

FUTUREtense



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FOREWORD

2015 is a special year for Singapore, marking our nation's 50th birthday. As we celebrate our achievements, it is also a good occasion to reflect on how to keep Singapore ahead as the world changes. Optimising resources, harnessing new capabilities and finding new markets have been consistent themes since the early years of Singapore's economic transformation. However, the environment we now face poses a different set of challenges to address, while existing constraints have evolved considerably.

At home, we are seeing moderating workforce growth amidst changing aspirations amongst Singaporeans. Jobs, companies and markets are all changing rapidly, fuelling concerns of technological unemployment, footloose investors and protectionist competitors. But these changes also provide opportunities, whether through investments in disruptive technology or commitment to foster closer regional integration in Southeast Asia.


Foresight's traditional role has been to help policymakers wade through the complexity of our operating environment and make sense of the shifts. But foresight on its own will not be enough. As we chart out a course for the next fifty years, translating foresight into strategies that can ride out volatility and uncertainty will be critical.

I hope you enjoy reading this edition of *Future Tense*.

Mrs. Ow Foong Pheng
Permanent Secretary
Ministry of Trade and Industry, Singapore
December 2015

POLES TO POLARISATION






Let's get over the idea of a "new normal".

Even a brief look at our global system in recent years shows that things have been anything but normal. The post-Cold War global order has kept us all guessing, swinging wildly between fragility and resilience. For example, the apparently inevitable "Grexit" did not materialise. Similarly, tensions rose between claimants in the South China Sea, but that did not stop them from continuing negotiations for a regional free trade agreement.

Much is therefore not what it seems. Signals of unravelling are sometimes emerging as consolidation in disguise. In *The Splinternet*, we see this playing out in the debate over who controls the Internet. Not all the calls for regionalised data storage are based on privacy concerns – erecting digital barriers also allows countries to nurture tech champions. Similarly, *The People's Republic of Change* shows how the current slowdown in China's economy may well be a passing side-effect of ongoing adjustments. The vision of China emerging out of this transitory phase stretches from manufacturing all the way to outer space.

Nonetheless, necessity is ever the motivator of innovation. The turmoil of our times is pushing countries to find ways to navigate economic obstacles. In *A New Economic Diplomacy?*, we track the growing use of sanctions as a tool of economic policy. On the other side of the coin, *Pivots under the Radar* looks at quiet charm offensives designed to tilt the status quo of economic relations.

Today's counter-culture can be tomorrow's norms. *Inevitable Surprises* examines early signals of societal pushback to the current cult of "globalisation equals growth". We look past narratives of technology-driven utopia, from bots that influence the social landscape to a "hijack" of fiscal priorities by the elderly.



A NEW ECONOMIC DIPLOMACY?

Sarah Tan

Geopolitics is back, and the likelihood of conflict between major powers is at the front and centre of many businesses' concerns in 2015. However, future political conflict may increasingly be fought through economic instruments instead of force.

There is a growing unilateral use of economic instruments – both “carrots” (access to capital and markets) and “sticks” (sanctions)¹ – as a weapon to achieve political aims. For example, the US cut off Russian companies' (e.g. Gazprom and Rosneft) access to capital unless Moscow agreed to the terms of the Minsk agreement.² Russia retaliated by sending consumer-safety regulators to inspect more than 200 McDonald's restaurants, forcing operations to close temporarily.³

As economic tit-for-tat becomes more common, it raises the risk that more governments may become inclined to use sanctions to achieve foreign policy goals and target specific economic sectors. As a result, companies, not governments, may bear the brunt of future geopolitical tussles between states.

Governments targeted by sanctions will increasingly see companies that comply with them as instruments of foreign power. The US has extensive control over markets through the dollar – 81% of global trade

finance is conducted in USD – and one consequence of the US' unilateral deployment of economic carrots and sticks will be to accelerate the move towards non-dollar arrangements.⁴ This is particularly so in Asia, where China has the muscle and capacity to create its own institutions, e.g. the New Development Bank and the Asia Infrastructure Investment Bank.⁵

If more countries are using unilateral economic sanctions to promote political objectives, how do we avoid getting caught in the crossfire if this happens between our major trading partners? –F

1 Bremmer and Kupchan, “Top risks 2015,” *Eurasia Group*, 5 Jan 2015

2 Roberts, “Sweeping new US and EU sanctions target Russia's banks and oil companies,” *The Guardian*, 12 Sep 2014

3 McDonald and Corcoran, “McDonald's says Russia inspecting more than 200 outlets,” *Bloomberg Business*, 20 Oct 2014

4 Bremmer and Kupchan, “Top risks 2015”

5 *Ibid.*



PIVOTS UNDER THE RADAR

Sarah Tan

Recently, it seems like everyone's pivoting to Asia, but Russia's “Look East” policy may be more substantial than most. In response to sanctions and souring relations with the EU and the US after annexing Crimea, President Putin has launched a serious economic charm offensive eastwards, e.g. Moscow's 30-year gas deal with Beijing may prove to be a game-changer and provide China with a measure of energy security. Moscow-Beijing cooperation may also lead to changes in regional trade architecture, such as new financial structures, that exclude the US.¹

What other pivots may be happening under the radar, and what possible game-changers might we miss out on?

China's turn to Eurasia, for instance, could have a significant impact on global trade flows. While Russia's economic fortunes in Eurasia wane with the continued fallout from annexing Crimea,² China has stepped in to offer Central Asia a new “Silk Road Economic Belt,” which connects its inner provinces to Duisburg, Germany, via Eurasia. The construction of the high-speed Belgrade-Budapest rail link, and purchase of the port of Piraeus, are also likely to accelerate Chinese trade. Combined with future plans for the yuan to become the currency of choice in Central Asia,³ Chinese investment may speed up development of central and eastern European states, and impact global trade flows.⁴

Another pivot is Japan's quiet investment in Russia's

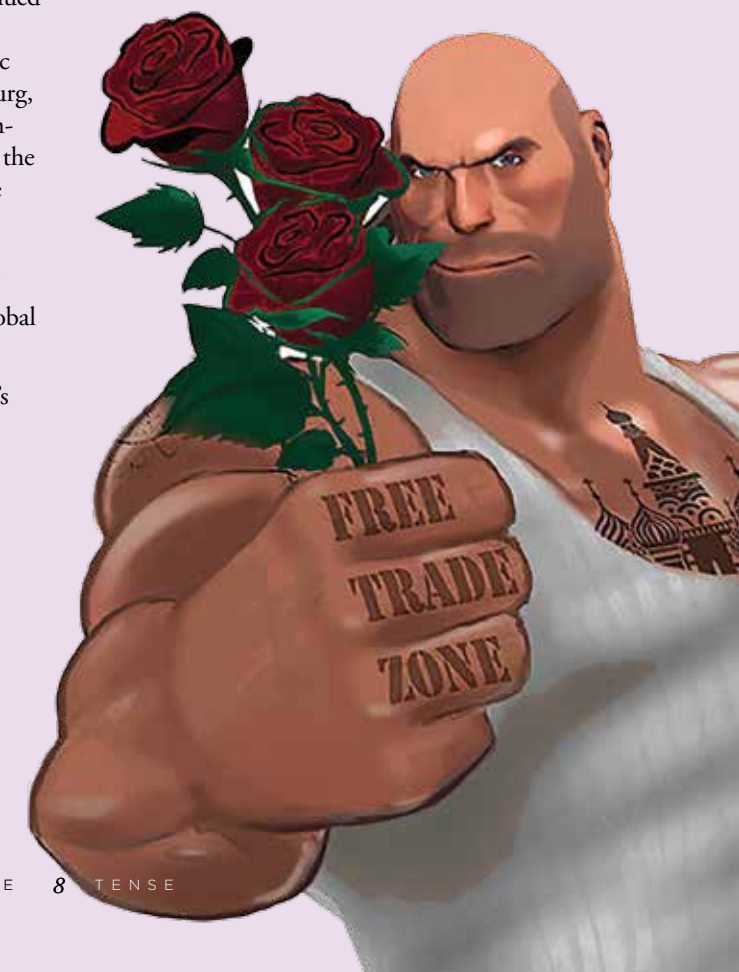
Far East in response to Russia's courtship. Japanese investment in gas infrastructure and possible trade zones could lead to the Russian Far East emerging as a new node of global industrial activity. Combined with Arctic ice melt, this could potentially speed up regional development along the Northern Sea Route. –F

1 Bremmer and Kupchan, “Top risks 2015,” *Eurasia Group*, 5 Jan 2015

2 Hille, “Russia: Dangers of isolation,” *Financial Times*, 9 Jan 2015

3 Dettoni, “The new Silk Road's currency,” *Nikkei Asian Review*, (8-14 Dec 2014)

4 “Belgrade-Budapest rail link to facilitate Chinese imports,” 31 Dec 2014



THE PEOPLE'S REPUBLIC OF CHANGE

Sarah Tan, Rebecca Lim and Zheng Minlu

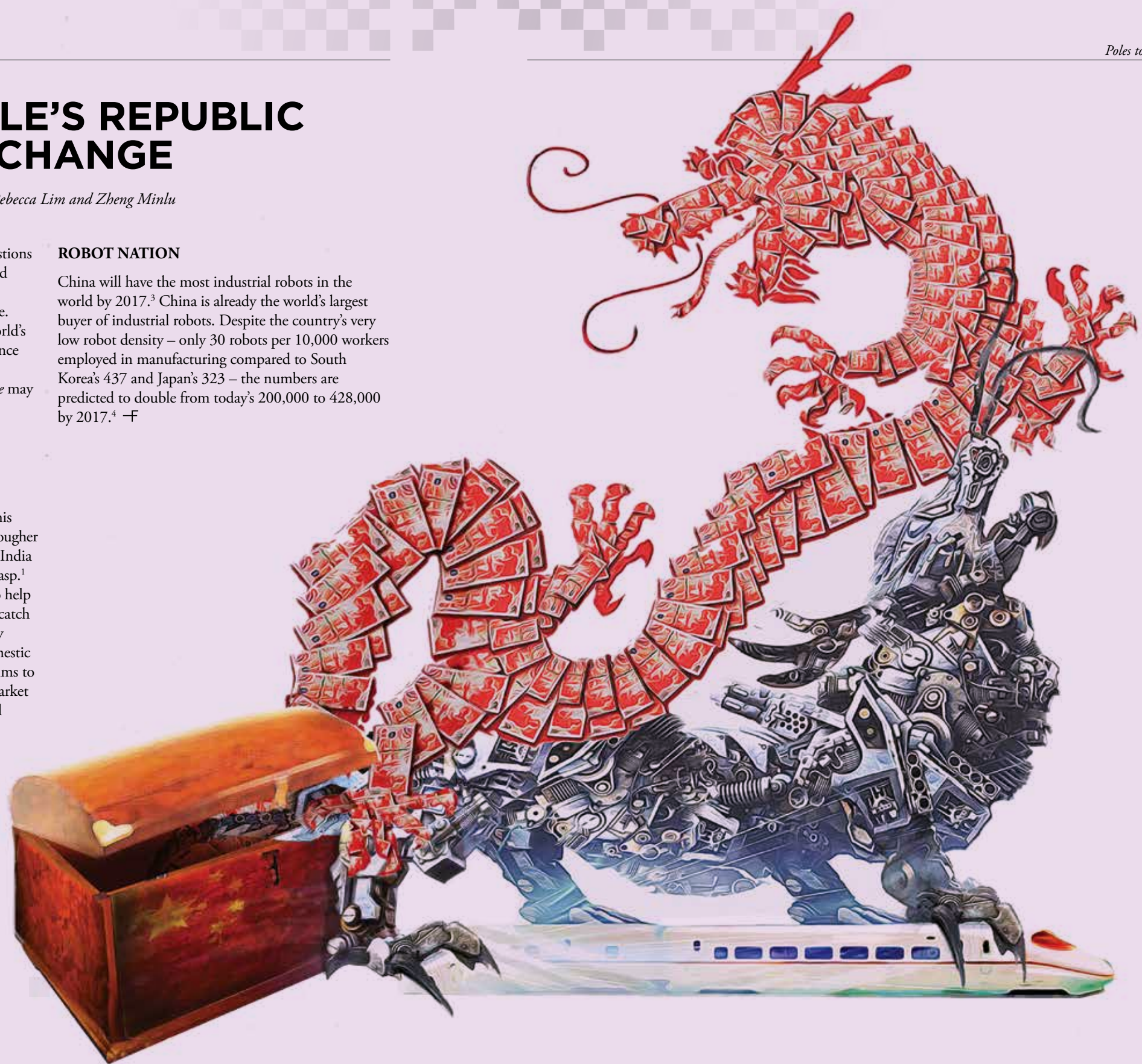
China's growing economic pains have raised questions about its prospects for sustained high growth, and observers are jittery over the current slowdown. Recent developments, however, suggest otherwise. From an ambitious policy to make China the world's manufacturing superpower, to bold plans to finance infrastructure connecting far-inland cities to the eastern seaboard, the People's Republic of *Change* may be about to take off.

"MADE IN CHINA 2025"

In May 2015, China launched "Made in China 2025", the first of three 10-year action plans to transform the country's manufacturing sector. This development comes at a time when China faces tougher competition from a re-industrialising US and an India gearing up to prise global production from its grasp.¹ Refocusing on the manufacturing sector will also help China, a latecomer to advanced manufacturing, catch up with countries like Germany with its Industry 4.0, and meet the demands of an expanding domestic middle class. By 2049, "Made in China 2025" aims to produce a number of indigenous MNCs with market and technical supremacy in fields like biomedical science, robotics and aviation.²

ROBOT NATION

China will have the most industrial robots in the world by 2017.³ China is already the world's largest buyer of industrial robots. Despite the country's very low robot density – only 30 robots per 10,000 workers employed in manufacturing compared to South Korea's 437 and Japan's 323 – the numbers are predicted to double from today's 200,000 to 428,000 by 2017.⁴ –F



THE NEXT CHINESE CAPITAL WAVE

China is emerging as the next investor to the world – its outward direct investment is growing steadily, and it now holds the largest share of world investment (25.8%).⁵ Previous waves of Chinese investment ranged from resources to acquiring EU technology and intellectual property. Looser regulation in China may see it become an even larger source of outward investment in the decade ahead, funding the next round of global economic expansion.⁶

Asia is naturally well-placed to benefit from this capital wave through new international finance institutions spearheaded by Beijing, e.g. the New Development Bank, Asian Infrastructure Investment Bank (AIIB) and Silk Road Fund. The AIIB and Silk Road Fund will eventually provide US\$140bn in funding for infrastructure projects.⁷ Chinese financing is also likely to go into the construction of critical infrastructure in Siberia, Central Asia, Myanmar and Pakistan. These projects will also be connected by a network of new railroads and motorways to China's

main production hubs,⁸ forming trade networks that cut transportation times, e.g. China to Europe from 30 days by sea to 10 days or less overland. This could prompt some heavy industry to relocate from Europe to Asia.⁹

India may also benefit from this. The country is positioning itself as the next Asian manufacturing powerhouse, absorbing significant quantities of Chinese capital to boost infrastructure spending in order to replicate the East Asian growth model.¹⁰

Others speculate that the US is a more likely destination for the current wave of Chinese investment, given its renewed appetite for financing to repair its deteriorating infrastructure.¹¹ Such an arrangement could lead to the return of “Chimerica” – a period of global imbalance before the 2009 financial crisis, where cheap Chinese credit fuelled US consumption and growth. This is not necessarily a bad outcome. If the US overcomes mistrust and reluctance to accept Chinese investments, it could lead to a period of sustained growth in the US, and by extension, the global economy.

CHINA'S GONE SHOPPING

Cash-rich China is buying up European brands and technology, with Chinese deals in Europe rising from US\$2bn in 2010 to US\$18bn in 2014.¹²

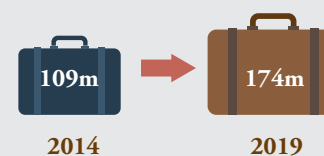
- Chinese sovereign wealth fund China Investment Corporation (CIC) has bought an 8.68% stake in Thames Water's parent company, Kemble Water, for an undisclosed sum estimated at US\$780m.¹³
- China COSCO, a state-owned enterprise, has bought part of the port of Piraeus, in Greece.
- China National Chemical Corporation, a state-owned conglomerate, announced its buy out of Pirelli, an Italian tyre maker, for US\$7.7bn.

CHINA'S TOURISM BOOM

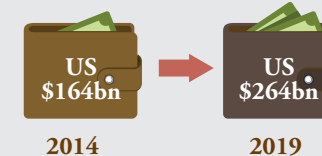
1 in 10 international tourists are already Chinese, and they are prolific spenders – 174 million Chinese tourists are tipped to spend US\$264 billion by 2019 compared with 109 million who spent US\$164 billion in 2014.¹⁴ Mainland tourists mostly travel to Hong Kong and Macau, but more of them are going further afield to buy just about everything – from luxury items to daily necessities – in places like Japan and South Korea.¹⁵ The number of Chinese travellers is expected to grow – only about 5% of China's 1.3 billion citizens hold passports¹⁶ – making the potential for outbound tourism vast.

BOARDING PASS

Total number of Chinese tourists



Total spending (Chinese visitors)



Where Chinese tourists are going

1. France
2. Italy
3. UK
4. Germany
5. Switzerland

ONE ROAD TO RULE THEM ALL

Under the “One Belt, One Road” initiative, China is creating a modern Silk Road Economic Belt and a 21st Century Maritime Silk Road. The Belt and Road connect Asia, Europe and Africa, offering huge potential for economic development to the countries

involved. Over 50 countries have expressed interest in this initiative, and President Xi has declared that the annual trade volume between China and the participating countries could reach US\$2.5 trillion in a decade.¹⁷ At the time of writing (May 2015), the list of participating countries was not finalised.

Rotterdam, Netherlands

The strategic position of the Netherlands as a hub to enter the European market has long piqued China's interest. The Netherlands has expressed great enthusiasm in the Silk Road initiative, with Dutch Prime Minister Mark Rutte concluding a second trip to China in March 2015,¹⁸ which included meetings on deepening cooperation between the two countries, e.g. in ICT, electronics and agriculture.¹⁹

Duisburg, Germany

President Xi Jinping issued a call in March 2014 for Germany to join China in developing the New Silk Road.²⁰ Germany, faced with sluggish domestic demand in Europe, may heed the call, given the success of the Chongqing-Duisburg railway that connects the two countries, and with rail volumes between Europe and China growing apace.

Moscow, Russia

Putting aside misgivings about China's rising influence in its backyard, Russia signed an agreement with China in May 2015 to work together on the New Silk Road initiative. This ties the development of Russia's Eurasian Economic Union with the New Silk Road project, and can potentially extend the New Silk Road to include the Chinese-funded Moscow-Kazan High Speed rail.²¹

Istanbul, Turkey

Turkey has expressed its interest in the New Silk Road initiative, and has substantially increased its investment in railway construction in recent years, with China expected to back more rail projects in future.²²

Tehran, Iran

China has welcomed Iran's desire to participate in the Silk Road Economic Belt and Maritime Silk Road initiatives, although it remains to be seen what this might look like.²³

Almaty, Kazakhstan

The gateway for Beijing's westward push, Kazakhstan is a key partner in the New Silk Road initiative. In March 2015, both countries signed 33 deals worth US\$23.6bn covering energy, and railways.²⁴

Bishkek, Kyrgyzstan

Kyrgyzstan and China have pledged to strengthen economic cooperation since 2013. China has also welcomed Kyrgyzstan's application to join the AIIB as a founding member.²⁵

Ashgabat, Turkmenistan

No official announcement of Turkmenistan's participation in the New Silk Road initiative has been made thus far. Nevertheless, as China's largest gas supplier – accounting for almost 50% of gas imports²⁶ – Turkmenistan is closely linked to China through what has been called a “gas road.”

Urumqi, China

China has designated the Xinjiang province as a starting point to link and upgrade rail lines that reach all the way to Europe, e.g. plans are underway to extend China's recently upgraded “Lan-Xin” rail route from Xinjiang to Central Asia.²⁷

Islamabad, Pakistan

In April 2015, China unveiled a US\$46bn deal with Pakistan to undertake energy and infrastructure projects, part of a broader China-Pakistan Economic Corridor initiative, which is an extension of the Silk Road Economic Belt.²⁸

Dushanbe, Tajikistan

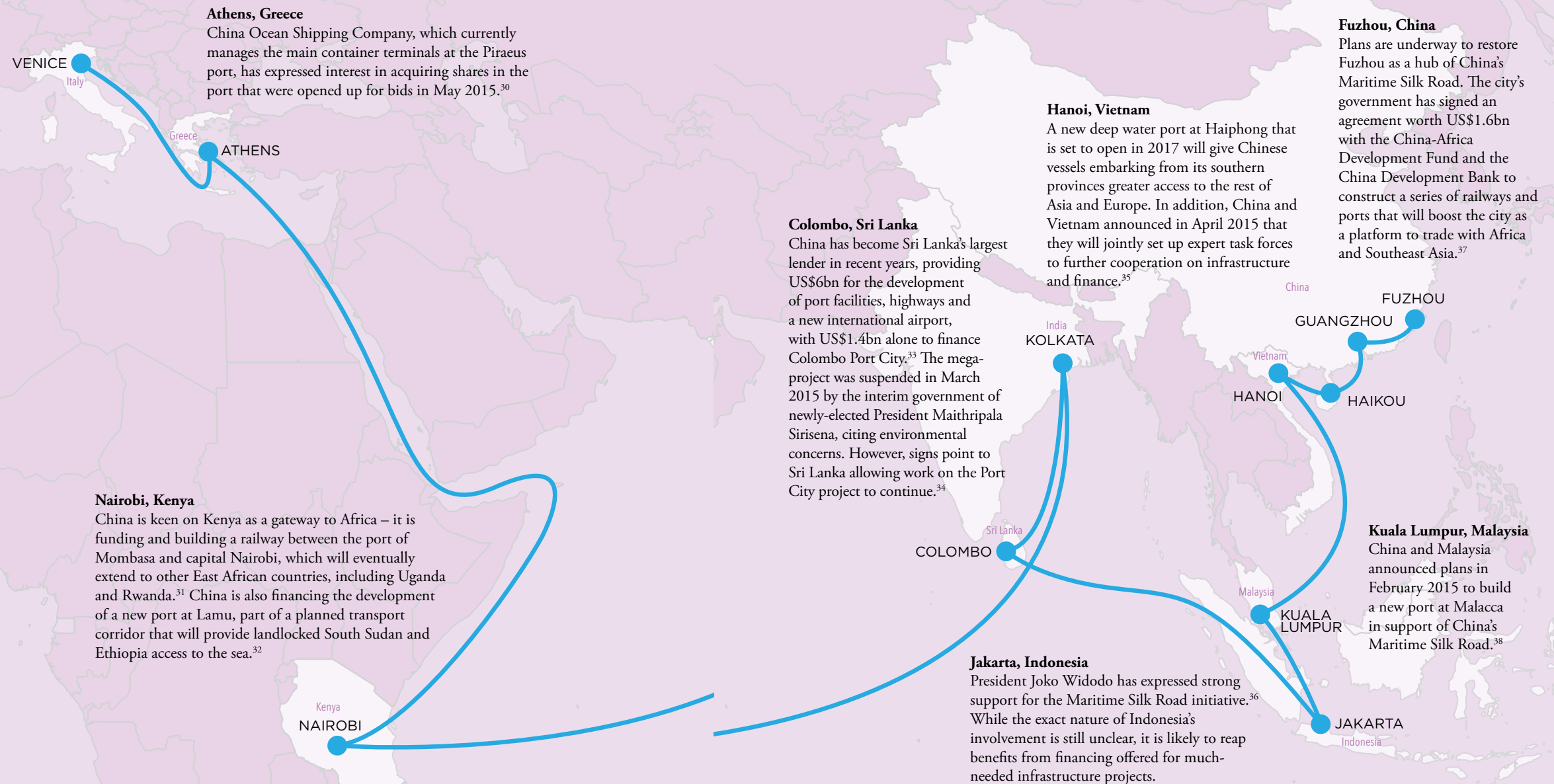
Tajikistan has fully embraced its participation in the Silk Road Economic Belt – it has committed to deepening economic ties with China through a 5-year, US\$3bn partnership that will step up investment in infrastructure, energy and mining.²⁹

NEW SILK ROAD

China launched the New Silk Road in 2013 to connect inland cities like Xi'an to neighbouring countries and beyond to final demand markets like Rotterdam in the Netherlands.

NEW MARITIME SILK ROAD

The new Maritime Silk Road starts at Fuzhou on China's eastern coast, through the South China Sea and the Indian Ocean, and ends in the Mediterranean at Venice in Italy.



COULD A “RED MOON” BE THE NEXT FRONTIER OF POLARISATION?³⁹

China has been investing heavily in its space programme, which became the fourth largest globally in 2014.⁴⁰ While China's US\$6.1 billion investment in its programme is a far cry from the US' US\$39.3 billion,⁴¹ American investment declined from US\$43 billion in 2011.⁴² As China's space ambitions materialise, will it make lunar territorial claims once it successfully lands a taikonaut on the moon?

- 2003 – Shen Zhou-5 (first manned space flight). Third country after US and Russia to launch man into space.
- 2007 – Successful anti-satellite missile test. – Chang'e-1 (first lunar orbiter).
- 2011 – Tiangong-1 (first space laboratory).
- 2013 – Chang'e-3 (lunar lander) and Yu Tu (lunar rover).
- 2016 – Tianzhou (first cargo spacecraft).⁴³
- 2022 – China Space Station.⁴⁴
- 2025 – First taikonaut on moon.⁴⁵

- 1 “Made in China 2025” plan unveiled,” *Xinhua*, 19 May 2015
- 2 *Ibid.*
- 3 International Federation of Robotics, “Industrial robots global study: China to overtake EU and North America by 2017,” 28 Jan 2015
- 4 *Ibid.*
- 5 Sanyal, “The age of Chinese capital,” *The Wide Angle*, 15 Oct 2014
- 6 *Ibid.* and Anderlini, “China's outbound investment set to eclipse inbound for first time,” *Financial Times*, 22 Oct 2014
- 7 Zha, “Chinese economic diplomacy: New initiatives,” *RSIS Policy Report*, Mar 2015
- 8 Gave, “The burning questions for 2015,” *Gavekal Dragonomics*, 3 Dec 2014
- 9 Sanyal, “The age of Chinese capital”
- 10 *Ibid.*
- 11 *Ibid.*
- 12 “Gone shopping,” *The Economist*, 28 Mar 2015
- 13 Gosden, “Santander sells Thames Water stake to China,” *The Telegraph*, 20 Jan 2012
- 14 Curran, “Chinese tourists are headed your way with \$264 billion,” *Bloomberg Business*, 11 Mar 2015
- 15 Waldmeir, “China's tourists head for Japan, S Korea and Russia,” *Financial Times*, 25 Mar 2015
- 16 “Coming to a beach near you,” *The Economist*, 19 Apr 2014
- 17 Wee, “China's Xi: Trade between China and Silk Road nations to exceed \$2.5 trillion,” *Reuters*, 29 Mar 2015
- 18 Liu and Fu, “Dutch PM affirms support for the Silk Road initiative,” *China Daily Europe*, 27 Mar 2015
- 19 Vasileiou, “Interview: Chinese investments in the Netherlands expected to increase: Dutch official,” *Xinhua*, 25 Mar 2015
- 20 Rao, “President Xi calls on China, Germany to build Silk Road economic belt,” *Xinhua*, 30 Mar 2014
- 21 “Russia, China agree to integrate Eurasian Union, Silk Road, sign deals,” *RT*, 8 May 2015
- 22 “Interview: China's ‘Belt and Road’ initiative to boost Turkey's economy: Expert,” *Xinhua*, 27 May 2015
- 23 “Iran president calls for stronger ties with China,” *Xinhua*, 16 Feb 2015
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- 25 “China's Finance Ministry welcomes Kyrgyzstan to join AIIB,” *Xinhua*, 31 Mar 2015
- 26 Detroni, “Turkmenistan faces competition from Russia as China's largest supplier,” *Nikkei Asian Review*, 14 Jan 2015
- 27 Meyer, “China's newest recipe for solving its Xinjiang problem: A high-speed rail line,” *Forbes*, 11 Nov 2014
- 28 “China to invest \$46bn in economic corridor with Pakistan – media,” *RT*, 20 Apr 2015
- 29 “China welcomes Tajikistan's participation in Silk Road Economic Belt Initiative,” *Xinhua*, 13 Sep 2014
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- 31 “China to build new East Africa railway line,” *BBC News*, 12 May 2014
- 32 “Kenya to start work on new northern seaport – President,” *Reuters*, 23 Feb 2015
- 33 “Sri Lanka approves Chinese port project to avoid ‘misunderstanding’ with Beijing,” *The Guardian*, 6 Feb 2015
- 34 “After suspension, Sri Lanka may let China resume work on Port City project,” *Channel NewsAsia*, 29 May 2015
- 35 Abe and Tomiyama, “China, Vietnam to cooperate on new trade corridor,” *Nikkei Asian Review*, 8 Apr 2015
- 36 Tiezzi, “China woos Indonesia's new president,” *The Diplomat*, 5 Nov 2014
- 37 “Fund to boost China's maritime Silk Road development,” *Xinhua Finance*, 19 May 2014

- 38 “Global port in the works for Malacca under China's Maritime Silk Route plan,” *The Straits Times*, 21 Feb 2015
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- 40 “Government spending in space programs at \$66.5 billion in 2014,” *Euroconsult*, 13 May 2015
- 41 OECD, *The Space Economy at a Glance 2014* (OECD Publishing: 2014)
- 42 OECD, *The Space Economy at a Glance 2011* (OECD Publishing: 2014)
- 43 Jones, “China's space station is still on track,” *Space Daily*, 11 Sep 2014
- 44 Areddy, “T-minus eight years: China sets launch date for space station,” *Wall Street Journal*, 11 Sep 2014
- 45 Kremer, “China considers manned moon landing following breakthrough Chang'e-3 mission success,” *Universe Today*, 15 Jan 2014

THE SPLINTERNET

Audrey Ho and Lim Dao Chang

Following Snowden's revelations, privacy concerns prompted governments to restrict data flows and tighten data security regulations. For example, Germany and Brazil proposed data localisation laws for firms and the BRICS countries proposed a new undersea cable to bypass the US. These actions (see boxes) have rekindled old worries of a "splinternet", where the global Internet fragments into national or regional internets, limiting its reach.¹

MORE CABLES, LESS SURVEILLANCE?

