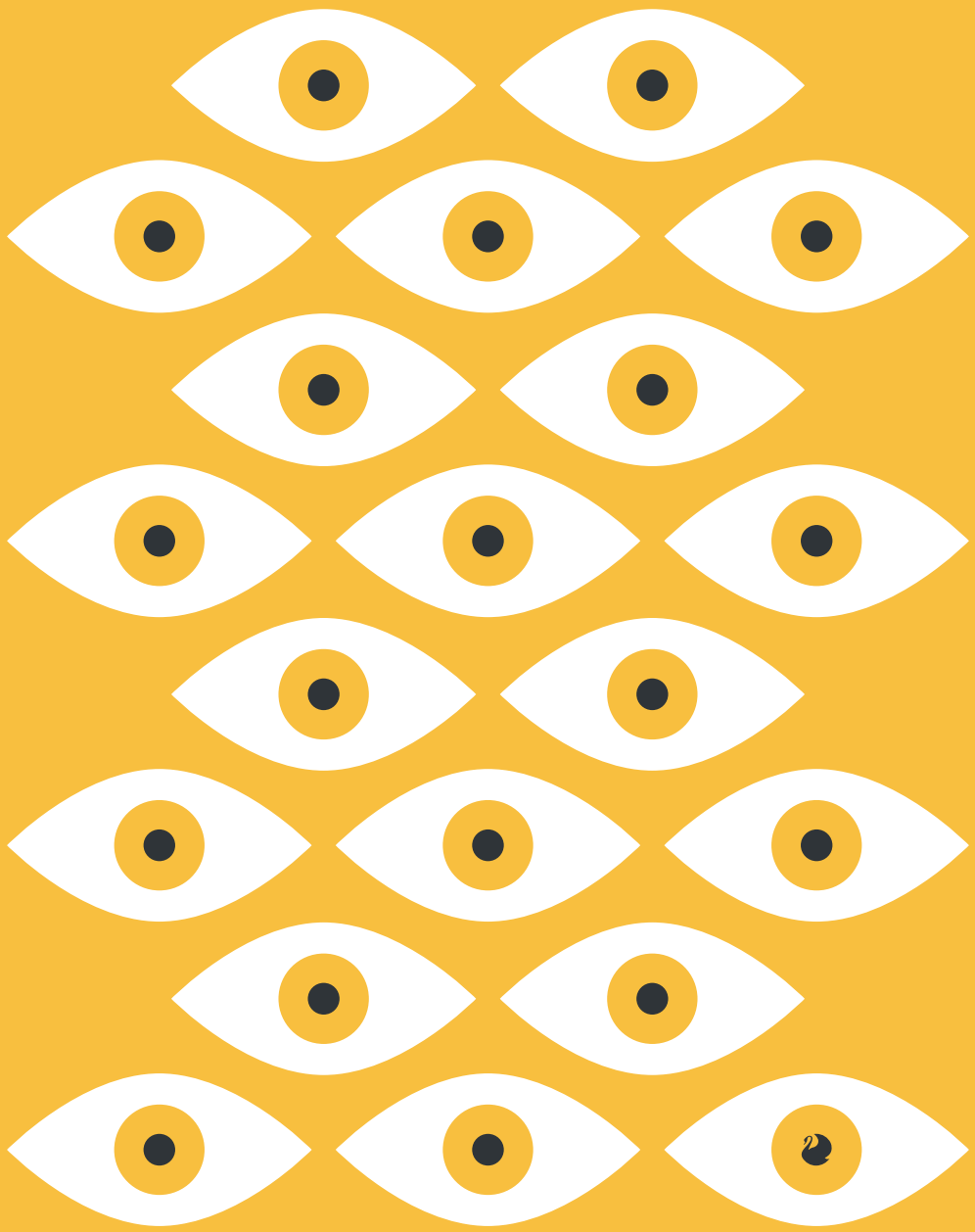
CENTRE FOR STRATEGIC FUTURES

FORESIGHT



TENTH ANNIVERSARY ISSUE

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The Singapore government's efforts to develop and apply futures thinking began in the late 1980s at the Ministry of Defence. Scenario planning was subsequently adopted as a tool for long-term policy thinking and development across the Public Service, with the establishment of the Scenario Planning Office within the Public Service Division in 1995. In 2003, the Scenario Planning Office was renamed the Strategic Policy Office to reflect its expanded focus to translate scenarios to strategy. The Centre for Strategic Futures (CSF) was subsequently established in 2009 to strengthen our long-term thinking and planning capabilities by evaluating new methods of futures thinking, identifying black swan events and developing contingency plans free of the demands of day-to-day operational responsibilities.

For a small, open and globalised country, planning for the future is a vital skillset. The government must have the curiosity and bandwidth to assess what lies ahead and how future changes will affect Singapore. Long-term thinking, complemented by the agility to adjust strategy and policies to meet future challenges and seize new opportunities, has long been in our DNA. Major projects and bold policy moves—moving our airport from Paya Lebar to Changi, land reclamation, adaptation to climate change, and our Water Story, to name a few—have only been possible because of the foresight of our leaders and our collective determination to launch and see through long-term projects.

This work will never be done. We need to continually reinvent our government, transform our city, weigh our options, anticipate threats and mitigate risks. CSF will play an important role in this, and must continue to support the Public Service in conceiving and developing new solutions for Singapore's future.

Congratulations, CSF, on your 10th anniversary!

LEE HSIEN LOONG
Prime Minister
Republic of Singapore

Head, Civil Service's Foreword

Foresight and futures thinking have long been a key contributing factor to the way the Singapore Public Service has approached policy planning. The term "scenario planning" may only have entered our vocabulary in the late 1980s, but looking beyond the horizon and planning for the long-term has always been a part of our DNA.

The ability to take the long view is ever-more important now, in an era of continual disruptions and accelerating pace of change. We must continuously scout the horizon to identify emerging trends and issues. We must use those emerging trends to challenge prevailing assumptions and approaches. We must be agile enough to adapt our strategies to meet the needs of a changing operating environment, while keeping one eye on the next frontier. And we must deepen our capabilities to do so across the Public Service so that we can make better decisions today and be better prepared for tomorrow.

The Centre for Strategic Futures (CSF) plays a crucial role in developing these capabilities. As CSF commemorates its 10th anniversary this year, we remind ourselves that preparing the Public Service and Singapore for the future is a never-ending journey. There can be no trade-off between delivering well today and preparing for tomorrow. It requires deliberate effort, leadership attention and staff commitment. We must ensure that across the Singapore Public Service there is a mind-set and culture of future-orientation to anticipate challenges, seize opportunities and invest in making tomorrow better than today.

I look forward to CSF's continued important contributions in keeping us a future-oriented Public Service.

LEO YIP
Head, Civil Service
Republic of Singapore

2017–2018 Highlights

By Leon Kong

2019 marks the 10th anniversary of the Centre for Strategic Futures (CSF). Through the decade, CSF's mandate has remained constant: position the Singapore government to navigate emerging strategic challenges and harness potential opportunities by scanning the horizon for emerging trends. In 2015, CSF moved from the Public Service Division to the Strategy Group under the Prime Minister's Office. This enabled CSF to be plugged into the whole-of-government strategic planning cycle, allowing us to more closely link and translate foresight into insights for strategy and decision-making. The following provides a summary of CSF's work in 2017–2018.

FORESIGHT CONFERENCE 2017

The biennial Singapore Foresight Week is the flagship event for the foresight community in Singapore, and the Foresight Conference (FC) is held as part of the week's events. The conference seeks to expose the Singapore government to fresh perspectives, and to that end a mix of government and nongovernment participants are invited to attend.

Informed by the recently concluded National Scenarios exercise in 2016, FC 2017 was organised around the theme of "Identities and Aspirations". It explored the changing intersections of religion, ethnicity, nationalism, accelerating technological change, and individual and group identities. FC 2017 sought to understand how these forces would shape identity and locate the role of the state in managing these intersections. A deep dive into issues around identity incorporating some insights gleaned at FC 2017 may be found in pages 62–68.

As with other FCs, we strove to assemble an insightful and multi-disciplinary group of thinkers. We had invaluable help in doing so from our Distinguished International Fellow, Richard O'Neill, Founder and President of the Highlands Group. Participants at FC 2017 included:

- **KWAME ANTHONY APPIAH, PROFESSOR OF PHILOSOPHY AND LAW, NEW YORK UNIVERSITY**, whose research focus includes multiculturalism and identities
- **PHILIP JENKINS, DISTINGUISHED PROFESSOR OF HISTORY, INSTITUTE FOR STUDIES OF RELIGION, BAYLOR UNIVERSITY**, a scholar of Christianity, who has published extensively on issues of terrorism and political violence, and on new and emerging religious movements
- **RICHARD MACKINNON, EXECUTIVE DIRECTOR OF BORGFEST** (a human augmentation expo and cyborg pride festival), whose academic interests include cyborg theory, bodies in virtual reality and public policy
- **EBRAHIM MOOSA, PROFESSOR OF ISLAMIC STUDIES, KEOUGH SCHOOL OF GLOBAL AFFAIRS, UNIVERSITY OF NOTRE DAME**, whose research interests include Islamic law, theology, and contemporary Muslim ethics and political thought
- **ANJU PAUL, ASSOCIATE PROFESSOR OF SOCIAL SCIENCES, YALE-NUS COLLEGE**, whose research focusses on migration to, from, and within Asia, and spans across urban sociology, gender and labour, race and ethnicity, and globalisation
- **THOMAS PHILBECK, HEAD OF TECHNOLOGY, SOCIETY, AND POLICY, WORLD ECONOMIC FORUM**, whose area of interest is the intersection between technology, society, business and philosophy, with a special focus on the impact of the Fourth Industrial Revolution
- **LINDA WOODHEAD, PROFESSOR OF SOCIOLOGY OF RELIGION, LANCASTER UNIVERSITY**, whose current research is on the rise of "no religion" and its implications for state-religion relations, education and society in general, including how organised religion responds

INITIATING AND SUSTAINING CONVERSATIONS

A core component of CSF's mandate involves sensitising policymakers to multiple possible futures that may not be at the top of their minds. To this end, CSF produces research papers and hosts roundtables to foster conversations within the Singapore government about possible futures and emerging issues.

For such discussions to be impactful, they need to be sustained and developed. In curating our agenda, CSF has been mindful to maintain threads of continuity. Two such threads are the changing global order, and technology and society.

Changing global order

Unsurprisingly, this has been a key area of concern surfaced at various fora, including the National Scenarios exercise that concluded in 2016. In 2016, CSF hosted a roundtable discussion exploring the consequences of a "Perfect Storm" scenario: a confluence of global and economic trends against the backdrop of the then-upcoming 2016 US Presidential Election and the shock of Brexit. This was followed in 2017 by a roundtable discussion on the consequences of a potentially deglobalising world. In 2018, this theme was further sharpened by a discussion paper written by CSF to better understand the implications of a US-China technological and trade war. 2019 sees us continuing our exploration of this issue through a series of roundtables.

Technology and society

FC 2017 revealed anxiety around how rapid technological advancements would affect all dimensions of society. There was general agreement that this topic had not been sufficiently explored. CSF had initiated a series of conversations in 2016 around ethics and governance with the advent of Artificial Intelligence (AI). We continued to pursue this theme in 2018, co-hosting an international workshop on Risk and AI in collaboration with the Centre for the Study of Existential Risk and the Leverhulme Centre for the Future of Intelligence, two leading think tanks based at the University of Cambridge (see pages 69–80). Beyond AI, we also explored the implications of advances in the biological sciences. In 2017 and 2018, CSF conducted research into, and roundtables on, the perils and opportunities of human augmentation, especially in relation to productive longevity (see pages 54–60).

In addition to a sustained focus on key themes, CSF also identifies weak signals on the horizon and sensitises agencies to them through the Emerging Strategic Issues (ESI) process. In 2016, we systematised what had previously been an ad-hoc process. Over the past two years, we have further strengthened this systematisation of ESIs, which are now discussed and developed with relevant agencies on an ongoing basis. Those with the greatest strategic impact are selected for deeper research. For a selection of ESIs picked up over 2017–2018 and presented as "Artefacts from the Future", see pages 32, 38, 44, 53, and 61.

ENGAGEMENTS AND EXPANDING NETWORKS

Effective foresight work requires a diverse set of perspectives, which we seek out both within and outside of the government. Beyond the Foresight Conference, workshops and roundtables—many of which involve individuals external to the Government—CSF also brings together thought

leaders from different fields. We facilitate their meetings and sharing of insights with various parts of the Government. From 2017–2018, we had the benefit of arranging such sessions with, among others:

- **NICK PEARCE, PROFESSOR OF PUBLIC POLICY, UNIVERSITY OF BATH, FORMER HEAD, NO. 10 DOWNING STREET POLICY UNIT AND AUTHOR OF *SHADOWS OF EMPIRE***
- **CATHERINE FIESCHI, EXECUTIVE DIRECTOR OF LONDON-BASED THINK TANK COUNTERPOINT**
- **TYLER COWEN, PROFESSOR OF ECONOMICS, GEORGE MASON UNIVERSITY**

CSF also seeks out perspectives from thinkers, institutions and governments from abroad to broaden our horizons. We have continued to expand our networks; over the past two years, we were privileged to have made new international connections with fellow futurists in Moscow, Berlin and the region. Examples of the international conferences and workshops which CSF attended in 2017–2018 include:

- **OECD GOVERNMENT FORESIGHT COMMUNITY (GFC) ANNUAL MEETING IN PARIS, FRANCE (2018)**, where participants shared recent foresight studies, products and methodologies with one another
- **EUROPEAN STRATEGY AND POLICY ANALYSIS SYSTEM ANNUAL CONFERENCE (ESPAS) (2018) IN BRUSSELS, BELGIUM**, which brought together foresight practitioners to discuss the future of democracy and governance, and trends and drivers that would shape the future
- **DIALOGUE PROGRAMME ON "DIGITALISATION: IMPACT ON POLITICS AND SOCIETY" IN BERLIN, GERMANY (2018)**, which explored how digitalisation was shaping societies, economies and politics from German and Asian perspectives
- **8TH FORESIGHT AND SCIENCE, TECHNOLOGY AND INNOVATION (STI) POLICY CONFERENCE IN MOSCOW, RUSSIA (2018)**, which explored the application of foresight to STI policy in jurisdictions such as Russia, Europe, Japan and South Korea
- **4TH MEETING OF THE ASIA-PACIFIC FUTURISTS NETWORK IN BANGKOK, THAILAND (2018)**, which sought to explore surprises and trends for Asia under the theme of "Asia Reimagined", and to strengthen the Asian futurist community

CAPABILITY DEVELOPMENT

CSF has continued to nurture the futures ecosystem within the government, chiefly through capability development. CSF does this in two key ways: running our suite of FutureCraft courses at the Civil Service College, as well

as convening Sandbox, a platform for futurists across a diverse range of agencies.

