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**Singapore versus Malaysia Artificial Intelligence Readiness**

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for

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## Background

Artificial Intelligence (AI) may perform human physical tasks or human cognitive skills. AI is characterized by a number of applications, including computers playing games, understanding human languages, virtual personal assistants, robotics, and reacting to sensory stimuli (Pareek, 2012). Broadly, AI is the sets of technologies that can perform human tasks with a degree of, what most would call, intelligence. One study “estimates the projected global economic impacts associated with the use, development, and adoption of AI over the next ten years, and finds a reasonable range ... to be between \$1.49 trillion and \$2.95 trillion” (Chen, Christensen, Gallagher, Mate, & Rafert, 2016 p. 2). Estimates of potential job losses due to AI automation range from an oft-cited figure of 47% for the United States (Frey and Osborne, 2017), to a more conservative estimate of 9% for OECD countries (The Risk of Automation for Jobs in OECD Countries, 2016). François Chollet conducts research in deep learning for Google. He recently said, “Unfortunately it’s much easier to predict which jobs will get automated than it is to imagine which jobs will be created, but that has always been the case. Pessimists have been warning everyone against technology-induced mass unemployment for over a hundred years. It has never come to pass.” (How AI Could Reshape Economies, 2017). Although it is possible that these new technologies will create more jobs than they displace, the deployment of AI will most assuredly result in worker migration from existing jobs to either new ones or to no job at all. Countries should plan to both seize the opportunities that AI presents and help mitigate worker displacement. Planning will need to involve coordination between business entities,

educational institutions, and civil organizations. Governments can play an important role in this coordination. To this end, the The Economist Intelligence Unit developed an Automation Readiness Index which evaluated 25 countries. The index “measures policies that promote technological progress, the creation of new businesses, the development of skills and policies that can help manage transitions in the labor market.” (The Economist Intelligence Unit 2018, p. 10). This index ranks Singapore in the third highest readiness position while Malaysia is ranked fourteenth.

These two countries were once the same country (Singapore gained independence from Malaysia in 1965) and Malaysia was a former British colony (Malaysia gained independence from United Kingdom in 1957). These two countries are geographically near each other (see map below):



Both countries have similar ethnic make ups. However, the concentration of Malays to Chinese is flipped. Malays versus Chinese is roughly 60/20 for Malaysia and 10/70 for Singapore. Both countries speak similar languages and have similar religious affiliations. Each has a parliamentary form of government with universal suffrage.

While Malaysia's overall economy is significantly larger than Singapore's (\$900 Billion versus \$500 Billion), Singapore's per capital GDP of \$94,000 is much higher than that of Malaysia's \$29,000. Otherwise, other economic factors such as unemployment, inflation and tax rates appear similar. See summary table below. (The World Factbook, 2018).

Country	Malaysia	Singapore
Ethnic Groups	Bumiputera 61.7% (Malays and indigenous), Chinese 20.8% (2017 est.)	Chinese 74.3%, Malay 13.4% (2017 est.)
Languages	Bahasa Malaysia (official), English, Chinese, Tamil, Telugu, Malayalam, Panjabi, Thai	English (official), Mandarin (official), Malay (official), Tamil (official)
Population	31,809,660 (July 2018 est.)	5,995,991 (July 2018 est.)
Religion	Muslim (official) 61.3%, Buddhist 19.8%, Christian 9.2%, Hindu 6.3% (2010 est.)	Buddhist 33.2%, Christian 18.8%, Muslim 14%, Taoist 10%, Hindu 5%, other 0.6%, none 18.5% (2015 est.)
Government	Federal parliamentary constitutional monarchy	Parliamentary republic
Suffrage	Universal	Universal and compulsory
GDP	\$933.3 billion (2017 est.)	\$528.1 billion (2017 est.)
GDP per capita	\$29,100 (2017 est.)	\$94,100 (2017 est.)
Unemployment Rate	3.4% (2017 est.)	2.2% (2017 est.)
Below poverty line	3.8% (2009 est.)	NA
Taxes	16.4% (of GDP) (2017 est.)	15.7% (of GDP) (2017 est.)
Inflation Rate	3.8% (2017 est.)	0.6% (2017 est.)

Source: CIA The World Fact Book

Therefore, it is curious why Singapore is prepared for the AI deployment so much more than is Malaysia.

### Research Question

Why has Singapore taken a leading role in preparing for AI transformation while Malaysia has not?