Reflecting the genesis of the Internet, more than 70% of existing undersea cables connect to the US. As more cables are laid between other countries, this increases overall connectivity. Some of the proposed cables are:

- A BRICS cable to link Brazil, Russia, India, China and South Africa exclusively.²
- A cable linking Brazil and Portugal, built by Brazil and the EU. This would create a European network "protected" from US surveillance.³
- The Russian-led ROTACS cable linking Japan, Russia and the UK, also bypassing the US.⁴

FORGET-ME-NOW

The Costeja decision by the European Court of Justice set a precedent for restricting search engines from displaying particular kinds of data.⁵ Google has since received more than 120,000 requests to delete information from its search results, usually limited to country-specific providers. Acquiescing to data removal requests means that users in one European country would not have access to the same information available to another country's users, effectively creating multiple Internets across Europe.

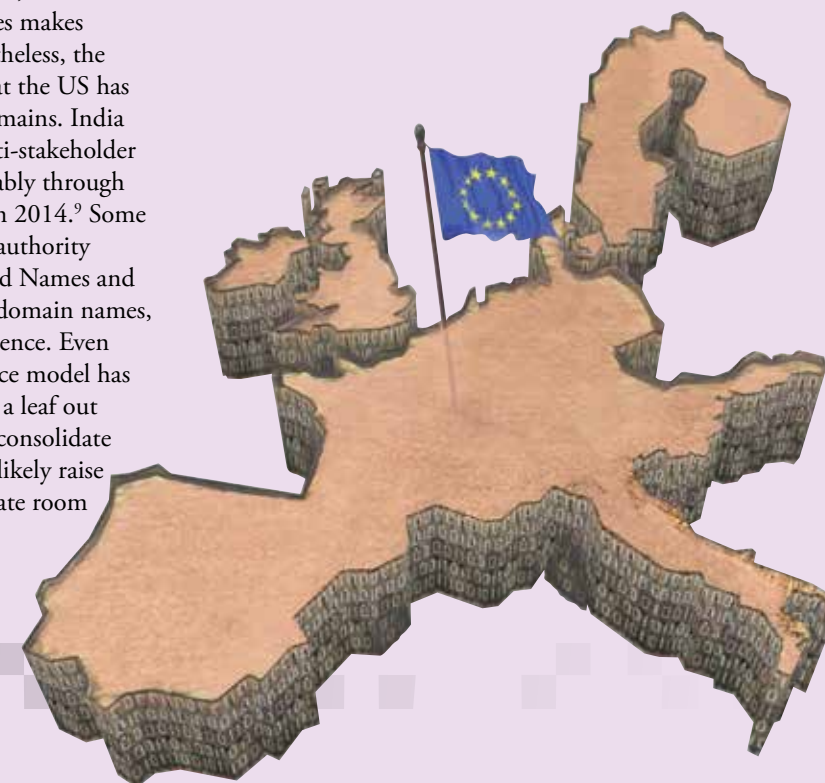
So, is the Internet really splintering? The rhetoric of data sovereignty appears to be toning down, but Germany and Brazil remain committed to multilateral efforts to strengthen data protection. More cables between BRICS and other regions are being built, bypassing the US and theoretically reducing the possibility of US surveillance. However, rising connectivity reflects greater economic value generated between new centres of global demand and is hardly a sign of balkanisation. Arguably, the "splinternet" already exists. The large, sophisticated Chinese, Korean and Japanese digital markets are distinct from the English language digital market for largely cultural/linguistic reasons. The Chinese language Internet is already larger than the English language Internet, and still growing compared to the more saturated Korean and Japanese Internets.⁶

The Chinese Internet is often held as the challenge to a global Internet, and the government's hand is very visible in this sphere. Crackdowns on foreign tech suppliers for alleged antitrust violations and regulations favouring local companies for procurement and technology transfer have fuelled the rise of

indigenous digital giants. Companies like Baidu, Alibaba and Tencent (commonly called "BAT") have impressive market capitalisations and have successfully expanded into foreign markets. Alibaba's successful disruption of state-dominated sectors like finance has also garnered political support.⁷ Premier Li Keqiang's "Internet Plus" programme aims to replicate this disruption to drive restructuring in state-dominated sectors like agriculture and healthcare, connecting supply more efficiently with demand.⁸ When realised, this vision will transform China's economy and mesh the interests of Beijing even more deeply with that of BAT.

The Chinese digital giants' expansion overseas is moving in tandem with China's push for a new Internet governance model – one without the US at the helm. China floated its new model at the World Internet Conference in 2014, but the ensuing pushback from other countries makes mainstream adoption unlikely. Nevertheless, the growing perception post-Snowden that the US has too much control over the Internet remains. India and Brazil have also pushed for a multi-stakeholder approach to Internet governance, notably through the inaugural NETmundial meeting in 2014.⁹ Some posit that, with the US relinquishing authority over Internet Corporation for Assigned Names and Numbers, the global body governing domain names, new stakeholders will increase in influence. Even if China's proposed Internet governance model has few takers, Europe seems to be taking a leaf out of China's book. The current push to consolidate a single digital market in the EU will likely raise barriers for foreign competitors to create room for indigenous digital giants to grow.

Overtly, Europe is supposed to be a single market with a potential customer base of 500 million people. Yet differences in contract law, taxes, consumer/data protection and copyright laws among 28 member states inhibit cross-border trade in digital goods and services, essentially splintering the market. As a result, only 15% of European consumers bought goods and services online from another EU country, but 44% did so domestically.¹⁰ This inhibits scaling, hence the small number of indigenous digital giants competing with foreign (mainly American) companies like Google, Uber and AirBnB. To consolidate a single digital market, the EU is aiming to unify member states' data protection and copyright laws by the end of 2015.



INEVITABLE SURPRISES

Lee Chor Pharn, Tan Zhi Rong and Ng Jing Lin

The idea of a single digital market may also make it harder for foreign companies to operate in the EU.¹¹ For example, the EU is launching an inquiry into competition barriers in e-commerce.¹² The push for this inquiry comes on the back of ongoing investigations into US e-commerce companies. These include antitrust probes against Google,¹³ courts challenging Facebook over data privacy,¹⁴ and proposed changes to telecom rules favouring telecom operators over messaging service WhatsApp.¹⁵ It is likely that there will be more to come, as such measures buy time for the EU to invest in bringing its traditional industrial strengths online. One initiative in this direction is the Alliance for Internet of Things Innovation (AIOTI), launched in March 2015 by Günter Oettinger, the European Commission's digital economy czar.

As the global Internet moves towards additional fragmentation, which other regions have a similar will and the capability to erect regional digital markets to favour indigenous digital companies?

India is a strong candidate. Today, 900 million Indians have access to mobile phones and smartphone use is likely to increase from around 200 million to 500 million by 2020. A new generation of mobile-first digital startups are being launched in existing IT hubs like Bangalore and in centres of excellence such as the Indian Institutes of Technology.¹⁶ The promise of 100 smart cities by 2020 and initiatives like Aadhaar – the world's biggest biometric database to create a reliable digital identity for 1 billion people – will bring companies, talent, data and government demand together. It is not unlikely that India may seek to guard its own digital market to grow indigenous digital giants as Europe and China have done. —

- 1 The term was first used in 2001 to describe “parallel Internets [that] run as distinct, private, autonomous universes.” Kumar, “Libertarian, or just bizarre?” *Wired*, 25 Apr 2001
- 2 “Brazil-Europe Internet cable to cost \$185 million,” *The BRICS Post*, 13 Feb 2014
- 3 “Rousseff backs EU-Brazil cable project,” *Deutsche Welle*, 24 Feb 2014
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- 6 “Chinese internet users to overtake English language users by 2015,” *The Telegraph*, 26 Sep 2012
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- 13 Oliver and Barker, “Europe antitrust chief not afraid of starting a fight,” *Financial Times*, 8 Mar 2015
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- 15 Fairless, “EU considers new telecom rules to level the playing field,” *Wall Street Journal*, 7 Apr 2015
- 16 “Playing leapfrog,” *The Economist*, 23 May 2015



The cult of “globalisation equals growth” is seeing an updated pushback, thankfully not in the form of wars. Surprising “revolutions” have happened in the space of a decade. For example, pivots in attitudes – enabled by novel social uses of technology – have fed bottom-up street movements against economic inequality in the West and Asia. With “netizen” activism apparently holding companies and governments in check, the high priests of technology-driven utopia have been quick to award credit to their companies’ messianic digital platforms.

But we have been here before.

Aviation technologists during the Cold War spoke of airplanes with atomic propulsion and routine supersonic travel. Technologies were pointing in one direction, and society was expected to follow into an inevitable future. Yet this wave of optimism vanished by the 1980s, and not because technologies failed, but due to unexpected pushback from society. As planes flew faster, they became more expensive to design and operate. Consumers didn’t want to pay for supersonic travel because... it wasn’t worth it. Aviation technologies as they stood were good enough. The noise pollution from sonic booms and threat to the ozone layer from aviation exhaust also contributed to societal pushback.

As software continues to eat the world, it is instructive to remember that technologies, like globalisation, have no pre-ordained mandate to disrupt and dominate. The “inevitable surprise” of societal pushback is taking shape, and foresight needs to look beyond a technology-driven utopia to catch it. —

CAN ALGORITHMS BE EVIL?

Pacific Social’s Tim Hwang works with social bots to alter the social landscape and user behaviour. These bots, essentially lines of code, are deployed on infrastructures of influence, e.g. Twitter and Facebook. For example, bots were active in promoting candidates at the 2012 Mexican presidential election, though these bots were, at the time, crude and easily detectable. Even so, these imaginary netizens are able to make public personalities and companies appear more popular than they really are, thereby influencing the social and political agenda. As social bots become more sophisticated, they may very well “infiltrate” social groups, shape decision-making, and wield influence with a greater chance of avoiding detection and controversy.

Source: Lee and Maniam, “Island Forum 2014: Advancements in robots and artificial intelligence,” *Robohub*, 6 Jan 2015.

RECONFIGURING THE INVISIBLE HAND

Under Pope Francis, issues like youth unemployment, income inequality, and climate change may become the moral issues of our time. There is a strong parallel to Pope John Paul II’s anti-communist stance in Central and Eastern Europe during the 1980s, credited as the spiritual inspiration behind communism’s downfall. Might Pope Francis’s criticism of capitalism’s failures gather popular momentum to demand that markets include social considerations as desired outcomes?

Source: Hoffman and White, “The Pope as messenger: Making climate change a moral issue,” *The Conversation*, 10 Apr 2015.



HIJACK BY THE ELDERLY

Today's elderly are different. Rich and well-educated elderly voters are exerting political pressure to shape legislation and policy. The better this "grey lobby" does, the worse it looks for the young. The growing schism between the old and young is most apparent in developed economies, where older people tend to fare better in fiscal wars. In the US, entitlements for the elderly have become a sacred cow, to the detriment of the young. For example, medical and Social Security benefits were mostly untouched in Obama's 2012 budget. Meanwhile, youth programmes, e.g. the Adolescent Family Life Program and Career Pathways Innovation Fund, were cut. With pensions left unreformed, the young will bear the brunt of the recession, as exemplified by high youth unemployment and poor job prospects in the West.

There is also mounting evidence that Western "gerontocracy" is contributing to persistent policy gridlock. For example, America's "grey lobby" frequently uses its influence to block attempts to limit the leverage of large financial institutions, and to maintain a favourable carried interest tax treatment. Politically, baby-boomers continue to find scapegoats to protect their own interests, e.g. the Tea Party in the US and the National Front in France blame immigrants for economic problems.

Sources: Marche, "The war against youth," *Esquire*, 26 Mar 2012, Luce, "Is the West clinically depressed?" *Financial Times*, 22 Dec 2014 and Maximino, "The influence of elites, interest groups and average voters on American politics," *Journalist's Resource*, 14 Nov 2014.

CAN ASIA RIDE OUT ITS "SILVER TSUNAMI"?

Asia will soon have to deal with its own "silver tsunami" as it ages rapidly. Japan leads Asia's aging curve, and shows how slowing workforce growth and declines in support ratios mean less savings and less economic growth. Is Asia coming to the end of a demographic golden age, and have the past few decades been "as good as it gets"?

Japan

Unhappy co-existence between the generations is rife in Japan. The young are upset about footing the elderly's social security bill at the expense of their financial security, while the elderly are criticising youth for being uncaring and ungrateful:

"Those who came of age amid the post-war ruins, with its grinding poverty... pride themselves on having rebuilt Japan; to which those too young to have known anything but the stagnant economy... might reply, 'For whose benefit? Certainly not for ours!'" [Y]oung adults today... [are] shut out of regular employment and feeling deprived of sufficient financial security to marry."

Source: Hoffman, "Generations square off in a battle for the ages," *The Japan Times*, 13 Dec 2014.

Hong Kong

The younger generation attributes rising housing prices and escalating cost of living to Hong Kong's close relationship with China. This relationship is perceived as benefiting (elderly) business elites, while struggling young adults try to make ends meet. The younger generation also believes this (elderly) elite group is blocking their attempts for universal suffrage, as seen in the contrasting responses from young and old to the Umbrella Movement.

Source: Chu and Law, "Hong Kong protests expose generational, economic divide," *Wall Street Journal*, 28 Sep 2014.

Taiwan

Many young Taiwanese feel gloomy about their economic future and are quick to blame this on Taiwan's closer relationship with China. Some believe that the youth-led Sunflower Movement had saved Taiwan from economic domination by China. Will these youth-led movements have holding power and lead to economic reform? Or are they more like the Tea Party and Occupy Wall Street movements, which arguably faded away without significant achievements?

Source: "Sunflower seeds," *The Economist*, 11 Apr 2015.

South Korea

Might the young choose to drop out? A survey of South Koreans in 2014 showed more than half wanted "de-growth" – the intentional contraction of what they saw as an "overly-inflated" economy. Support for "de-growth" among the young comes from the belief that the perpetual pursuit of economic growth is not necessary for society. This may be partly because youth feel structurally disadvantaged in the current growth-at-all-costs model.

Source: Park, "The rising appeal of a de-growth future," *World Economic Forum*.



In an ideal world, renewable energy would stand on its own as a reliable, competitively-priced alternative to fossil fuels.

But we don't live in an ideal world.

Renewable energy business models still depend on government subsidies in order to derive profit.

Energiewende takes a closer look at Germany, where deliberate policy measures to move towards climate-friendly energy supply have driven a renewables boom. The energy transformation is popular with voters, but has harmed Germany's industrial competitiveness and surprisingly not reduced CO₂ emissions. Popular sentiment tinged with green ideology has saddled Germany with a costly energy policy that will take time to unwind.

More businesses are accounting for carbon on their balance sheets. *Pricing the Environment*

highlights signals of MNCs incorporating shadow carbon prices into hurdle rates for project evaluation. This phenomenon is not restricted to emission-intensive sectors either, with companies like Google using shadow carbon prices to determine where to site data centres. Even as the world inches closer towards more formalised carbon markets, there is still much uncertainty for businesses. Larger MNCs can bank on their experience across multiple jurisdictions, but smaller businesses venturing into new markets are likely to need a leg up.

Even if renewables are cost-competitive without subsidies, they suffer from irregular supply.

However, affordable grid-scale energy storage solutions using batteries can smooth the peaks and valleys of irregular supply, allowing renewables to compete on cost. *Batteries Now Included* argues that this may materialise before 2025, with significant reductions in battery costs being made through bold investments like Tesla's Gigafactory.

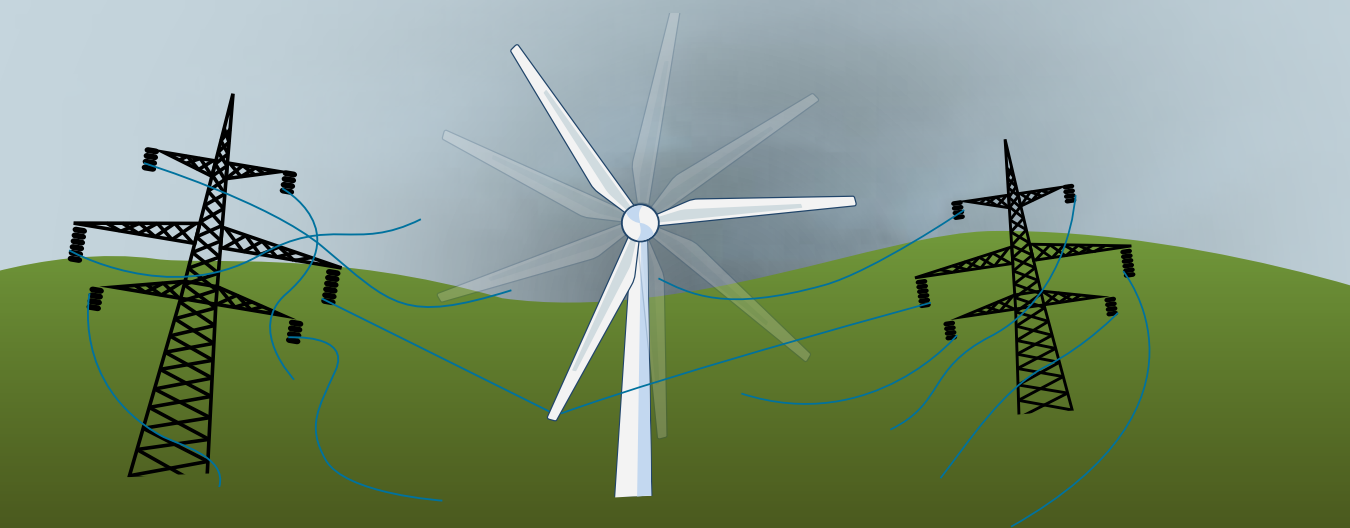
Utilities are not going anywhere anytime soon.

The excitement over "renewables plus storage" competing on cost has fed into a narrative of grid defections creating a utilities "death spiral". We think this narrative may be a bit extreme. *Utilities' Reinvention* highlights signals of utilities' responses to high penetrations of distributed generation in markets like Europe. For example, incumbents are actively investing in the Internet of Things to engage energy users to manage demand patterns.

Power to the People sheds a bit more light on other evolutions in utilities' business models. Europe is witnessing the emergence of peer-to-peer utilities that act as an "Uber for electricity" to connect distributed producers and consumers on a localised scale. Incumbent centralised and emergent decentralised utilities may challenge each other for dominance at some point, but that day is a bit further out for now.

Energiewende

Rahul Daswani



In an ideal world, renewable energy would stand on its own as a reliable, competitively-priced alternative to fossil fuels. But we don't live in an ideal world. Many renewable energy business models depend on government subsidies in order to derive profit,¹ riding on climate-friendly policies aimed at engineering big shifts towards green technologies to reduce carbon emissions.

Germany's climate-friendly policies, collectively known as *Energiewende* (energy transformation) are among the world's most ambitious, with a target of 60% electricity consumed from renewable sources by 2050.² In addition to this environmental goal, the German government also decided in 2011 to phase out nuclear power – a decision that garnered 85% parliamentary support across political parties.³ Coming so close after the Fukushima disaster, *Energiewende* garnered enthusiastic support for its promises of:

- Energy security – reducing dependence on Russian gas,
- Competitive energy prices, and
- Reducing greenhouse gas emissions (40% by 2020, 80-95% by 2050, relative to 1990).

Events have not worked out this way. The development of renewables capacity under *Energiewende* has pushed clean energy's share to nearly a quarter⁵ of Germany's power consumption, but at the same time has driven up electricity bills⁶ and hurt German industrial competitiveness without a reduction in CO₂ emissions. Energy supply security has not improved.

How did this happen? The sustainability of *Energiewende* was underpinned by three flawed assumptions:

- Global fossil fuel prices would continue to rise, making renewable energy competitive sooner rather than later,
- Developing an energy market would stimulate technological innovation, and
- An increased focus on renewable energy would reduce greenhouse gases, and increase security of energy supply.

Energiewende triggered a rush of small energy producers by offering price guarantees via feed-in tariffs and priority access to the grid. However, these subsidies cost German consumers €16 billion (US\$21 billion)

in 2013,⁷ and German industry paid about 2.5 times more for electricity than its US competitors in 2012.⁸ Despite EU pressure to limit subsidies, *Energiewende* policies did cap renewables charges for energy-intensive industries in an effort to shield them from the costs of switching to renewable energy. Even so, energy-intensive industries such as chemicals, petrochemicals, aluminium and steel increasingly found Germany less attractive as a production location, e.g. German chemical giant BASF expanded production facilities in the US, specifically citing the attraction of lower energy costs.⁹ The German Minister for Energy and the Environment warned of “dramatic de-industrialisation” and the need to “control the expansion of renewable energy... and reduce costs so that it remains affordable.”¹⁰

Germany's use of policy levers to make fossil fuels more expensive and increase adoption of renewables is a self-inflicted risk with a direct impact on its competitiveness. Industries that relocate out of Germany due to higher energy costs will tend to be long-cycle, capital-intensive industries that may not return easily. Furthermore, *Energiewende* did not account for global fossil fuel prices sliding dramatically due to a mixture of weakened demand and oversupply. Fossil fuel prices are likely to remain depressed for some years, and this will continue to undermine the incentive to switch to renewables.

German utilities have also been adversely affected. The low marginal cost of renewables has been driving down the marginal cost of power, affecting wholesale electricity prices, which fell from €80/MWh in 2008 to €38/MWh in 2013.¹¹ Furthermore, the wholesale prices promised to small producers of renewable energy are too low to incentivise new investments by utilities. This may signal deteriorating market functionality, where the market is unable to deliver new investments, and supply security is ironically not being achieved with renewables.¹²

Beyond destabilising the energy market and raising costs, the increase in renewables capacity has had other unintended consequences. Germany's decision to shift away from nuclear energy removed a major source of carbon-free electricity, and the capacity gap was filled with coal, resulting in a 2.4% increase in greenhouse gas

emissions from 2011 to 2013.¹³ The shift to coal has also left Germany relying heavily on neighbouring Sweden for its energy security. In October 2014, Germany's Vice-Chancellor warned of serious consequences for electricity supply and jobs if Vattenfall, Sweden's state-owned utility, abandoned plans to expand two coalmines in the northeast of Germany.¹⁴

As it stands today, Germany has rapidly developed renewables capacity, but failed to achieve its goals of competitively-priced energy and a reduction in CO₂ emissions. Popular sentiment tinged with green ideology has saddled the country with a costly energy policy that will take time to unwind.¹⁵ Supporters of *Energiewende* still believe that it will provide a foundation for Germany's future economic growth, positioning the country for a global low-carbon economy. Moving forward, there are plans to modify *Energiewende* – to retain rebates while moderating the growth of renewables, using natural gas as bridging fuel, and building a capacity market – so that Germany can secure a sustainable, albeit slower path towards a renewable energy future while maintaining the export competitiveness of its industry. –F

1 Feed-in tariffs (FITs) are the primary policy tool used by Japan and Germany to promote renewable energy in the electricity sector. FITs account for 87% of all solar and 64% of all wind capacity deployed globally. Ebinger et al, *Transforming the electricity portfolio: Lessons from Germany and Japan in deploying renewable energy* (Brookings: Sep 2014), p. 11

2 *Ibid.*, p. 7

3 *Ibid.*

4 *Ibid.*

5 *Ibid.*, p. 6

6 Slomka et al, “Energiewende 2.0 – don't risk competitiveness,” *Deutsche Bank Research*, 26 Nov 2013, p. 4

7 “Solar shambles,” *The Economist*, 29 Nov 2014

8 Slomka et al, “Energiewende 2.0 – don't risk competitiveness,” p. 3

9 BASF is allocating a quarter of its €20bn investment budget over five years to the US. Gapper, “Cheap energy is the new cheap labour,” *Financial Times*, 26 Nov 2014

10 Eddy, “German energy official sounds a warning,” *New York Times*, 21 Jan 2014

11 “How to lose half a trillion euros,” *The Economist*, 12 Oct 2013

12 Ebinger et al, *Transforming the electricity portfolio*, p. 23

13 *Ibid.*, p. 29

14 Clark et al, “German plea to Sweden over threat to coal mines,” *Financial Times*, 24 Nov 2014

15 “The costly muddle of German energy policy,” *Financial Times*, 6 Oct 2014

Pricing the Environment

Cheong Kai Jian

Natural capital refers to elements of nature that produce value for society.¹ Despite underpinning all forms of capital, natural capital is largely absent from corporate balance sheets and current business models. However, we see increasing signs of businesses moving towards accounting for carbon in relation to business strategy and performance.

At the same time, there is much uncertainty over how carbon pricing will be implemented globally. About 40 countries and 20 cities now use carbon pricing mechanisms or have plans to implement them (see Figure 1). There have been many twists and turns – Australia repealed its carbon tax in July 2014, while a China-USA carbon deal was struck in November 2014 – but it seems likely that more countries will move towards adopting carbon pricing.

Hundreds of MNCs already incorporate shadow² carbon prices for project evaluation which vary widely depending on the sector, e.g. from Google's US\$14 to ExxonMobil's US\$60-80.³ Despite the absence of global regulation for carbon emissions, the widespread use of carbon pricing as a corporate planning tool indicates a degree of mainstream acceptance, e.g. Google uses its shadow carbon price for data centre site analysis to better account for operation costs down the line.

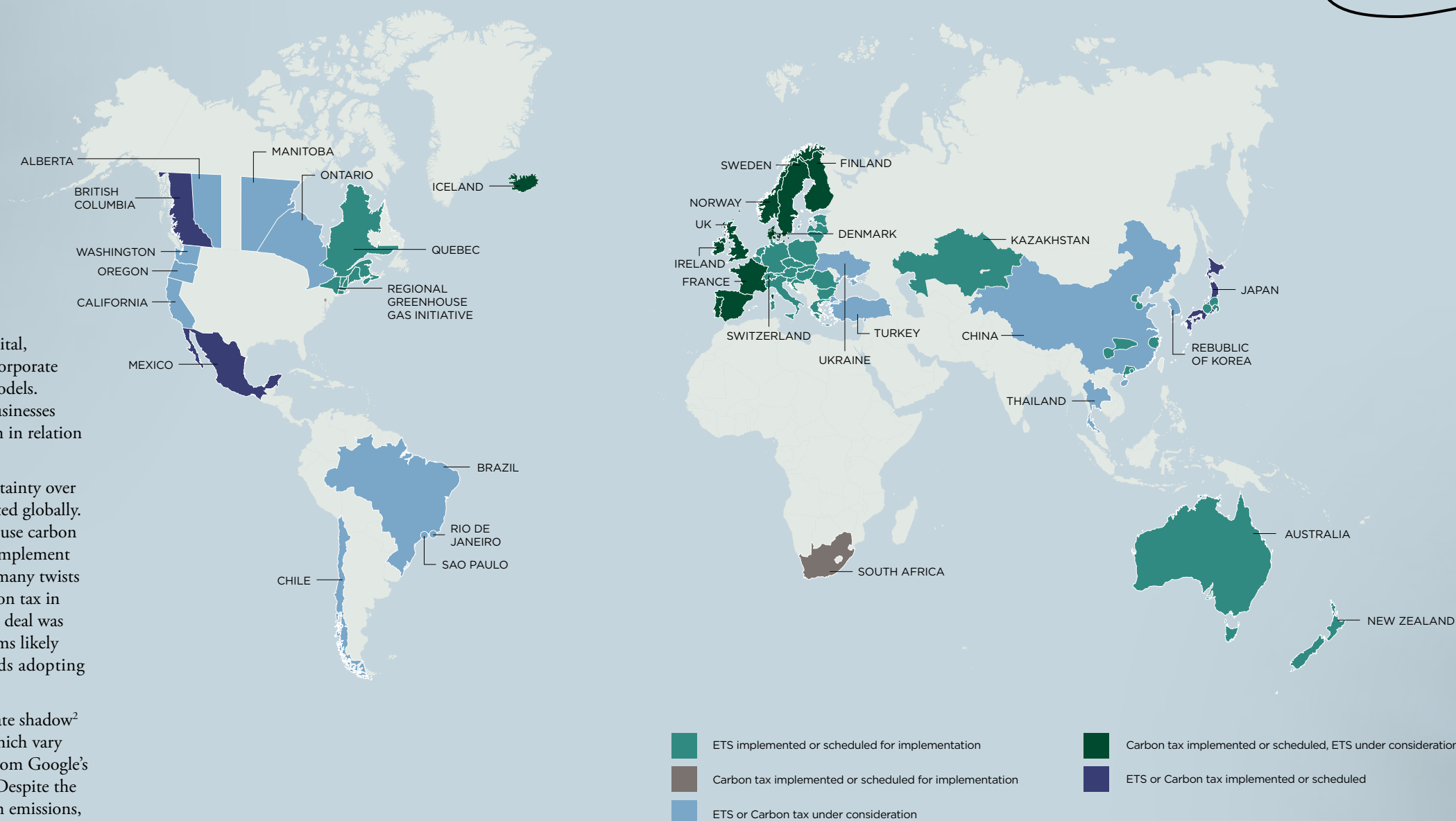


Figure 1 – Source: *State & Trends of Carbon Pricing* (World Bank: May 2014), p. 16. Note that Australia repealed its carbon tax in July 2014.