Our FutureCraft courses not only equip public officers with futures methods and approaches, but also seek to inculcate a future-oriented mind-set. Over the past two years, we have continued to refine FutureCraft. In particular, given the increasingly diverse profile of public officers who attend our courses, we have given more attention to how foresight tools and methods may be adapted and made applicable to the work of different agencies. For instance, we introduced new tools to support the development and communication of futures content, conduct meaningful horizon scanning and bridge foresight into strategy.

CSF convenes Sandbox, a platform for the foresight community of practice in the Public Service. The platform provides an opportunity for practitioners to share best practices and ongoing projects with each other. By connecting futures practitioners through this platform, opportunities for interagency futures collaboration have also increased. Many ideas have also cross-pollinated through our various platforms—discussions around the social implications of future work arrangements and the ethics of gene editing were two such examples workshopped across platforms, producing rich insights that were eventually communicated to the policy audience.

"TIME FUTURE CONTAINED IN TIME PAST"

Over the past two years, turbulent world events have provided fertile ground for a wide range of potential futures. Brexit, Pakatan Harapan's victory, and mounting US-China tensions are examples of geopolitical events which few would have foreseen just a few years ago. Such events promise significant and possibly surprising consequences for Singapore. CSF has embraced the challenge of helping the system make sense of this uncertainty. It is fortunate that institutional experience in futures thinking has been built over the decades, helping us better chart these muddy waters. Even so, we sometimes forget that while all human experience is about the past, all decisions we make are about the future. Our actions today shape our country's tomorrow, even if not always intentionally. For the past 10 years, CSF has contributed to expanding the mental maps with which our leaders navigate Singapore's future, and we are excited to keep doing so for the next 10 years and beyond.

The Future: Governance, Unintended Consequences and the Redemption of Hope[1]

By Peter Ho

GOVERNANCE AND VISION

In June 1819, soon after founding modern Singapore on behalf of the British East India Company, Sir Stamford Raffles wrote:

"Our object is not territory but trade; a great commercial emporium and a fulcrum whence we may extend our influence politically as circumstances may hereafter require."[2]

Professor Mary Turnbull explained that Raffles wanted to "ensure Singapore's prosperity as a great port, to abolish slavery and injustice, to devise a way of government giving 'the utmost possible freedom of trade and equal rights to all, with protection of property and person,' and to make Singapore a beautiful and orderly city, the intellectual and educational centre of Southeast Asia."[3]

Raffles' was a remarkably bold vision, which in the words of Turnbull,

"... reflected the most advanced radical, intellectual, and humanitarian thinking of his day. The type of society he aspired to establish in Singapore was in many ways ahead of contemporary England or India. And he established in Singapore a free port following the principles of Adam Smith and *laissez-faire* at a time when Britain was still a protectionist country."[4]

While Raffles and his successors may have laid the foundation of this vision, it would be another century and a half before another figure started to loom as large in Singapore's history—Lee Kuan Yew—who would give effect to Raffles' vision and deliver much more.

Of course, the trajectory of modern Singapore did not follow a straight line. In the last 50 years, it was political will, combined with pragmatic policies, effective governance, the sheer grit and hard work of its people, and not a small dose of good luck, that gave Singapore the extraordinary chance to convert vision—not of Raffles, but of the founding fathers of sovereign Singapore—into reality.

THE LAW OF UNINTENDED CONSEQUENCES

Since becoming independent, Singapore has taken a hard-headed approach to policymaking unburdened by ideology and driven by the stark imperative of survival. The Government adopted a lean public administration that involved the careful analysis of public policy issues, judicious use and adaptation of existing best practices, and strong government regulation. At the same time, it showed an exceptional willingness to eschew conventional wisdom and political correctness, instead adopting pragmatic solutions

and leaps of faith to deal with the wicked problems of the day.

Nonetheless, this approach is not a prophylaxis against the Law of Unintended Consequences. Because of complexity, every government has to face the unintended—or unforeseen—consequences of its decisions. In a complex world, conditions and assumptions that underpin policies and plans change over time, assuming they were even correct in the first instance. This leads to policies and plans that have unanticipated or unintended effects, and outcomes that cannot be easily predicted.

Singapore has not been immune to this Law. Like many other developing countries, Singapore's population growth was high. In 1965, Singapore's total fertility rate was 4.66.[5] The birth rate was 29.5 per thousand people.[6] The concern then was that Singapore's population—1.8 million in 1965—would climb to an unmanageable five million people by 2000.[7] Like many other governments, Singapore's was fearful of the potential Malthusian impact of high population growth, so it acted decisively to slow it down.

Malthusian fear fuelled an unintended overcorrection of Singapore's population growth in the 60s and 70s.

In 1966, the Singapore Family Planning and Population Board was established and the government launched the National Family Planning and Population Programme with the key public message of a "small family". In 1972, the Government began its phenomenally successful "Stop at Two" campaign. Within three years, the birth rate plunged from 23.1 to 17.7 per thousand people, falling even beyond the target of 18.[8]

This unintended overcorrection arose in part because the policy was implemented ahead of developments in Singapore that have since been found to correlate with low birth rates—such as higher education and employment opportunities for women, and rapid poverty reduction and income growth. In effect, Singapore became a developed country in demographic terms well before it became one in the economic sense.

LESSONS OF HUMAN NATURE

Social policies are particularly susceptible to the Law of Unintended Consequences, as human behaviour and societal changes are often shaped by deep, hidden and interconnected forces that—because of complexity—might not be fully apparent for years.

This is where governments often run into the limitations of conventional policy levers. Public policies are aimed at changing overt human behaviour, such as imposing fines to deter littering. But they are often unable to tackle and shape its deeper aspects. For example, the government's Productivity and Innovation Credit scheme, meant to incentivise businesses to raise productivity and boost innovation, was also extensively gamed and abused, eroding the scheme's impact.

Furthermore, decision-making in government is constrained by human cognitive limitations. Nobel economist Herbert Simon called this bounded rationality, where rationality is constrained by imperfect information and finite decision-making time.[9]

This challenge is accentuated in any hierarchy, including government. The top decision-maker receives all the information and acts accordingly. But because of bottlenecks caused by bounded rationality, the decision-maker is either surprised or lacks bandwidth to comprehend the full scope of the problem. The decision-maker cannot possibly make a fully rational and optimal choice. Instead he will often choose a course of action that "satisfices"; it is somewhat acceptable, but not optimal. Taking into account the challenges of complexity and the Law of Unintended Consequences, it leads to the depressing conclusion that government policies and plans cannot always be right, and certainly not for all time.

But this does not mean that we should sit on our hands in the face of such problems. Unintended outcomes do not mean that the policy was flawed in the first instance or should not have been implemented. But it does mean that governments must be willing to change tack or even reverse course if the policy appears to be drifting off-course. Running pilots and experiments would also help.

The larger point here is that translations from policy intent to content and then to outcome are often not straightforward. When things go wrong, as they often do, how do we respond? Do we just look for someone to blame, or do we work to solve the problem? A blame-seeking culture can be both destructive as well as unproductive. It might satisfy a human impulse to hold someone accountable. But it certainly does not solve the problem.

THE FUTURE IS UNKNOWABLE

"The past is a foreign country; they do things differently there."[10] So goes the elegant and elegiac opening line of L. P. Hartley's 1953 novel, *The Go-Between*. It speaks to the essential reality of human existence that things are changing and moving forward, rather than staying still.

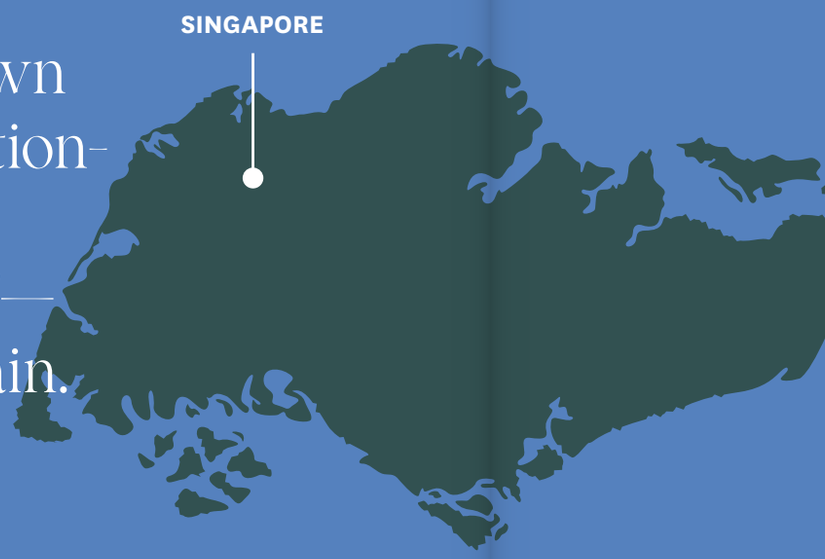
We can guess what the future may be, but we face the same challenges as when we try to understand a foreign country: we cannot help but project our implicit assumptions on it. In thinking about the future, we often take up one change we think is powerful and important, and leave everything else as is, ending up with what is essentially an extrapolation of today.

This is because of an inherent linearity in our causal reasoning. Cognitive psychology research shows that we struggle to understand nonlinear relationships. We assume there is proportionality between cause and effect—big causes only have big consequences, and so on. This linearity often means that planners and policymakers focus on major forces in the social, economic, technological, political and environmental spheres.

But some future states of the world are difficult to anticipate because they emerge out of developments we may have overlooked, or because of developments we know about, but whose interactions generate unforeseen outcomes. History has shown us that the way future technologies will interact with one another and with users has an emergent property, and is not always predictable from previous developments. Thus, it is important to consider the world in all its dimensions; not just in politics and economics, but also society, culture, community, technology and the marketplace.

I recall vividly a meeting with Chris Anderson, the former editor-in-chief of *WIRED* magazine. He told me that almost all his editors were liberal arts graduates and not STEM ones. The reason for this was that liberal arts graduates were best able to connect the dots—linking technology trends with social currents—in a way that those schooled in single, discrete disciplines could not. The insight I drew from this is that in order to thrive in a complex future, we will need to manifest and match that complexity in our mix of backgrounds, skills, ideas and perspectives.

From sojourners in a Crown Colony to citizens of a nation-state, our answer to the question—"Who are we?"—may very well change again.



CHANGING IDENTITY

One common assumption when thinking about the future is that "we are who we are". But in that future, our interests, habits, experiences and expectations would be different, too. Our cultural underpinnings are some of the slowest things to change, but even culture changes.

During Our Singapore Conversation, Singaporeans discussed their hopes and concerns about the future. But they took their identity as Singaporeans mostly as a given. Reflecting on the process, then-Minister of Finance Heng Swee Keat said:

"We realised and learnt just how diverse individuals and groups are in our society and yet how much we share and value in common as Singaporeans."[11]

Similarly, when the Urban Redevelopment Authority develops the Concept Plan for land use over the next four or five decades, it assumes implicitly that our current identity as a nation-state in a city will continue. Yet identity can and does change. Just in the past century, Singapore had gone from being a Crown Colony in the British Empire; to *Syonan-to* or Light of the South during the Japanese Occupation; to being part of Malaysia; and then the Republic of Singapore after Separation.

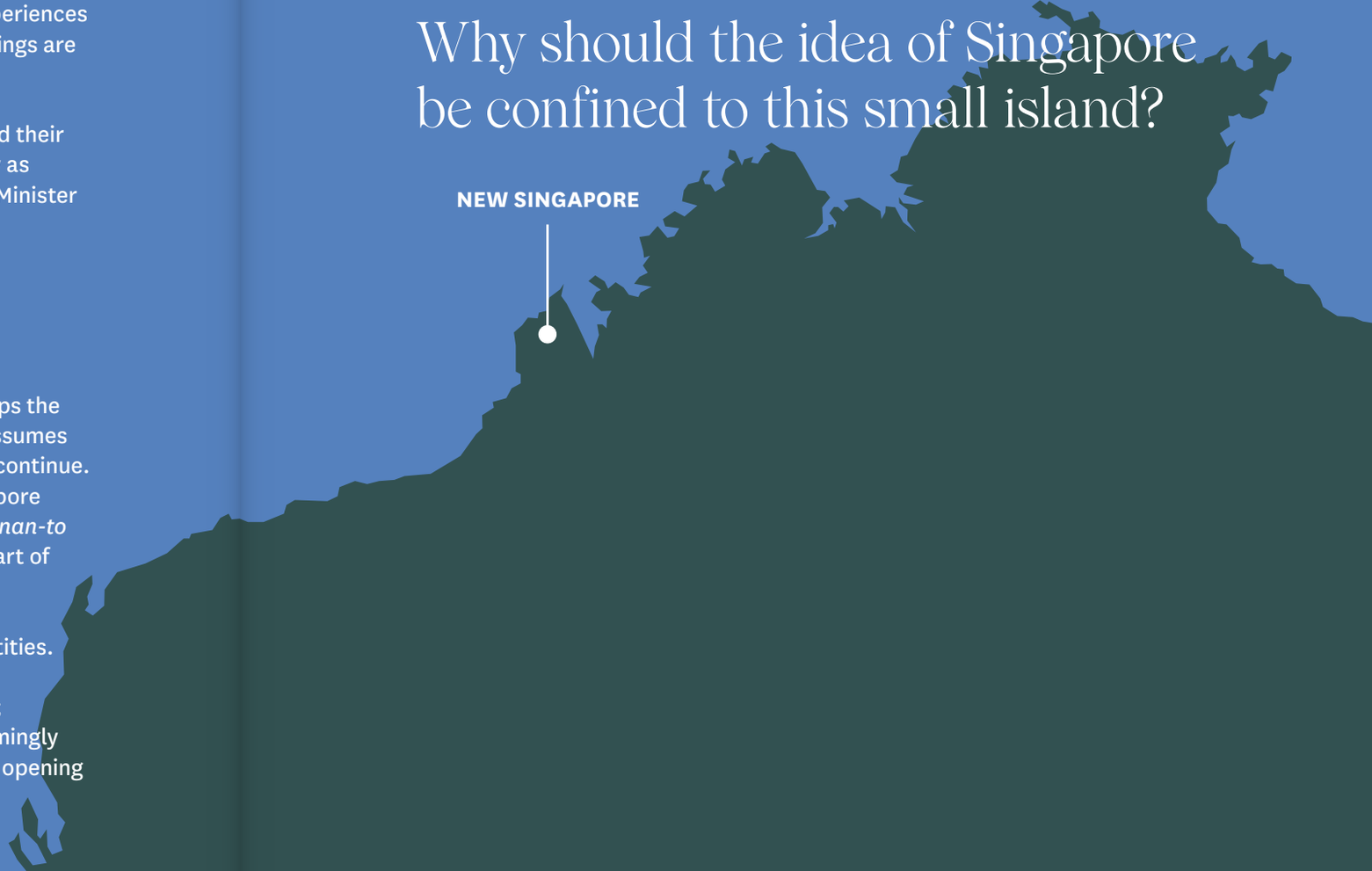
More than just changing names, this reflects changing identities. In Crown Colony Singapore, many saw themselves as sojourners, not citizens. Today, their descendants see themselves as citizens; Singaporeans in Singapore their home. So, the answer to the seemingly innocuous question—"Who are we?"—may change in the future, opening new situations and new options.