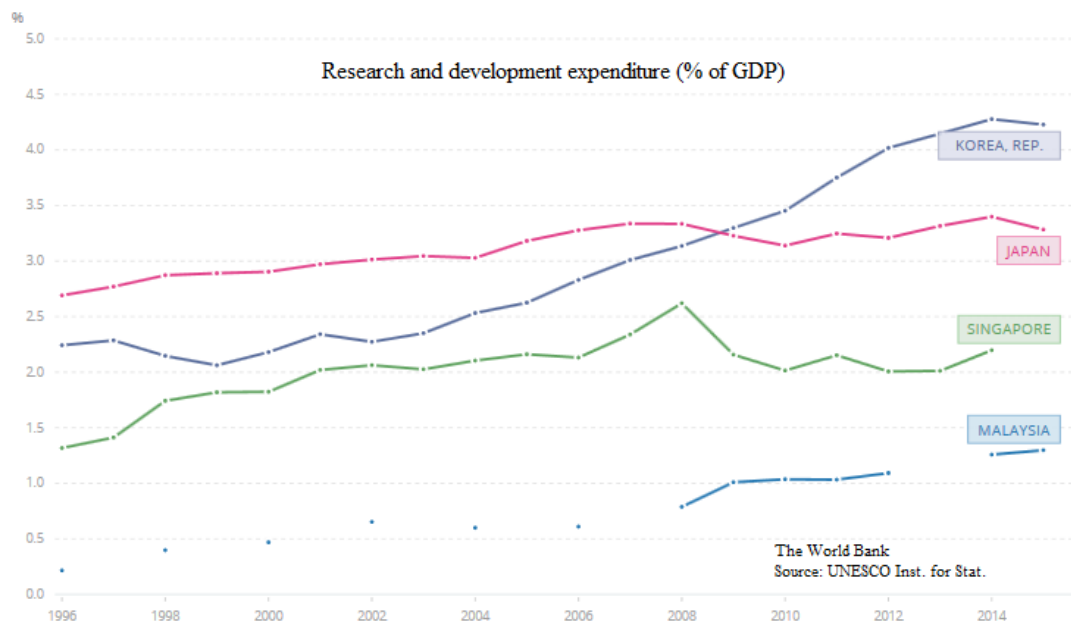
## Potential Explanations

To explain the difference between Singapore's more active role in AI preparedness versus Malaysia's the following three hypotheses are proposed: 1) Amount of investment in fundamental research, 2) Importance of international trade, and 3) Degree of cooperation between government and labor.

### Hypothesis #1 – Investment in Fundamental Research Drives AI Preparedness

Hypothesis: In comparing two countries, those that are more active in conducting research and development (R&D) will more likely prepare for AI developments.

If a country is more engaged in activities surrounding R&D it is more likely to wish to protect those investments and to maintain an advanced technology status and, therefore, more likely to prepare for AI advancements. As can be seen from the graph below, Singapore has had a history of outspending Malaysia on R&D as a percentage of GDP. In fact, Singapore is one of the highest spending countries on R&D as a percentage of GDP in the world. It does not spend as much as a top spender like Korea or Japan, but it is in close competition.



The below table further demonstrates how significantly committed Singapore is to basic research. Singapore has nearly 3 times as many people (per million of population) engaged in research when compared to Malaysia and, as an assumed consequence, has applied for 8 times as many patents (per million of population).

Country	Number of Researchers full-time equivalent per million people (2005-15)	Patent applications filed Residents + Nonresidents Count (2016)	Patent applications per million of Population (2016)
Singapore	6,658	10,980	1960.7
Malaysia	2,261	7,236	234.9

The below other top AI prepared countries provided for reference:

Korea, Rep.	7,087	208,830	4110.8
Germany	4,431	67,899	822.0
Japan	5,231	318,381	2540.9
Canada	4,519	34,745	959.8

Source: THE WORLD BANK, World Development Indicators (Last updated date 09/18/2017)

## Hypothesis #2 – International Business Relationships Drives AI Preparedness

Hypothesis: In comparing two countries, those more engaged in international trade will more likely prepare for AI developments.

The competitive pressures that engagement in international trade brings to a country will likely drive that country to seek competitive advantage through the development and preparation for the deployment of AI. When comparing Singapore versus Malaysia on international trade engagement, Singapore clearly stands at the front. According to a 2017 World Trade Organization (WTO) report, Singapore was ranked number 14 and 10 in the world, with respect to exports of merchandise and commercial services, respectively. Malaysia was ranked 25 and 32 in those two categories. Singapore commanded 2.11% of the world's merchandise export trade in 2017. Its top exports were electronic integrated circuits (\$80 Trillion) and petroleum (\$46 Trillion). Malaysia had only 1.23% of the world's export trade. Its top exports were also electronic integrated circuits (\$32 Trillion) and petroleum (\$13 Trillion) (World Trade Organization, n.d.).

### Hypothesis #3 – Government / Labor Cooperation Drives AI Preparedness

Hypothesis: In comparing two countries, those having a higher degree of cooperation between government and labor will more likely seek AI preparedness.

Because workers are likely to be concerned about job loss due to automation, those countries with a higher degree of cooperation between government, business and labor are more likely to address these concerns and proactively mitigate the risk to labor from AI implementation.

About 16% of the workforce is unionized in Singapore (Labor Rights Report – Singapore, 2017) and only 6% in Malaysia (The state of the labour movement in Malaysia, 2017). Labor relations are difficult to assess without a detail review of legal frameworks and labor history. However, a cursory review of internet articles and data sets gave a clear indication that Singapore's labor relations were substantially better than Malaysia's.

As an example, below are two quotes from two United States Department of Labor reports that provide some insight into the relationship between government and labor within the two countries. First, a report discussing Singapore,

“The vast majority of unions (69 of the 72 registered unions) are affiliated with the National Trade Union Congress (NTUC) ... both the NTUC and the PAP [People's Action Party; the ruling party in Singapore] have depicted the “symbiotic relationship” as one that has enabled Singapore to create a cooperative system of industrial relations, establish a durable system of



tripartitism [relationship between Government, Labor, and Employers], and institutionalize a system that insures that worker interests are permanently incorporated into all government decisions.” [Comments in brackets added by this author] (Labor Rights Report – Singapore, 2017 p. 3-10).

Next, a report discussing Malaysian,

“The project’s key interventions ... focus on reforming Malaysian labor laws, strengthening the labor inspection system, and increasing the effectiveness and efficiency of dispute resolution mechanisms ... to provide technical assistance to amend or reform the Employment Act, the Industrial Relations Act, and the Trade Union Act. ... the ... project has only recently started to implement its strategies due to delays ... the ... project has only managed to make progress on six of the 20 indicators ...” (Support for Labor Law and Industrial Relations Reform in Malaysia, 2018, p. 8-10).

In conclusion, AI presents an exciting opportunity and a worrying dilemma for any country. Being prepared for this new technology should be an important part of any country’s long-term strategy. Predicting the likelihood of a country’s preparedness might be possible using one or more of the above hypotheses.

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