For a global market to emerge, there must be a widely accepted policy framework for carbon pricing in the near term. Current prospects hinge on agreement at COP21⁴ in Paris (December 2015). However, if COP21 does not yield any consensus, there is a risk that countries may seek to unilaterally impose environmental tariffs on imports, as in the case of the USA's Waxman-Markey Bill.⁵ Even if all goes well at COP21, it is difficult to gauge the timeframe for implementing a global agreement.

The road to implement a global carbon price is not straightforward either, and there is a need to temper expectations:

a. Australia's experience shows that, despite spending a decade's worth of political and economic capital to come up with a climate change framework,

it can be unwound quickly. There is a real risk that other countries may react similarly to future economic/political stresses and unwind their climate change agreements.

b. The EU Emissions Trading Scheme (ETS) also highlights the difficulty in using a carbon price to drive climate change mitigation. The concept behind the ETS is simple – a finite, declining pool of ETS allowances being allocated and surrendered as CO₂ gets emitted, aimed at driving decarbonisation. Implementation has, however, proven tricky.⁶ After ten years, CO₂ prices are still too low⁷ to foster investment in low emissions technology, leading to skepticism whether the ETS has actually helped the EU decarbonise.

Both unilateral environmental tariffs and an unstable global carbon market favour⁸ large companies that have extensive experience in preparing for and implementing carbon pricing across several jurisdictions. At the same time, smaller firms are at a disadvantage. How can SMEs prepare for either development? Unsurprisingly, carbon constraints do not appear on the list of SME concerns in the 2014 survey of Singapore's SMEs by DP Information Group. Does carbon increase internationalisation costs significantly for SMEs? If so, how would we prioritise geographical markets differently using carbon price enforcement? For example, would ASEAN look more attractive compared to China, as SMEs can tap on regional growth and have a longer time to adjust to environmental regulations?

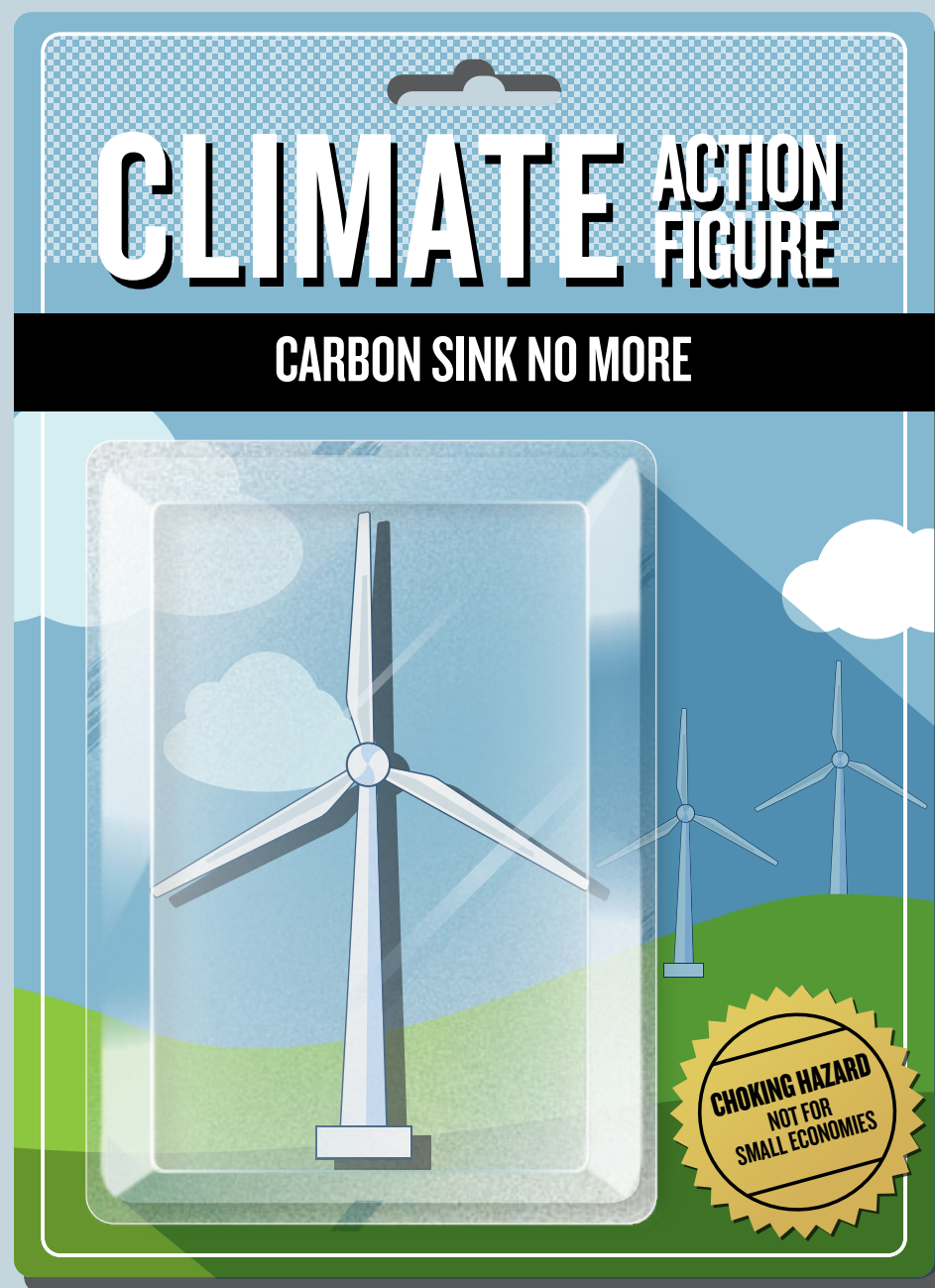
How might a global carbon price raise costs and affect national/sector competitiveness? Preliminary findings⁹ show that a global carbon price – through a combination of fuel subsidy removals and a lower proportional increase in Singapore's energy prices – may level the playing field with Singapore's competitors. However, this may be slightly optimistic, as countries have shown they can respond in creative ways to manage their net carbon emissions. Germany's Energiewende policy excludes some 1,600¹⁰ energy-intensive companies from levies related to renewables despite EU challenges that it amounts to state-sponsored support. Other countries, e.g. Malaysia, that possess abundant natural capital like forests can reduce deforestation instead of opting for a carbon price to meet their climate change obligations. This disadvantages countries such as Singapore which have less natural capital or price electricity fairly to reflect energy prices. Such countries will need to invest in energy-efficient technologies that are fairly capital intensive, and this is likely to drive up costs. In addition, Singapore does not have the option of switching to renewables on a large scale given its land constraints.

Looking ahead, is there appetite to price other forms of natural capital like NO_x, SO_x? Observing the length of time and uncertainty for carbon to enter mainstream discussion, we think the global appetite to price another environmental good depends on the success of implementing and managing a global carbon price in the next few years to come. –F

- 1 The elements of nature referred to include forests, rivers, land, minerals and oceans. Rapacioli et al, *Accounting for natural capital: The elephant in the boardroom* (Chartered Institute of Management Accountants: May 2014), p. 4
- 2 An internal or shadow carbon price is a mechanism used to manage future regulatory risk that parts of a company or a future project may be exposed to, e.g. an eventual cost incurred by the expected emissions of carbon dioxide which may threaten future viability. A shadow price allows investors to reconsider the project, change its scope, modify its design or simply accept the level of risk and proceed ahead. Hone, "Business and carbon pricing," *Shell*, 27 Feb 2015
- 3 Carbon Disclosure Project, "Global corporate use of carbon pricing: Disclosures to investors," Sep 2014, p. 10
- 4 Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC)
- 5 The final version of the Bill – which was passed in the House of Representatives, but defeated in the Senate – introduced trade provisions for imported goods. These provisions would have effectively extended the Bill's cap-and-trade scheme to designated imports, and importers would have needed to acquire allowances before the products could be sold in the US
- 6 Oversupply of ETS allowances has countered the desired impact on CO₂ prices. In response, the EU has postponed auctions to reduce the number of available allowances to increase CO₂ prices. Ebinger et al, *Transforming the electricity portfolio: Lessons from Germany and Japan in deploying renewable energy* (Brookings: Sep 2014), p. 29
- 7 The intent of the ETS was for a long-term carbon price signal in Europe to guide decarbonisation efforts. As carbon prices have fallen over time, however, the ETS has increasingly been viewed as a compliance formality. Hone, "Ten years of the EU ETS," *Shell*, 10 Jan 2015
- 8 Peace et al, "Preparing for carbon pricing – Case studies from company experience: Royal Dutch Shell, Rio Tinto, and Pacific Gas and Electric Company," *Partnership for Market Readiness/World Bank*, Jan 2015
- 9 From a PwC study commissioned by the National Climate Change Secretariat, 27 Jan 2014
- 10 Increasing numbers of companies have demanded to be exempted, rising from 59 in 2003 to over 2,000 in 2013. After the EU challenge, Germany reduced the number of exemptions to 1,600. "Tilting at windmills: Germany's Energiewende bodes ill for the country's European leadership," *The Economist*, 15 Jun 2013

Batteries Now Included

Jared Poon and Lawrence Wong



Renewables suffer from a fundamental problem – irregular supply. The sun does not always shine, and the wind does not always blow. Energy storage solutions¹ can smooth the peaks and valleys of irregular supply by storing energy when supply is high and demand is low, and releasing it when supply is low and demand is high. As more countries shift towards the adoption of renewables via decentralised generation, energy storage solutions using batteries are gaining traction as they are generally the most practical for small-scale renewable energy producers.² However, batteries cost an estimated US\$410/kWh,³ which means that decentralised renewables generation cannot compete with fossil fuels on cost.

Citigroup cited US\$230/kWh as the tipping point at which batteries would enable renewables to be cost-competitive relative to fossil fuels.⁴ While there are a range of views on when this tipping point may be achieved, many projections land between 2025 and 2030.⁵ There may be a chance, however, that the tipping point is reached as early as 2017.⁶ Electric vehicle (EV) manufacturer Tesla Motors (Tesla) has invested US\$5 billion in a battery production facility called the “Gigafactory” that is expected to generate a significant reduction in battery costs through economies of scale. The Gigafactory is slated to be operational in 2017, making batteries for an estimated 500,000 EVs by 2020.⁷

Tesla CEO Elon Musk has plans for the Gigafactory that extend far beyond EVs. The April 2015 announcement of the “Powerwall” – a battery system designed for powering homes using solar panels – highlights the ecosystem that Musk intends to create between Tesla’s batteries and the solar panel systems produced by SolarCity, where he is Chairman. The Powerwall is part of the new “Tesla Energy” product line, which also offers battery storage systems for businesses and utilities, signalling Musk’s intention to enter the grid energy storage sector. While Musk presents a compelling vision of Tesla at the centre of a world powered by solar energy, existing net metering regulations in the US make it economically disadvantageous for homes generating electricity from rooftop solar panels to store what is generated.⁸ Tesla will likely find a more conducive market for the Powerwall in countries where energy policies incentivise the storage of electricity, e.g. Germany.

Tesla is not the only company aiming to drive down battery costs, with startups like Alevo aiming to achieve the same goal via breakthroughs in battery capacity instead. This path is particularly challenging. Unlike the regular improvements in semiconductor performance that consumers have become used to, battery capacity has been slow to develop, with most improvements coming from reducing power consumption rather than better batteries. The use of organic electrolytes is one of the main reasons for batteries losing performance over time. Alevo’s breakthrough has been to use research into inorganic electrolytes to develop batteries that require no active cooling, and which have lifetimes that are much greater than most current batteries. Unlike other startups, however, Alevo will be able to go straight into mass production, having raised US\$1 billion in funding, and will manufacture their batteries at a facility in North Carolina in 2015.⁹

While battery costs look set to tumble in the coming years, there is less certainty over the “batteries plus renewables” combo edging out fossil fuel generation on cost. Nevertheless, batteries are now included in the possible options arising for energy storage solutions, and look poised for growth in a low-carbon future. —F

- 1 There is a range of energy storage solutions currently available – pumped water, compressed/liquefied air, molten salt, ice, flywheels, fuel cells. Their viability, however, does not depend on storage capacity alone – other factors include charge cycle life and crucially, the amount of energy invested to construct the storage solution.
- 2 Currently, Western Europe leads the world in adoption of decentralised generation. Navigant Research expects the annual installed capacity in the global distributed generation market to grow from 87.3 Gw in 2014 to 165.5 Gw in 2023
- 3 2014 industry-wide cost estimate. Source: Nykvist and Nilsson, “Rapidly falling costs of battery packs for electric vehicles,” *Nature Climate Change* 5 (2015), p. 329
- 4 Savvantidou et al, “Storage batteries: A third growth market,” *Investment themes in 2015* (Citigroup: 2015), p. 52.
- 5 Muenzel et al, “Affordable batteries for green energy are closer than we think,” *The Conversation*, 23 Jul 2014
- 6 Nykvist and Nilsson, “Rapidly falling costs of battery packs for electric vehicles,” p. 330
- 7 “Tesla Gigafactory,” *Tesla Motors*, n.d.
- 8 Freedman, “Tesla’s Powerwall is a step toward a clean energy economy — but isn’t a game changer,” *Mashable*, 2 May 2015
- 9 Ayre, “New battery startup, Alevo, has raised \$1 billion in private funding, looking to blow up US energy storage industry,” *Cleantechnica*, 7 Nov 2014

Utilities' Reimvention

Rebecca Lim

Incumbent electric utilities are coming up with new business models in the face of competition from renewables like solar.

One prevailing view is that a dramatic drop in the cost of electricity generated from renewables and a subsequent rapid uptake of distributed energy sources would be highly disruptive to incumbent utilities in the US and Europe. As more users switch to solar energy and batteries, utilities would need to raise electricity rates to cover costs, causing even more people to go off-grid – leading to a utility “death spiral.”

This has not happened. While solar power growth is strong, it has not made utilities redundant. Solar power is still not cost competitive without subsidies in most geographies, and solar power remains a very small proportion of overall global power generation. Energy demand will continue to be met by fossil fuels. Critically, without power storage to smooth out supply, solar power output differs substantially from customers’ power demand profile, meaning that energy users would still need to be dependent on the grid for a portion of their power.¹ Utilities aren’t outdated yet.

Utilities are taking advantage of the profusion of cheap sensors and emerging home operating systems to alter end-user consumption patterns by paying energy users to turn the power off during peak demand, e.g. users in Austin, Texas earn rebates on NEST, an internet-enabled thermostat, when they conserve energy usage.²

Utilities are also making the grid more agile to accommodate diverse energy sources, and increasingly act as a coordinator and supporter of numerous localised networks of distributed generation. This is in anticipation of technologies that enable peer-to-peer energy sharing, e.g. Boston-based Gridco has invented power routers that allow utilities to harness energy from any source and distribute it.³ This allows “prosumers” to sell electricity directly to other businesses or residents using the utilities’ infrastructure for distribution.

Utilities may transit to a mix of centralised and peer-to-peer business models to stay ahead of the game. Looking ahead, significantly cheaper power storage costs may be achievable by the end of this decade (e.g. Tesla’s Gigafactory breakthroughs), and are most likely to disrupt dependence on the centralised model of utilities. This may be the “tipping point” that motivates a complete shift off-grid. Until then, any pronouncements of a utilities “death spiral” are highly premature. —F

1 Morgan Stanley, “Solar power and energy storage: Policy factors vs. improving economics,” *Blue Paper*, Jul 2014

2 “New business models,” *The Economist*, 17 Jan 2015

3 Taneja, “Unscaling the trillion-dollar power industry,” *TechCrunch*, 21 Aug 2014

Power to the People

Sarah Tan

Peer-to-peer (P2P) electricity solutions may bring about a new electric system that is cheaper and more resilient than centralised utilities.¹ However, a P2P electricity solution is still held back by several factors: the lack of (a) distributed energy resources (not everyone owns their own small-scale power plant!), (b) a shared grid to handle intermittent energy sources, and (c) a trusted third-party platform to process transactions between consumers and producers.² In short, it is unlikely we will go completely “off the grid” anytime soon.

Despite these constraints, our scans show weak signals where all three conditions are met – e.g. Netherlands-based startup Vandebron, a third-party service provider that allows consumers to buy electricity directly from local farmers with excess electricity production and manages the shared grid.³ Vandebron does not profit off the electricity sold but charges its users a flat subscription rate of US\$12. Initiatives like Vandebron are still small-scale projects at the community-level – currently there are only 12 producers on site that can produce electricity for 20,000 households.⁴ We need to continue to observe whether P2P electricity systems can scale up.

Until then, centralised utilities will still be needed as a significant technical and financial outlay is required to store and transport decentralised power across great distances.⁵ —F

1 Taneja, “Unscaling the trillion-dollar power industry,” *TechCrunch*, 21 Aug 2014

2 Briggs, “Does energy have a place in the sharing economy?” *The Energy Collective*, 17 Sep 2014

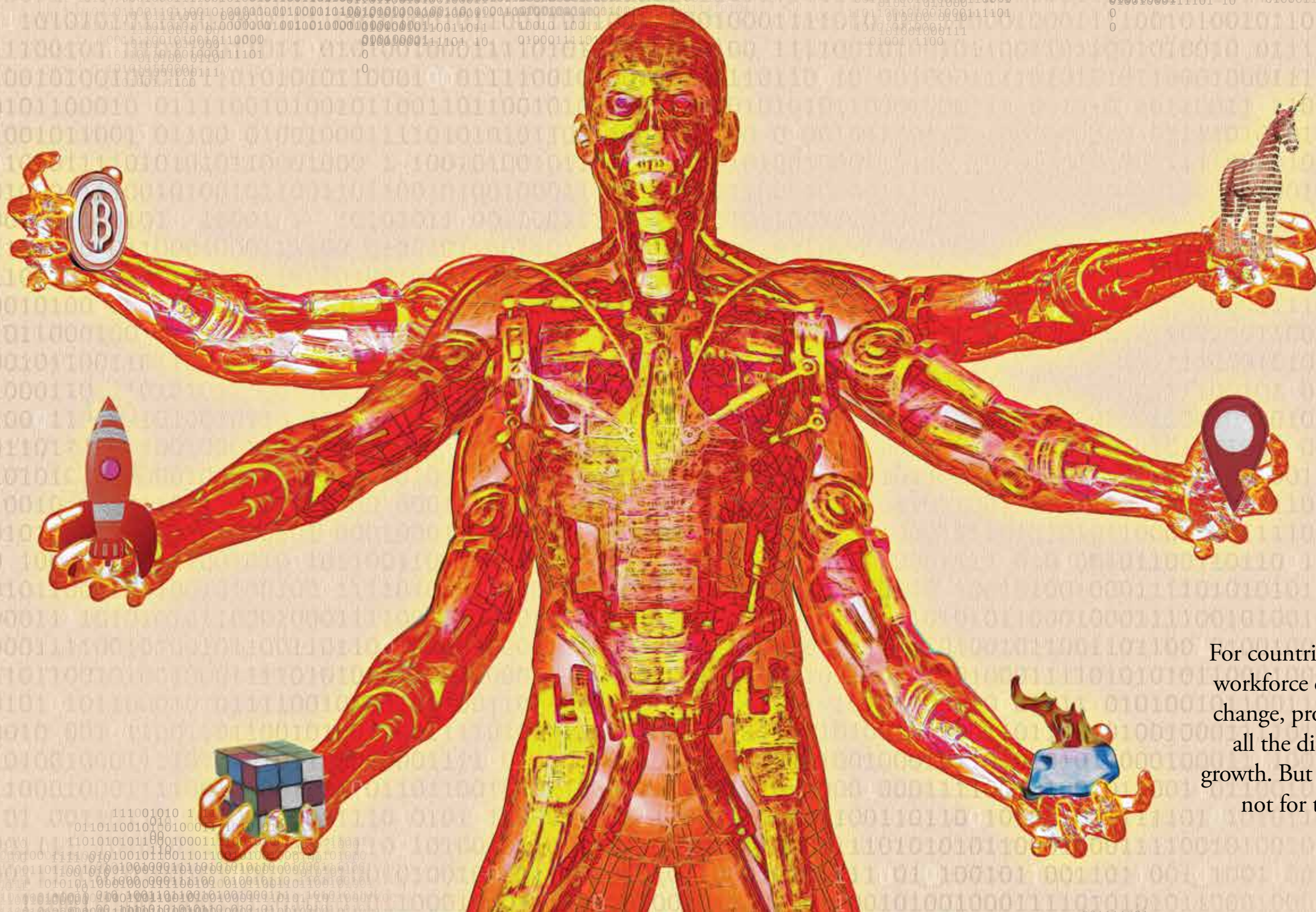
3 Crosby, “An Airbnb or Uber for the electricity grid?” *RMI Outlet*, 2 Sep 2014

4 Schiller, “The sharing economy takes on electricity, so you can buy your power from neighbors,” *Fast Company*, 30 Sep 2014

5 van Sprang, “Collaborative pioneer interview with Aart van Veller, founder of Vandebron,” *Collaborative Consumption*, 12 Nov 2014

PUSHING OUT TO

THE FRONTIER



For countries facing a shrinking workforce due to demographic change, productivity will make all the difference for future growth. But raising productivity is not for the faint of heart.

The woes of developed economies may impose limits on struggling emerging economies. They may be forced to move from extensive to intensive growth sources (e.g. from FDI to R&D) much earlier than countries like Japan and South Korea. At the same time, there will be new constraints and costs to mitigate, from carbon to cybersecurity. Nevertheless, we see signals of countries committed to finding novel ways to push out their economies to the productivity frontier.

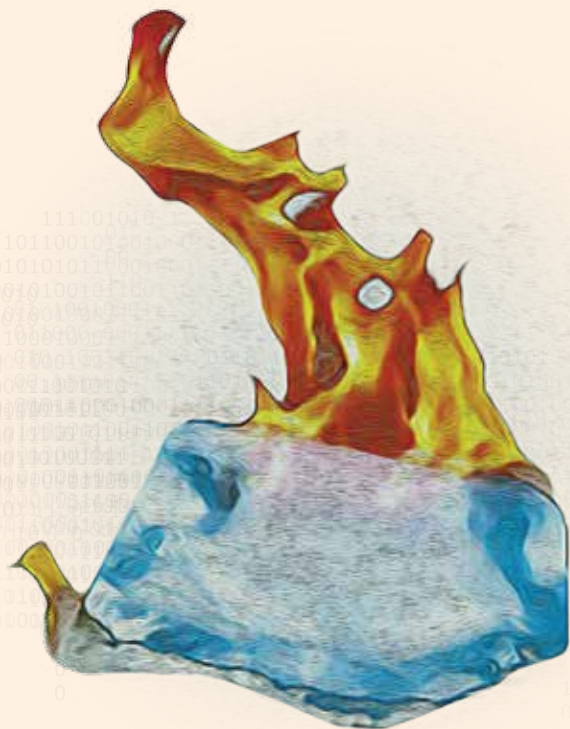
Energy security is a critical hurdle to clear. *Japan's Song of Ice and Fire* highlights how the country's aggressive pursuit of methane hydrate might reduce a costly reliance on natural gas imports. However, cheaper energy alone is not enough – in the previous edition of *Future Tense*, we highlighted the myth of developed economies overcoming sluggish demand with cheaper energy. The USA is a case in point – the shale gas revolution was expected to spur re-shoring of manufacturing. However, *USA Re-shoring: False Dawn?* argues that, despite high profile announcements, firms (and jobs) are not returning. Lower energy costs have been unable to make up for weak regional industrial ecosystems.

Technology breakthroughs are opening up new ways to catch up with the labour productivity frontier. Previous editions of *Future Tense* covered advances like robotics on the factory floor, AI in the service sector and autonomous vehicles. The companies championing these technological breakthroughs have ended up playing outsized, quasi-national roles in promoting new business models. *The Next Space Race* shows companies breaking into a sector previously dominated by national agencies, pushing down costs and opening up new niches for value-added services. Similarly, *Sharing as Economic Policy* looks at how the sharing economy has altered dynamics in sectors where underutilised capacity has been connected to existing demand. Going beyond individual sectors, *Software is Eating the World, and it's Still Hungry* aims to sketch out a more nuanced picture for where digitisation is headed.

Amidst these changes, technological unemployment remains a concern. The emerging consensus, however, is that automation helps to keep good human jobs via human-robot augmentation, while the AI that will replace humans is decades away. The balance of power is also shifting – from digital conglomerates as the age of social media wanes, to new giants powered by the rise of intelligent devices. Smaller countries hard-pressed to produce indigenous champions can now, with appropriate industrial ecosystems, compete for a fair share in the rise of intelligent devices.

JAPAN'S SONG OF ICE AND FIRE

Tan Chor Hiang



Methane hydrate (also called gas hydrate) is a naturally occurring ice-like solid containing methane gas that can be extracted as fuel. Many nations have on-going research interests in methane hydrate, with Japan leading the way.¹ Commercial extraction, however, is still in early stages due to relatively high costs. For example, Japan's Research Consortium for Methane Hydrate Resources (MH21) estimates cost of production to be US\$17.50 – US\$66 per million BTU,² higher than the US\$14.62 per million BTU for Japan's LNG imports³ (Aug 2014 figures). However, the combination of political will and heavy investment in methane hydrate extraction technology may lead to a cost breakthrough for Japan within the decade. Methane hydrates could play a transformative role in North-East Asian geopolitics and the Japanese economy, with some parallels to the North American shale gas revolution.

Nuclear power used to make up more than 30% of Japan's energy mix – this has fallen and imported LNG and oil have been increasing their share post-Fukushima (Figure 1).⁴ However, Japan still faces a power crunch⁵ which may impede industrial growth and PM Abe's goal to revive the economy.⁶ Industrial capacity has shrunk by 5% since the Fukushima accident caused a shortfall in electricity. The uncertainty about future electricity capacity led manufacturers to build capacity offshore instead.⁷ Japan's Ministry of Economy, Trade and Industry is seeking to overcome the country's high dependency on overseas energy sources by developing domestic energy resources to raise its self-sufficiency ratio.⁸ In addition to developing methane hydrate, Japan has also restarted nuclear reactors despite strong opposition from the public.⁹

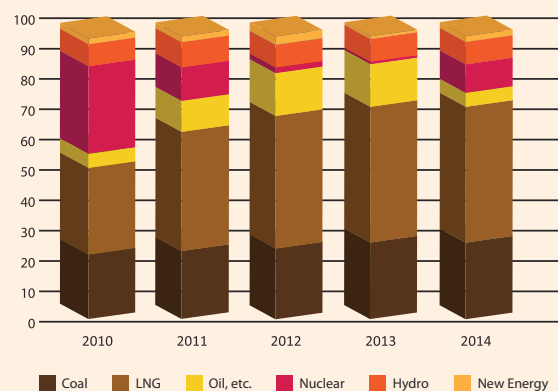


Figure 1: Japan's dependence on fossil fuels has risen significantly post Fukushima

Source: Kilisek, "Energy 'policy costs' impact Japan's international competitiveness," *Breaking Energy*, 10 Mar 2014
Adapted from: Institute of Energy Economics of Japan (IEEJ)

There is an abundance of methane hydrate within Japan's geographical boundaries. This is matched with political will and investments to extract methane hydrates for energy security. Japan Oil, Gas and Metals National Corporation (JOGMEC) estimates 1.1 trillion m³ of methane hydrate trapped beneath

the eastern Nankai Trough – enough to offset a decade of LNG imports.¹¹ JOGMEC has managed to successfully extract methane gas offshore in 2013,¹² with commercial extraction planned for 2018.¹³

Future advancements in technology may lead to a fall in cost¹⁴ of extracting methane hydrate – production costs may either be marginally higher or significantly lower than conventional sources like LNG. Either way, Japan is likely to accept higher prices in return for energy security.¹⁵ However, higher energy prices will have knock-on effects for manufacturing competitiveness and will hinder PM Abe's plans for economic revival. If production costs are significantly lower than conventional sources like LNG, there could be a parallel to the US shale gas revolution. Energy independence due to unconventional energy sources could result in Japan going from an energy importer to energy exporter – this is likely a game-changer and should be monitored.