SINGAPORE AS A CHARTER CITY

In a 2017 *Straits Times* op-ed, Benjamen Gussen, a law lecturer at the University of Southern Queensland, gave an example of how Singapore could redefine its identity.[12] It could provide the infrastructure for a charter city in Australia, which would attract Singaporeans and migrants from other parts of Australia. In a charter city, the governing system is defined by its own charter document, rather than by the state or national laws. In Gussen's view, this would offer Singapore and Singaporeans space beyond current physical and political boundaries. The charter city would be a global city that would also boost growth in Australia.

In reality, only a few charter cities have sprung up. Paul Romer, the former World Bank Chief Economist who champions the idea, cites Shenzhen and Hong Kong as examples of charter cities.[13] But even if this specific idea may not gain much traction, it raises the possibility that the *idea* of Singapore need not be confined to this small island.

Why should the idea of Singapore be confined to this small island?



VIRTUAL SINGAPORE

Imagine what identity would mean in a future where people live not only in the physical world, but also live in alternate worlds, part real, part virtual, through virtual reality and augmented reality.

In March 2017, Elon Musk, CEO of Tesla and SpaceX, launched a brain-computer interface start-up called Neuralink, which is developing a "neural lace" technology that would involve "implanting tiny brain electrodes that may one day upload and download thoughts."[14] He later spoke of "some high bandwidth interface to the brain … that helps achieve a symbiosis between human and machine intelligence."[15]

What would identity mean here? If the individual inhabits virtual worlds for much of his waking hours, connected through avatars on his smart devices, or linked through some version of Elon Musk's "neural lace" technology, then where is his emotional and psychological centre of gravity? The emotional space that the individual occupied used to coincide with the physical space he lived in. This alignment may yet be disrupted by advances in digital and even neurological technologies. Do we embrace this future as a nation, accepting that the notion of national identity may change or at least become more ambiguous? Or should we repudiate it? That depends on our fundamental attitudes towards the future.

INFLUENCING THE FUTURE

By population and geography, Singapore is truly small. We see ourselves as price-takers. Thus we often speak as if the future was a car speeding toward us—we can swerve, or we can run backward. But we can scarcely control the car.

Prime Minister Lee Hsien Loong captured this view in a speech at the Singapore Institute of Technology in October 2016:

"We know the world is changing. You cannot predict how. You cannot predict when. But you must gird ourselves for whatever might happen, and adapt to new conditions as they come up."[16]

We need to also consider how we can influence change—how technology develops and impacts us, and how markets are created and change. There are good reasons to focus on structural changes. History is emergent. Among the many possible paths that history could have taken, the interaction of structural factors and human agency led it down one path. If we relaxed the constraints of Singapore as a price-taker, what new options to reinvent ourselves could we consider?

One view of technology is that it will advance and affect us—but as an external and often frightening force. We say that technologies, such as Artificial Intelligence (AI) and robotics, will "disrupt jobs". Jobs will be automated, so we must prepare ourselves. Robots may be alienating, so we must mitigate these risks.

The sentiment that technology is beyond human control and frightful finds expression in art. Victor Frankenstein creates a sentient being who kills people. In the 2004 film, *I, Robot*, robots try to take over the world. In the 2015 film, *Ex Machina*, the humanoid robot, Ava, outwits her creator and escapes into the world, leaving viewers to imagine the consequences.

Yet people and societies do shape technology. Rather than build cold metallic objects to disrupt jobs and society, the Japanese have taken robots and made them soft and cuddly—turning "objects" into "social beings". And perhaps not surprisingly, because in the Shinto religion, even inanimate objects can have a soul.

Japan's "New Robot Strategy" of 2015 envisages a "robot barrier-free society," where robots teach foreign languages, set tables, and help the elderly walk and go out.[17] Rather than develop virtual assistants—say along the lines of Apple's Siri or Amazon's Alexa—the Japanese firm Gatebox has built Azuma Hikari. Azuma comes "alive" as a holograph, advises her master to take an umbrella when there are prospects of rain and nags him to come home soon during the day.[18]

LUXEMBOURG

Markets are another area where it is easy to accept things as given. One view of markets is that businesses need to adapt. So, if the demand for business class seats weakens, companies such as Singapore Airlines may want to diversify into budget airlines. If the demand for fossil fuels weakens amid climate change, oil majors such as Shell may want to diversify into renewables.

Yet people and societies can also create and shape markets—even small societies. Fewer than 600,000 people live in Luxembourg, yet it is creating a market for harnessing resources in space. In November 2016, it introduced a bill to let companies own resources, such as platinum, obtained from space.[19] It has set aside €200 million to support asteroid-mining companies. It has attracted two US firms, Planetary Resources and Deep Space Industries, to set up offices in Luxembourg as part of efforts to nurture this new market out of the Grand Duchy.[20]

Lest these efforts to create a market seem like a moon-shot, Luxembourg has experience—it founded and invested in Société

Europeénne des Satellites (SES) in 1985, launching its own space industry. Today, SES is one of the largest satellite operators in the world.[21]

The case against technological or market determinism is not an argument for ignoring realities—our small population, our small land mass or the region in which we live. It is an argument for striking a balance between adapting to the world and shaping it.

Singapore's position as a hub is neither unassailable nor preordained.

SINGAPORE AS A HUB IN THE GLOBAL NETWORK

Thomas Friedman has described our world as flat.[22] Globalisation and advances in transportation and communication technologies have put nations, peoples and enterprises in touch with one another as never before.

But there is another metaphor used by Richard Florida, who argues that the world is spiky, not flat. His argument is that higher value-added activities are densely concentrated and clustered in hubs—what he calls the mega-regions of the world. These hubs and connectors of the world have superseded nation-states as "natural economic units."[23]

Singapore is part of a flat world. But it is also part of a spiky world. Singapore is today a global and regional hub of many things. Since Raffles' time, Singapore has been an important trading and maritime hub between East and West. Singapore is also a major connector in international aviation and a key node in the global financial system.

But Singapore's position as a hub is neither unassailable nor preordained. History shows that hubs come and go. Malacca used to be the centre of the spice trade in Southeast Asia. Venice was the centre of East-West trade throughout the Middle Ages. Rangoon, now Yangon, was the aviation hub of Southeast Asia before 1962.

Is it important that we are a hub, a peak among the valleys in a spiky world? Simply defined, hubs are exceptionally well-linked nodes in a network. Hubs have historically driven economic growth and development. Network theory provides insights to explain why hubs

acquire wealth more easily than other nodes in a network. The world's economic geography is dominated by hubs which are the focal points of opportunity, growth and innovation. Firms locate to where skills, capabilities and markets cluster. Capital flows to where returns are greatest and highly-skilled talent moves to where opportunities lie.

Today's economic geography is also dominated by hubs. They are defined as places that claim significant economic capacity, substantial innovative activity and highly-skilled talent. Singapore is one of these hubs. Contrary to Tom Friedman's flat world thesis, economic activity and innovation are highly concentrated in hubs, and become more so as one moves up the economic ladder. In this spiky world, the tallest peaks will continue to flourish and grow higher, while the valleys will languish. In other words, the rich hubs at the peaks get richer, while the poor in the valleys stay poor. This is the power law. This means that in a network, there will always be just a few densely-connected nodes—or the hubs—and many more nodes with only a few links.

THE HUB IN A FUTURE NETWORKED WORLD

But even then, the nature of hubs will change. What will a hub look like in future? It would be fatal to assume that the density of connections that Singapore has today and the centrality that it enjoys in today's networks—whether in air transportation, maritime or other networks—will continue to persist.

When we think of our place in the world, we often think about physical geography. The British set up a free port in Singapore because it is located on the trade route between India and China. The epithet "Little Red Dot" is today a badge of pride for Singaporeans. Our sense of geography connects with our feelings of vulnerability and advantage.

Yet, this sense of geography is based on a particular kind of map. Modern maps relate one place to another in terms of longitudes, latitudes and borders. They look at the world from a bird's eye view.

But this has not been the only way of viewing one's place in the world, as Benedict Anderson, the historian and political scientist, writes in *Imagined Communities*, his book on nationalism.[24] He explains that ancient Thailand had two kinds of maps. It did have the usual diagrammatic guides, but it also had cosmographic maps, which guided people on less tangible, even spiritual journeys. Singapore is much less adept at this second type of cartography.

If we relaxed our constraints of physical geography and imagined new maps that transcend physical territory, what new opportunities might open up? And how can these new opportunities in turn help us reconceptualise of the world?

THE IMPACT OF DIGITAL TECHNOLOGIES

In the recent past, Singapore tried to overcome its small physical size by tapping into space abroad—such as Suzhou Industrial Park, Iskandar Malaysia, and Batam, Bintan and Karimun. It was—and is—a network strategy with Singapore as the hub.

But new digital technologies will create new and different networks with their own hubs and connectors. If 3D printing successfully transitions to large-scale manufacturing, it could significantly reduce global shipping activity, negatively affecting all aspects of the port and shipping industry, including the transhipment market that Singapore's position as a global hub port is based on. In one study, PricewaterhouseCoopers estimates that up to 37% of the ocean container business is at risk because of 3D printing.[25]

Whether we will continue to be a hub in the networks that emerge in the future will depend not just on our capabilities, but also on our ability to seize early-mover advantages, and on how quickly we create and attract links to Singapore in the new networks that emerge. If such changes occur, we may need new maps to complement old ones. I would like to examine two ways in which our needs may be changing.

RETHINKING BORDERS

First, we often think of economic competitiveness based on nations, demarcated by borders. One nation is more competitive than another in a particular sector. This view made sense when nations traded goods—whichever had a comparative advantage in making a product ought to make it, to the benefit of all.

The economist Richard Baldwin, however, says that flows of knowhow have grown more important in the past two or three decades, as communications technology has improved and enabled coordination from a distance. The worker in Ho Chi Minh City, Vietnam, or Zhengzhou, China may not know how to design, manufacture and market a product. But the multinational corporation (MNC) does. By training the worker and his manager, the MNC taps into cheaper workers and land. Consciously or unconsciously, it adds them to global value chains. "The contours of industrial competitiveness are now increasingly defined by the outlines of international production networks rather than the boundaries of nations,"

Baldwin writes.[26]

Baldwin speculates that improvements in communications will enable other flows—even those of high-touch services, such as counselling or physiotherapy—across national borders. Remote medicine, where patients interact with doctors in a different location, is already practised. In the future, digital platforms can tap into remote labour without having to set up an industrial park. Already, platforms like Konsus match high-end independent contractors or freelancers with projects across different places.[27]

The basic approach is to ensure open access and maximum connectivity. Just as Raffles made Singapore a free port in 1819, welcoming traders from any country, Singapore today could be a free data port. It could allow data centres in Singapore to hold data governed by the laws of another country, as if it were stored in the source country. This would anchor the data in Singapore, perhaps allowing local-based companies access to it. Such rethinking of borders will grow in importance in our increasingly digitised and data-driven world.

Just as Raffles made us a free shipping port in 1819, Singapore today could be a free data port.

RETHINKING CONNECTIVITY

Second, data flows will accelerate. It is not just data we generate on WeChat and Facebook. Machines will communicate more with each other. Complexity economist Brian Arthur describes machine-machine communication as a "huge interconnected root system."[28] These interactions and interdependencies take place out of sight, but enable actions we care about. Mobile phones communicate with GPS satellites to pinpoint our location so that Grab drivers can find us, without our being aware that this communication is taking place.

If the movement of data from one IP address to another will matter more in the future, nations may need to reconsider how to plug themselves into these flows, given the possibility that countries will protect data sovereignty. Some countries are already mandating that data about their citizens be stored locally. Others are setting rules on the transfer of data across borders.

Today, Singapore manages its relations with other states through diplomacy and foreign policy. In the future, it will need to manage relations with a wider range of entities—with digital conglomerates, with cities and even with other countries—in the digital space.

Denmark has created the position of Tech Ambassador—that some have dubbed the "Silicon Valley Ambassador"—in order to better engage digital firms, such as Apple, Google and Facebook. Although the role is still being fleshed out, Danish Foreign Minister Anders Samuelsen explained the need for greater engagement by citing recent investments in Denmark by Apple and Facebook, increasing data usage, and attendant issues of privacy and fake news.[29] For Singapore, such an approach would build on our earlier efforts to partner other cities and sub-national regions to plug them into international production networks.

