing AI's Blackbox*

Simultaneously, R&D must address the "Blackbox" problem through technical research into **model interpretability**. This not only solves for lacking transparency in internal AI decision-making, a prerequisite for overcoming current roadblocks in system reliability and safety, but also potentially **streamlines probabilistic thinking processes to lower token costs**, allowing for cheaper scaling of AI automation.

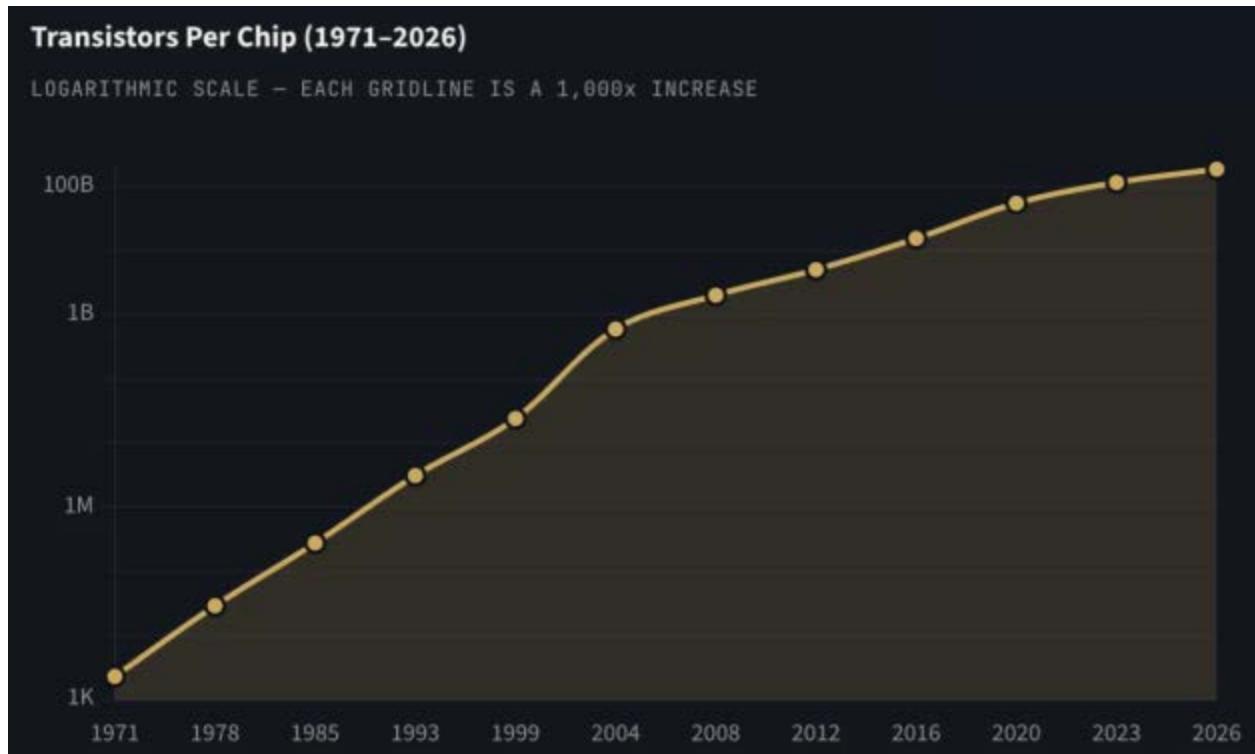
### *c.iii. Overcoming AI Developmental Roadblocks*

Specific issues undermining AI progress similarly require R&D to overcome — Moore's Law<sup>32</sup> no longer holds given researchers are presently **incapable of shrinking transistor size** below 2nm; any smaller leads to quantum tunnelling between chips. By focusing on the efficiency of training data and transistor limitations, Singapore can bypass the present global "brute force" approach to AI development, similar to other countries like Taiwan and South Korea<sup>33</sup>.

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<sup>32</sup> Moore's Law is the observation that the number of transistors on microchips double roughly every two years while costs decrease. The law predicts that as transistors become smaller, computing technology will continually advance, increasing in efficiency.

<sup>33</sup> Taiwan, via TSMC, is aggressively expanding 2nm node and advanced packaging (CoWoS) capacity to meet the global demand for high-performance AI accelerators (TSMC, 2026). Simultaneously, South Korea is executing an "AI Memory Supercycle," with SK Hynix and Samsung tripling production of High-Bandwidth Memory (HBM4) to fuel the massive data throughput required for "brute-force" model training (Stanford HAI, 2026). These capital-intensive investments in physical infrastructure contrast with Singapore's focus on sovereign AI and resource-optimised development.



*Fig. 19: Moore's Law, first predicted by Gordon Moore, co-founder of Intel in 1965, has held for 61 years, but is unlikely to be able to continue given the physics of shrinking silicon-based transistors has been becoming harder*

This strategic allocation of NAIRD funding ensures our competitive advantage is built on the **technical sophistication** and **resource-sustainability**, rather than raw computational volume.

## IV. CONCLUSION

Singapore's strategy has always prioritised structural integrity over the reckless pursuit of raw computational scale. As analysed, a "growth at all costs" approach to AI risks hollowing out the professional domain expertise that has historically been Singapore's primary asset. To automate entry-level roles without a safeguard for skill retention is to trade immediate productivity gains for a long-term deficit in high-level judgment and accountability.

However, the Republic can distinguish itself by offering a unique "premium" in the global market: a jurisdiction defined by security and predictability. This is a renewal of Singapore's identity as a judicious gatekeeper. Ensuring start-ups and SMEs progress alongside Big Tech and Big Banks is another key focus that secures equitable progress. Ultimately, Singapore's success will not be measured by just its speed of AI integration, but by its ability to maintain a high-agency workforce across the board that remains the final, expert arbiter in an increasingly automated global economy.

Word count: 2000

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