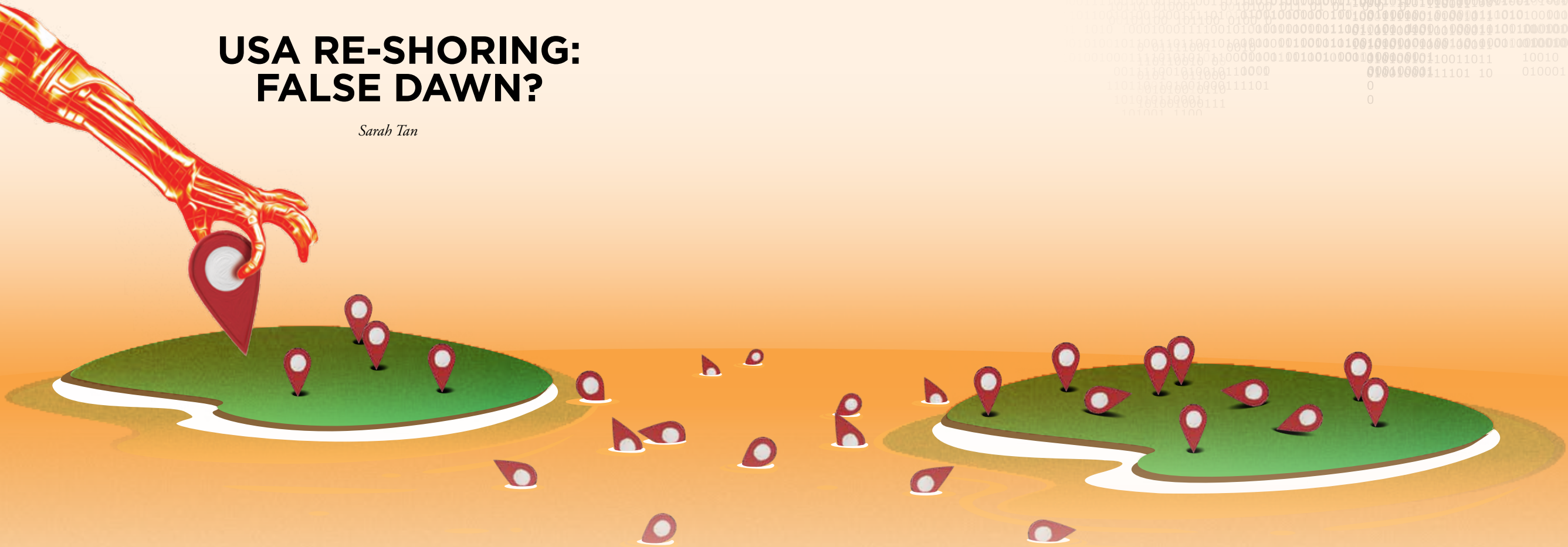
Japan is not alone in the search for energy security. Energy-poor South Korea and China are also exploring methane hydrates. South Korea is leading a research survey into the Beaufort Sea to search for methane hydrate, supported by Canada and the US.¹⁶ China's Ministry of Land and Resources estimates that commercial production of methane hydrate in the Pearl River Delta could commence by 2030.¹⁷ As the extraction potential of methane hydrate increases and extraction costs decrease, we may see more territorial disputes. Tensions between Japan and South Korea have already been increasing¹⁸ due to disputes over the Liancourt Rocks – known to contain 600 million tonnes of methane hydrate – setting back US efforts to repair ties with its two key Asian allies. The East China Sea, where Japan has on-going territorial disputes with China, is also known to have copious amounts of methane hydrate.

Who would have expected so much heat from Japan's quest to unlock fire from ice? –F

- 1 Aside from NE Asia, the USA and Canada have started research programmes into methane hydrate extraction, but they have little incentive to develop it as aggressively as Japan due to the shale gas revolution. India launched its Natural Gas Hydrate Program in 2001, but it is still largely in the exploration and research stage. Source: "Developing nations join R&D race for gas hydrates," *SciDevNet*, 21 Jan 2014
- 2 BTU refers to British Thermal Units, a standard measurement unit for energy
- 3 "Japan breakthrough raises red flags," *World Gas Intelligence*, 3 Apr 2013
- 4 "Nuclear power in Japan," *World Nuclear Association*, 20 Jun 2014
- 5 Adelman, "Nuclear-free Japan faces summer power crunch in heartland," *Bloomberg*, 30 May 2014
- 6 High cost of energy imports have pushed up prices, causing year-on-year income of workers to fall by 3%. Source: "Worrying economic signs," *The Japan Times*, 15 Aug 2014
- 7 There has been zero growth in manufacturing capital stock since 2012. Source: Katz, "Is electricity shortfall deindustrializing Japan?" *The Oriental Economist*, 21 Apr 2014
- 8 Other priorities include reinforcement of relations with resource-supplying nations, reinforcement of the current procurement environment, and improvement of terms of resource procurement. Source: "Strategic Energy Plan," Ministry of Economy, Trade and Industry, Japan, 11 Apr 2014
- 9 Richards, "Abe, energy sector keep restart on track," *The Diplomat*, 19 Jun 2014
- 10 Japan has spent roughly US\$1 billion since the 2000s to explore offshore methane hydrates. Source: "The Japanese energy transition," *World Economic Forum*, Dec 2013
- 11 "Japan breakthrough raises red flags," *World Gas Intelligence*, 3 Apr 2013
- 12 Kumagai, "Japan pushes for methane hydrate production," *Platts Oilgram News*, 31 Dec 2013
- 13 Cresswell, "Japan sets stage for long-term methane hydrates trial," *The Press and Journal*, 7 Jul 2014
- 14 JOGMEC is optimistic that the cost of methane hydrate extraction will fall with advancement in technology. Blackman, "Methane hydrates: A new gas boom?" 9 May 2013
- 15 Japan hopes to improve self-sufficiency by developing and introducing indigenous energies like methane hydrates to minimise the impact of changes in overseas circumstances, as part of its aim to create a resilient energy structure. "Strategic Energy Plan," Ministry of Economy, Trade and Industry, Japan, 11 Apr 2014
- 16 Bennett, "South Korean icebreaker leads expedition to Canada's Beaufort Sea for methane hydrates," *Foreign Policy Association*, 30 Sep 2013
- 17 Boyd, "China reports large methane hydrates deposits in Pearl River Basin," *IHS Global Insight Daily Analysis*, 18 Dec 2013
- 18 Jun, "South Korea denounces Japan's renewed claim on disputed Liancourt Rocks," *The Wall Street Journal*, 4 Apr 2014

USA RE-SHORING: FALSE DAWN?

Sarah Tan



Re-shoring is not what it is cracked up to be.

According to AT Kearney's Re-shoring Index,¹ the impact of the re-shoring wave has been overhyped.² With data collected from re-shoring cases over the past five years – where a positive index value means net re-shoring and negative value means net off-shoring – the Re-shoring Index turned positive only once in 2011.³ While there have been announcements of re-shoring from high profile companies (e.g. Apple), this has not meant that companies⁴ actually closed off-shore production – they merely added domestic capacity while continuing to off-shore.⁵ So, despite the re-shoring hype, why aren't firms (and jobs) returning to the US?

One reason is that different industries have different "tipping points" before deciding to bring operations back. Electronics firms – often tipped as most likely

to bring operations back to the US – have not actually re-shored. Electronics manufacturers have gone out rather than come in. In fact, the Re-shoring Index for Electronics (2004-2014) has never been positive and is, in fact, significantly lower than the overall Re-shoring Index.⁶ Electronics manufacturers have chosen to off-shore because import costs have risen faster than expected and the amount of imports far exceeds the amount of exports.⁷ By contrast, the apparel sector is an unexpected re-shorer, with firms moving back in order meet fast-changing fashion trends and consumer demand.

Another reason is that the US economy is generally unprepared for firms looking to re-shore. Since the 1980s, the exodus of various types of US manufacturing has thinned out regional industrial ecosystems.⁸ With the loss of foundational

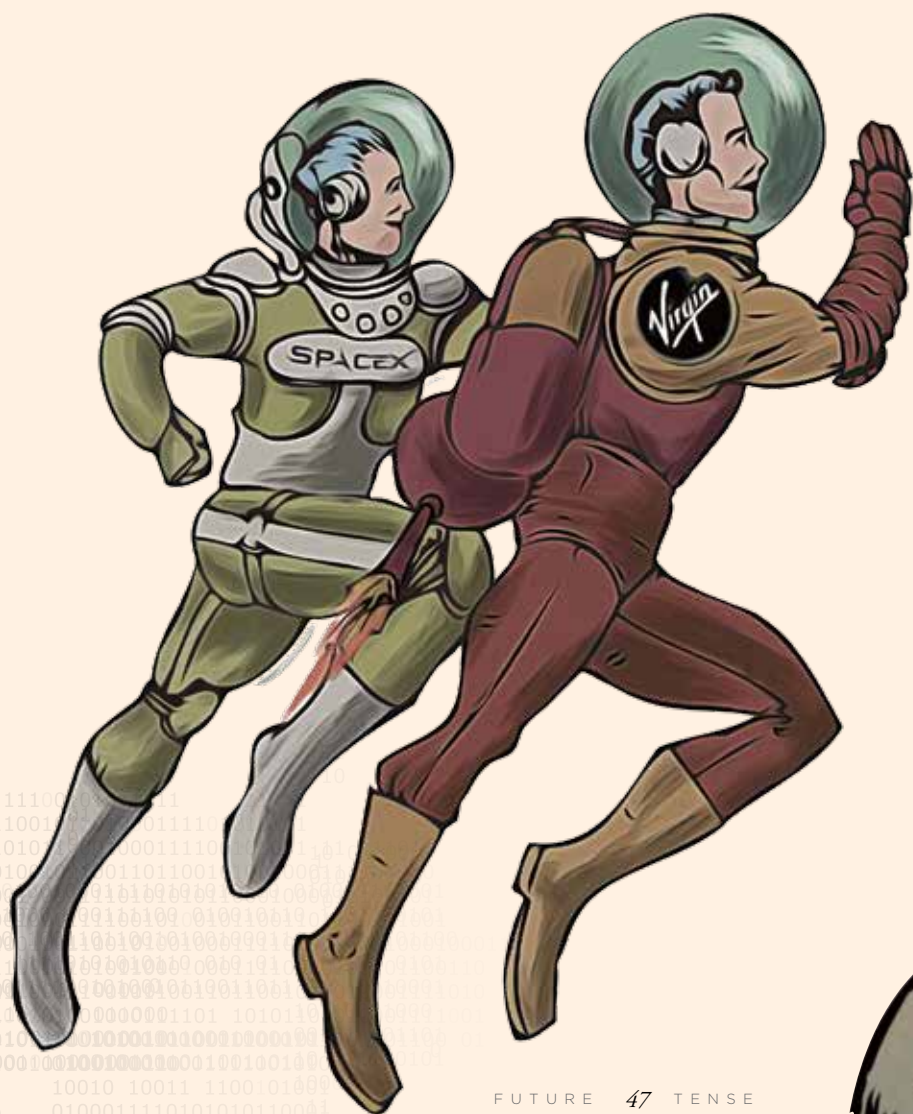
manufacturing assets (e.g. people with the right skill-sets, supplier availability), lower energy and labour costs alone cannot convince firms to move operations back to the US. Fewer US metropolitan areas contain these clustered competencies – a reduction from 59 in the 1980s to 23 in 2013.⁹ Such clustered competencies are especially crucial for firms in advanced industries such as aerospace and automotive manufacturing.

If the US is serious about bringing manufacturing home, it has to work harder to re-establish its network of regional industrial ecosystems. —F

- 1 The Re-shoring Index tracks the year-over-year spread in the Manufacturing Import Ratio (MIR), which is measured by the total manufactured goods imports as a percentage of domestic manufacturing gross output.
- 2 AT Kearney, "The truth about re-shoring: Not what it's cracked up to be!" Dec 2014
- 3 *Ibid.*
- 4 Rice and Stefanelli, "Re-shoring: New day, false dawn, or something else?" *Industry Week*, 19 Sep 2014
- 5 *Ibid.*
- 6 AT Kearney, "The truth about re-shoring"
- 7 *Ibid.*
- 8 Muro and Kulkarni, "Re-shoring: Why it's not easy," *Brookings*, 3 Oct 2014
- 9 Rice and Stefanelli, "Re-shoring"

THE NEXT SPACE RACE

Chiu Chai Hao



The space industry is no longer a state-dominated big-boy's club. National space agencies are now joined by privately-funded corporations that both collaborate and compete with them, sparking a new space race across three frontiers: space tourism, microgravity biomedicine and manufacturing, and low-earth orbit (LEO) satellite technology/applications. While space tourism attracts more news headlines, the current cost of space travel restricts it to a luxury good catering to the super-wealthy.¹ Microgravity biomedicine and orbital manufacturing remain² for now as innovative research which may yield promising applications in the medium term. It is in the third frontier – LEO satellite technology/applications – where significant breakthroughs are emerging, driving the development of related services.

Private space players have emerged at a time marked by deep budget cuts at NASA and the end of the Space Shuttle program in 2010. Following the Obama administration's call³ for increased partnership and reliance on private aerospace companies, players like SpaceX, Blue Origin and Virgin Galactic have contracted with NASA to provide resupply missions to the International Space Station, and with DARPA to build space planes.⁴

These private space players are changing the business model of the space launch industry from cost-plus to a more cost-effective and efficient model. For example, SpaceX launches satellites at US\$1,864 per pound⁵ into LEO with reusable launch systems (which form a large component of launch costs), making the most credible challenge to go below the US\$1,000 per pound price floor. Industry experts believe that below this price barrier, a significant amount of demand for satellite launches will be unlocked.⁶ SpaceX's cost-competitiveness is also renewing competition in the space launch industry, triggering downward pressure on launch prices.⁷ In the satellite manufacturing sector, improved computing power has reduced the launch weight of satellites. Both developments are expected to exert downward pressure on launch prices for the next ten years.⁸

Apart from established space powers like the United States and Russia, there is considerable national interest in space from non-space powers. 58 countries⁹ have invested at least US\$10 million in space applications and technologies in 2013, up from 37 in 2003, and 22 more countries have plans underway. While Government-to-Government collaboration remains the predominant method for non-space powers to gain access to space via established space powers like the United States, the emerging private space industry means lower costs and more access without depending on geopolitical relationships. For example, some governments have switched to SpaceX for cheap, reliable launches.¹⁰ SpaceX's launch manifest includes 37 missions up to 2018, and the list is growing, with a diverse client base ranging from Japan, Turkmenistan to Iridium and Inmarsat.¹¹



Figure 1: Future applications of satellite services

Some ambitious companies have their own private space programmes. Google, for instance, has acquired Skybox Imaging and its 180 high capacity mapping satellites¹² to augment its portfolio of mapping apps like Waze. This has direct benefits to existing ventures like Google Maps, drones and autonomous vehicles. With the 180 satellites, Google also wants to connect “the other 3 billion” and spread its reach to unwired regions of the Earth.¹³ In the foreseeable future, Google may deploy its constellation of satellites to provide faster wireless connections and establish itself as a competitive challenger to telecom incumbents.¹⁴ Another digital conglomerate, Facebook, is also developing its space and drone programmes for the same purposes under its “Connectivity Lab” project.¹⁵ As the number of Google and Facebook

users increase, the network effect created further increases the value of their own satellite services (see Figure 1).

In contrast to the first space race, which was between countries, the new space race will be between space infrastructure providers and digital conglomerates. This space race is starting out with cheaper hardware (satellites) to enable more users – countries, firms and ultimately individuals – to access space. We have already observed weak signals for the next lap of the race – data – from military-grade satellite imagery due to be made available to the public. DigitalGlobe has been authorised by the US government to sell images at a resolution as detailed as 25 cm to the public from February 2015.¹⁶ DigitalGlobe’s WorldViewer3, launched in August 2014, can

identify the location of carplates, minerals and even tree species with specific latitudes and longitudes. Affordable and publicly accessible high resolution satellite images¹⁷ could fuel powerful applications like monitoring farmlands, urban traffic and capital assets like oil rigs. Satellites are also able to circumvent security concerns of drones in performing these tasks, and this could allow it to gain traction faster than drones – where regulations are currently an obstacle to mainstream adoption. Digital conglomerates like Google may also use the wealth of satellite data for more sophisticated services like risk modelling for insurance premiums.

What might these developments mean for Singapore? Singapore is currently part of the global supply chain for space-qualified components in the satellite manufacturing industry.¹⁸ There is regional competition in the satellite manufacturing industry as our neighbours have similar ambitions. The other two sectors of the space industry – launches and ground equipment – are land-intensive and make up

a small part of the space industry by value. Services, by contrast, make up 61% of current global space industry value¹⁹ (Figure 2). As noted earlier, the revenue for satellite-manufacturing is projected to decrease despite growing demand due to falling manufacturing costs.²⁰ We may see future growth emerge from data analytics and adjacent sectors as the space race moves into the next lap.

There are obstacles – security/surveillance pushback and space junk – that could impede the industry’s growth. Publicly available high-resolution images may trigger future privacy concerns and a civilian pushback over non-permissive data collection – similar to the public outcry brought about by Edward Snowden’s revelations. These images may also spark security concerns. While they allow governments to monitor geopolitical events with improved accuracy (such as the mobilisation of Russian troops on the Ukrainian border), they also allow terrorists to orchestrate more precise attacks. Governments also need to reconsider the new “balance of power”, now

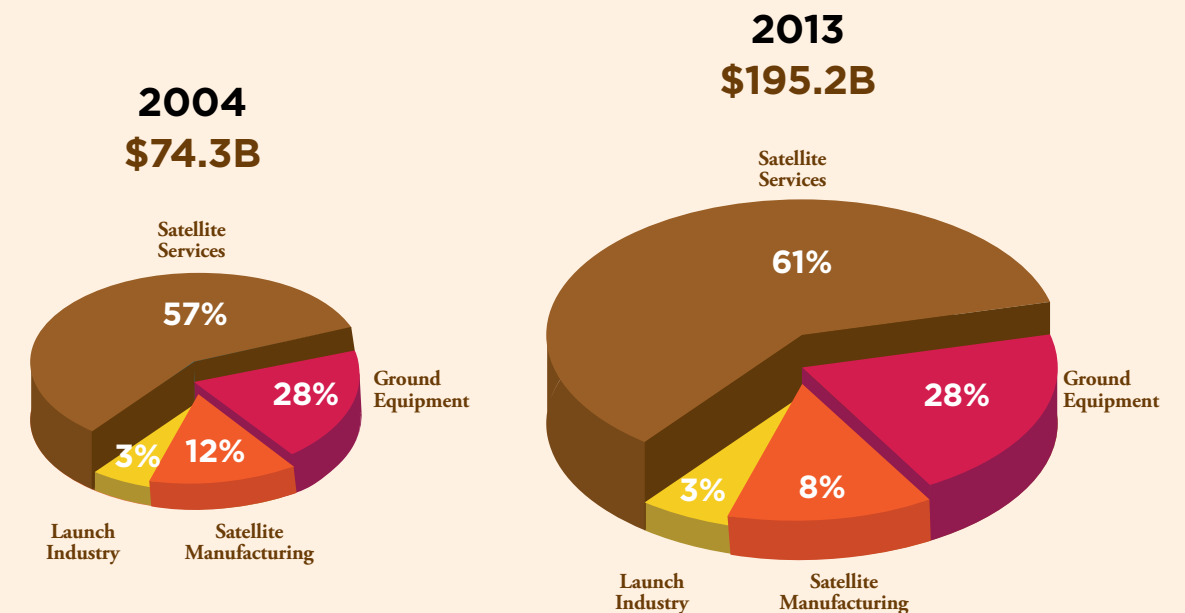
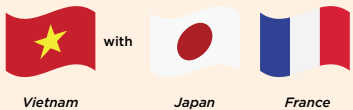


Figure 2: Global space industry, sector-by-sector contributions (2004 vs 2013) Source: Satellite Industry Association

SPACE PLANS IN SOUTHEAST ASIA



Vietnam spent US\$93 million in 2012 and US\$34 million in 2013. Besides 3.9 billion Yen in assistance from Japan, it also receives cooperation and funding from France. Vietnam has plans to become a centre for satellite manufacturing, and intends to build a space centre for earth observation by 2020 with help from Japan.



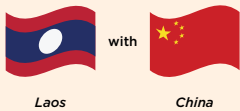
Thailand spent US\$20 million per year in 2012 and 2013. Thailand's space program has been largely independent, with some technical transfer from NASA. It has plans to be a satellite exporter with a focus on earth observation, and has a comprehensive youth development programme to create interest among students.



Malaysia spent US\$18 million in 2012. Sent first astronaut to space with the help of Russia in 2007. Plans to develop and export her own satellites with help from South Korea, but its first co-built satellite failed.



Indonesia spent US\$38 million in 2012, US\$43 million in 2013. Developed sounding rockets for experiments and is working on microsattelites and small space launchers. Indonesia also has plans to build a spaceport with Russia. Discussions have been ongoing since 2006, but to no conclusion.



Laos spent US\$87 million in 2012 and US\$20 million in 2013. China plans to build a Dong Fang Hong satellite and a satellite control centre for Laos.



Cambodia currently relies on Singapore, Vietnam and Thailand for its satellite-based telecommunications. However, that may change as the Royal Group of Companies is currently negotiating the purchase of a telecommunications satellite from China Aerospace Science and Technology Corporation.

Expenditure refers to expenditure on civil space programs. 2012 figures from SciDev.Net and 2013 figures from The Economist; both primarily sourced from Euroconsult. (Infographic from various sources³)

that they do not have exclusive access to military-grade images and are increasingly reliant on partnership with private firms. Governments may regulate the access to such images, or make firms regulate themselves, but excessive restrictions on satellite imaging technology could impede the growing analytics sector.

The other obstacle is space junk. While satellite traffic in the LEO increases, companies today do not consider space junk as much of a concern. The regulation of space traffic today is limited to the goodwill and strategic interests of the major national space agencies via an inter-agency coordination centre. Space junk is a tragedy of the commons – there is a lack of economic incentives for governments or firms to clean up existing space debris, or programme their satellites to re-enter Earth's atmosphere and burn-up after service. The Kessler effect could render the launch of future satellites unfeasible – where the density of debris is so high that collisions between objects could cause a runaway cascade of collisions. Japan has dedicated military resources to monitor space junk with the US by 2019, indicating the gravity of the issue.²¹ Nonetheless, potential research and new sectors could arise from clearing up of space debris. In fact, a Singaporean start-up is already looking at this.²² Harpoons, grapplers, and nets have been suggested as possible mechanisms, but none have yet been proven effective in catching objects orbiting at thousands of kilometres per hour.

Amidst all the excitement, the space industry remains an inherently risky business. –F

4 "Space: the next startup frontier," *The Economist*, 7 Jun 2014

5 Wang, "Upgraded SpaceX Falcon 9.1.1 will launch 25% more than old Falcon 9 and bring price down to US\$4109 per kilogram to LEO," *NextBigFuture*, 22 Mar 2013. SpaceX does not disclose its launch charges online

6 Rosenberg, "The coming revolution in orbit," *Foreign Policy*, 12 Mar 2014

7 Arianespace, a launch giant backed by the European Space Agency, has started cutting its launch prices, and Boeing is joining forces with Safran to retain its foothold in the business and to "safeguard Europe's autonomous and reliable access to space." Sources: Raghuvanshi, "Arianespace cuts launch prices as upstart gains," *Wall Street Journal*, 2 Jul 2014 and Cowing, "ESA Aerospace teams up to take on SpaceX," *NASA Watch*, 17 Jun 2014

8 "Satellites to be built & launched by 2022, World Market Survey," *Euroconsult*, 8 Nov 2013

9 Keith, "Emerging space programs spark earth observation growth," *Earth Imaging Journal*, 20 Jun 2014

10 SpaceX has sent all its satellites into space for its 16 missions so far – the only blemish being sending an Orbcomm satellite into an abnormally low-orbit due to limitations set by NASA, the owner of the primary payload. Sources: "SpaceX launch manifest," *SpaceX*, Aug 2014. De Selding, "Orbcomm craft launched by Falcon 9 falls out of orbit," *Space News*, 11 Oct 2012

11 "SpaceX launch manifest," *SpaceX*, Aug 2014

12 Huet, "Google buys Skybox Imaging – not just for its satellites," *Forbes*, 10 Jun 2014

13 This is already initiated by Google's earlier projects: Project Loon and the acquisition of Titan Aerospace. Barr, "Google invests in satellites to spread internet access," *Wall Street Journal*, 1 Jun 2014

14 Google has shown willingness to use its capacity to aid incumbent broadband providers in providing high-speed internet in Kansas City. Internet connection speeds increased by 86% in Q4 2012 after Google's installations. Talbot, "Google Fiber's ripple effect," *Technology Review*, 26 Apr 2013

15 Olenick, "Facebook's Zuckerberg looks to use lasers, drones and satellites to bring the web to the world," *Tech Times*, 29 Mar 2014

16 Tucker, "The public will soon be able to buy military-grade satellite images," *DefenseOne*, 13 Aug 2014

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18 "Aiming high: Singapore space industry gets boost with new satellite centre," *Channel NewsAsia*, 19 Aug 2014

19 "State of the Satellite Industry Report," *Satellite Industry Association*, May 2014

20 Henry, "New Euroconsult report forecasts exciting changes in the satellite industry," *SatelliteToday*, 8 Nov 2013

21 O'Callaghan, "Japan to launch military space force in 2019: Fleet will protect Earth from cosmic junk and prevent satellites being destroyed," *Daily Mail*, 4 Aug 2014

22 Terence Lee, "This Singapore startup wants to remove killer litter from space," *Tech in Asia*, 27 Feb 2014

23 "Ye olde space race," *The Economist*, 18 Feb 2014

The Space Foundation, *The Space Report 2013* (Apr 2013)

"Cambodia's conglomerates in talks to buy communications satellite from China: Minister," *Chinese National Television*, 10 Apr 2013

Singh, "Can China help South East Asian space ambitions?" *SAEA Group Research*, 2 May 2013

"Vietnam's space ambition: Master satellite tech," *TuoiTrenews*, 22 Sep 2012

"Is Asian space science drive harming development?" SciDevNet, 16 May 2013

"SpaceX launch manifest," *SpaceX*, Aug 2014

"Angkasa official portal" *Agenasi Angkasa Negara, National Space Agency*, accessed Aug 2014

Interview with Office for Space Technology and Industry, Economic Development Board, Aug 2014



SHARING AS ECONOMIC POLICY

Siantar Christopher She Dongfa

The sharing economy is growing from strength to strength at rates exceeding 25%,¹ coinciding with a depressed economy as people monetise their assets to make up for a drop in income.² Firms at the forefront of the sharing economy, e.g. Airbnb,³ have since grown in scale and scope to become mainstream players. Who would have expected Airbnb to be considered a larger hotelier than brick-and-mortar competitors like the Hilton or the InterContinental Hotels Group?⁴ In this scan, we look to identify possible supply and demand dynamics set in motion by firms like Airbnb that policymakers can consider as part of a larger solution to increase system flexibility or accelerate industry upgrading.

FLEXIBLE SUPPLY

In the run-up to the 2014 FIFA World Cup hosted by Brazil, the government allowed⁵ Airbnb to step in to manage an “extra” demand of 60,000 travellers⁶ that were looking for a place to stay. For example, the city of Rio de Janeiro was expecting 60,000 tourists, but only had 55,400 hotel beds available. When approached to help, Airbnb added 11,000 listings for the city over the space of a year, making Airbnb the largest hospitality company in Brazil. In the city of Cuiaba, Airbnb increased the properties listed from 400 to 1,000 within a few weeks by sending a strike team to encourage locals to put up their rooms for rent.⁷

Brazil’s positive experience with Airbnb to expand room supply for the 2014 FIFA World Cup was reactive, making virtue out of necessity. Proactively, policymakers have the option of including Airbnb (and similar services) as a deployable flexible supply of rooms on top of planned hotel infrastructure roll-out, i.e. Airbnb can target a particular profile of customers while established hotel chains may cater to other customer profiles. Figure 1 illustrates a hotel room supply dashboard that includes Airbnb listings for the cities of Sao Paulo and Rio de Janeiro (figures from 2013).

The impact of deployable flexible supply can also be seen for public transport. Uber, the other poster child of the sharing economy, uses surge pricing to lure “on-demand” drivers to offer their services during peak hours. By matching passengers with drivers efficiently, it can quickly disperse congestion. A study by UC Berkeley concluded that every shared car takes 9 to 13 cars off the road.⁸

REALLOCATING LOWER-END DEMAND

A Boston University study showed that for every 1% increase in Airbnb listings, quarterly hotel revenues

STAYING THERE

SAO PAULO, 2013

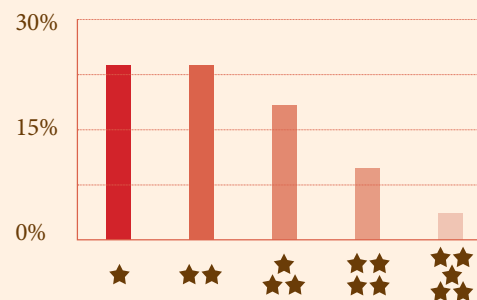
Hotels
3,797

Rooms
133,000

Ave. Daily Room Rate, US\$
132

Airbnb Listings*
3,940

Quality Profile, % of total hotel outlets



RIO DE JANEIRO, 2013

Hotels
1,754

Rooms
53,000

Ave. Daily Room Rate, US\$
173

Airbnb Listings*
14,559

Quality Profile, % of total hotel outlets

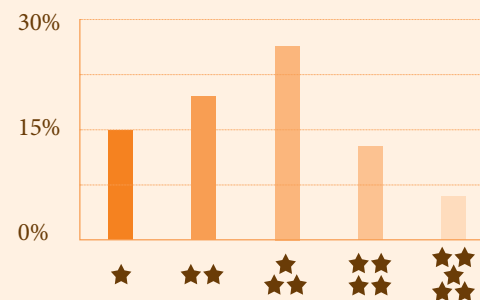


Figure 1: Hotel vs. Airbnb listings in Sao Paulo and Rio de Janeiro in 2013.