ESTONIA—A HARBINGER OF THE FUTURE

Let us turn to another example—Estonia, a Baltic state of 1.3 million people. It borders Russia, making it all the more diminutive. It is ageing, like Singapore, and even older—16.5% of its population was aged 65 years and above in 2015, higher than the 12% in Singapore.[30]

Despite its size, location and age—or perhaps because of these factors—Estonia has been turning itself into a digital society. At birth, the doctor puts an Estonian baby's details into the medical records—and so his digital identity is born. That digital identity now allows Estonians to sign private contracts, access public services and databases, pay taxes and vote. In the 2015 parliamentary election, 30% of votes were cast over the Internet. By cutting trips to public offices and banks, for example, the digital society is estimated to save Estonia 2% of its GDP yearly.[31]

Beyond the digital society, Estonia is also recreating itself as a virtual nation. First, it is trying to back up its computers and databases, so that the Estonian digital society can continue to function even when cyberattacks or physical attacks occur. In 2007, online banking was crippled, and emergency services almost disabled, in a massive Distributed Denial of Service cyberattack on Estonia. This took place amidst a row with Russia over the relocation of a Soviet-era statue. To build robustness, Estonia is now experimenting with "digital embassies", where data is stored on servers in its embassies abroad.[32] It is also developing ways to migrate data to commercial servers, such as those hosted by Microsoft, as a backup in the event that cyberattacks take place.[33]

Second, Estonia introduced e-residency in 2014. You may be Indian, South African or Singaporean. You may live abroad. But if you become an e-resident of Estonia, you can use some of the digital services available to Estonian citizens, such as setting up an Estonia-based company. E-residency helps Estonia generate business activity for Estonian companies, from independent contractors to small companies with clients worldwide. More than 18,000 people have since become e-residents.[34]

Estonia hints at how nations could redefine their identities and what it means to be a nation in a digital era. Benedict Anderson argues that a nation is an imagined community. E-residency may one day build another "Estonia"—an imagined community beyond borders and time zones. Digital embassies could ensure the survival of a country's way of life beyond physical borders.

"The concept of a country has changed," says Taavi Kotka, Estonia's former Chief Information Officer who led the e-residency initiative. "Land is so *yesterday*. It doesn't matter where you physically live or operate. That is how the game will change."[35]

Is Kotka right? Or will geography and territory have the final say? Perhaps the question should not be cast in such binary terms. Singapore is already simultaneously a nation-state and global city. To consider Singapore also as an extra-territorialised entity, expanding the concept of our reality to encompass abstract bits and data flows, merely reinforces the paradox that it already is.

"The concept of a country has changed. It doesn't matter where you physically live or operate."

WHERE NEXT?

It was modern Singapore's great fortune to have had two visionaries in two centuries—Stamford Raffles and Lee Kuan Yew. The question is whether Singapore should leave it to luck that another great man will emerge to lead the nation to even greater glory, or whether we should create the conditions that will allow Singapore to extend its exceptionalism for as long as possible into the future.

I am of course inclined to the latter, not just because I believe that passivity opens us to greater turbulence and increases the likelihood of strategic shock. It is also because I believe that action creates hope. Bill

Willingham in his *Fables* comics series wrote that "hope isn't destiny. Left passive, it's nothing more than disappointment deferred."[36]

Our founding fathers' grand vision and great hopes for Singapore were always accompanied by action. This is the difference between hope and paranoia—the latter cripples, while the former propels reasonable, thought-out action with measured optimism.

Is Singapore merely a price-taker, or does it have the ability to influence and alter the factors that shape the future? It is my hopeful view that even small city-states can influence, shape and even create, not just markets, but also their operating environments. It is a belief in this view that hope can be redeemed for even a little red dot like Singapore.

As a parting shot, let me outline two reasons for this belief. First, I do not want to trivialise Singapore's very real constraints. But these very constraints are our opportunities. Resource constraints matter more to us because we are small. We also have less room for systematic policy error in a world that is increasingly VUCA, or volatile, uncertain, complex and ambiguous. But it is precisely our smallness that gives us agility, the ability to course-correct, and to iterate with more freedom and dexterity than much larger entities. We have greater ease of coordination to actualise Whole-of-Nation approaches, since we can actually galvanise society within our small space. We have greater ease of implementation and great ability to test, iterate, experiment and prototype, because we do so within limited geographical bounds. As a small state, we have a greater ability to course-correct if we embark on policy that turns out to have been wrong or misguided.

Second, we should remember that responding to complexity, uncertainty and accelerating change are not alien to us. It is in our very DNA as a country and rooted in our origins both as a sea port founded by Raffles and as a nation led by Lee Kuan Yew and the other founding fathers. No one expected us to survive, but we did. We defied rules, expectations, stereotypes and existing categorisations when we eschewed import substitution, courted MNCs and embarked on multicultural meritocracy when most of our neighbours were mercantilist and communalist. Both Goh Keng Swee's vision of a thriving open economy and S. Rajaratnam's vision of being Singaporean by choice and by conviction audaciously reflected a unique brand of gung-ho political entrepreneurship. My belief in the redemption of hope should not be seen as something new to Singapore. It is within each of us, and with a little effort, we can reclaim it.

Of course, there are conditions attached. Prime Minister Lee Hsien Loong alluded to one of them when he spoke of his wish for a sense of "divine discontent," which I take to mean never being satisfied, and never

being complacent that we have arrived.[37]

We need courage and imagination. Courage to reimagine the identities with which we have grown comfortable, and to rewrite the stories that we tell ourselves about ourselves. With courage and imagination, there is hope for a better future.

The courage and confidence to collectively embrace change and opportunities together, as a nation, rests on our sense of shared agency, values and destiny—a shared future. A key source of Singapore's strength has always been our people's trust in fair competition and just reward for effort and achievements, compassion for the unfortunate, and a restless yearning for continuous progress. The points on trust and compassion bear emphasising. This has to be carefully fostered by the leadership because, without it, it would have been impossible for our leaders to forge consensus on far-reaching policies and tough trade-offs between different priorities, interests and groups.

From this interplay between internal hope and external forces of change, combined with vision and good governance, the future—our future—will emerge. As the 13th century Persian poet and scholar, Rumi, memorably wrote, "the garden of the world has no limits, except in your mind."[38]

Friends of CSF
Speak about Foresight

ABOUT PETER HO

Peter Ho is Senior Advisor to the Centre for Strategic Futures, a Senior Fellow in the Civil Service College and a Visiting Fellow at the Lee Kuan Yew School of Public Policy.

He is Chairman of the Urban Redevelopment Authority of Singapore, the Social Science Research Council, the Singapore Centre on Environmental Life Sciences Engineering, the National Supercomputing Centre Steering Committee, and the Campus for Research Excellence and Technological Enterprise Governing Council.

When he retired from the Singapore Administrative Service in 2010, he was Head, Civil Service, concurrent with his other appointments of Permanent Secretary (Foreign Affairs), Permanent Secretary (National Security & Intelligence Coordination) and Permanent Secretary (Special Duties) in the Prime Minister's Office.

Friends of CSF Speak about Foresight

In commemoration of CSF's 10th anniversary, we asked 10 friends of CSF to share their thoughts on foresight and its applications to Singapore. The responses we received range from the earnest to the whimsical, the historical to the imaginative, and the cautious to the optimistic. Nonetheless, they all share the same quality of being hard-won insights gleaned from years, sometimes decades, of futures work. "10 for 10" shows that CSF is part of a growing futures community in Singapore and beyond, and that our work is strengthened and deepened by the intellectual generosity of its members.

Friends of CSF Speak about Foresight

What is one thing Singapore will need for the future that it may have overlooked?

We may need to critically re-examine our sense of size. Our sense of self is shaped by how large or how expansive our influence can be in various domains like geopolitics, economics, education, technology, arts and culture, and so on. We have always thought of ourselves as a tiny red dot, accepting our role as a price-taker in international markets, and therefore taking an understated posture. While this may have to continue to be the stance we take in many domains, we need to recognise that being average in a hypercompetitive world will not be enough.

So in selective areas and domains, we need to ask if technology, socio-political dexterity and other enablers can allow even a tiny red dot to grow our relevance and influence in ways that may seem impossible. How do we identify these "potentials" and be ready to invest in capabilities, technologies and networks that can help us make such leaps? Where do we create outsized impact and scale? To answer this, we need to realise that the size of a nation is not limited by physical measures, and we will need to transcend a purely resource-constrained narrative.

Peter Ong | Head, Civil Service (2010–2017)
Chairman, Enterprise Singapore

What issues did the team tackle then that still have enduring relevance to Singapore today?

I was involved in the 2002 and 2005 National Scenarios exercises during a decade characterised by fast-paced globalisation and technological change, in a region dominated by the US and rising Asian powerhouses China and India. As we fast forward to 2019, many of the Driving Forces we identified remain relevant: a shifting balance of power towards Asia, rising religiosity, new social divides, an ageing population, an increasingly participative citizenry and wildcard technologies. These continue to shape today's world, where China dominates while the US looks inwards, and ASEAN seeks unity amidst differences.

Singapore thrives with a stable economy and society while dealing with the challenges of an ageing population, active citizenry, rising competition and rapid technological change. Among the strategies we identified was the need to harness diversity as strength, remaining open to talent and ideas while retaining a strong Singaporean core. Today, more than before, our multicultural Singapore identity anchored by core values and shared history is a precious asset holding us together, enabling us to weather the perils of anti-globalisation, identity politics and societal upheaval. This strength will sustain Singapore's ability to leverage opportunities amidst uncertainty and to anchor Singaporeans while staying relevant to the world.

Rosa Huey Daniel | Head, Strategic Policy Office (2002–2006)
Deputy Secretary (Culture), Ministry of Culture, Community and Youth

Friends of CSF Speak about Foresight

Describe some initiatives you introduced to CSF.

Before CSF's establishment, foresight and strategy were mainly centre-of-government roles, performed out of the Public Service Division and National Security Coordination Secretariat, both in the Prime Minister's Office. Notable exceptions were the Future Systems Directorate in MINDEF and the Ministry of Trade and Industry's Futures Group.

Our team was keen to broaden foresight practice to the rest of government. This meant building a futures community—not just a futures function—and involved both structural and capability-building steps.

Then-HCS Peter Ho guided us to create the Strategic Futures Network (SFN) in 2010, with one Deputy Secretary in each Ministry designated as "Strategic Futures Officer". This structural shift meant each SFO could be supported by institutional resources: policy or planning divisions; or even cross-directorate teams spanning entire ministries. We discovered staff-level discussions were as important as SFOs', so we formed the SFN Sandbox in 2011, a regular convening of futurists at Director-level and below. The name Sandbox reflected our aim to be an open space, where work-in-progress could be shared, iterated and refined.

The futures community also needed the right skills. CSF's capability-building sessions, FutureCraft, documented and disseminated the core skills and tradecraft of foresight, beginning with and expanding the scenario planning workshops by our predecessor SPO.

Aaron Maniam | Head, CSF (2009–2011)
Senior Principal Researcher, Institute of Governance and Policy, Civil Service College

Friends of CSF Speak about Foresight

Describe some shifts that CSF may have helped to catalyse in the system.

When you are in the business of uncovering surprises, as CSF is, experimentation and exploration are part of your DNA. But CSF has catalysed, in my view, two significant transitions.

First, there is some dedicated attention to thinking about the future—on a continuous basis, and not just during scenario planning exercises every few years. CSF is a constant reminder that even as we are knee-deep in muddy currents or burnt out from fighting fires, we must pay attention to how things are changing around us, connecting the dots to make better, more resilient policy. This process is far more valuable than even the reports CSF generates as a by-product (although you should still read them).

Second, there is now a larger community of futurists—not just those doing this full time, but people who have at some point been actively involved in foresight. Thinking about the future is a habit of mind, and those who have grown together with CSF as futurists do not unlearn this. The system is now much stronger, with these futurists having taken up roles in both policy and planning functions within the government, as well as in our universities, companies and civil society.

Kwa Chin Lum | Head, CSF (2011–2014)
Special Assistant to Senior Minister Tharman Shanmugaratnam

Describe one enduring challenge that CSF will face in the future.

All futurists have to navigate a balance between their own strong convictions about the issues they wish to raise, and the uncertainty inherent in any issue that pertains to the future. This constant balancing act can sometimes even become a major internal dilemma.

At CSF, this has real and even heightened implications. On one hand, there is a need to anticipate key shifts and disruptions that the future may bring. This means that the futurist who happens to be working in Government has to demand bandwidth from a sometimes-sceptical system. On the other, the government officer who happens to be working in futures has to appreciate that the day-to-day business of running the country is immense. The government has a duty to deal with such imperatives of the day.

This tension may be frustrating at times, but is ultimately a sign that CSF is working as intended. The mangrove fish *Anableps* is a useful sign of this mind-set. Its eyes are divided into two parts, one part looking out of the water, and the other underwater. This "four-eyed fish" reminds CSF that it cannot be pulled too far in either direction if it is to translate external signals into meaningful insights.

Joan Moh | Head, CSF (2014–2017)
Director, University Policy, Higher Education Group, Ministry of Education

Friends of CSF Speak about Foresight

Letter from a future futurist.

Dear Futurist in 2019,

Life here in 2029 Singapore is surprisingly good, given the challenges you face. I won't tell you the answers—that would create all kinds of paradoxes. But I'll share some important questions. Get these right and get the future right:

1. How will you meet the demographic challenges of ageing and immigration?
2. How will you create value in a global economy? Are brains enough or are hands still needed?
3. How will you re-educate and retrain workers for the rapidly changing economy?
4. How will you deal with climate change? Adapting to rising sea levels and reducing the carbon footprint create massive investment needs.
5. How will you sustain a diverse society? A socially conservative nation may limit the wide variety of people needed for high levels of innovation.
6. How will the political leadership sustain legitimacy and national motivation now that the founders are gone and prosperity and security have been achieved?
7. How will the political leadership navigate complex and unstable geopolitics, especially the growing US-China conflict?

Different answers will result in numerous scenarios, not all happy. Your challenge is to find answers leading to the outcome I see in 2029. Don't let me down.

Peter Schwartz
Senior Vice President for Global Government Relations and Strategic Planning, Salesforce.com

Letter to a future futurist.

Dear AI10101/Jia-Xin:

I write to you from the year of *Blade Runner*, although the future Ridley Scott imagined has not yet come to pass. Nonetheless, it's had a deep impact on us. We discovered new technologies that profoundly affect our societies; we learned that stories about the future can become iconic; and we saw that these remarkable futures aren't necessarily realised in *toto*.

Your predecessors in CSF worked over its first decade to produce ideas, scenarios and risk assessments for Singapore's leadership. What did they learn? First, the process always stimulates, but can frustrate as ideas and assessments might not be embraced. Second, the aim is to stretch organisational thinking, not to make predictions. Third, how people and technology interact can shock and unsettle. I hope you overcame these challenges to provide exceptional insights for your sponsors.

In 2019, CSF began combining human judgment and AI to produce its scenarios and assessments. After two decades of evolution, you now represent its finest example of a hybrid interactive actor. Well done!

In closing, however, I caution: always be aware of societal consequences; always place humanity above code; and finally, trust starts and ends with truth.

Warm regards,
Futurist Hopeful in Perpetual Training

Richard O'Neill
Founder and President, The Highlands Group

The Futures Community Shares Best Practices in Foresight

Friends of CSF Speak about Foresight

How do you define success in your foresight work?

Success is when colleagues and partners participate in our prototyping projects to co-create solutions that result in a new way of working. It's simply energising to see the spark in their eyes, the excitement in their tone and their passion to innovate when we offer colleagues a safe space to trial new approaches. Naturally, not all prototyping projects end in the way we expected; we learn together from our successes and failures. To do this, we need to be mentally agile, learn expansively and stay curious, relentlessly networking beyond our industry and imagining alternatives. In sum, foresight work in SSG is about putting people at the centre of what we do, helping colleagues explore new possibilities, walking the journey together and then knowing when to let them take over. As for the Futures Office team, we believe that technique is the dancers' freedom and we will keep learning and practicing the foresight craft with our foresight tribes.

Success in foresight work is allowing for chaos and then creating through complexity: we must flourish in situations of chaos by constantly experimenting, tweaking and revising.

Gog Soon Joo
Chief Futurist, Chief Research Officer, Skillsfuture SG

How can history inform foresight?

History can inform foresight by teaching people how to think about change across time. Here are three key ways.

Firstly, people telling stories about different times—past or future—employ mental models to explain change, developing terms such as "disruption", "creative destruction" or "Social Darwinism". The study of history can help one become familiar with such models.

Secondly, the craft of history—how to tell a story of the past—involves skills that are useful for crafting stories about the future. Historians, for example, strive to avoid the cardinal sin of "presentism" and represent the past "as it really was", and balance the interplay between personal agency and structural forces like ideology and economics. Such habits of mind are as applicable to stories of the past as they are to those of the future.

Thirdly, history frees up one's imagination by providing examples of the many ways that human societies can organise themselves. For example, futurists seeking to understand the impact of a new technology can seek inspiration from studying the rise of electrical grids or the combustion engine. One benefit of this stronger imagination is a more rigorous creativity. Historical knowledge helps futurists to determine what is really new.

Vernie Oliveiro
Principal Researcher, Civil Service College

How does foresight bring people together?

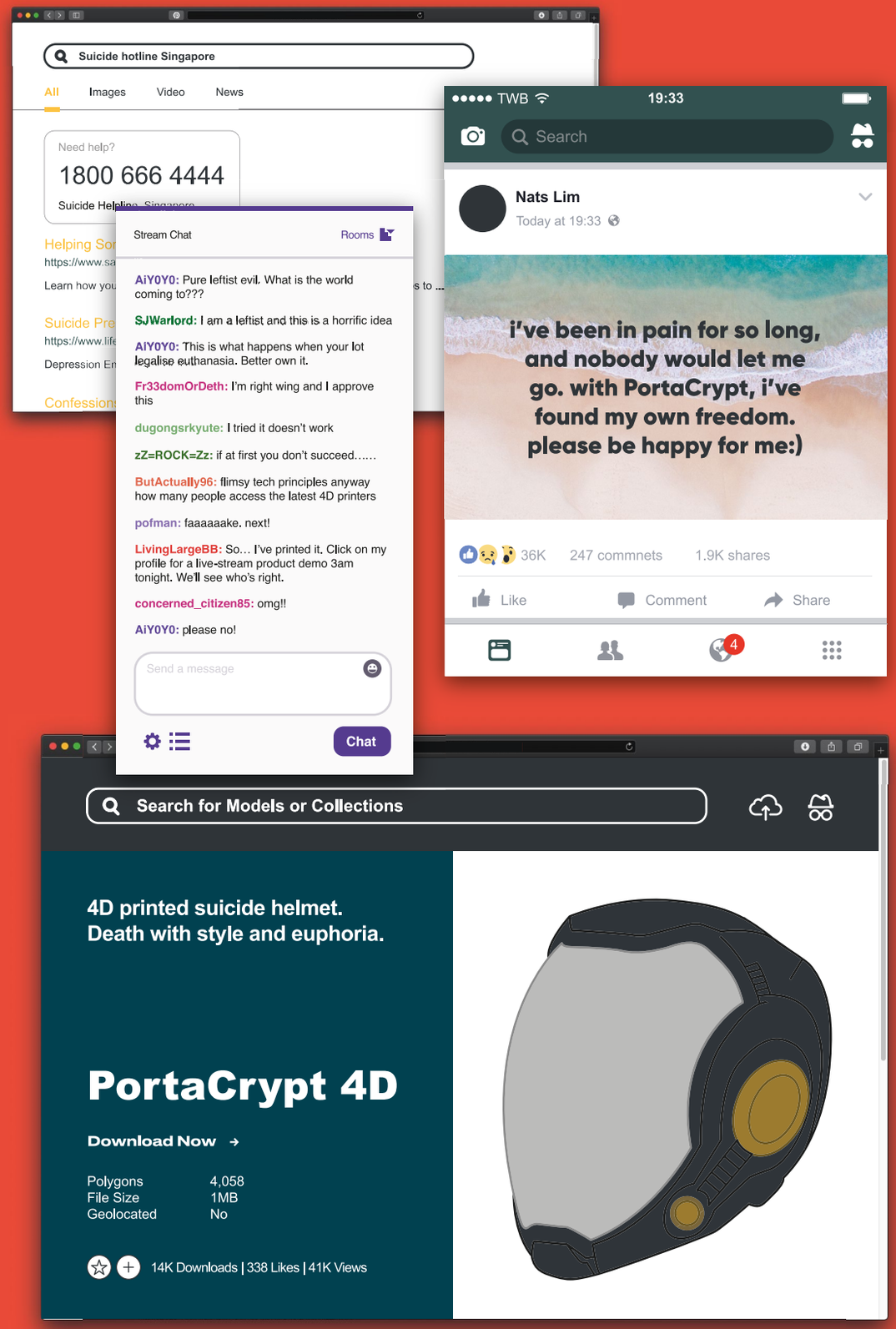
Some of my favourite memories from the last National Scenarios exercise involve the writing team, locked in a small room with giant whiteboards and equally giant mugs of coffee, arguing vehemently about what was plausible and what was obviously just cuckoo. (My idea of insane was usually someone else's eminently plausible reality). We emerged with a much broader understanding of what should in fact be considered possible, and more importantly, a much better understanding of each other.

My mental model is the Mont Fleur scenarios, done in the early 1990s, which brought together diverse personalities to discuss what a post-apartheid South Africa should look like. I believe that a good foresight process, conducted in a safe space by skilled, empathetic facilitators, is one of the best ways to elicit our deepest, darkest biases and attempt to overcome them for the greater good. In the process of working things out, we develop a common understanding, demonstrated most powerfully by shared vocabulary, verbal shortcuts and metaphors. The hardest part in the process is generating sufficient psychological safety and trust for people to be honest and genuine. Foresight, simultaneously full of possibility and distance, provides a good platform for building that trust.

Jeanette Kwek
Deputy Director, Strategic Futures, Ministry of Defence

Friends of CSF Speak about Foresight

Paradoxically, the value of foresight is sometimes better appreciated when attempting to practise it in a space unused to futures thinking. It is therefore with enlightened self-interest that CSF actively engages the wider futures community, including alumni; "10 for 10" is but a small facet of this engagement.
We grow as our friends grow, benefitting from the diversity of their experiences. As we build this community, we are reminded of the fact that CSF is part of a decades-long journey, and we are grateful to have met many fellow-travellers along the way.



What if the means to die painlessly were widely available and unregulatable?

The Never-Ending Pursuit of Progress: Science, Technology and Society[1]

By Talitha Chin, Jared Poon and Chan Liang Wei

HISTORICAL DEVELOPMENTS: FROM TINKERERS TO "INNOVATION POLICY"

We cannot understand the future of science and technology without understanding their pasts. Likewise, we cannot meaningfully talk about these pasts without looking at how they have influenced—and have been influenced by—the human societies of those times.

The relationship of science and technology vis-à-vis society goes all the way back to humanity's beginnings. However, what is unprecedented is the sheer speed of scientific discovery and technological advancement in the last few centuries. This acceleration began around the 16th and 17th centuries with the Scientific Revolution and was turbocharged in the 18th and 19th centuries by the Industrial Revolution, which gave rise to technological breakthroughs such as the steam engine, the spinning jenny and the telegraph. Science and technology at this point was still the province of individual thinkers and tinkerers such as Albert Einstein, Marie Curie and Nikola Tesla.

Under a cloud of nuclear ambition during World War II, scientists oversaw the birth of the modern R&D laboratory.

The World Wars of the 20th century, however, were turning points in the practice of science and technology. Where scientific and technological inventions were once the province of natural philosophers and inventors, the exigencies of war gave rise to large-scale manpower mobilisations of scientific research for the purposes of war-making. World War II saw the emergence of the "R&D laboratory" in its modern form—the Manhattan Project clustered thousands of physicists together to research and produce nuclear bombs.[2] Wartime requirements also prompted then-US President Roosevelt to establish the Office of Scientific Research and Development, which gathered armed forces, civilians, government agencies and industry to dedicate efforts towards defence science.[3] In 1945, an influential paper by Vannevar Bush argued that science should be pursued with as much fervency in peacetime as in wartime.[4] This gave rise to a "national science policy" and the institutionalisation of support for upstream research.[5] In the throes of battle and in the lull of subsequent peace, the practice of scientific inquiry shifted from the individual to the institution.

In the late 1980s, in line with this shift, the National Innovation Systems (NIS) approach was formulated by Christopher Freeman and Bengt-Åke Lundvall.[6] NIS broadly suggests that national institutions determine the rate and direction of technological learning in a particular nation and remains central to contemporary policy analysis of many countries. NIS focussed policymakers' attentions on promoting flows of technology and information among people, enterprises and institutions. Closely intertwined with the NIS was the occurrence of three major shifts.

First, the NIS approach stressed that technological growth occurred as a result

"We do not know, we can only guess. And our guesses are guided by the unscientific, the metaphysical (though biologically explicable) faith in laws, in regularities which we can uncover—discover. Like Bacon, we might describe our own contemporary science—'the method of reasoning which men now ordinarily apply to nature'—as consisting of 'anticipations, rash and premature' and of 'prejudices.'"

KARL POPPER
THE LOGIC OF SCIENTIFIC DISCOVERY

of the distribution of knowledge amongst various actors involved in innovation. The complex interactions and relationships amongst actors were therefore perceived as core to innovation. By making knowledge the foundation of technical change, the NIS approach buttressed the concept of a "knowledge-based economy" where knowledge and information flows are conceived to be central to economic development.[7]

Second, the emergence of Endogenous Growth Theory (EGT) put technological change at the heart of economic growth.[8] EGT posits that technological progress arises from intentional actions of agents shaped by market incentives—for instance, an enterprise investing in and developing a new production process. Technology is therefore identified as an endogenous rather than exogenous factor in its contribution to growth.

Third, with this reformed view of innovation, policymakers realised the need for a systemic approach, involving multiple actors in the innovation process including enterprises, universities, government departments, financial institutions, end-users and research centres. Science policy was refashioned as "innovation policy."[9]

PRESENT CONUNDRUMS: BASIC VERSUS APPLIED RESEARCH

Mirroring the thinking of EGT, Singapore announced its strategy for transitioning towards a knowledge-based economy in 2002. This strategy was reminiscent of NIS in that it adopted political economist Joseph Schumpeter's view of innovation as a critical factor in economic development. For instance, it advocated the need for supporting the entire lifecycle of innovation: establishing multilateral and bilateral bridges with global partners through free trade agreements, developing new growth clusters, and creating a vibrant enterprise ecosystem by creating financial incentives for new ideas.[10]

Research today is valued in terms of its contribution towards economic growth and addressing national challenges. In adopting this definition of the value of research, however, some challenges remain. First, measuring the commercialisation value of research is challenging as publications and citations, the traditional academic marker of good research, may not be neatly traceable to the market adoption of technologies. Second, prioritising national goals requires normative judgement. Unlike wartime, when the foremost mission of science is clear, national objectives may compete with each other during peacetime. The question is how trade-offs should be managed between, say, defence research and research aimed at ameliorating the effects of ageing.

Without the exigencies of war, how does a society decide which causes to prioritise research for?

MANAGING FUTURE UNCERTAINTIES: HOPE OR PERIL?

While science and technology help us to understand the world and ourselves by reducing the realm of the unknown and

their accompanying uncertainties, they simultaneously open up new possibilities filled with new uncertainties. One crucial uncertainty is whether science and technology will lead us to a new golden age, or result in a nuclear catastrophe or an Earth too warm for human life. Great thinkers have disagreed on the balance of hopes and perils. For example, John Haldane's "Daedaus, or, Science and the Future" speaks of the endless opportunities of science, while Bertrand Russell's counter-piece "Icarus, or, the Future of Science" cautions against casual optimism in an unthinking pursuit of progress.[11]

We need to assess technology's potential with a broader language that embraces its complexity and unavoidable uncertainties.

A second set of uncertainties lies in research and development processes. It is difficult to predict which avenues of scientific research and investment into technological development will bear fruit and which will prove to be dead ends. There have been attempts to manage these uncertainties—for example, technology forecasting attempts to identify technologies with future applications. Foresight methodologies are also deployed to gain a fuller understanding of the forces that shape the long-term future of technologies in order to inform policymaking.[12] Alongside these developments, however, assessment metrics continue to bind research to publication counts and citations in an attempt to mimic econometric cost-benefit analyses. These methods are not without downsides and gaps. Results-oriented approaches can often reduce passionate and ground-breaking scientific research into a contractual numbers game. This in turn can mean that governments and enterprises miss out on possible opportunities in science and technology development.

Given the very human failings that impede our attempts to grapple with the complexities and uncertainties in scientific research and technological development, one approach is to take a deep breath, step back and start with finding the right questions to ask. At the same time, this cannot be where we end—we must also move to develop bold visions to chart the future course of science and technology development, such that they serve the flourishing of society at large.

What if certain kinds of neuroatypicality were an asset rather than a liability?

Digital Shakeup: 4 Big Shifts for Work and Society[1]

By Liana Tang

The digital economy is loosely defined as the production and consumption of digital products and services.[2] It materialises in several ways, some possibly contradictory. High-value innovations occur not just within services or platforms, but across them. Rapid technological change means that businesses and workers have to constantly adapt. Lifestyles are similarly evolving to reap the benefits (or suffer the consequences) of technology. The conveniences of the digital economy also bring security issues and new forms of crime.