Source: Motta et al, *Brazil's business and consumer environment: Future growth, city profiles and the impact of the 2014 World Cup* (Euromonitor International, 2014), p.16.

across all market segments generally decrease by 0.05%.⁹ The impact is felt most by lower-end hotel chains, with a potential decrease in revenues by up to 10%. Premier hotel chains are currently unaffected because their current customers desire amenities that typical Airbnb rentals do not offer (e.g. swimming pool).¹⁰ This reinforces the perception of Airbnb users as lower-end tourists, especially given Airbnb's roots as a platform for couch-sharing. The data, however, indicates otherwise. Airbnb users in the USA have a similar median income profile as regular

hotel guests, stay longer (an average of 5.5 days versus 3.5 days) and spend more (an average of US\$1,045 versus US\$840).¹¹

Airbnb is also moving upstream, entering the business travel market through a tie-up with Concur – a corporate expense management company for over 20,000 corporate clients.¹² With this tie-up, Airbnb takes on hospitality giants like the Intercontinental Hotels Group. If lower-end hotels exit the market due to demand reallocation, displaced hotel

employees can be retrained for similar jobs at higher-end hotels that offer better prospects and income. However, if Airbnb succeeds in reallocating significant demand away from mid-to-high-end hotel chains into private homes, cities may be left with a surplus of mid to high-end hotel rooms.

A BROADER REGULATORY APPROACH

Present regulations in Singapore inhibit Airbnb's progress. HDB, URA and JTC disallow subletting for less than 6 months and require sub-tenants to be registered with the HDB within 7 days from the commencement date of subletting.¹³ This means that Airbnb's model of short-term rentals is technically illegal and there are limits to growth under current regulations. To counter this, Airbnb has been advocating for sharing economies to be regulated under a different model – one that lies between stringent regulations imposed on commercial hotels and non-existing regulations governing the short-term stays of visiting relatives.

What might policymakers want to consider in their approach towards the sharing economy? So far, the response has ranged from cease-and-desist orders to a cautious welcome.¹⁴ Others have taken steps to incorporate elements of the sharing economy in public services, e.g. the Helsinki government launched a smartphone app to provide residents with a one-stop marketplace for all transport options (public, private and shared)¹⁵ so as to eliminate car ownership, reduce resource use and congestion. These steps and responses are arguably narrow “tweaks” – typical considerations include possible tax revenue loss and regulation parity between existing businesses and new entrants on consumer protection – but not a systems-wide approach to use flexible supply and/or demand reallocation dynamics to create new value by accelerating industry upgrading and increasing resource flexibility.

While designing policies to exploit the benefits of the sharing economy, policymakers need to create a win-win relationship with the Airbnbs and Ubers of

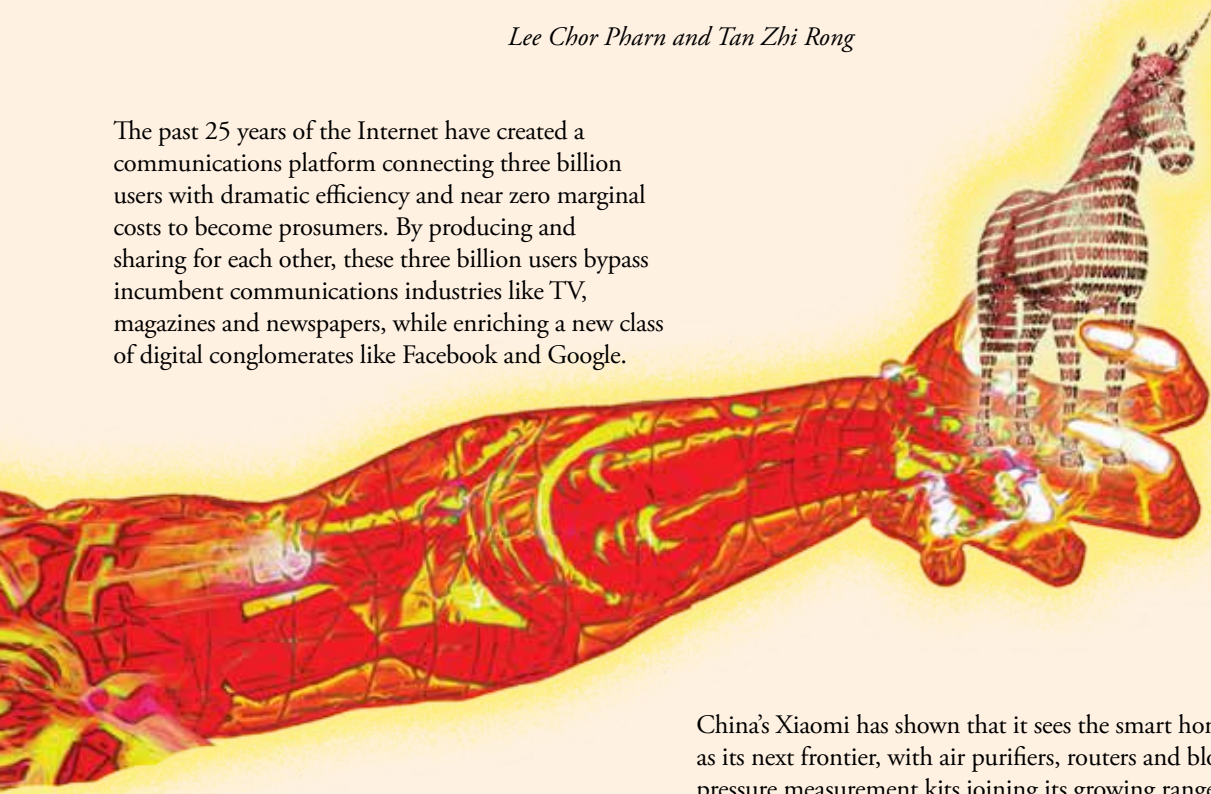
the world to tap on their large real-time datasets (in hospitality, road usage, etc.) for better policy planning. At the same time, this relationship needs to avoid firm lock-in. Sharing economy business models are also changing rapidly (as seen in Airbnb's entry into the corporate travel market) and we will need to learn to live with untidy regulation in the transition between old and new models. –F

- Forbes estimates that the revenue flowing through the sharing economy directly into people's wallets will surpass \$3.5 billion, with growth exceeding 25%. Source: Geron, “Airbnb and the unstoppable rise of the share economy,” *Forbes*, 23 Jan 2013
- Real wages of middle to low income US households have fallen since the recession, and people are joining the sharing economy to monetize their assets to make up for the drop in income. Source: Roose, “The sharing economy isn't about trust, it's about desperation,” *New York Magazine*, 24 Apr 2014
- Airbnb, the poster child of the sharing economy, is a trusted community market place for people to list, discover and book unique accommodations from around the world. With over 800,000 listings worldwide in over 34,000 cities, Airbnb has been expanding rapidly. Source: Airbnb
- Singh, “Why hotel brands should care about Airbnb's disruption,” *Skift*, 28 Nov 2013
- “Airbnb makes most of FIFA World Cup tourism,” *Travel and Tour World*, 15 Jun 2014
- One out of five (120,000 in total) guests stayed in an Airbnb listing in Brazil during the FIFA World Cup. Source: Airbnb
- “Airbnb makes most of FIFA World Cup tourism,” *Travel and Tour World*, 15 Jun 2014
- Martin et al, “Impact of carsharing on household vehicle holdings: Results from North American shared-use vehicle survey,” *Transportation Research Record: Journal of the Transportation Research Board*, no. 2143 (2010): pp.150-158
- The study's projection refers to Texas, USA. Zervas et al, “The rise of the sharing economy: Estimating the impact of Airbnb on the hotel industry,” *Boston University School of Management Research Papers*, no. 16 (2013): pp. 3-4
- Ibid.*, p. 12
- Figures are from an HR&A Advisers study on San Francisco commissioned by Airbnb. 60% of the travellers in the data set were travelling on vacation, 23% were travelling for personal reasons and 17% were on business. The median income for travellers using Airbnb was around US\$80,000 to 120,000. Source: HR&A Advisers, *Airbnb: Economic impacts in San Francisco and its neighbourhoods* (Findings Report Preview) [November 2012]
- Brustein, “Uber and Airbnb welcome corporate travellers to the sharing world,” *Bloomberg Businessweek*, 29 Jul 2014
- In addition, tenants or owners of the flats must continue to live in the flat with the subtenants during the period of subletting. Source: HDB, URA, JTC
- Bill ALUR was passed in France in 2014 – it is a law clarifying that hosts can rent out their homes without having to ask permission from the local city hall. Source: Hantman, “A major step forward in Paris and France — Une avancée majeure en France,” *Airbnb*, 26 Mar 2014
- Users will input variables such as an origin, destination, type of transportation, available time, etc. and the application will plan and handle payments for the trip. Source: Kaye, “Helsinki mulls a future free of car ownership,” *TriplePundit*, 6 Aug 2014

SOFTWARE IS EATING THE WORLD... AND IT'S STILL HUNGRY

Lee Chor Pharn and Tan Zhi Rong

The past 25 years of the Internet have created a communications platform connecting three billion users with dramatic efficiency and near zero marginal costs to become prosumers. By producing and sharing for each other, these three billion users bypass incumbent communications industries like TV, magazines and newspapers, while enriching a new class of digital conglomerates like Facebook and Google.



“DECACORNS” WAITING IN THE WINGS

2014 saw privately-owned tech startups raise billions of dollars in unprecedentedly large rounds of funding. Calling these startups “unicorns” will soon stop making sense, however, as the number of startups worth US\$1 billion grows. But some of the “unicorns” are in a league of their own. Out of the eighty or so startups on Fortune’s list of “unicorns,” nine are worth more than US\$10 billion. It is not hard to see why, as these firms are major disruptors in their respective sectors. We already see signs of a few “decacorns” positioning themselves to become the next digital conglomerates.

Source: Griffith and Primack, “The age of unicorns,” *Fortune*, 15 May 2015.

China’s Xiaomi has shown that it sees the smart home as its next frontier, with air purifiers, routers and blood pressure measurement kits joining its growing range of products.

Sources: Russell, “Xiaomi expands beyond smartphones once again with new \$150 air purifier,” *TechCrunch*, 9 Dec 2014 and Russell, “Xiaomi furthers its smart home ambition with \$200m investment in appliance maker Midea,” *TechCrunch*, 14 Dec 2014.

Throughout 2014, Uber’s interest in becoming a global logistics service was clearly visible through a range of targeted pilots in various cities – a bike courier service in New York City (Uber Rush), food delivery in California (Uber Fresh), grocery delivery in Washington D.C. (Uber Essentials) and moving services in Hong Kong (Uber Cargo).

Even as it battles failure to develop a viable space vehicle that can be reused, Elon Musk’s SpaceX is moving into low-cost internet via micro-satellite swarms.

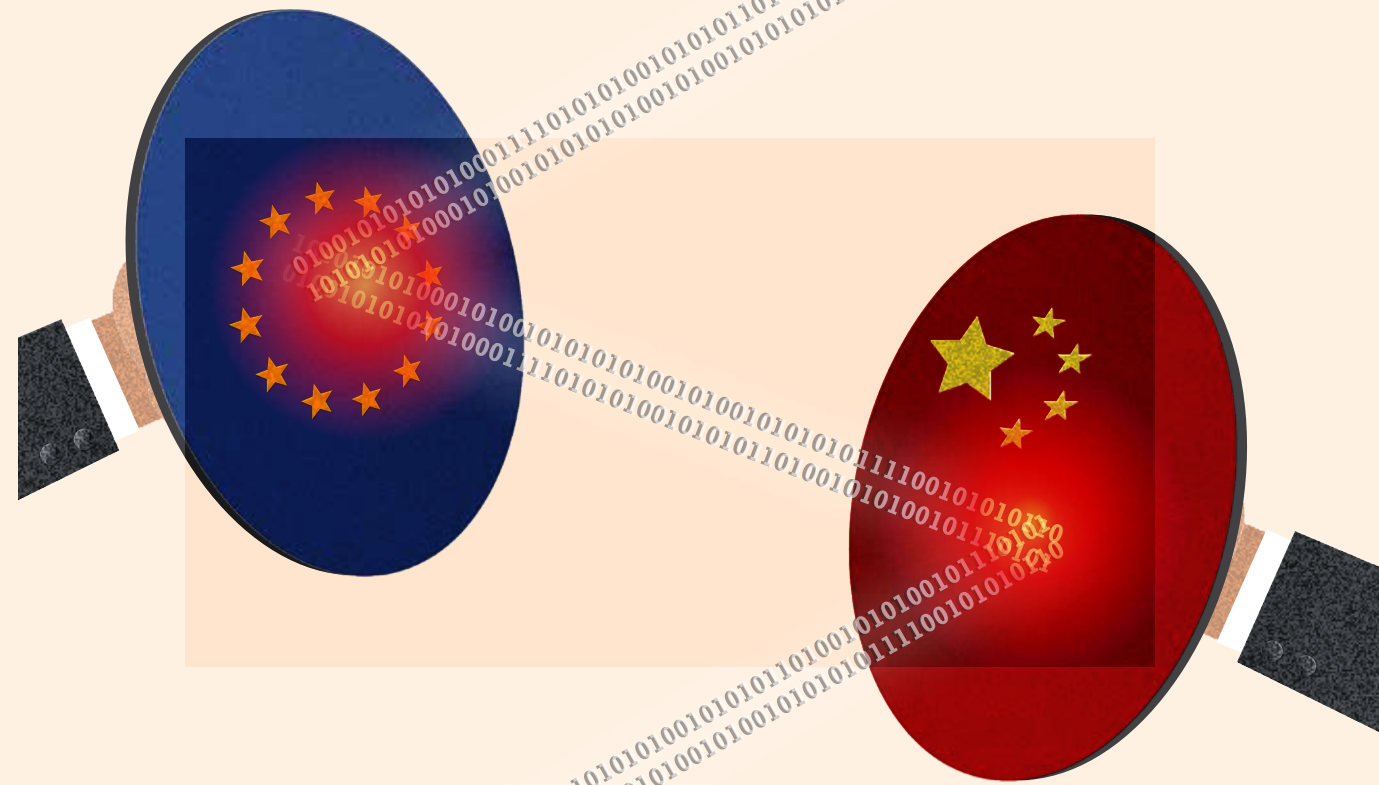
Source: Knapp, “SpaceX is entering the micro-satellites game,” *Forbes*, 12 Nov 2014.

DATA ISLANDS

Through foresight or chance, China’s Great Firewall effectively makes its Internet a data island (or continent) where indigenous digital champions like Baidu, Alibaba and Tencent are forged amidst intense competition. Chinese Premier Li Keqiang’s “Internet Plus” programme wants to use these dynamics to drive economic restructuring and “eat” state-dominated/inefficient sectors like financial services, agriculture and healthcare. As China’s next phase of expansion – (“One Belt, One Road”) – extends railways, highways, pipelines and industrial parks to link entire regions to inland markets, Chinese digital champions will follow hard on the heels of infrastructure and finance to connect and reorganise regional economies.

Source: “Full text: Report on China’s economic, social development plan,” *The National People’s Congress of the People’s Republic of China*, 19 Mar 2015.

Europe is taking a leaf out of China’s playbook to nurture indigenous European digital champions in a truly EU digital market without barriers. This move is perhaps prompted by Snowden’s revelations, the fall of once-mighty Nokia and its unceremonious windup by Microsoft. Aside from China and the EU, few regions have both the market clout and administrative capability to set up data islands. It might not stop some from trying, though, and we may see more instances of partial deglobalisation.



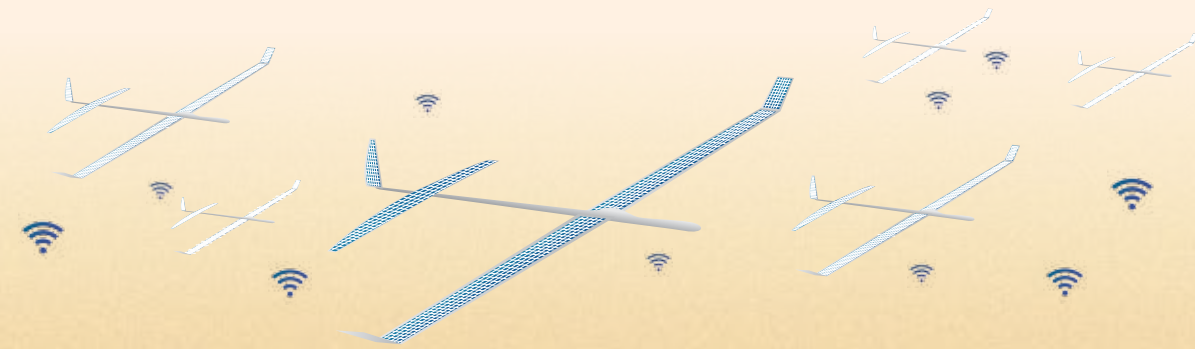
CONNECTING THE UNCONNECTED

By 2014, about 3 billion people were online, leaving 4.2 billion unconnected. The economic potential that can be unlocked by connecting the unconnected is immense, and several technology companies – most of them digital conglomerates – are stepping in to provide connectivity in creative ways where governments have been unable to. This may not altogether be altruistic. As they face bruising battles over market share in China and Europe, the future growth of digital conglomerates like Google and Facebook depends on finding even more potential consumers.

Source: “Mark Zuckerberg and Facebook’s plan to wire the world,” *Time*, Dec 2015

Google’s Project Loon deploys high-altitude balloons to create a communications network that beams data to smartphone users over the LTE spectrum. Google intends to extend this network worldwide and augment it with a fleet of solar-powered drones and low-cost satellites with similar data-transfer capabilities. This network has direct benefits to existing ventures like Google Maps and autonomous vehicles, and puts Google in direct competition with telecom incumbents in emerging markets.

Source: Hardy and Dougherty, “Google and Fidelity put \$1 billion into SpaceX,” *New York Times*, 20 Jan 2015.



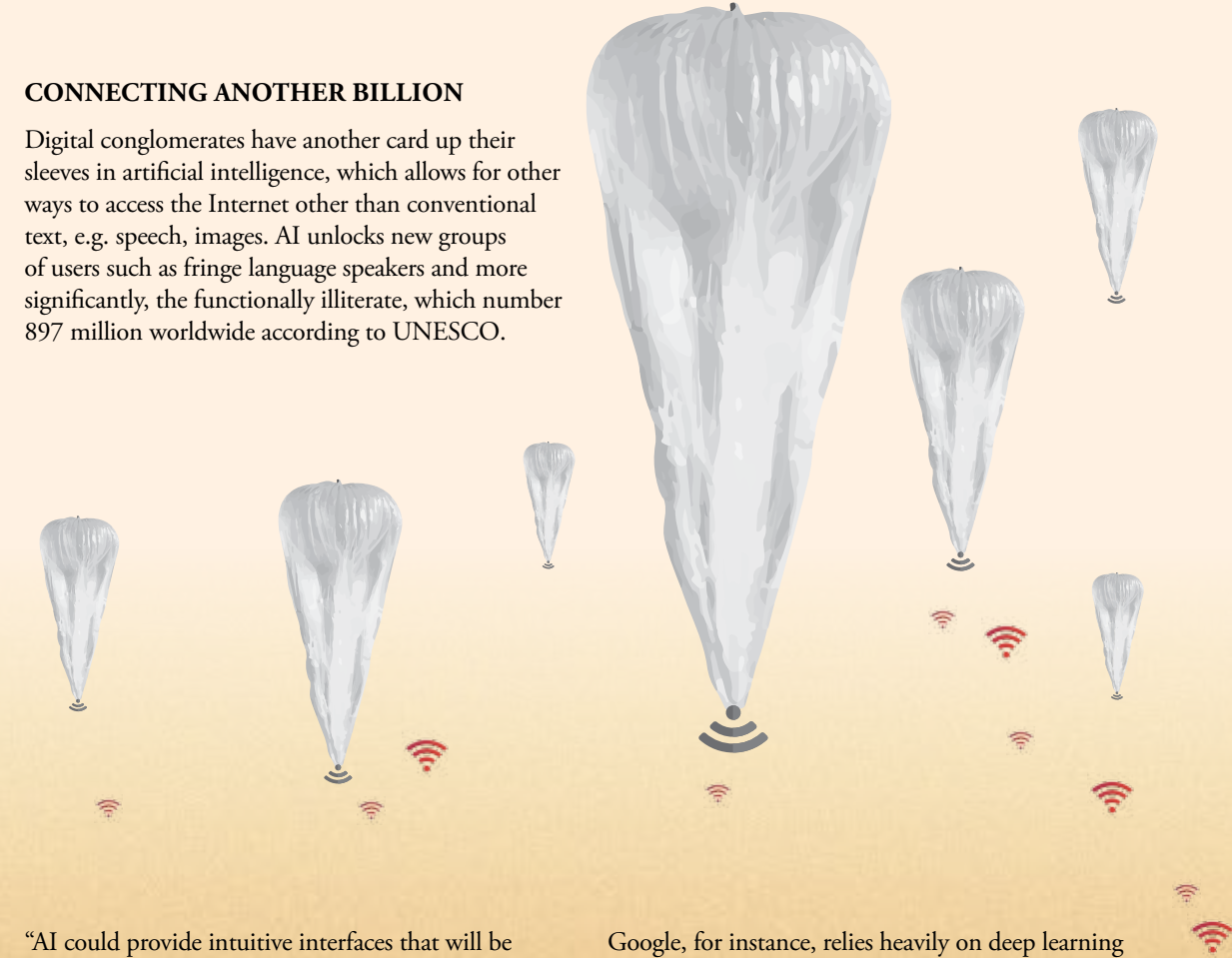
Facebook is collaborating with phone manufacturers like Samsung and telecom carriers in emerging markets in a coalition known as “Internet.org” to allow users free access to specially-designed apps. Facebook identifies a particular geographical region that lacks internet access, creates content that might be compelling enough to get its inhabitants online in the region’s dominant language, and packages the content into customised apps. Users gain access to a curated, walled sliver of the Internet for free, while telecom carriers enjoy an increase in registered mobile data service users who decide to pay for access to the wider Internet. For instance, in Rwanda, Facebook is working with the government and edX, the open online learning platform co-founded by Harvard and MIT, to develop an app with which Rwandan students can participate in free lessons over data connections.

Source: Rothberg, “EdX partners with Facebook to provide open online education to Rwanda,” *The Harvard Crimson*, 26 Feb 2014.



CONNECTING ANOTHER BILLION

Digital conglomerates have another card up their sleeves in artificial intelligence, which allows for other ways to access the Internet other than conventional text, e.g. speech, images. AI unlocks new groups of users such as fringe language speakers and more significantly, the functionally illiterate, which number 897 million worldwide according to UNESCO.

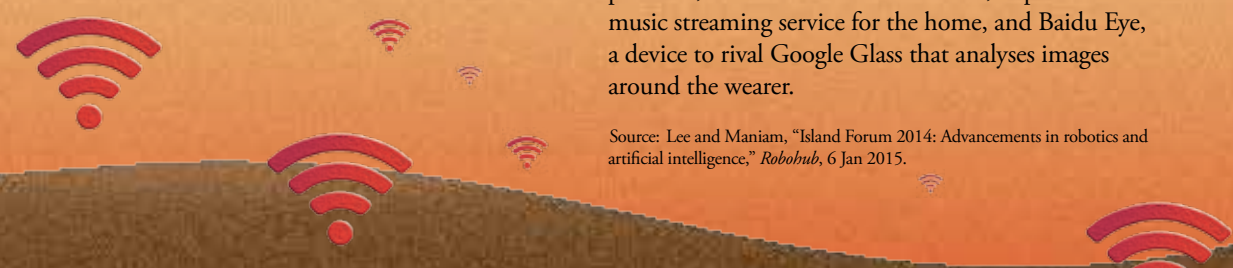


“AI could provide intuitive interfaces that will be attractive to computing beginners. Those newcomers to the Internet—like all of us, really—will not want to learn new modes of interaction. They will prefer to speak naturally to their devices to get the information or translation they want.” - *Dr Andrew Ng, Chief Scientist, Baidu*

Google, Baidu, Facebook and others have made heavy investments in AI research, particularly deep learning.

Google, for instance, relies heavily on deep learning algorithms to drive its Voice Search and Search by Image functions. Dr Andrew Ng, founder of the Google Brain project and now Chief Scientist at Baidu, highlighted that 10% of Baidu’s search queries today are via speech. Deep learning may one day enable speech/ image “killer apps” that allow users to interact with technology they are unfamiliar with. Some examples include Baidu’s deep learning products, such as the Baidu Cool Box, a speech-based music streaming service for the home, and Baidu Eye, a device to rival Google Glass that analyses images around the wearer.

Source: Lee and Maniam, “Island Forum 2014: Advancements in robotics and artificial intelligence,” *Robohub*, 6 Jan 2015.



GROWING YOUR OWN INTERNET?

Peer-to-peer distributed networks are transforming the Internet. By focusing on simple services or transactions that are fast and lightweight, these distributed networks are able to maintain a communications network quicker, more efficiently, and without the costs of a centrally controlled system.

Open Garden / Firechat: Open Garden creates wireless hotspots, and its FireChat app allows users to chat anonymously with each other using mesh networking. In a mesh network, a group of smartphones can create their own network with only one smartphone connected to the web. The app's use of untraceable peer-to-peer connections has made it popular in places where accessing the Internet is restricted or dangerous. For instance, during the 2014 Taipei Sunflower Movement, student activists downloaded FireChat to communicate among themselves in case the government shut down web access.

Source: Olson, "Could this app create a free, secret web?" *Forbes*, 5 Jun 2014.

StorJ: Described as a secure, private and fast network using P2P technology and encryption, StorJ is a Dropbox-style file service that is paid with bitcoin. Data storage is provided by peers with excess space without central storage.

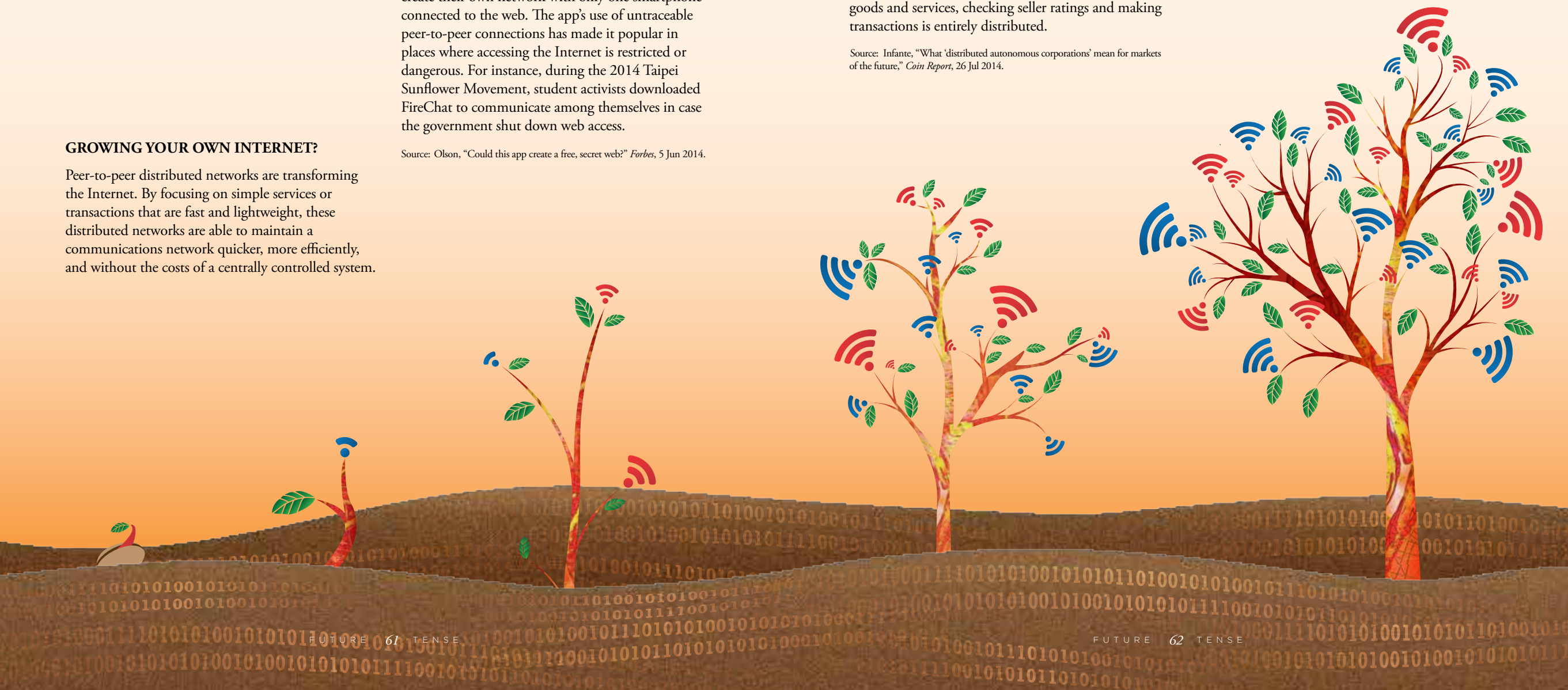
Source: Wilkinson, "StorJ: A peer-to-peer cloud storage network," 15 Dec 2014.