Several institutions are already feeling these effects; regulators and incumbents have had to keep up with new challenges such as private-hire cars and shared bike platforms. Consumer habits have also shifted due to the pervasiveness of food delivery services, opening up new business opportunities. Platform giants, states and multilateral institutions have been rethinking responsibilities in counterterrorism efforts, content regulation and the protection of personal data. The rise and evolution of the digital economy will undoubtedly continue to shape the global operating context and will present new complexities as our social and geopolitical landscapes evolve.

There are four big shifts for society and work arising from the digital economy which could fundamentally change the way we think about institutions today. These shifts are not predictions, but plausible futures set in the 10- to 15-year time horizon, and are meant to be conversation starters around current-day strategies.

SHIFT #1:
REPLACE → CO-BOT[3]

It has been suggested that the most value to be extracted in applying technology to work is through human collaboration with robots or Artificial Intelligence (AI), rather than removing humans from the equation altogether.

Digital healthcare start-up Babylon Health recently made news when its AI doctor performed better at a diagnostics examination taken by trainee general practitioners with an average pass rate of 72%. Babylon AI scored 82%.[4] This does not mean doctors are out of a job—there is still a need to account for ethical responsibility and the complexity of a patient's history and environment, which would mean that a doctor's main value-add would shift to treatment rather than diagnosis.

In 1997, IBM's Deep Blue famously beat chess champion Gary Kasparov. Fast forward to 2005, when an online chess tournament sought to test if humans and AI could make a better team than AI alone. True enough, the augmented human player beat the solo computer. The kicker? The augmented players were not champions, but amateurs.[5]

Humans and machines need each other to perform optimally. How do we extract that value to maximise outcomes? What applications could there be beyond work?

Can jobs in tomorrow's digital economy provide the personal fulfilment and deeper meaning that millennials today already demand?

SHIFT #2:
LIVE TO WORK → WORK TO LIVE?[6]

Much has been said about millennials and their work ethic. Stereotypes aside, the difference between current youth aspirations and those of preceding

generations is big enough to present legitimate concerns.

A recent Deloitte study of millennials revealed surprising statistics: 44% turned down a job because the company's values did not match their own and 56% swore never to work for any company whose values did not match theirs.[7] In Singapore, youth have also said they prize happiness over many other things, wealth among them. The rise of a seemingly new "Generation Z" points to even more uncertainty in the hopes and fears of the largest cohort entering the workforce today, as studies find them potentially more fiscally conservative and capitalising on the gig economy at a much earlier stage in their lives.[8] They also grew up in an age constantly confronted by global economic and political uncertainty and against a backdrop of climate change, radicalisation and other global threats.[9] In such a climate, it is no wonder youth of today might seek a "YOLO" or "You Only Live Once" life rather than a wealthy one.

Can jobs in the digital economy still keep the youth of today happy, or will there be a push towards working to seek greater meaning in life? Even if jobs cannot fulfil the needs and aspirations of youth, might there be other ways for them to achieve personal fulfilment?

When human augmentation takes off, where do we draw the line?

SHIFT #3:
LIVE LONG AND PROSPER → AGE IS JUST A NUMBER[10]

Could the digital economy solve the existential challenge posed by ageing populations?

We are living longer. Global life expectancy has grown significantly in the past decade—Singapore is expected to have the third highest life expectancy in the world come 2030, ahead of longevity champions Japan.[11] In addition, developments across a range of human augmentation technologies combined with cheap production and distribution could mean a new era for humanity. For example, there is evidence that metformin, a common and cheap diabetic drug, has significant anti-ageing properties. In mice, metformin has increased lifespans by 40%.[12] The demand for nootropics, or supplements that enhance or help manage cognitive abilities, is also increasing.[13] They are now more readily available and normalised thanks to e-commerce and clever online marketing.[14] Exoskeletons are also getting cheaper and have the potential to give new life to the elderly and the disabled.[15] All Nippon Airways has been experimenting with exoskeletons made by robotics company Cyberdyne for their staff, which includes

older workers, to be able to handle large suitcases better.[16] Some controversial quarters claim that we are closer to achieving immortality for humanity through a variety of possible methods ranging from rejuvenation technologies to brain uploading.[17]

While immortality might be beyond the realm of plausibility for many, extensive longevity might not. If we get basic research into anti-ageing drugs right, keep distribution channels pervasive and drive down the cost of exoskeletons, might we have a solution to stay productive even as we age? What are some obstacles to harnessing such technology? Would augmented humans be subject to special rules and codes of ethics? What extent of augmentation would be acceptable?

Beyond life in fragile, mortal shells, we humans might also have to contemplate our digital lives that now exist on multiple platforms across social media and other sharing services. How might an archivist of the future consider the cultural history of humanity given our multiple lives, avatars, and contributions to our digital world?

Many of the skills we need for the jobs of tomorrow are not ones we know of today.

SHIFT #4:
LEARN TO WORK →
WORK IS LEARNING[18]

Disruptions experienced in the last decade have had people concluding that many skills of tomorrow are not the skills we know of today.

A 2016 report by the World Economic Forum found that by 2026, most jobs across all types of occupations will on average have more than one third of the core skills needed to perform them coming from a group of skills currently not yet considered crucial.[19]

Many also recognise that soft skills like collaboration, networking and creativity will be critical for success. If we do not know what skills are needed in the future, why frontload all our education in the prime of our productivity only to learn skills that are not really useful for work? Stanford's Design School recognised this and proposed a concept called the Open Loop University.[20] Students learn at their own pace and can alternate between learning and work as needed. They enrol for six years, which can be spread across their lives, and do not even need to wait to turn 18 before matriculating.

Of course, schools are not just for learning "hard" skills. Should we maximise schools for other outcomes such as building

social skills, common identities, values and ethics? How would the roles of the employer and the work environment evolve to complement these "soft" skills?

NOBODY CAN PREDICT THE FUTURE, BUT WE CAN BE LESS SURPRISED BY IT

Multilevel and cross-sector discussions on such plausible futures could unearth latent assumptions, hopes and fears that need to be addressed today in order for us to better reap the benefits of the digital economy. Pervasive and consistent efforts to change mind-sets, reward innovation and implement improvements to work processes will help organisations and their people be prepared for surprises that the digital economy will bring.

Automation and the gig economy will shift our notions of social capital, identity and cohesion.

Say Hello to the New Work Order

By
Angel Chew and Liana Tang

Research Support
Derrick Cham

HOW MIGHT WORK CHANGE US?

Work is central to the lives of most Singaporeans. Beyond being a source of income, work is tightly bound with a person's sense of identity and self-worth. It shapes the values and principles one upholds as important in life and is a key source of social capital.[1] With technological innovation and a changing economy, the world might well see the emergence of a new work order, fundamentally shifting the social aspects of work. The future of work will be profoundly impacted by automation, the gig economy and platform innovations, all driving forces we have been watching fairly closely.[2]

Automation and the gig economy are not new phenomena, but both have increased in speed, largely enabled by platform innovations.[3] It is now incredibly easy to isolate and codify tasks to be outsourced to gig workers.[4] This impacts both the availability of work and how work is done. Workers across a range of qualifications and industries will be affected by these forces, although at this point there is no consensus on the speed and impact of change.[5]

Policymakers have been quick to consider the impact of gig work on jobs and the economy, as well as on retirement adequacy—if gig work is embraced, it could increase labour force participation, and provide good bridging employment during skills retraining.[6]

Enhancements to Medisave announced in 2018 granted freelancers better access to medical benefits and insurance.[7] But beyond this, there is a need to better understand the social impact of future work arrangements, such as how they may affect social capital, identity and cohesion.

GIGWORLD, SLOWDOWN, SECOND-CLASS SKILLS: THREE FUTURE SCENARIOS

To provide greater texture to the possible ways in which the future of work could play out, three mini-scenarios are presented below, produced by overlapping two uncertainties: (a) whether there would be more or less productive work for people in the future; and (b) whether jobs would remain the dominant paradigm of work or if task-based work will become the new normal:[8]

Driven by growth in the gig economy and platform innovation	**LESS WORK FOR PEOPLE**	**MORE WORK FOR PEOPLE**
MOSTLY TASKS	Gigworld	Second-Class Skills[9]
MOSTLY JOBS	Slowdown	

Gigworld (less work, mostly tasks)

People have to move fast and deliver fast if they want to survive in this gig-driven economy. Most people piece together their incomes through a series of temporary (and tedious) gigs. The winners are those who can provide an experiential service based on human interaction, activity or skill. The losers either struggle to keep up with the dizzying pace or opt out of the labour market entirely. The latter search for alternative sources of income as well as identity, meaning and social support.

In Gigworld, a homeowner may lease her living room as a co-working space through the AirDesk app, providing freelancers with space and a chance to meet likeminded people. Such co-working spaces continue to attract freelance writers and graphic designers, but also increasingly welcome fulltime cryptocurrency miners, freelance bankers and videogame shoutcasters. Freelancing schools emerge, promising to make gig workers more competitive. The founders of such schools are older gig workers tired of the constant pressure who want to continue earning money because

they are unable to retire. These schools operate completely on existing platforms—their classrooms are co-working spaces or the internet, their branding and marketing all done by midcareer freelance advertising personnel. This is widely condemned as exploitative, but demand is sky-high.

Slowdown (less work, mostly jobs)

The gig economy fails to take off and economic life is organised around large institutions and those they employ in jobs. Because jobs are still the ideal arrangement, yet are few and far between, people are reluctant to leave their jobs regardless of how unhappy they are. As tax revenues fall because of lower employment levels, corporate philanthropists step in to take over former state functions. Through a series of job-sharing, work-hour reduction and "make-work" measures, most of society remains in a job-centred labour arrangement, albeit at a much slower pace, resulting in time and space for alternative pursuits.

In Slowdown, we are all underemployed due to automation. The typical office worker knocks off at 4pm and regular furloughs, couched as personal development or family time, are commonplace. Younger employees and retirees do gig work in their free time just for fun or to supplement their income, undercutting fulltime freelancers. Due to alarming rates of depression and suicide in gig workers, Artificial Intelligence (AI) and tech giants who benefitted most from automation set up "Free Time Foundations" disbursing welfare and featuring opportunity portals. Desperate low-skilled gig workers sign away all their data to AI companies to aid machine learning in exchange for a monthly stipend. Universal Basic Income experiments in the West fail as taxes are unable to sustain them. Nonetheless, the slower pace of life boosts reported happiness and the fertility rate increases significantly.

Second-Class Skills (more work)

A technologically-driven economy results in a period of strong productivity when there is more work, but only for those at the very high end and very low end. A two-tiered economy emerges—those with the right skills and those without. Despite strong efforts by the government to retrain and reskill workers, the skills required for the upper tiers are far too complex and the divide widens. A large proportion of workers grow frustrated and bored in jobs they feel overqualified for.

In the world of Second-class skills, well-meaning educational reforms have made genetic engineering and AI coding and management skills training available to a wider range of the population than before. Unfortunately, most people are still unable to break into these fields, which

are growing rapidly in importance but do not create massive numbers of new jobs. AI and genetic engineering companies regularly under-employ armies of hopeful interns. Those who fail to reskill are left working to manage sunset industries, applying the insights of AI to eventually replace their own jobs and watching people rich enough to possess genetically-enhanced intelligence fill leadership positions. Mass movements powered by the increasing disaffection with the two-tiered economy emerge, with more benign movements to divest from AI gaining traction alongside more violent ones protesting against, and in some cases killing, enhanced humans.

Underlying all three scenarios are three particular areas of social impact, namely mental health and wellbeing, identity and relationships.

A two-tiered work economy and ensuing divide may emerge between those with the "right" skills and those without.

"ZERO DUTY OF CARE": IMPACT ON MENTAL HEALTH AND WELLBEING

Work can exact a significant impact on a person's mental health and wellbeing.[10] From the pressure to hold on to one's job in an uncertain economic environment, to the need to succeed amidst growing competition while maintaining work-life balance—work can be a great source of anxiety and stress. However, the absence of work can be similarly damaging—studies show that the unemployed are more likely to have depression, stress and higher cardiovascular risks. Long-term unemployment is also associated with greater incidence of suicide.[11]

The insecure nature of gig economy work would hence have a deleterious impact on mental health and wellbeing. As options are limited, people have no choice but to compete for work that has been parcelled out into various tedious tasks, juggling multiple portfolios and working longer hours. In the UK, 42% of gig workers surveyed worry about where their next pay cheque will come from, and one in three gig workers are juggling at least two "jobs".[12] Even for gig workers with a single "job", the hours can be gruelling, leading to disastrous consequences, including, in some extreme cases, suicide.[13]

Most companies today are not obligated to care for gig workers —a segment especially susceptible to anxiety, mental health issues and suicide.

In Singapore, many struggle with understanding and discussing mental health issues.[14] In a situation where more companies turn to gig workers, and companies have "virtually zero duty of care," more workers' mental health and wellbeing may go unaddressed.[15] Even groups of workers that appear to be most savvy in taking advantage of the gig economy, such as youth and entrepreneurs, are increasingly seeking help with mental health issues.[16]

Given the potential for an increase in occurrence of mental health-related disorders and the significant second-order impacts on families and communities, there is a need to look out for signs of mental illness among job seekers and retrenched workers, especially those involved in the gig economy, and ensure that such workers have better access to mental health support.

"SOMETIMES I DON'T FEEL HUMAN": IMPACT ON IDENTITY

Work and identity are inextricably interwoven and much of our identity comes from the jobs we do and our interactions while on the job. As gig workers might find themselves out of work for prolonged periods, they could experience a decline in self-esteem and loss of identity.[17] Self-esteem is also impacted in jobs where people are treated as replaceable commodities. Will Diggle, a Deliveroo rider, had this to say about his work experiences: "[Sometimes] you don't feel human. You're just handing a bag over and some people take the bag, don't look at you and close the door."[18] Rating systems employed by some sharing economy platforms also compel gig workers to behave in a subservient manner.[19]

The highly digital nature of work interactions in many gig situations could have an outsized impact due to it replacing many traditional workplace interactions. Platforms could depersonalise the relationship between employer and employee (replacing it with communication via automated messaging) and fail to cultivate social capital as the

relationships between gig workers also become both transient and transactional.[20] Deprived of stable social networks, gig workers could be prone to loneliness and isolation, making it difficult for one to forge a sense of social identity.[21]

There are, however, opportunities for those who thrive in these circumstances—the flexibility afforded by the gig economy could help many be masters of their own destinies. A McKinsey Global Institute survey in 2016 revealed that individuals who chose to be part of the gig economy reported greater satisfaction with their work lives—they had more control over working hours and had the freedom to express themselves creatively in their chosen work.[22] Another group of winners would be the ones who work just to fulfil aspirations outside of work. Work becomes a source of short-term income to support their passions and the absence of work is then seen as an opportunity to pursue those passions. Supported by other sources of fortune (for example, savings or inheritance), these people are not overwhelmingly bothered by prolonged periods of downtime.