OpenBazaar: Allows users to anonymously buy and sell goods from anywhere in the world. Each user hosts their anonymous storefront and the process of locating goods and services, checking seller ratings and making transactions is entirely distributed.

Source: Infante, "What 'distributed autonomous corporations' mean for markets of the future," *Coin Report*, 26 Jul 2014.

Bitmessage: A decentralized communications network that can be used by individuals to send encrypted messages to other individuals or groups.

Source: "5 ways to send secret messages," *Deep Dot Web*, 13 Feb 2015.



Software has now jumped the air gap between the virtual world of communications and the physical world of infrastructure, devices, and transport. The story is familiar - infrastructure and devices will be embedded with hundreds of sensors, data is stored in the cloud, and individual and collective performance is optimised by artificial intelligence. The result is dramatic efficiency gains and near-zero marginal costs as users seek out consumer surplus in housing, transport and other real-world sectors. This unfolding revolution goes by several names – the “sharing economy”, the “on-demand economy” – and it has enriched a new set of digital conglomerates like Uber and Airbnb while enraging incumbents.

“SOCIAL” AND “CAPITAL”

The emergence of “sharing economy” firms like Airbnb and Uber was first hailed as a new economic model, allowing consumers to bypass traditional hierarchical structures and earn profits without red tape while building community. Many hoped that financial capital and ownership in a competitive capitalist market would be replaced by social capital in a collaborative commons.

Source: Diana, “The sharing economy,” 11 Sep 2014, Rifkin, *The zero marginal cost society* (Palgrave Macmillan: 2014) and du Preez, “Is the ‘sharing economy’, in its current form, just a capitalist con?” *diginomica*, 16 Mar 2015.

NEW MONOPOLIES

What emerged instead are new monopolies that are fiercely profit-driven, taking a large cut from services exchanged, challenging incumbents for market share by being simply more efficient and open middlemen. This is the opposite of what the Internet promised: a shared, networked global commons in which all humans can collaborate and create value without significant costs.

Source: Morris, “Robocorp,” *Aeon*, 26 Jan 2015.

RESISTANCE

“Sharing economy” firms are facing strong resistance in many Western countries and cities in the form of complete bans, fines, lawsuits or strikes against the establishment. In an on-going lawsuit in the US, Uber is alleged to have misclassified its drivers under the law: the company pays individuals who supply logistics and manpower like independent contractors, but demands from them the work expectations of employees. Was Uber’s business model founded on a legal mistake? “Sharing economy” firms will have to pay employees’ benefits if the lawsuit is successful, and this may affect their profit models.

Source: “Uber gets OK for much of Pennsylvania, not Philly,” *Daily Mail Online*, 13 Nov 2014 and Hill, “Meet the lawyer taking on Uber and the rest of the on-demand economy,” *Fusion*, 16 Apr 2015.

Looking ahead, the story of software is beginning to turn to energy, starting with renewables. In Denmark and Germany, there are now a significant number of small players producing renewable energy. What is interesting is that fixed costs have been decreasing rapidly – solar prices have dropped from 21.4c/kWh in 2010 to around 5 – 9c/kWh in December 2014, heading towards zero. Energy prosumers do not truly exist because of constraints in energy storage technologies and the absence of a grid to support peer-to-peer energy consumption. It may take the better part of a decade for the many moving parts to click into place. When it does, we will likely see an Uber-like digital conglomerate emerge in the energy space.

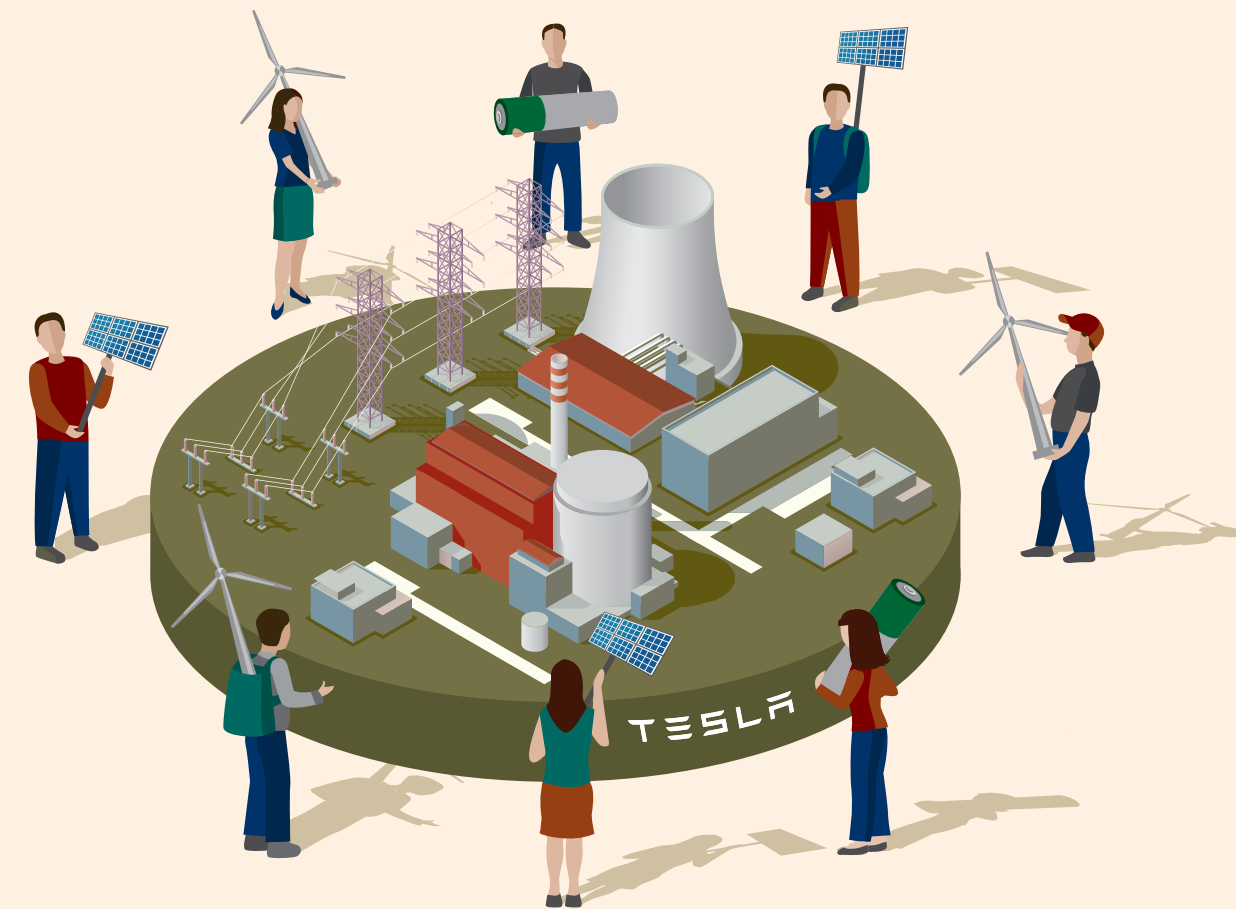
Source: “Cost of solar PV will fall to 2cents/kWh in 2050, says Fraunhofer study,” *Cleantechnica*, 25 Mar 2015 and “The falling price of utility-scale solar photovoltaic projects,” US Department of Energy.

TESLA’S HOME BATTERY REVOLUTION

Tesla CEO Elon Musk recently unveiled the Powerwall, a battery in 7 or 10 kilowatt-hour sizes – for just US\$3500. Valued for its price and portability, the battery can be used for “load shifting” at home: it can store excess energy generated during peak production times in the day and pull power from the grid during off-peak (and cheaper) hours for use at night when

energy demand is the greatest. As of May 2015, Tesla has already taken orders worth US\$800 million, and GTM Research forecasts the overall market to be worth US\$1.5 billion by 2019.

Source: Stockton, “How Tesla’s batteries will power your home,” *Wired*, 1 May 2015 and Francis, “Why Tesla’s new battery is kind of a big deal,” *Sydney Morning Herald*, 9 May 2015.



SOFTWARE IS STARTING TO EAT THE WORLD OF VALUE...

The emergence of new currencies like Bitcoin and consumer finance services fronted by digital conglomerates such as Alibaba point to increasing pressure on incumbent financial infrastructure. Consumers have started to turn away from traditional financial institutions to digital conglomerates as the latter offer financial services at starkly lower costs. It is intriguing to see if the emergence of new currencies will shift from being based on nations and states to within the networks of large corporations (Alipay, Apple Pay) or peer-to-peer communities (Bitcoin, Altcoin).

Source: Gave, "The burning questions for 2015," *Gavekal Dragonomics*, 3 Dec 2014

Proponents argue that Bitcoin's promise lies not in its use as a currency, but in the underlying blockchain technology. The blockchain is a distributed network of computers maintaining a permanent, public record of every single Bitcoin transaction ever made, stored in a distributed database not owned or controlled by any single entity and accessible from anywhere, anytime. The ability of the blockchain to support other digital currencies, create digital contracts and virtual companies could very well be the next phase of software eating the world.

Bitcoin has had a very public rise and fall over the past year, as seen in the closure of the world's largest bitcoin exchange Mt. Gox after a US\$500 million heist with no refunds for investors, and the price of Bitcoin falling from US\$1,000 in Jan 2013 to US\$240 in mid-May 2015. Corporate interests, driven by the need for cheaper payment systems, may be crucial in bringing Bitcoin into the mainstream.

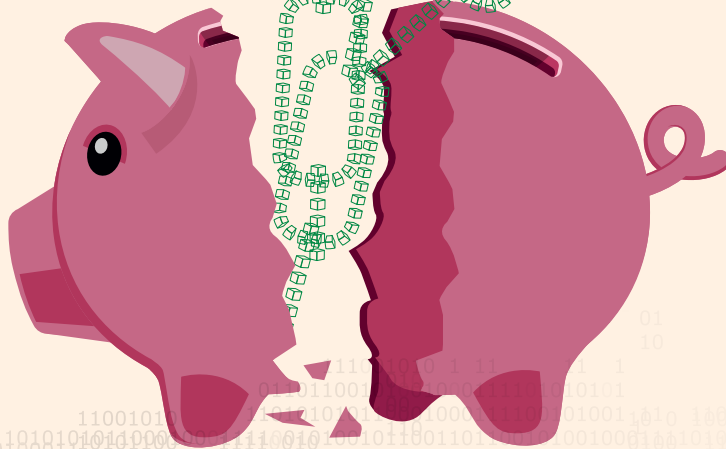
Source: Demmit, "Floyd Co. entrepreneur cashes in on virtual currency craze," *The Roanoke Times*, 8 Mar 2014 and Kosner, "Tech 2015: Block chain will break free from Bitcoin to power distributed apps," *Forbes*, 31 Dec 2014.

Intel and IBM are considering using blockchain technology to create a decentralized cash and payment system for governments and central banks. They emphasize the development of cutting-edge, cryptographic algorithms to improve the resilience and security of transaction verification and for secondary uses such as digital marketplaces.

Source: Prisco, "Intel joins the blockchain technology race, forms special research group," *Bitcoin Magazine*, 19 Mar 2015.

Wall Street Bitcoin Alliance is a new organisation formed by business and technology executives within the financial industry. The Alliance aims to guide and promote the comprehensive adoption of digital currency and blockchain technology across financial markets.

Source: Perez, "Wedbush, TeraExchange execs form Wall Street Bitcoin advocacy group," *CoinDesk*, 12 Mar 2015.



...FROM RECORDS TO AUTONOMOUS CORPORATIONS

Programmers can encode a small volume of information to every Bitcoin transaction, and have it peer-verified in what is essentially an all-purpose global database. In this way, services can be transferred via a peer-verified network. To make this work, the service has to be more efficient than that of existing, centrally managed systems.



Ethereum, one of the more ambitious crypto-ledger firms, is coming up with a programming language to build specialised applications that go beyond transferring value or simple recording. These could be simple tasks where a computer verifies if a party to a contract has fulfilled its duties, and enforces agreements based on the contract. Extending this application, algorithms/robots can run businesses themselves and host/coordinate more complex tasks like casino operating games, online voting, lotteries and asset-trading platforms.

Source: Morris, “Robocorp,” *Aeon*, 26 Jan 2015.

This is where we enter the realm of science fiction, where these distributed autonomous corporations perform multiple functions – making complex decisions like identifying profit opportunities, modifying their operating parameters, evolving new capabilities – completely on their own without human intervention. Could this be the future of the digital economy?

Source: Walsh, “DACs vs. the corporation,” *Bitcoin Magazine*, 18 Nov 2014.

Counterparty provides a platform for exchanging bitcoins and allows users to “engage in advanced financial contracts without having to trust anyone else to hold your funds or do your accounting.”

Source: Orcutt, “Why Bitcoin could be much more than a currency,” *MIT Technology Review*, 8 May 2015.

Factom maintains a “permanent, time-stamped record” of a company’s data in the blockchain. The aim is to reduce the “cost and complexity of audit trails, managing records, and complying with government regulations.” Factom wants the service to enter the mainstream, and is building a tool for health-care providers to store data that would give clarity during billing disputes or audits.

Source: Orcutt, “Why Bitcoin could be much more than a currency,” *MIT Technology Review*, 8 May 2015.

CoinSpark, based in Tel Aviv, adds messages to the blockchain to create an affordable way to notarise, e.g. wedding vows, because “once something is in the blockchain, it cannot be removed.”

Source: “Blockchain: The next big thing,” *The Economist*, 9 May 2015.

V Initiative is a bitcoin-based e-voting effort in the US. E-voting works through the same dynamics as a bitcoin transaction – each registered voter is given a “votecoin” and voting involves sending the votecoin to a chosen candidate.

Source: Neal, “Bitcoin could change voting the way it’s changed money,” *Vice*, 6 Jun 2014.

fg@onve rsations

WHY

FG Conversations was born out of a desire to initiate meaningful discussions on issues that we felt were important but did not get enough attention. So we put our heads together to brainstorm questions, convinced interesting people to talk to us, and we're now sharing the results with you.

WHAT

For this first run, we wanted to gather fresh alternate views on what Singapore might be like in 2025, and approached people whom we felt could offer us alternative perspectives on the future.

WHO

Generally, the people we spoke to were forward-looking, had substantial leadership experience, and were committed to the betterment of society.

How

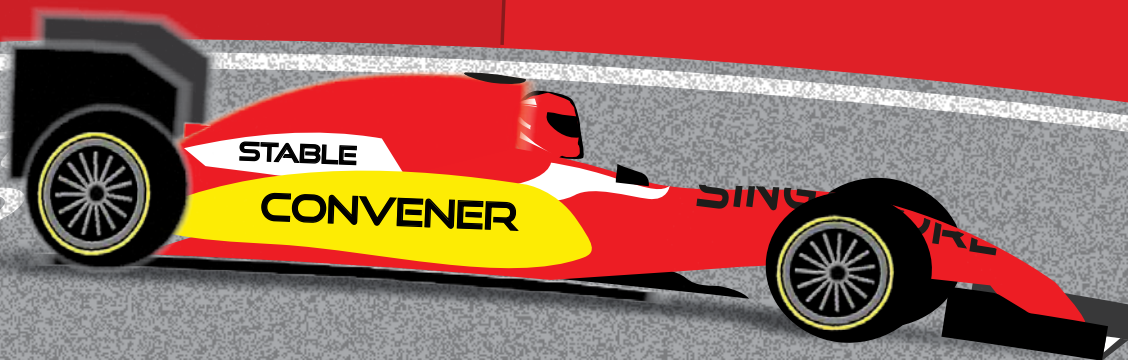
Each interview we conducted had two segments:

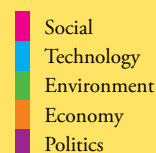
1. Pick 3 words to describe Singapore in 2025

Participants' responses were distilled to highlight possible transformations and tensions for Singapore in 2025.

2. Questions we asked

The responses we chose to share here challenge conventional wisdom and question existing assumptions about Singapore's future.





Twenty thought leaders have generously shared their views with us so far. There is more to come as we continue our conversations in the coming months, but for now, what words did they choose to describe their vision of Singapore in 2025?

One third of the words chosen were **smart city** and related words like **automation**, **robots**, **autonomous vehicles**, and **drone economy**. They described a smart city ensuring a high quality of life as Singapore ages and becomes more densely populated. Being a smart city keeps Singapore **competitive** with respect to **tomorrow's markets** (other Asian cities), by agglomerating people with creative ideas, and being the gateway to Asia. Industry composition will change accordingly: Singapore the smart city is a **low-carbon economy** with **climate-friendly** sectors, i.e. more advanced manufacturing and much less petrochemicals. Because Singapore is at the heart of many trends shaping the global economy – technology disruptions, resource constraints, an ageing population, just to name a few – we can export smart city solutions to meet future needs of tomorrow's markets.

This future Singapore – the smart city – comes closest to a unifying, desired vision. But this vision is incomplete.

One-third of the words chosen – **culture wars**, **demographic cliff**, **hijack by the elderly**, **polarised job market** – point to widening domestic fault lines in a future Singapore. Many expressed concern about the downsides of a smart city if automation leads to technological unemployment, widespread dehumanisation, and robs our youth of social skills. Almost everyone interviewed wanted more to be done for the marginalised and disadvantaged, e.g. migrant workers, sexual minorities and single parents. Successful global cities are more than just high-tech marvels; an increasingly engaged citizenry needs strong, human-centred leadership to bridge these fault lines. Some acknowledge that Singapore today is already more inclusive and compassionate,

but the effect of policy shifts in that direction is muddled by poor communications.

An eighth of words picked – **youth revolution** and **strawberries** – warn against populism: a tendency to react to issues of the day and the lack of a common vision for the next decade. Many cautioned that the young are unprepared or unwilling to address real constraints facing the economy that will limit our choices. A few were more optimistic that a more technologically-aware and skilled next generation will surprise and go places with the exposure they received in Singapore.

Future Singapore does not exist in isolation. A quarter of the words chosen – **China takes over the world**, **rise of the rest**, **new economic diplomacy** – are external forces beyond Singapore's control. How these geopolitical and economic trends pan out will shape the trajectory of Singapore's future. Most see increased economic development and regional integration benefiting Singapore. Some suggest a different, less "zero-sum" approach to ASEAN while others insist China is the only game-changer in town to pay attention to. A few worried about hard power becoming more prominent in the longer term as regional economies develop and squeeze our operating space.

The overall picture of Singapore in 2025 is one of conditional optimism. The domestic economic and social transitions required are possible and within our control. But excessive navel-gazing distracts and takes precious attention away from what is more vital to Singapore's future – the shifting politics and economics of the region – at a cost to our competitiveness and relevance.

Turn over to see what these thought leaders said in their own words.



Which established idea is ready to be moved aside so that Singapore can advance? Which beliefs, values, or economic theories are blocking our progress?



What old ideas should we revisit?



What do we need to stop doing?



What will future generations look back on and find morally unacceptable?



How do you govern a world that doesn't exist yet?



What are some new ideas for Singapore?



2025

Singapore must remain relevant

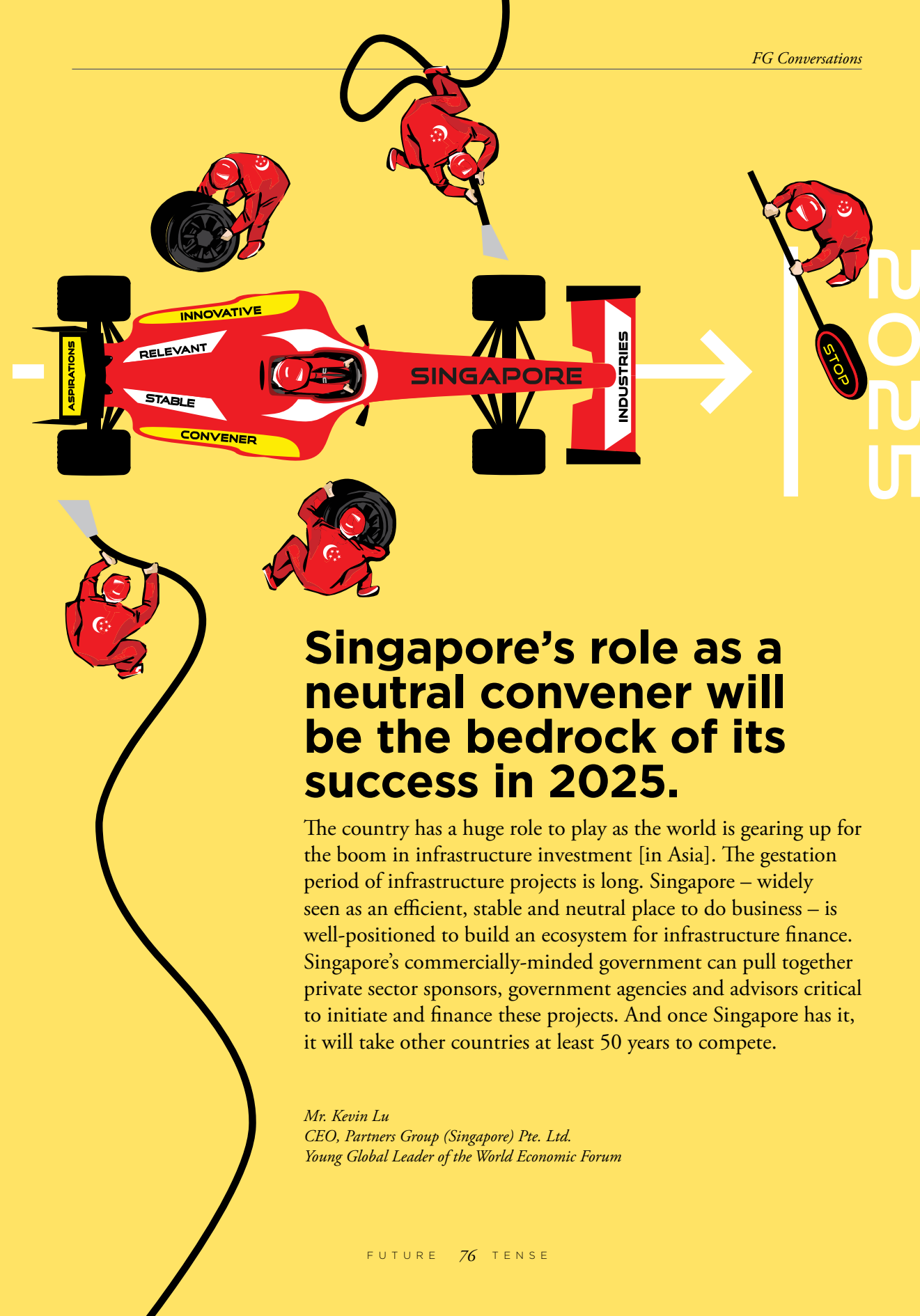
- the question is, what will our comparative advantage be in 2025? Singapore faces challenges on both external and domestic fronts – geopolitical forces, global/regional competition, demographic changes, social tensions. Questions to ask ourselves include: how will industries change and organise themselves globally? How can we better understand and meet the aspirations of successive generations of Singaporeans?

*Mr. Loh Khum Yean
Permanent Secretary,
Ministry of Manpower*

Singapore is not just about Singapore.

Singapore is a supplier to global demand. Singapore needs to remain continuously attractive, whether as a hub for creativity and innovation or an entry point to the rest of the region. And I don't doubt that it can.

*Mr. Lutfey Siddiqi
Managing Director, UBS
Young Global Leader of the World Economic Forum*



Singapore's role as a neutral convener will be the bedrock of its success in 2025.

The country has a huge role to play as the world is gearing up for the boom in infrastructure investment [in Asia]. The gestation period of infrastructure projects is long. Singapore – widely seen as an efficient, stable and neutral place to do business – is well-positioned to build an ecosystem for infrastructure finance. Singapore's commercially-minded government can pull together private sector sponsors, government agencies and advisors critical to initiate and finance these projects. And once Singapore has it, it will take other countries at least 50 years to compete.

*Mr. Kevin Lu
CEO, Partners Group (Singapore) Pte. Ltd.
Young Global Leader of the World Economic Forum*



Government policies aren't necessarily badly formulated, but they may be badly communicated.

10 years later, people would be thinking that “this made sense back then, but it still didn't stop us from hating it.”

*Mr. Kwok Jia Chuan
Co-Founder,
Conjunct Consulting*

Poor communication can snatch defeat from the jaws of victory.

We need to attach value to the style in which messages are communicated, not just the substance. Especially in the context of new media, great substance can fail to have the desired impact if not communicated in the right way, or engaged interactively with the right tone and attitude.

*Mr. Lutfey Siddiqi
Managing Director, UBS
Young Global Leader of the World Economic Forum*



Narratives.

We need to stop being so obsessed with narratives. Singapore is a technocracy at heart – we've always been pragmatic and that's how we get things done. After the [2011] elections, however, there's been an obsession with narratives. But using a thesaurus is not a strategy. Moving words around is not a substitute for the strong policy that emerges from technocratic deliberation – and those policies speak for themselves.

*Dr. Parag Khanna
Managing Partner, Hybrid Reality Pte. Ltd.
Young Global Leader of the World Economic Forum*



ASEAN won't be a game-changer.

A game-changer marks a significant shift in the way things are done. We trade with ASEAN because we're neighbours, but things will chug along slowly. The real game-changer will be led by China, via its strategy of infrastructure finance, e.g. the "One Belt One Road" initiative.

Mr. Kevin Lu
CEO, Partners Group (Singapore) Pte. Ltd.
Young Global Leader of the World Economic Forum



A mature Singapore will need to find ways to work with more dynamic neighbours.

We're used to 5-6% growth rates, but the fact is Singapore will grow at 1-2% at best in the future. Our prevailing view – that Southeast Asian economies will steal our business – needs to change. It is less about competing with each other but how we as a region can grow together.

Mr. Keith Tan
Deputy Secretary (Policy),
Ministry of Defence



Develop, validate, iterate hypotheses – when should levers be pulled, and when should things run their course?

Doing more is not always the best idea unless you know what it is you are trying to achieve. Over the years, Singapore has grown capabilities in delivering large projects and systems which addressed the issues of the time. If we do not know or define what new problems we want to address, we cannot tackle them effectively. One needs to have a clear hypothesis before embarking on the solution, because this is more effective in the longer run than swimming in a sea of options and data.

*Mr. Yee Ping Yi
Deputy Secretary (Policy),
Ministry of Finance*



Let's create an "AIIB" for the 4 billion poor.

Four billion people with low incomes – the base of the pyramid – make up the new biggest market worth \$5 trillion. The majority of these people are in Asia and they're buying everything from water, sanitation, off-grid energy, housing, education, fast-moving consumer goods, wellness, etc. Singapore is the ideal hub for creating a game-changing environment to transform this opportunity into a massive and vibrant globally-integrated marketplace, bringing together technology, financing, logistics, design, public policy models and efficiency. It's time to share our Third World to First World know-how.

*Mr. Jack Sim
Founder, World Toilet Organisation & BoP Hub
Schwab Fellow of the World Economic Forum*



Ideology.

The idea that people can be economically self-sufficient and the government does not need to ramp up on social welfare programs can no longer hold. Already today - let alone in 2025 - our elderly society and the rising cost of living make the mantra of individual self-reliance a pure fantasy. The most respected and compassionate societies in the world are welfare states.

*Dr. Parag Khanna
Managing Partner, Hybrid Reality Pte. Ltd.
Young Global Leader of the World Economic Forum*



What is the kind of adult Singapore wants to be?

Singapore is no longer the underdog. But I see Singapore as still wearing toddler clothes and trying to get the child-price ticket even though it has outgrown them. I see the country moving into adolescence and struggling with its identity. She'll experience growing pains, but the bonus will be that you're independent. The government will still be the parent, but it will not be a parent looking after a 5 year-old. It will need to treat Singaporeans with respect – as responsible adults.

*Ms. Kang So-Young
Catalyst & CEO, Awaken Group
Young Global Leader of the World Economic Forum*



Meritocracy could be a myth in 2025.

We are already witnessing an increase in definitional debates on the meaning and role of meritocracy in our society; if we don't move quickly, we may lose control of the narrative by 2025. We must convince people that meritocracy is still the best path for upward social mobility, and that the alternatives (such as favouritism or leveraging on connections / wealth) are problematic and even corrosive to our core values as a people. We are already seeing subtle signs of this happening – richer parents buy homes next to top schools to ensure their children get in. Once the influence of wealth and connections creeps into higher education and the working world, our meritocracy narrative will hold little credibility. We must take active steps to ensure that meritocracy does not get eroded or corroded, and to convince people that it is the best solution towards creating a level playing field for all Singaporeans.

*COL Gaurav Keerthi
Head Air Plans, Republic of Singapore Air Force
Founder, dialectic.sg*



We may need to relook how we define the concept of meritocracy.

Meritocracy is a noble ideal and has always been a cornerstone of Singapore's policies, but now there is an increasing fear that it is being justified only by those who have succeeded through a narrow definition of "merit". So we may want to look at how meritocracy has changed over time and is best suited to Singapore's changing environment - do we assess merit as based on someone's qualifications at a fixed point in time, or by the results someone produces over time? Google doesn't care which college you're from, but what you do with what you know.

*Mr. Kwok Jia Chuan
Co-Founder,
Conjunct Consulting*



An engaged citizenry.

In 2025, we will have an active and engaged citizenry, who will use technology to unite and advocate for their causes. Intellectual groups (such as university students and political analysts) and advocacy movements (e.g. the Bukit Brown group) will self-organise, gain traction among the masses, and push their policy agenda to the Government.

*COL Gaurav Keerthi
Head Air Plans, Republic of Singapore Air Force
Founder, dialectic.sg*



Stop thinking in terms of trade-offs.

Trade-offs are helpful as a tool to frame policy, but not for youth. Taking in so-called “realities” at an early age has young people quickly write off their ideals as improbable. Our youth narrow their aspirations and they don’t think creatively in creating win-win solutions. While holding the tension of a trade-off is invaluable as we continue to search for solutions, accepting trade-offs creates inevitability.

*Mr. Tong Yee
Founder, Director,
The Thought Collective*



Becoming a “smart nation” could lead to the degradation of our humanity.

Our search for the shiny and sexy has led people to hide behind technology and to lack the requisite social skills to function in society. But I think Singapore’s openness to disruptive thinking will enable it to be a role model to teach others how it is like to be human by 2025.

*Ms. Kang So-Young
Catalyst & CEO, Awaken Group
Young Global Leader of the World Economic Forum*



Do we want to prepare people for their first job or get them ready for life?

Are we preparing people for the journey of life? Can we extend the role of our “education system” beyond the first 20+ years, and really think about good quality lifelong learning for people that are in their 30s, 40s and beyond?

*Mr. Loh Khum Yean
Permanent Secretary,
Ministry of Manpower*

A “good job” will be about mastery and meaning.

Young people will have very different ideas of what constitutes a “good job”. As household wealth levels increase, their idea of a good job will focus less on material rewards, and more on the potential to develop mastery (deep skills) and finding meaning in the work they do.

*Mr. Lionel Yeo
Chief Executive,
Singapore Tourism Board*

We would like to thank the thought leaders who generously shared their time with us:

Mr. Jeremy Au
Co-Founder, Conjunct Consulting

Mr. Peter Ho
CEO, Hope Technik

Ms. Kang So-Young
*Catalyst & CEO, Awaken Group
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Mr. Dave Lim
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Ministry of Communications and Information*

Mr. Tong Yee
Founder, Director, The Thought Collective

Mr. Yee Ping Yi
Deputy Secretary (Policy), Ministry of Finance

Mr. Lionel Yeo
Chief Executive, Singapore Tourism Board

ASIAN FRONTIERS



WHY ASIAN FRONTIERS?

Our starting point is a collective realisation among Asian policymakers and thought leaders after the 2007-8 Financial Crisis that the existing (predominantly Western) growth model is becoming unsustainable. The search for alternative models is producing new insights – not a new model of growth just yet – that depart from the old system of grow-at-all-costs. At the same time, Asia faces unique challenges with few historical or contemporary “model answers” to refer to. This exploratory project takes stock of these new insights and useful takeaways for Singapore. We hope to continue sharing our findings in subsequent editions of Future Tense.

ASIAN FRONTIERS 2015

In this first run, we look at two challenges shared by Singapore and other advanced Asian economies – Japan, South Korea and China¹: (1) a shrinking workforce and (2) the transition to a low-carbon economy:

1. Shrinking workforce

Demographic tailwinds of the past decades harnessed through good governance have led many Asian countries onto the path of prosperity. In the advanced Asian economies, however, these demographic winds are starting to blow the other way – Japan’s population is already in decline, China’s workforce contracts from 2017, South Korea and Taiwan’s workforces will start to shrink in 2016. Although productivity improvements can make up for slower population growth, they will have to be considerably higher just to match historical growth rates – as much as 80% faster for the next fifty years!² The challenge lies in coming up with breakthrough productivity solutions just to sustain current levels of growth, and we want to know how and where these solutions are coming from.

2. Low-carbon economy

Fast-growing Asian economies are set to dominate global energy demand, but escalating political tensions and territorial disputes (e.g. in the Middle East and South China Sea) will make achieving energy independence more crucial. At the same time, Asian cities are under pressure to find clean energy solutions that will meet COP21 commitments while maintaining quality growth. Germany’s

APPROACH

We start with desktop research to generate a set of initial findings:

- What breakthrough solutions are being explored?
- What does this shared (or not) vision of a new future look like?
- Who are the main actors (governments, sovereign wealth funds, state-owned enterprises, conglomerates) that are realising this vision?

We then validate the initial findings with:

- Strategists, analysts, researchers and academics who are studying ways to overcome these challenges; and
- Policymakers with an overview of regional/ national economic strategy formulation.

Energiewende is one example of a transition to a low-carbon economy, but it has had a negative impact on competitiveness – the challenge for advanced cities in Asia will be to make the same transition while avoiding the bad side-effects.

Turn over for our initial findings on how Japan, China and South Korea are finding ways to overcome these two challenges on the frontier.

IN THE NEXT RUN OF ASIAN FRONTIERS: SOUTHEAST ASIA

Developing Southeast Asian economies face a different set of challenges as the existing growth model starts to falter. A combination of deficient capital markets and ineffective technology transfers has meant that, despite decades of being plugged into global value chains, Southeast Asian SMEs specialise in low-tech, labour-intensive tasks while MNCs typically occupy higher value-added segments.³ This is in marked contrast to SMEs in advanced Northeast Asian economies, some of which have grown into champions of innovation and technology, e.g. Samsung, Xiaomi. Southeast Asia’s persistent “technology-less” industrialisation will complicate attempts to get out of the middle-income trap. For some Southeast Asian economies, e.g. Thailand, demographic tailwinds are starting to turn into headwinds, making the transition up the value chain an even more urgent issue. In this context, do the startup ecosystems in various Southeast Asian economies point to a structural shift out of “technology-less” industrialisation?

Turn over for our initial findings on emerging digital champions in Southeast Asia. –F

1 Specifically referring to advanced mega city clusters like Beijing and Shanghai

2 Wien, “Market Commentary: Population and productivity,” *Blackstone*, 28 Apr 2015

3 Kikuchi and Masutomo, “Why S-E Asian SMEs are low-tech,” *The Straits Times*, 21 May 2015

JAPAN

Sarah Tan

Japan's competitive edge has all but vanished over two "lost decades," with productivity growth slowing in nearly all sectors, including advanced manufacturing. Japan now trails many advanced economies, e.g. its labour productivity gap with the US is projected to widen from 25% in 2011 to 37% in 2025.¹ At the same time, demographic challenges will intensify as Japan's working-age population is expected to decline from 79 million to 71 million in 2025.² Faced with a shrinking workforce and stagnating economy, Japan has to boost productivity in order to reinvigorate growth.

But Japan can change course – successfully doubling the rate of productivity growth could boost annual GDP growth to approximately 3%.³ To get there, Japan can ride on the explosion of demand from emerging markets (see "Winning in emerging markets"), but the real game-changer will be breakthrough innovations by its own companies.

WINNING IN EMERGING MARKETS

While Japan's share of world exports has shrunk from 7% in 2000 to 4% in 2013, it has both the industrial capability and financing to reclaim its fair share. Emerging economies are becoming growth markets for precision machinery, cars – and all these are long-standing strengths of industrial Japan.

A SECOND WIND?

Japan continues to pioneer high-tech breakthroughs with positive implications for productivity. Many Japanese firms are at the heart of technological disruptions reshaping the global economy, e.g. in electric cars, healthcare, and alternative energy:

- Consumer electronics firm Panasonic has trimmed its core business and started making car batteries. The firm has contracted with Tesla Motors to supply 2 billion battery cells until 2017.⁴
- Fujifilm has ventured into healthcare equipment (e.g. digital x-ray diagnostic equipment and medical endoscopes),⁵ which now accounts for 12% of its revenue, while photographic film only makes up 1%.⁶
- Toshiba, traditionally dependent on semiconductors and nuclear power, has consolidated its R&D units to promote healthcare as the third pillar of its business.⁷
- ZMP aims to commercialise driverless cars and have them on public roads by 2020. The company also works with Japanese machinery maker Komatsu to deploy autonomous driving technology for construction equipment.⁸

A ROBOTICS SUPERPOWER

Robotics may be the answer to Japan's ageing workforce. Automotive maker Honda's assisted mobility devices, e.g. the Bodyweight Support Assist, could help older workers stay productive for longer. Advanced robots will also drive further productivity gains in Japan's manufacturing sector. Kawada Industries has developed NEXTAGE, a mobile humanoid robot designed to safely work alongside humans. Unlike current industrial robots that are chiefly stationary, these "collaborative robots" increase overall manufacturing productivity by taking over hazardous and repetitive tasks, freeing workers to perform higher value-add activities. Tadahiro Kawada, the President of Kawada Industries, claims that collaborative robots have actually helped bring skilled jobs back to Japan.⁹

SEARCH FOR ENERGY INDEPENDENCE

The high cost of importing gas due to post-Fukushima nuclear shutdowns has weakened Japan's energy security, motivating it to adopt an ambitious transition to renewables similar to Germany's Energiewende. So far, however, there have been a few bumps on the road:

- While Japan's feed-in tariff policy attracted 1.2 million applications initially, utilities are beginning to resist, claiming the grid is not able to handle supply from renewables on a large scale and that renewables are not reliable enough to ensure uninterrupted power.¹⁰
- Plans to liberalise electricity and gas markets in 2016 and 2017 respectively may bring down electricity prices which have soared in the aftermath of the nuclear shutdowns, but it is still unclear what role nuclear power will play in a reformed energy market.¹¹

Other than conventional renewables, Japan is also banking heavily on methane hydrate and solar in space to become viable in the coming years:

- In 2013, Japan became the first country to successfully extract methane hydrate from the ocean floor, and has made targeted initiatives¹² to develop this abundant and potentially game-changing fossil fuel. This includes a joint venture of eleven companies to invest in production tests (more details in "Japan's Song of Ice and Fire").¹³
- The Japan Aerospace Exploration Agency (JAXA) has plans for a 1-gigawatt commercial solar power satellite by 2030.¹⁴ JAXA hopes to conduct its first space-to-earth power transmission experiment by 2018. Mitsubishi Heavy Industries has already conducted a ground test that confirmed the viability of wireless power transmission over long distances.¹⁵ –F

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SOUTH KOREA

Sarah Tan

After decades of robust growth, South Korea now faces a deflationary, low-growth situation similar to Japan in the present. Its faltering economy, which clocked an average growth rate of 3.6% in the last 10 years, is projected to slow to a growth rate of 2.5% for the coming decade.¹ A rapidly ageing population – of which 14% will be 65 or older by 2017 – will make it harder for South Korea to regain economic momentum.² Given this demographic drag, sustained productivity improvements of 26% or higher over the next two decades are needed just to maintain historical growth rates.³

A TALE OF TWO ECONOMIES

All is not lost, however, as South Korean conglomerates (*chaebols*) have grown by tapping on emerging markets, raising manufacturing output and productivity (Figure 1).

Chaebols like Samsung have also positioned themselves in new growth sectors:

- **Biotechnology:** Facing stiff competition in the smartphone market, Samsung has invested at least US\$2bn in biopharmaceuticals. This includes the development of biosimilars, which are brand-name biotechnology products that have lost patent protection. Samsung Bioepis, the business unit overseeing its biotechnology ventures, expects to generate more than US\$1.8bn a year from biopharmaceuticals by 2020.⁴
- **Batteries:** Samsung SDI has entered a joint venture in Shaanxi Province with auto parts maker Anqing Ring New Group to set up China's biggest lithium-ion battery production facility. This move is aimed at giving Samsung a foothold in supplying batteries to the world's largest electric vehicle market in China, which has targeted to place 5 million new electric vehicles and hybrids on the road by 2020.⁵

However, increasing productivity through automation and shifting production overseas has resulted in jobless growth, with total employment in the manufacturing sector falling by 2% annually.⁶ Meanwhile, the services sector has become the source of new jobs, but these jobs

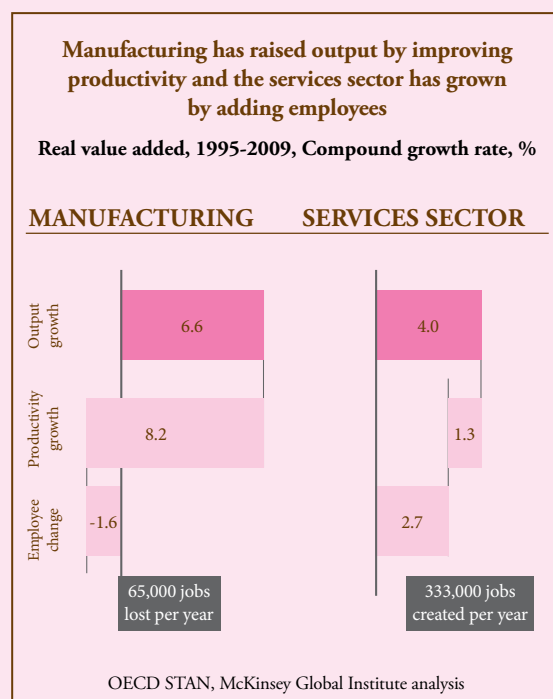


Figure 1 Source: Choi et al, "Beyond Korean style: Shaping a new growth formula," *McKinsey & Company*, Apr 2013

are low in productivity and wage growth. This contrasts with other advanced economies, where the services sector is the largest source of export-led growth. South Korea's services sector is stunted by a large number of small firms that employ about 70% of the labour force but are only 40% as productive as the *chaebols*.⁷

BRIGHT SPOTS

South Korea's leading manufacturers are looking to the explosion in demand for infrastructure projects in emerging markets to stay ahead. The opportunities are substantial – the Asia Pacific infrastructure market is expected to reach US\$5.36tn annually by 2025,⁸ and the Middle East alone has an estimated US\$30-40bn deficit in infrastructure investment.⁹ South Korean firms have jumped at the opportunity:

- Hanwha Engineering & Construction has clinched more than US\$10bn in contracts to develop social infrastructure for Iraq's Bismayah New City project, slated for completion by 2019.¹⁰
- Hyundai Engineering and LG International are building two gas processing plants worth US\$4bn in Turkmenistan.¹¹
- A consortium of Korean conglomerates – including Hanwha, Samsung Engineering and Hyundai Heavy Industries – are bidding to build the US\$14bn Al-Zour Refinery in Kuwait.¹²
- Steelmaker Posco sold a 38% stake worth around US\$1.1bn in its engineering and construction unit to Saudi Arabia's Public Investment Fund in June 2015, and is due to set up a joint venture with the Saudi government to handle the Kingdom's major infrastructure projects.¹³

In spite of deteriorating economic ties between South Korea and Japan, firms from both countries have increasingly teamed up in joint ventures targeting third countries in emerging markets:

- Doosan Heavy Industries and Mitsubishi secured a US\$1.5bn contract in 2013 to build a coal-fired power plant in southern Vietnam.¹⁴
- Daewoo partnered Toyo Engineering to win a US\$765mn contract in 2012 for construction of a fertiliser plant in Port Harcourt, Nigeria.¹⁵
- Lotte Chemical and Ube Industries established a joint venture in 2013 in Johor, Malaysia, to manufacture rubber.¹⁶
- Sumitomo tied up with CJ CheilJedang in 2013 to operate a flour mill in Ba Ria Vung Tau Province in southern Vietnam.¹⁷

GREEN LEADERSHIP FALTERING?

South Korea was ahead of its East Asian neighbours when it announced a National Strategy for Green Growth in

2009. This strategy led to an ambitious commitment to reduce carbon emissions 37% by 2020,¹⁸ a robust legal framework for green growth and the world's second-largest cap-and-trade system after the EU Emissions Trading Scheme.¹⁹ However, as with Germany's Energiewende, South Korea's "Green New Deal" has yet to deliver a significant reduction in emissions²⁰ and there has been push-back from local industry citing a loss of competitiveness.²¹ At the same time, President Park has gradually shifted away from her predecessor's emphasis on green growth – e.g. the Presidential Committee on Green Growth established by President Lee to drive the National Strategy for Green Growth has been scaled back and demoted to an office under the Prime Minister.²² –F

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CHINA

Sarah Tan

Despite three decades as the “world’s factory”, China still lags behind developed economies like South Korea in absolute productivity levels, even as it faces reduced price competitiveness and high dependency on foreign technology. The pressure from rising labour costs and increased competition from developing countries growing their manufacturing capabilities will become more acute as advanced economies embrace re-industrialisation and encourage on-shoring.

To revitalise its manufacturing sector, China has announced the “Made in China 2025” and “Internet Plus” programmes. The transformation proposed through these programmes aims to raise China’s productivity, develop technological core competencies and nurture new export industries with an accompanying wave of indigenous champions. China will become a formidable competitor to advanced manufacturing powerhouses like Germany, Japan and South Korea, while the wave of indigenous MNCs nurtured under the programmes can be a source of FDI as well as competition for other countries.



Source: Manikya et al, “A productivity perspective on the future of growth,” *McKinsey & Company*

MADE IN CHINA 2025

Announced by Premier Li Keqiang in March 2015, “Made in China 2025” is part of China’s long-term economic transformation blueprint.¹ There are two objectives – transform China from the world’s low-cost factory to a high-end manufacturing powerhouse,² and shift gears from imitating to innovating – from “manufactured in China” to “created in China.”³ Policy directives include establishing 15 manufacturing innovation centres by 2020,⁴ increasing R&D expenditure from 0.88% of manufacturing revenues in 2013 to 1.68% by 2025,⁵ and raising domestic content of core equipment and component needs to 70% by 2025.⁶ The following 10 key industries have been identified as critical for the transition:

1. Next-generation IT
2. Data control and robotics
3. Aerospace equipment
4. Marine engineering and advanced ships
5. High-speed rail
6. Fuel-efficient and new energy vehicles
7. Electricity generation
8. New materials
9. Biologics and medical equipment
10. Farm equipment

Next-generation IT

China is stepping up efforts to become a leading player in semiconductor design and manufacturing as part of its vision to become a “cyber power.”⁷ The push for semiconductors also dovetails with China’s growing aspirations to wean itself off foreign technology – the country is by far the largest consumer of semiconductors, already accounting for 45% of worldwide demand for chips.⁸ To put this into context, China imported US\$210bn worth of integrated circuits in 2014, which was more than its oil imports.⁹ To accelerate domestic semiconductor development, the government has unveiled a US\$26bn plan to create a world-class semiconductor industry that sources core components from local Chinese suppliers.¹⁰

Data control and robotics

China is highly dependent on foreign companies for high-end Computerised Numerical Control systems (CNCs) – about 95% are imported (2011 figures).¹¹ Reducing this reliance on foreign suppliers is made more urgent by the fact that China is turning to robotics to address labour shortages and raise productivity as it runs up against the limits of available workers. Guangdong Province has a head start, with plans to automate 80% of its factories by 2020, starting with a 3-year program to subsidise robots for 2,000 big local manufacturers.¹² So far, the plan has been well-received by companies suffering from high labour costs, e.g. appliance maker Midea announced its goal to replace 6,000 workers – one-fifth of its workforce – with robots by end-2015.¹³

Aerospace equipment

China looks set to establish a foothold in the global aerospace industry following the announcement of homegrown passenger plane COMAC C919’s maiden test flight by end-2015.¹⁴ China is also making progress in developing satellite technology, e.g. its homegrown version of the GPS navigation system, BeiDou, will see three to four more satellites launched in 2015, with the entire network of satellites due to be completed by 2020.¹⁵

Marine engineering and advanced ships

Bogged down by oversupply in recent years, China’s shipping and shipbuilding industry is likely to see consolidation.¹⁶ China also intends to expand its marine engineering capabilities by acquiring foreign firms, e.g. Zhuzhou CSR Times Electric recently purchased British ocean engineering company Specialist Machine Developments for US\$190m.¹⁷

High-speed rail

The merger of two state-owned railroad equipment makers in 2015 created the world’s second-largest industrial company after General Electric.¹⁸ Worth US\$130bn, the new company will allow China to compete even more aggressively for overseas rail deals (more on this in “People’s Republic of Change”).¹⁹

ASEAN SURPRISES

Calvin Chu and Tan Zhi Rong

Fuel-efficient and new energy vehicles

Despite years of joint ventures, Chinese automobile companies are not domestic market leaders, and struggle to gain international recognition, e.g. in the passenger sedans segment, Chinese brands have a market share of 22% compared to German brands' share of 27%.²⁰ However, the absence of existing market leaders in the new energy vehicle categories provides an opportunity for local brands to innovate and hopefully, dominate.²¹ Backed by strong government support, Chinese companies are also plugging into the autonomous vehicle market:

- Auto maker SAIC Motor and tech giant Alibaba have invested US\$160 million in a fund to develop Internet-connected cars to be launched in 2016.²⁴
- Baidu has partnered with BMW to develop an autonomous car by end-2015.²⁵

If successful, these collaborations will reshape the auto-industrial chain, and create a market worth approximately US\$600-950 billion.²⁶

INTERNET PLUS

The "Internet Plus" programme works in tandem with "Made in China 2025" to develop e-commerce as a new growth engine, and accelerate SOE reforms by integrating the 10 key industries with the Internet.²² This includes connecting supply and demand more efficiently to correct existing information asymmetry, forcing SOEs to become more competitive and efficient. We have seen similar dynamics at play with Alibaba's disruption of the state-dominated consumer finance sector.

If successful, "Internet Plus" will boost economic growth and create an estimated 46 million new jobs by 2025.²³ This may end up blurring the lines between government and digital conglomerates further.

WRITING CHINA'S NEXT ECONOMIC CHAPTER

If "Made in China 2025" and "Internet Plus" succeed, China will cut deeply into market segments that developed economies currently enjoy a lead in. At the same time, by reducing reliance on imported industrial equipment and components, China would also cut out developed economies from cross-border production chains that have developed in the past three decades to supply the "world's factory." This rosy scenario, however, does not account for the fact that existing advanced manufacturing economies like the US, Germany and Japan are themselves scrambling to keep their lead. In the end, we may see that China is still left with a lot of catching up to do.²⁷ —F

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Developing Asian economies face a different set of challenges in the search for a new growth model compared to Northeast Asia. Heavy reliance on foreign capital and ineffective technology transfer from MNCs to local businesses has meant that, despite decades of being plugged into global value chains, Southeast Asian SMEs continue to specialise in low-technology industrialisation while MNCs occupy the higher value-added segments.¹

With notable exceptions, many ASEAN countries have yet to produce high-tech hubs with a global reputation. The current crop of indigenous corporate champions are more likely to be found in sectors supporting the growing ASEAN middle class such as consumer goods. Indigenous digital champions along the lines of China's Xiaomi or Alibaba are conspicuously absent. ASEAN's innovation capacity is also limited – Indonesia and Cambodia rank in the bottom half of the Global Innovation Index and

Global Creativity Index, while Vietnam and the Philippines fare better.²

However, as the region rapidly goes digital, the expanding pool of Internet and mobile users is stimulating ASEAN's innovation scene, and opening new windows of opportunity. We are starting to see signs of a startup culture within selected clusters across the region, and emerging contenders for digital champions.

ASEAN IS RAPIDLY GOING DIGITAL

ASEAN is one of the fastest growing mobile markets – mobile penetration rates exceed 110%, with 350 million mobile subscriptions added from 2008 to 2013.³ The region is also home to the 4th largest internet population in the world, with its internet population growing by 16% during the same period.⁴

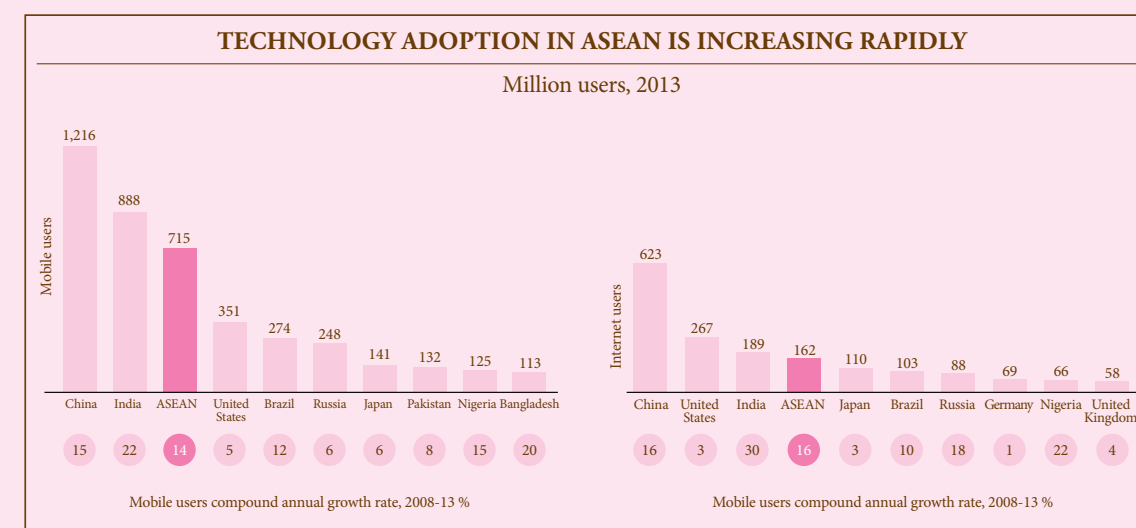


Figure 1 Source: Woetzel et al, "Southeast Asia at the Crossroads: Three paths to prosperity," *McKinsey Global Institute*, Nov 2014

SOUTHEAST ASIA'S STARTUP FEVER

Startup culture is taking root throughout Southeast Asia, from national capitals like Bangkok to smaller cities like Bandung. This ecosystem for innovation – with research institutions, university initiatives, international partnerships, support of venture capitalists and greater digital connectivity – will be crucial to unleashing the potential of the region:

- **Bandung** plans to become a tech city. Indonesia's 3rd largest city is already abuzz with local startups and tech-savvy entrepreneurs, who come from across the country to study in some 80 higher education institutions.⁵ The Bandung government has set ambitious milestones to support the city's aspirations toward becoming Indonesia's Silicon Valley – it has pledged to provide 40,000 WiFi hotspots in Bandung, 800 hectares of land and investments totalling US\$800 million.⁶
 - **True Incube**, a seed fund and incubator program launched by telecom company True Corporation in 2013, plans to build a vibrant digital startup ecosystem in Thailand. It hosts regular programs to connect local entrepreneurs to a network of more than 200 mentors in 500 startups,⁷ with a pledge to invest at least US\$15,600 in each startup accepted into its program.⁸
 - The **Ayala Technology Business Incubator Network** works with local universities to strengthen private sector involvement in technology business incubation in the Philippines.
 - The startup scene in Malaysia has active support, ranging from government players – Multimedia Development Corporation, Malaysian Global Innovation and Creativity Centre, and Cradle – to private accelerators and incubators, e.g. 500 Durians, Founder Institute, and VLT Labs. Malaysia's government launched a program in May 2015 to open up eligibility for startups to acquire MSC Malaysia status, giving startups access to a host of incentives that have thus far only been enjoyed by larger tech companies investing in Malaysia.⁹
- Startups in ASEAN countries are beginning to scale:
- **Topica**, a Vietnamese startup, works with 5 local universities to provide online degrees targeting working-age professionals who want to raise their skills profile.¹⁰
 - **Tokopedia**, one of Indonesia's biggest consumer-to-consumer marketplaces, has plans to become the next Alibaba by venturing into business-to-consumer sales. Prospects look bright with the announcement of India's Sequoia Capital and Japan's Softbank investing US\$100 million to help it go global.¹¹
 - **Go-Jek**, better known as the “Uber for motorcycles”, has helped Indonesia address some of its traffic woes. The tech startup is now in talks to partner the government and Indonesia's city transport company, TransJakarta Busway, to provide a feeder service to stations.¹² In addition, Go-Jek has also launched a courier service to deliver a parcel to anyone, anywhere – all under 90 minutes.
 - **2C2P** is a Thai online payment platform that aims to provide easy payment solutions tailored to the needs of Asian and international businesses operating in the region. Its “123 Service” gives customers a reference number or a bar code that can be brought on any medium to a designated location to make payment. So far, the startup has a valuation of over US\$10 million and has processed over US\$2.2 billion payments for the 2014 financial year.¹³
 - Manila-based startup **Twitmusic**, which participated in the Silicon Valley-based accelerator 500 Startups in 2012, uses Twitter to allow artists and followers to easily launch inexpensive campaigns and share songs in minutes.

GrabTaxi, a ride-booking app originating from Malaysia, has taken Asia by storm. The successful startup has a presence across 20 cities and is reportedly valued at US\$1 billion. Creativity is the not-so secret to the company's success – it takes driver welfare very seriously, e.g. the Singapore arm recently launched its Provident Fund, a US\$2.8 million scheme for its active drivers who have a good track record.