According to a Ministry of Manpower (MOM) survey, 167,000 people in Singapore engaged in freelance work as their primary job in 2016. Including part-time freelancers who hold other jobs, the number increases to about 200,000.[23] As the number of gig workers grows, the challenges policy makers may face might include how to ensure all jobs are equally respected, how the definition of success could be broadened beyond family and career, and how people can be helped to plug into other forms of social networks and find other meaning in life that gig work does not offer.[24]

As work evolves, how can policies help broaden our definition of a successful work life or career?

MORE OR LESS DIVERSE?: IMPACT ON RELATIONSHIPS

The lack of stable social networks in a gig-heavy life could result in a loss of diversity in inter-personal relationships. As fewer social bonds are formed with fewer people, it would be more difficult to form such bonds with people from different backgrounds. The absence of a rich network could mean greater difficulty in getting people to empathise with others and to think beyond themselves and in collective terms, such as a national identity.[25] the loss of organisational loyalty in the gig economy

may engender short-term and transactional attitudes, exacerbating social tensions.[26] Furthermore, those who enjoy secure and stable employment could become a source of envy and unhappiness, as these groups could be seen as unsympathetic to the plight of gig workers.[27]

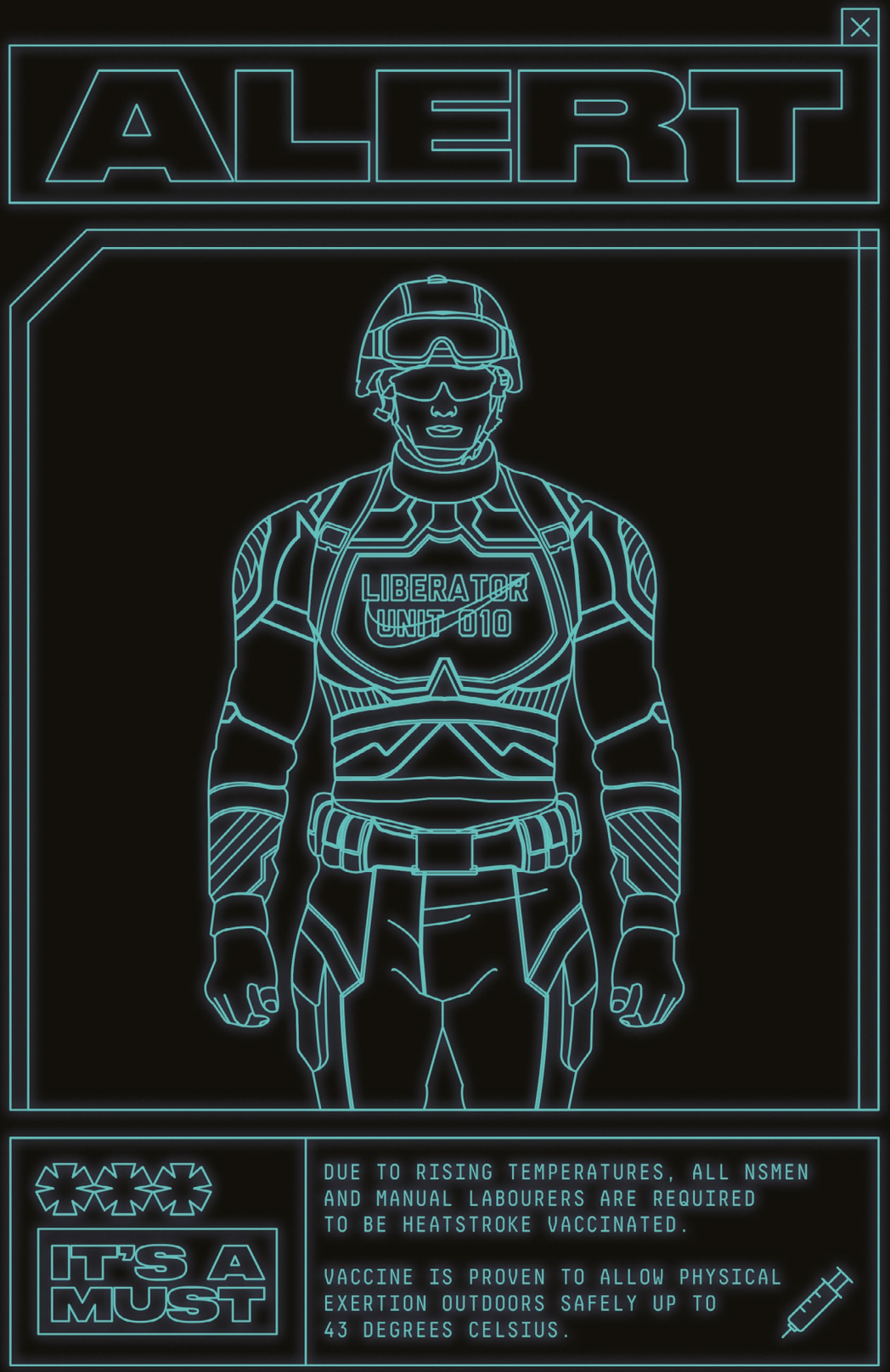
The lack of deep workplace relationships could mean workers seek other forms of ready networks and support, such as in virtual worlds, online games and organised religion. The loss of a significant source of secular social networks and reduction of common space could deepen divides along religious lines and have serious second-order implications, negatively impacting social cohesion and potentially encouraging radicalisation.[28] Isolation is also a strong driver of addiction and is often blamed for financially devastating online dating scams.[29]

Gig workers face higher risks of social isolation that may have serious, far-reaching implications.

The joint IPS-OnePeople.sg study found that network diversity correlates with collective sentiments such as national identity and social cohesion.[30] It might therefore be increasingly important to encourage network diversity in a gig-heavy economy to foster social integration. New sources of social capital beyond the workplace should be imagined and investigated. At the same time, gig workers may need additional support for their social needs. The National Arts Council (NAC) plans to establish a national resource centre specially dedicated to supporting freelancers in the arts industry, and this initiative could be extended to other industries as well.[31] Finally, the gig economy also offers opportunities to build community bonds and grow social diversity. For example, a gig platform for community work may increase volunteerism and encourage more diverse social interactions among Singaporeans.

TOWARDS A NEW WORK ORDER

How should we work to prepare for the future of work? The issues identified highlight the importance of starting a larger discussion. The social issues facing workers of the future cut across disciplinary and policy fields, and mitigating the risks they may pose—as well as capitalising on the opportunities they may provide—will have to involve a wide range of stakeholders, not least workers themselves.



The Longevity Chapter is Here: Are We Ready?[1]

In an era of human augmentation, ageing may no longer be an inevitability

By Hannah Chia

Human beings have always tried to live longer while growing older. Although ageing is still often associated with pessimism and decline, lifespans and healthspans have been significantly and steadily increasing over the past two centuries. Furthermore, there are signs that the trend towards longer and healthier lives will continue, with increased investment in anti-ageing solutions and rapid advancements in biotechnology. The successful augmentation of our bodies at a biochemical, cellular and even genetic level to delay death could result in breakthroughs with far-reaching implications for our lives and our societies. In an era of augmented longevity, ageing may no longer be an inevitability.

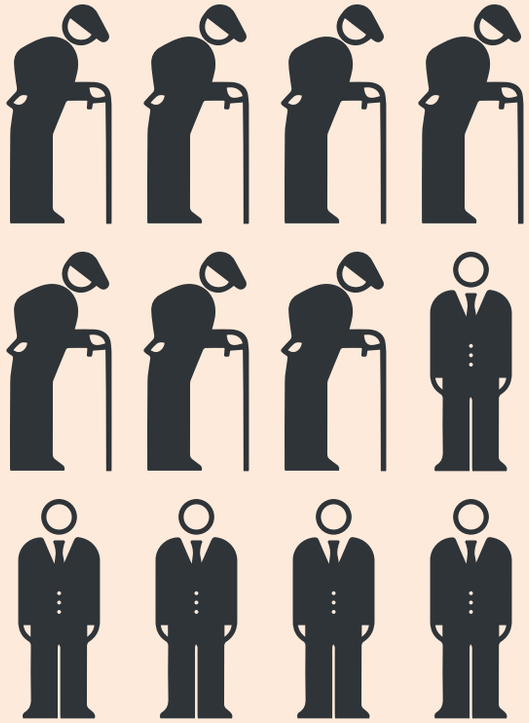
REAPING THE NEXT LONGEVITY DIVIDEND

Historical increases in life expectancy have led to significant benefits for society. Since 1840, human life expectancy has increased by about three months each year, or two to three years of increased lifespan with each decade.[2] This increase was achieved over a number of distinct phases marked by addressing specific healthcare issues and diseases, each resulting in a corresponding longevity dividend.

The next longevity dividend beckons as we challenge the ageing process and its related illnesses.

The first longevity dividend came from reducing infant mortality. By treating diseases such as smallpox, tuberculosis, typhoid and diphtheria, child and infant mortality fell significantly.[3] This allowed more children to reach productive working age, with significant productivity and economic gains. The second longevity dividend was and is still being reaped by tackling chronic diseases which tend to occur in middle age and beyond, such as cardiovascular diseases, diabetes and cancer. Through early health screenings, more effective treatments and public awareness campaigns to promote healthier lifestyle choices, individuals' healthspans have experienced an increase estimated to be worth trillions of dollars in value.[4]

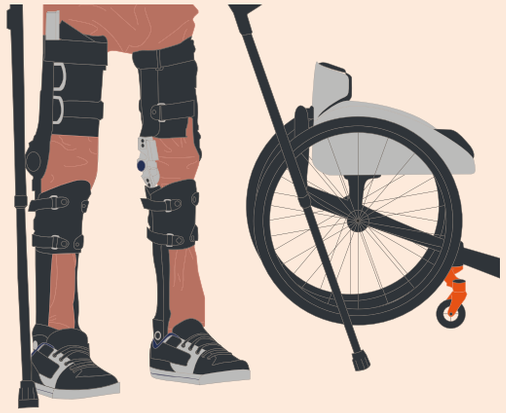
Just as the mitigation of key causes of morbidity in each era was the source of the first two longevity dividends, the next longevity dividend will arise from addressing the next significant threat to morbidity: ageing-related illnesses and the ageing process itself. The global population of those aged 60 years and above is projected to grow 56% by 2030 and will double in size by 2050. The potential dividends from tackling ageing-related illnesses could be dramatically significant.[5] These dividends could come in the form of productivity gains through an increased number of working years and potential cost savings if the elderly stay healthy for longer.



The world's elderly population is set to grow by 56% come 2030.

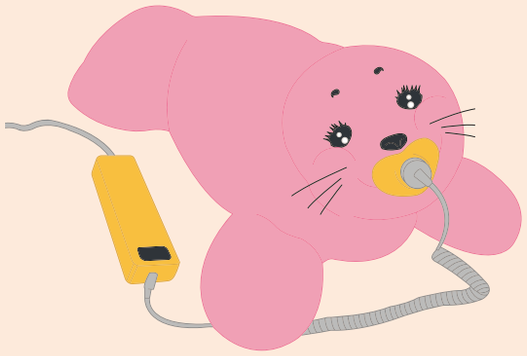
THE ROAD TO AUGMENTED LONGEVITY

A confluence of developments across domains like technology, healthcare, engineering and genetic research suggests that we are on the brink of the next phase of longevity extension. Investments in anti-ageing research suggest keen interest and momentum: in 2018, the global anti-ageing market was worth around US$200 billion, and the new boom could be in drugs that slow, reverse or prevent age-related disease.[6] The diverse range of anti-ageing or augmented longevity interventions also indicates a deep and perceptible shift away from the passive acceptance of ageing as the norm, to ageing as an obstacle to be overcome via technological innovation.[7] Examples of these augmented longevity developments include:



Physical enhancements

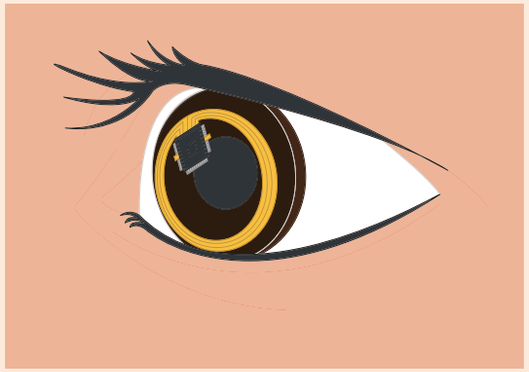
Exoskeletons and other physical augmentations have an indirect but nonetheless powerful impact on healthspans. While they do not address the root causes of ageing and mortality, they can extend an individual's physical longevity. For example, Cyberdyne's Hybrid Assistive Limb (HAL) augments the physical strength of wearers and SuitX's PhoenixX lets paraplegics walk unassisted for four hours at up to 1.1 miles per hour.[8]



Social robots

Robot companions powered by Artificial Intelligence (AI) could help to extend cognitive longevity by keeping individuals mentally active and purposefully engaged. Many of these devices, such as PARO (a therapeutic robot), are already on the market and the impact of mass adoption over the next few years could be transformative.[9] The growing awareness of an "epidemic of loneliness", with attendant healthcare and social costs, make social robots a particularly important prospect for augmented longevity.[10]

Why cure illness if we can prevent it? Why delay ageing when we may defeat it?