EMERGING ASEAN DIGITAL CHAMPIONS

Big multinationals dominate ASEAN's digital landscape, particularly in niches like communications, search and networking because of their worldwide outreach and vertical focus. In contrast, most local companies offer community services or serve customers whose preferences do not cross borders. This is changing as regional ASEAN digital champions such as GrabTaxi emerge (see box).

Where are these digital champions more likely to appear? By 2030, new demand centres in the form of new cities and consumers will appear in Indonesia, the Philippines and Malaysia.¹⁴ Successful implementation of development policies and education, as well as infrastructure investment, will likely unlock a virtuous cycle between demand and supply, fuelling a new wave of emerging digital champions in these countries, especially Indonesia.

RARING TO GO?

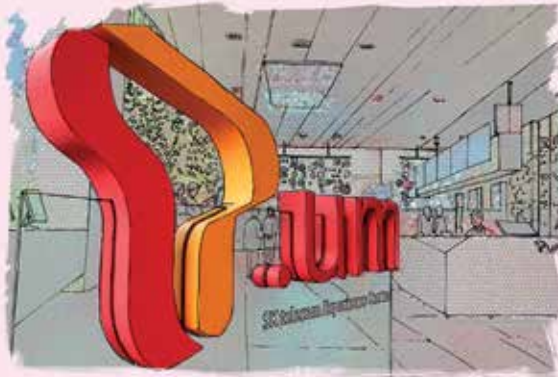
As the demand and supply pieces of ASEAN's digital ecosystem slowly click into place, will we see more ASEAN “unicorns”, with over US\$1bn in valuation? How would ASEAN digital champions work with and compete with digital giants from China and the US, and will these digital giants change the existing “technology-less” growth model? –F

- 1 Kikuchi and Masutomo, “Why S-E Asian SMEs are low-tech,” *The Straits Times*, 21 May 2015
- 2 Ranks indicated are for the 2015 editions of the Global Innovation Index (GII) and Global Creativity Index (GCI). Indonesia: 97/141 (GII), 115/139 (GCI); Cambodia: 91/141 (GII), 113/139 (GCI); Vietnam: 52/141 (GII), 80/139 (GCI) and Philippines: 83/141 (GII), 52/139 (GCI)
- 3 Woetzel et al, *Southeast Asia at the crossroads: Three paths to prosperity* (McKinsey Global Institute: Nov 2014), p.104
- 4 *Ibid.*, p.105
- 5 Lukman, “5 reasons why Bandung is a great tech city – and why it really could be Indonesia's Silicon Valley,” *TechinAsia*, 22 May 2014
- 6 *Ibid.*
- 7 Sakawee, “Thai telco True invests in 500 Startups, unveils 6 startup finalists,” *Tech in Asia*, 10 Sep 2013
- 8 Woetzel et al, *Southeast Asia at the crossroads: Three paths to prosperity*, p.108
- 9 “MDeC announces ‘MSC Malaysia for Startups,’ support from MaGIC,” *Digital News Asia*, 12 May 2015
- 10 Horn, “Entrepreneurs seek to transform education in Vietnam,” *Forbes*, 3 Mar 2014
- 11 Cosseboom, “How Indonesia's Tokopedia can become the next Alibaba,” *Tech in Asia*, 23 October 2014
- 12 Sulisto, “Go-Jek, Indonesia's Uber for motorcycles, in talks with government about solving traffic woes,” *Tech in Asia*, 16 Mar 2015
- 13 Tegos, “Online payments company 2C2P banks US\$7M in series C,” *Tech in Asia*, 27 Apr 2015
- 14 Woetzel et al, *Southeast Asia at the crossroads: Three paths to prosperity*, p.75

MUSEUMS OF THE FUTURE

Sarah Tan

Museums of the future have a long history in the West, e.g. the memorable 1964 New York World's Fair, which showcased American culture and technology. In recent years, this optimism has been eroded by increasing mistrust of technology utopias.¹ However, in Asia, governments and corporations continue to set up museums of the future, not just for marketing, but to highlight their country's stake in shaping the future.



SEOUL, SOUTH KOREA

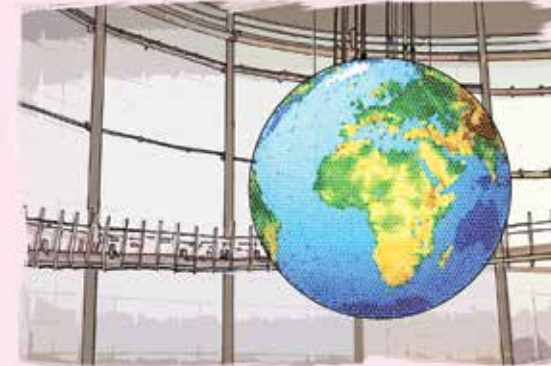
SK Telecom's Telecom Ubiquitous Museum (T.um)² is an interactive technology museum about how technology will shape lifestyles of the future, e.g. with respect to driving, shopping and life at home. Visitors are given a personalised "lifestyle key" – a "T-key" – to interact with the various exhibits, including:

- U.Home – the "living room of the future" – shows visitors how homes will respond to in-built motion sensors in the future, e.g. changing interior colours by waving a hand.
- U.Fashion – Visitors can create a 3D avatar and virtually try on various clothes recommended by a digital personal assistant.
- U.Driving – Experience the future of driving through SK Telecom's futuristic connected car.



INCHEON, SOUTH KOREA

Set to open in 2016, Robot Land is the world's first hybrid robotics research facility and theme park. It features interactive exhibitions and rides as part of South Korea's drive to rapidly expand its robot industry. In addition, Robot Land will offer a range of educational and industrial facilities – including a Graduate School of Robotics, a Robotics Institute and a R&D centre.³



TOKYO, JAPAN

The National Museum of Emerging Science and Innovation (Miraikan) allows visitors to experience the future roles of science and technology in coming up with solutions to some of the major challenges of our time:

- *Lifestyle 2050* – Visitors become citizens of an imaginary city (Itokashi City) in 2050, and experience future technologies, e.g. wearable computers, plant factories.⁴
- *TELESAR V* makes virtual transportation to just about anywhere in the world real. This "telexistence robot" allows a user to experience in real-time the sensation of being somewhere else through visual, auditory and haptic feedback.⁵



DUBAI, UAE

Dubai's Museum of the Future is the city's latest big-budget attraction.⁶ In addition to regular exhibits, the museum plans to incubate cutting-edge research and ideas when it opens in 2017. –F

¹ Raven, "Make technological utopia easier with this one weird trick," *Futurismic*, 12 Oct 2014

² "T.um," *SK Telecom*, accessed 14 Apr 2015, tum.sktelecom.com

³ Quigley, "South Korea's \$660 million robot theme park to open in 2016," *The Diplomat*, 31 Jan 2014

⁴ "Lifestyle 2050," *Miraikan*, accessed 14 Apr 2015, <http://life2050.jp>

⁵ Pierce, "Telesar V robot can see, feel and hear," *The Verge*, 7 Nov 2011

⁶ Hutchinson, "Dubai to splash out £90million on metallic, egg-shaped Museum of the Future... complete with 'time capsule' lifts and walls of poetry written by the Emirate's ruler," *Mail Online*, 12 Mar 2015

CATCHING UP WITH DUBAI ON THE ASIA-AFRICA SUPERHIGHWAY

Bridget Shoo and Pung Wan Qing

THE RISE OF THE ASIA-AFRICA¹ SUPERHIGHWAY

Asia-Africa trade topped US\$315bn in 2013, growing at a CAGR of 22% from 2003 to 2013,² and is expected to reach US\$1.5tn by 2020.³ The foundations for the Asia-Africa trade superhighway have been laid primarily by China's demand for natural resources such as oil, iron and other base metals to meet industrialisation needs. Since 2009, China has been Africa's largest trading partner, ahead

of the EU and the US.⁴ Trade is also flowing to Africa, driven by rapid infrastructure development and a rising African middle class, leading to growing imports of machinery and consumer goods from Asia. As African manufacturing capacities develop, we may see more indigenous manufacturers exporting light manufactured products to Asia, paving the way for more diversified trade.

As Africa looks east along the Asia-Africa trade superhighway, who might be the new fuel stops?

TANKING UP IN DUBAI

Leveraging its geographical proximity to the African continent, Dubai has become a de facto fuel stop for Asia-Africa traders and companies. Dubai has much to offer: favourable corporate tax rates, a strong financial eco-system and frequent air connections to Africa. International and Asian banks increasingly see Dubai as a financial hub for Africa, and have correspondingly set up their African headquarters in the Dubai International Financial Centre. Asian companies choose Dubai as their launch pad for Africa, attracted by the growing presence and network of African companies headquartered there. Dubai fuels both the offshore and physical trade between Asia and Africa.

Dubai is reaping the benefits, evident in its growth as a gold and diamond trading hub. In 2013, 40% of the world's physical gold was traded through Dubai.⁵ Dubai's strategy to be the node between producers in Africa and manufacturers of finished diamond products in India has also propelled it to be the third largest trading hub for diamonds.⁶

Is Singapore missing out?

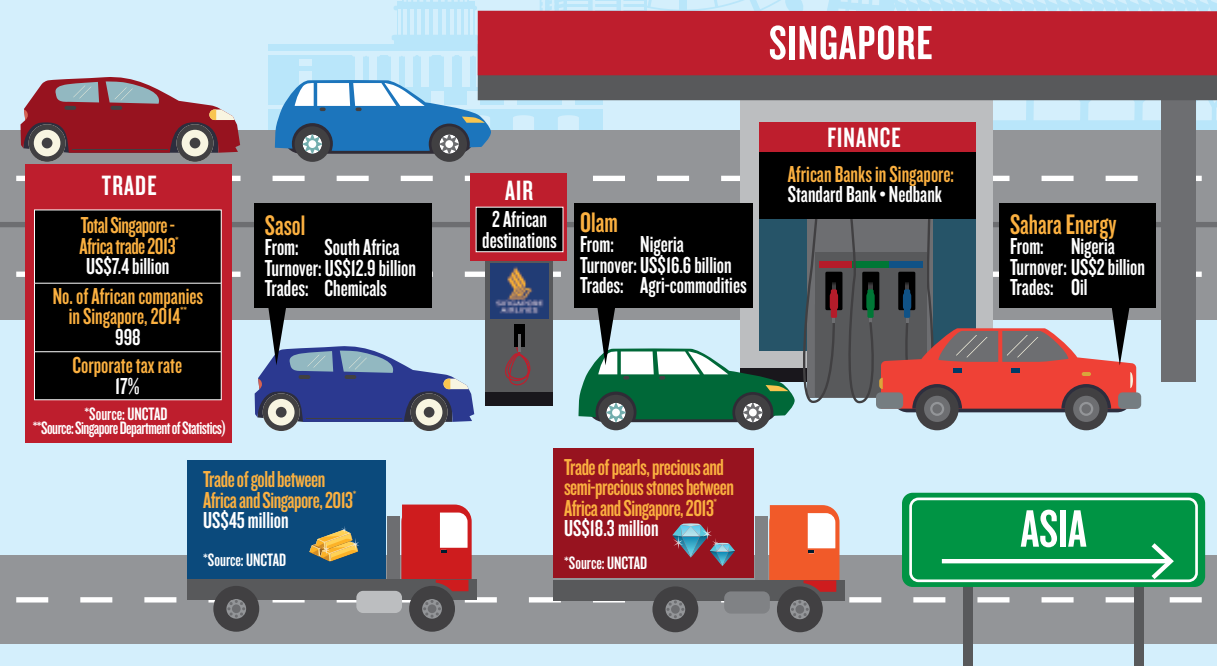
CATCHING UP

While Dubai may seem like the obvious choice, Singapore offers advantages to African companies going east. Singapore's financial and trade connections with Asia are deeper, with Asia-Africa maritime trade passing through Singapore on the way to final demand markets in China and East Asia. Singapore is also a major commodities trading hub for petroleum, metals and minerals, and is building up its network of Avoidance of Double Taxation Agreements. The Asia-Africa trade superhighway's growth prospects leave enough room for several fuel stops, and Singapore is well placed to catch up.

So Dubai or Singapore, which would you choose? —



- 1 The use of Africa here refers to Sub-Saharan Africa
- 2 United Nations Conference on Trade and Development Statistics, 2015
- 3 Jagtiani and Krishnan, "Maersk lured by \$1.5 trillion Asia-Africa trade: Freight markets," *Bloomberg*, 14 Sep 2011
- 4 Yun Sun, "Africa in China's foreign policy," *Brookings*, April 2014
- 5 Jamasmie, "Dubai gold trade reached \$75 billion in 2013," *Mining.com*, 7 Apr 2014
- 6 Kane, "Big banks lend support to Dubai's diamond trade ambitions," *The National*, 22 Apr 2015
- 7 "Dubai Chamber intensifies its preparations for Africa Global Business Forum 2014," *Dubai Chamber*, 11 Aug 2014



FROM MAPS TO METAPHORS: GOVERNING (IN) A WORLD THAT DOESN'T EXIST

Aaron Maniam

Before travelling to new places, we instinctively look for maps: either a physical map, charting out relative locations or distances, or a subjective map of friends' impressions and perspectives.

This need for maps reflects an age-old human yearning for order in an often messy and unpredictable reality. Maps give direction and articulation to the unknown, which they categorise and conceptualise. We often hear talk of “plans” and “blueprints” – essentially attempts to map paths into the future. Even the nowadays instinctive urge to “Google something” is, at its core, an effort to map the contours and boundaries of an issue that we might not know well.

FROM MAPS TO METAPHORS

The problem with maps is that the order, categorisation and clarity they bring is fundamentally retrospective. They are useful representations of things that someone, somewhere has already experienced. In the language of complexity theory, maps are wonderful tools for the unknown but knowable.

But maps cannot be made for things, issues and places that do not already exist. For the unknown and un-or-not-yet-knowable, we need different tools. I find it useful to take a leaf from creative writers – particularly poets – and mine the insights that come from the world of metaphors. Metaphors are not just about the comparisons we make between unlike things; they also reflect the deep stories we tell of ourselves and the things we care about.

In the case of how we govern a world that does not exist, the tentative beginnings of answers lie in our metaphors for two related concepts:

- **government** – the work of the public sector, involving both political leaders and professional civil services;

- and the broader phenomenon of **governance** – how the different sectors in a polity, economy and society organise themselves to deliver value to people.

METAPHORS AS MAGNIFYING GLASSES

Organisational management scholar Gareth Morgan notes that the “images” or metaphors we adopt for organisations affect how, and how effectively, we manage them and their attendant challenges.

If we view an organisation as a machine, our management approaches tend to focus on the stable, predictable and coordinated interactions among its constituent segments, each comparable to a cog, gear or other mechanical component. The machine metaphor simultaneously de-emphasises the protean, human elements of organisations and their subjective, adaptive interactions, which become more prominent once we view organisations as living organisms or cultures. Interacting power dynamics are highlighted by yet another metaphor – of organisations as political systems.

In each instance, metaphors function as magnifying glasses, highlighting certain aspects of organisations as particularly salient or critical.

The same can be done for government and governance. I suggest that four metaphors are particularly useful when thinking about governing the elements, issues and challenges of a world that doesn't yet exist.

COMPLEX CARTOGRAPHY

First, we need to jettison the comforting but false idea that there can be a single map of the future. By definition, there can only be multiple futures – a dizzying array of permutations and combinations. Some of these could be more likely, plausible or

desired than others, but even if we winnow down the possibilities to these, we could be left with a large number of potential futures to consider.

The metaphor of multiple futures underscores the reality, as the Futures Group and other practitioners of strategic foresight well know, that attempts to predict the future are exercises in futility. Governing a world that doesn't yet exist can only be done if we anticipate different possibilities now – including those that make us uncomfortable or prick at our prior assumptions, beliefs and biases about the world – and prepare for them. This preparation is not about slavish rehearsals or developing standard operating procedures (SOPs) that must be followed to a ‘t’ if a particular eventuality materialises. Rather, it is about understanding the range of possible outcomes and ensuring that decisions today help to maximise the range of desirable future options.

This is the principle at the heart of military wargames and contingency planning in internal security, like Singapore's public exercises to prepare for pandemic outbreaks. Carried out well, these provide important lessons for organisations. Sadly, as examples across the world show, their actual practice can sometimes be unfortunately rigid and inimical to the larger aim of building anticipatory capacity.

FORTRESS → ECOSYSTEM

Policymakers would benefit from viewing the world they govern as a dynamic ecosystem, constantly evolving in response to external stimuli. Ecosystems are different from fortresses – which, while large and powerful, can be rigid and resistant to change. The fundamental metaphor here is that government and governance are more similar to ecology, with its untidy webs of overlapping relationships, than to static engineering.

This metaphor frees policymakers from an artificial reliance on simple maps – because ecosystems are intrinsically unmappable, given their dynamism and perennial evolution. It also serves several other useful purposes, including highlighting:

- the living and breathing nature of both governing and governed agents, with life narratives and varied human needs that need to be met, even as governments endeavour to be fair and even-handed in policy formulation and delivery;
- the interdependencies among the different parts of the ecosystem, with all the possibilities this brings of feedback loops and reinforcing cycles (whether vicious or virtuous);
- the need for practitioners of governance to be alert to the changes in their ecosystem, and be willing to adjust earlier decisions in light of emergent information.

The regular iteration of Singapore's pro-fertility measures is a useful case in point, given that the key players (parents and employers, among others) are part of complex ecosystems, each with human concerns, fears and aspirations that may not be fully reflected in more mechanistic metaphors.

CHESS → SOCCER

What both earlier metaphors point to is the adaptive nature of governance problems. Dealing with this involves not just the chess player's ability to analyse and break down a problem into discrete component parts, but also a soccer star's skill at synthesising ideas, information and instincts across an entire system. Constant adaptation and agility are also important, since governance will involve the ability to adjust deftly to changes in a fluid operating environment.

Much of this will rely on a constructive attitude to meaningful failure (of the sort that comes after genuine effort in an iterative process; as opposed to failure arising from complacency or carelessness), and space for both the governed and the governing to engage in experimentation and evolutionary learning. Singapore's current efforts to tackle cybersecurity challenges, become a “Smart Nation” and reap both the economic and social benefits of cutting-edge technology like advanced manufacturing, robotics and big data, are important examples of such adaptive

issues, which will call for new metaphors and modes of thinking.

LEVIATHAN → PLATFORM

Fundamentally, we need better metaphors for what government is and does. Perhaps the most famous metaphors for governance are Thomas Hobbes' "Leviathan", the large and powerful entity that maintains order through what Max Weber later called the "monopoly on the legitimate use of force"; as well as the economic metaphors of government as either provider of public goods or regulator of economic actors in the public interest.

Both sets of metaphors assume that most salient actions are undertaken by public sector agencies. While maintaining order, provision and regulation are undeniably important roles, the increasing scope and complexity of governance tasks, coupled with the enabling effects of disintermediating technology, suggest that governments can do more as facilitative platforms, as suggested by both media commentator Tim O' Reilly and Princeton professor Anne-Marie Slaughter.

Governance as platform means enabling the like of businesses and civil society groups to perform some acts of governance, rather than having governments play all such roles themselves. Outsourcing is just the most familiar form of such facilitation; co-designing policies with citizens, public-private partnerships and the British government's experiments with "Citizen Juries" under PM Tony Blair to deliberate on contentious policy issues, are others.

To act as effective and meaningful platforms, governments will need more multi-faceted definitions of power – including the ability to convene, engage and persuade, not just coerce or instruct. Such power will also need to be shared, not monopolised in the Weberian sense, which in turn will require an educated citizenry capable of exercising such power judiciously. "Our Singapore Conversation", which ran from 2011 to 2012, was one example of government acting as a convenor, platform and facilitator for citizen voices to be heard.

METAPHORS AS MASKS

Metaphors matter, but they are not everything. They clarify, but can also obfuscate. Magnifying attention on certain aspects, by definition, de-emphasises other dimensions.

For instance, focusing too much on anticipation can make us forget that in some cases – demographic or econometric projections, for instance – discerning prediction has heuristic uses, especially if we keep our eyes open to its potential pitfalls. Our governance milieu is indeed an ecosystem, but there are instances where the clarity, stability and predictability of fortress-like structures can be beneficial. Focusing on agility and adaptation need not mean that we jettison analytical approaches entirely – they just cannot be the only parts of our toolkit. And governments acting as platforms will still have duties to maintain public order, provide public goods and regulate.

The world of the future will bring with it challenges of more information, complexity and heavier demands for those who govern. Multiple and mutually complementary metaphors, each playing up different priorities and areas of focus, will be important to ensure that we draw on a commensurately broad range of approaches in response. ─

HINDSIGHT AND FORESIGHT

Vernie Oliviero

Communication is now on the point of returning ... to that instantaneous reaction of person to person with which it began. ... What will be the outcome? ... More numerous contacts: more numerous demands on attention and time. ... One is faced here with a magnified form of a danger common to all inventions: a tendency to use them whether or not the occasion demands. – *Lewis Mumford*

Read little but become intimately familiar with what you read; experience the text over and over again ... Don't strive for quantity ... I especially don't want people to skip around as they read ... The reason people today read sloppily is that there are a great many ... texts. – *Zhu Xi*

The lamentations in the first quote will be familiar to anyone grappling with the impact of social media or the widespread use of smartphones. The second sounds like an ageing professor lecturing his students, nurtured on a diet of short Internet articles, on the art of mindful reading. Both speak to the negative personal effects of otherwise hugely beneficial modern technology.

The first quote comes from Lewis Mumford's *Technics and Civilisation*, published in 1934. His complaints were about the telegraph, telephone, and television, rather than smartphones and tablets!¹ In the same vein, Zhu Xi made his comments to candidates for the imperial examination in China in the 1100s, rather than to contemporary undergraduates. He was responding not to e-readers but to leishu – woodblock-printed learning aids which efficiently compiled examinable information.²

The familiarity of these complaints about the technological innovations of their time should give us pause. If our reactions to change are so similar, then where exactly does the challenge of change lie? What long-standing assumptions and values shape the way in which people think about the future? How might we understand change over time with greater rigour?

THINKING ABOUT THE PAST TO THINK ABOUT THE FUTURE

We can see the relevance of history to governance in how historical knowledge influences decisions about the present and future. As the late Harvard historian

Ernest May showed in *Thinking in Time: The Uses of History for Decision Makers* (1986), leaders often think using historical analogy. In 2003, when Americans debated whether they should embark on Operation Iraqi Freedom, proponents argued that the United States could bring democracy to Iraq through military means just as they had in Japan and Germany, while those opposed drew upon historical comparisons to Vietnam and Korea to sound a cautionary note. May, who also saw service with the Joint Chiefs of Staff, Department of Defence, and the 9/11 Commission in the US, argued that decision-makers had to learn how to think well historically so that history could best shape their judgment.

Here are three insights for how you can use history to better think about the future:

1. The future you envision is shaped by your story of history

People are better at remembering stories than raw facts or statistics.³ We create coherent links between events of the past, present, and future through stories in order to better make sense of them.

Foresight scenarios can be thought of as epilogues to a history, and our stories about the past shape the scenarios we produce. Many notable foresight failures are arguably failures to envision different narratives. IBM believed the story of computing was one of increasingly sophisticated mainframe computers used by institutions, and failed to imagine a different story – where the future of computing took place at home or on office desks in the form of personal computers. The

fall of the Berlin Wall was a surprise to many because few expected the plot of East German life, dominated seemingly by the Communist Party and the Stasi, to be driven instead almost by accident, blunder, and courageous East Berliners.⁴

It helps to think about chronological narratives of past and future as one would a novel or play: who are the heroes and villains, the main and supporting characters, where do the plot twists come from, and is the narrative a tragedy, comedy, romance, or even farce? For example:

- Orthodox narratives of the Cold War posit the Soviet Union as an ideologically-driven and expansionist antagonist in a high-stakes drama with the USA as the main protagonist.
- Revisionist accounts place the blame for the Cold War on Western allies who were insensitive about the insecurities of a Soviet Union that, twice in the living memory of its leaders, had been invaded from the West. The Cold War, in this narrative, is a classic tragedy involving a fatally flawed hero and victim.
- Neo-orthodox Cold War narratives contain a central villain: Josef Stalin. His ego, growing paranoia, ambitions, and ruthlessness, rather than anything inherent to communism itself, laid the foundations for a great 20th century rivalry.

Changing one's narrative of the past changes one's imagination of future possibilities: who drives change (a particular leader, an ideology, a system of government, or a seemingly minor player); or what kind of relationships might be possible (enmity, competition, partnership, friendship). The historian's tool of the counterfactual is useful to challenge fundamental assumptions about the chronological narrative: take away a key character or element in the narrative (Stalin, say) and see how differently a plot might unfold so we better gauge the relative importance of other elements in the story.

2. There are many models for change over time

In June 2014, historian Jill Lepore took on the current buzz phrase “disruptive innovation” by (i) challenging

whether innovation was, in fact, frequently disruptive, and (ii) noting that “disruptive innovation” was merely the latest in a series of theories of change. She pointed out that people have believed in: divine providence (historical events shaped by God's will), inexorable progress (propounded by British politician-historian Thomas Babington Macaulay), evolution (Social Darwinists) and creative destruction (most associated with Austrian economist Joseph Schumpeter).⁵

These are just five of the many models of change over time. An explanation for historical change can suddenly become hugely influential. As the Cold War drew to a close in the 1990s, people abandoned ideology for culture as the main determinant of international affairs. Samuel Huntington's *The Clash of Civilisations and the Remaking of World Order* (1996) posited that change in the future would be determined by major cultural and religious blocs. Historians began studying global cultural connections – Huntington's Harvard colleague Akira Iriye's *Cultural Internationalism and World Order* (1997) painted a more positive picture for the role of culture in global affairs.

Many Asian leaders thought “Asian Values” explained the region's economic prosperity. The Asian Financial Crisis of 1997 not only dampened enthusiasm for “Asian Values”, together with the bursting of the Dot Com bubble and the emergence of SARS, it set the stage for a new fascination with “globalisation” as the new key driver of change.

3. “Presentism” means that accounts of the past and future reflect our assessment of the present

Historians are well aware of the influence of presentism – studies of the past are shaped in some way or form by present concerns. Paul Ehrlich's *The Population Bomb* (1968) was written at a time when the global population control movement was at its height.⁶ As American multinational enterprises expanded their global presence in the 1960s, Jean-Jacques Servan-Schreiber in France worried about their impact in *The American Challenge* (1967), as did Canadian Kari Polanyi in *Silent Surrender: The Multinational Corporation in Canada* (1970). They

need not have worried – the following decade saw serious challenges to the United States' global economic dominance, and by the 1980s, authors were writing instead about Japan's dominance.

So ... are the robots taking over or not?

This brings us to the current fascination with technodystopia. Dystopian futures where human beings are overtaken by machines have been around for a long time. This vision of the future, proffered by Hollywood via the *Terminator* and *Matrix* franchises, also made its appearance in Jeremy Rifkin's *The End of Work* (due to the information economy and automation) and Kurt Vonnegut's novel *Player Piano* (where most of humanity, deskilled by machines, is rendered idle and purposeless).

Yet, history affords us three important reasons to be sceptical of such technologically-deterministic dystopias. The first is that inherent superiority and usefulness of a technology rarely singularly determines its use. The Aztecs knew about the wheel, but only used it for ceremonial purposes. The Chinese invented gunpowder, but largely used it for leisure. Woodblock printing existed in the Islamic world and Chinese empire for centuries, but its use for the mass reproduction of the printed word was restricted because of cultural factors that prized manuscripts. More recently, Google Glass ran aground in the face of overwhelming social resistance.

Second, histories of science and technology show how human agency shapes the development of technology. Marc Levinson's *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger* (2006) shows how varied individuals, organisations, companies, countries, and world events came together to produce the world we have now in which the container box makes global transportation by sea inexpensive and efficient.

Third, questions that position technology as a threat to human skills fundamentally fail to appreciate the adaptability of human beings. Sceptics in the 1990s feared the growth of Silicon Valley would herald increasing unemployment. In fact, the years during which Bill Clinton was President of the United States

saw tremendous job growth.⁷ More recently, smart phone apps have enabled many to augment their income in the sharing economy. Those who focus on the way technology might erode human skills rather than open up new avenues of opportunity should take caution from Plato's critique of writing as the practice spread throughout the ancient Greek world:

The fact is that this invention will produce forgetfulness in the souls of those who have learned it. They will not need to exercise their memories, being able to rely on what is written, calling things to mind no longer from within themselves by their own unaided powers, but under the stimulus of external marks that are alien to themselves. ... Then any man who imagines that he has bequeathed an art to posterity because he put his views in writing, and also anyone who inherits such an “art” in the belief that any subject will be clear or certain because it is couched in writing, such men will be utterly simple-minded.

Technology historian David Nye points out that “when humans possess a tool, they excel at finding new uses for it. The tool often exists before the problem to be solved”. He also argues that “technologies are not just objects but also the skills needed to use them.”⁸ Of course, writing has not robbed humanity of its intelligence. We may indeed be less capable of great feats of memorisation, but we are also freed to devote our brains to other uses (like all the advancement humanity has enjoyed since Plato's time). Similarly, our historically-bounded imaginations about intelligent robots shouldn't necessarily constrain our willingness to explore the opportunities they present. –F

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