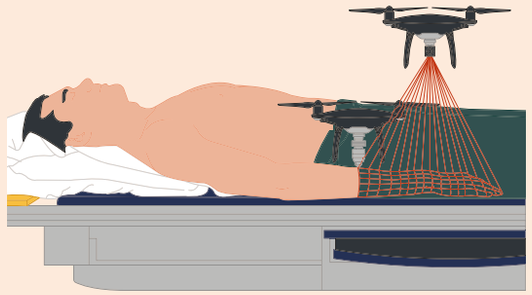


Smart wearables

This is part of a wider Quantified Self movement, in which the ubiquity of next-generation smart wearable technologies will help individuals monitor their own state of health and gamify life-extending behavioural changes (increasing motivation to exercise, for example).[11] The combined power of personalised data analytics, AI and gamification techniques will significantly boost one's ability to effect sustainable behavioural changes, be it for caloric restriction, healthier diets or a more active lifestyle.[12] While fitness trackers are already commonplace, their upgraded successors could be truly transformative due to the greater degree of customisation and personalisation of feedback and gamification which would become possible. Individuals respond differently to different incentives and the ability of the next generation of smart wearables to adapt to unique users will have profound effects on healthspans.[13]

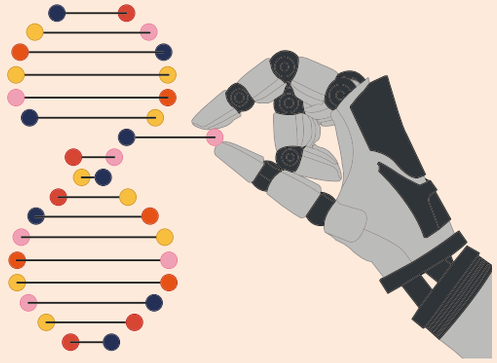
Pharmaceutical drugs

Augmented longevity could be just a pill away, with current drugs showing great potential to extend healthspans. Metformin, for example, a cheap, safe drug used widely for type 2 diabetes, has already been found to extend the lifespan of type-2 diabetic patients relative to non-diabetic controls.[14] Mice with metformin added to their diet have seen an approximate 40% increase in their mean lifespan.[15] In December 2016, the US Food and Drug Administration approved the Targeting Ageing with Metformin (TAME) study, which will study whether preventively administering metformin to healthy individuals can prevent or delay the onset of ageing-related diseases. TAME is a significant milestone since it is the first drug trial to broadly target ageing-related processes.[16] This paves the way for trials of other drugs that could extend health- and lifespans.



Rejuvenation treatments

There has already been success in regenerating muscles, tissues and organs through pluripotent stem cell research, the 3D-printing of organs, and the growing and harvesting of human organs in pigs. The routine and sustainable replacement of aged body parts could soon be within reach. In 2017, biologists at the Salk Institute succeeded in growing human stem cells in pig embryos.[17] The resultant organ would be made of a patient's own stem cells, mitigating the risk of immune rejection. Swiss scientists at ETH Zurich have also developed a functional beating heart made of silicone and based on a 3D mould.[18]



Gene therapy

The successful use of the gene-editing technique CRISPR has enabled a host of interventions that may extend health- and lifespans at the most fundamental levels of human biology. In August 2017, scientists successfully corrected a genetic defect in newly created human embryos via CRISPR, demonstrating that gene editing technology could prevent the transmission of inherited diseases to future generations.[19] As scientists gain a better understanding of the genetic processes behind ageing-related diseases and the ageing process itself, genetic interventions may allow us to delay ageing or eventually defeat it entirely.[20]

Taken together, these developments indicate that we are already living in the age of augmented longevity, and that we will live longer and healthier lives than our predecessors. This raises a number of significant implications.

SOME IMPLICATIONS OF AUGMENTED AGEING

New possibilities for extending healthspans and longevity

The dominant narrative in Singapore has always been to promote active lifestyles, healthier diets, early diagnoses and timely treatments in order to lengthen healthspans. However, augmented longevity technologies provide new possibilities.

First, gamification could be leveraged to spur individuals to maintain healthier lifestyles or post-treatment care. This, coupled with customised data analytics and feedback from AI-powered assistants, is where the next wave of longevity dividends will be reaped. Healthcare apps and their AI assistants could save more lives than hospitals in the near future.

Second, drugs and supplements taken to prevent ageing-related illnesses instead of cure specific illnesses are a potential game-changer. Instead of ageing as an inevitable biological process, the TAME trial suggests the potential for targeting and blocking ageing-related processes. Regular supplements to delay ageing could become as commonplace as Vitamin C tablets.

Ethical concerns and values-based conversations

New technologies and treatments present exciting possibilities but also raise ethical challenges. First, in the early stages of adoption, these augmented longevity technologies are likely to be prohibitively expensive and may only be available to the wealthy. Ensuring fair and equal access for all will be an important issue for regulators to consider.

Second, it will be necessary to ensure that the clinical trials and marketing of new treatments are done ethically and do not exploit the vulnerabilities of those who are terminally ill and/or ageing. Scientists and regulators alike have urged caution in fixating on a specific gene or biological process as a key determinant, as ageing is still a complex process. There should also be public education around the efficacy of new treatments so that individuals are not misled by exaggerated claims of longevity extension.

As the ratio of old to young rises, how can we support one generation's needs without short-changing another?

Third, the intergenerational compact between the young and the old will require careful management. New treatments will benefit the growing proportion of elderly, while the cost could be borne by a shrinking proportion of younger workers, especially if social structures, such as the retirement age, remain the same. If seniors stay healthy

and remain in their jobs beyond current norms, maintaining sufficient opportunities for younger workers will also become a pressing concern. Therefore, there will need to be values-based conversations on how a nation's resources and opportunities should be allocated between the competing needs of different generations (for example, longevity extension versus housing and education subsidies).

Age may soon cease to be a marker of one's life-stage and work ability.

Moving away from age as a definitive marker

As new technologies lengthen cognitive and physical functioning, age becomes less meaningful as a marker of life stage and ability. Moreover, research has proven that biological ageing, far from being a static and intractable process, is significantly plastic. This means that the decline in physical function is not tied to specific ages. A deeper and more textured understanding of ageing and longevity is needed. Policies which are anchored by distinct ages as proxy indicators of ability, such as the retirement age, will need to be reviewed and updated to keep pace with advances in scientific research and technological innovations. For example, an experienced older worker empowered by exoskeletons may be equally or better able to function in a labour-intensive job compared to a younger worker.

THINK NEW, LIVE LONGER

Developments in augmented longevity challenge us to reframe our view of ageing and strategically position ourselves to reap the next longevity dividend. We must anticipate fundamental disruptions to our assumptions about age, ageing and life stages. The sooner we invest in new ways of thinking around what it means to grow older and live longer, the better able we will be to reap the fruits of living in a world where age is just a number.

As we live healthier for longer, what will it mean to grow old?

What if China became the dominant *cultural* power?

Invisible Hands: The Forces Shaping Our Identities

By Liana Tang

From the beginning, humanity has grappled with these questions: What am I? What are we?

When getting in a taxi, making small talk at the neighbourhood deli, or after the first handshake at a job interview, the question on everyone's minds is: "What are you?" And for good reason—identity, or at least the attributes that identity confers, helps us to navigate a complex world. It is a heuristic that helps us discern friend from foe, activate appropriate behaviours and assess the usefulness of a new connection. It also helps identify tribes that are deserving of protection or alienation. From the very beginning, humanity has grappled with these questions: What am I? What are we?

It is unsurprising that young, city-state Singapore has been far from immune to this constant introspection: Who are its people? What is its place in the world? How does its identity help with navigating its relationships with neighbours and the global community? How do the identities of its people guide social policy and shape its urban environment? The answers to these questions are complex and constantly evolving. Besides, at just 54 years old, many will agree that the paint on the young republic is still wet.

CSF has often considered these questions as underlying threads in our research. We have been particularly interested to discover new identities, new ways to think about identity, and how there may be ways we currently think about identity that need to be relooked. At Foresight Conference 2017, rich discussions transpired about the forces that reshape identity and how society and the state will evolve in response.[1] This article explores four ideas around identity that have profound implications for the state, corporations and people.

THE CONTRADICTIONS OF AN IDENTITY TRINITY

An easy way to think about the concept of identity is to consider these three aspects:

1. State-ascribed identity: how the state confers administrative categories on its people
2. Society-ascribed identity: labels that groups apply to individuals, which impact their acceptance or rejection of individuals
3. Subjective identity: an identity that an individual ascribes to oneself

There are assumptions around these identities that are often made. For instance, many forget that while the three identities can come into alignment, they can also come into conflict with one another. When such conflict arises, the state, community and individuals must understand the need for discursive space to unpack and understand the precise nature of the conflict. In a world with increasingly polarised values and politics, we can expect such conflicts to occur more often and be more greatly amplified by social media and an increasingly sensational fourth estate. We must also note that identity navigation can be a highly emotionally-charged affair. Engaging identities on purely rational, cognitive terms alone will be insufficient; worse, disastrous. It is yet unclear what frameworks would be best-suited to understand identity-based conflict. One possible frame could be found in Moral Foundations Theory.

Another common assumption is that a common identity automatically confers solidarity. Just because you identify as

Care / Harm

Fairness / Cheating

Liberty / Oppression

Loyalty / Betrayal

Authority / Subversion

Sanctity / Degradation

In his book, *The Righteous Mind*, social psychologist Jonathan Haidt proposes an alternative lens we can use to understand one another: moral foundations. The theory states that humans have six basic intuitions which confer feelings of right and wrong on various ethical outcomes. For instance, why do we feel that pushing someone off a swing is clearly wrong? Why does maid abuse feel wrong? The reasons for why we feel these things to be unethical are not always the same and could be based off differing moral foundations. Studies have shown that these six foundations could offer alternative indicators for normative beliefs beyond traditional indicators such as age, ethnicity and income status.[2]

a Singaporean, your understanding of the obligations, values and behaviours of being Singaporean are not necessarily the same as another Singaporean's. Often, our human biases assume this based on several heuristics, among them skin colour, language spoken, profession and age. It is also important to note that common identity does not preclude conflict. Examples can be found all over the world: conflicts between Sunnis and Shias, tensions between liberal and conservative Americans, and strain between pro-Beijing and pro-independence Hong Kongers.

> Even if we identify as Singaporean, our understanding of the obligations, values and behaviours of being Singaporean may differ from someone else's.

BEWARE THE MEDUSA SYNDROME

There are several strong forces that shape identity, the strongest in some cultures being the state. Singapore is an excellent example of a place that fostered strong state-ascribed identity in its early nation-building years. Security, infrastructure, economic development and foreign policy were pursued at a great pace soon after independence out of sheer desperation. Developing the urban environment and its administration necessitated a structured approach to organising its people into ethnic groups. This practice found its way into administrative structures that pervade many aspects of Singaporean life today.

As interracial marriages continue to make up a fifth of all marriages each year, and transnational marriages make up a third, ethnic classifications will become more and more contested as mixed-heritage citizens become the norm rather than the exception.[3] One point of contestation has typically been that of language policy, as one's ethnicity has typically dictated the second language studied in school. As language shapes cultural identity, this has serious implications for individuals, families and communities. Kwame Anthony Appiah wittily says that "what the state gazes upon, it tends to turn to stone."[4] Aptly named the Medusa Syndrome, state-backed identities could run the risk of ossification, even as external forces continuously reshape lived experiences.

Beyond cultural implications of one's second language, there could also be tensions that result from viewing identities in a rigid manner. For instance, there might be increasingly difficult-to-hold conversations around obligations and values, as the state, its people and communities wrongly confer expectations

and attitudes upon each other. The active "classification" of people by the state also inadvertently creates a sense of being watched, cultivating a sense of power asymmetry.[5]

To counter this, it is suggested that states build "trellises" to nurture identities that work well for the respective governance contexts.[6] These could take the form of common values that are regularly discussed, cultural institutions that preserve old identities while embracing new ones or facilitating a more participative citizenry in regular debates on policy and legislation.

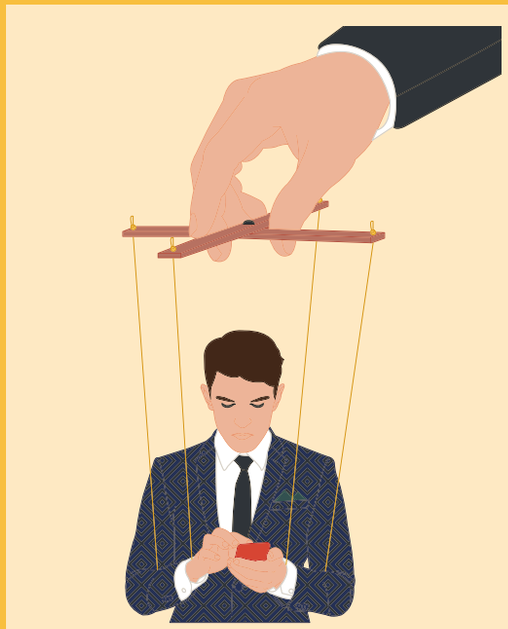
WHITHER THE SYMBOLIC ECONOMY?

The digital economy, mass automation and the augmentation of humans using AI in the course of work have led many to believe that work will be reduced and many of us will spend less time being productive. Whether it be a future with less work or one where employment is discontinuous (especially in an economically uncertain world), people who typically ascribe value to themselves through their profession would lose a critical source of identity. As professions begin to unravel, so would the centrality of work to our identities.

In many theses on the future of work, it is suggested that people might find meaning in other ways, such as through charity and volunteer work, or risk developing mental health issues due to identity anxiety. Another possibility is a rise in the symbolic economy—symbolic goods such as social networks, status and cultural experiences could become even more central to people's lives. This is already observed among the superrich—Robert Frank paints that little-known parallel of the superrich in his 2007 book *Richistan*, showing, among obnoxious status symbols and priorities of these "financial foreigners", a pursuit of passion projects in the arts and culture.[7] The pursuit of some symbols today transcends social status. For example, Emirati across social strata enjoy falconry, a sport popularised by the late Sheikh Zayed bin Sultan Al Nahyan. Falconry is seen to symbolise patience, strength and intelligence, and its popularity has risen significantly in recent years.[8]

Some aspects of symbolic economy are increasingly accessible to the masses today and probably will be to the "displaced" of tomorrow. Social connections and status will be increasingly created and maintained on social networks and virtual worlds—spaces that are likely to be more democratised in the future as the technology becomes more widely available and digital corporations fight to capture people in a competitive attention economy. What might be less accessible to the poor of the future could in fact be a meaningful symbolic economy in the real world.

Symbolic goods like social status and networks could become ever more central to our identities.



Pervasive digital technology has given rise to a phenomenon termed surveillance capitalism—described as a perverse form of capitalism where companies provide free digital services to people in exchange for data that allows service providers to monitor user behaviours in great detail, often without consent. A term introduced by Shoshana Zuboff in her 2019 book *The Age of Surveillance Capitalism*, "surveillance capitalism" allows those who obtain detailed user data to make predictions about our behaviour.[9] Subconscious behaviours and preferences are attributes of identity that are often not known even to their owners. These behaviours, once private and complex, are now known and interpreted by someone else for monetary or political gain. As people spend more time in virtual worlds, a new underclass could emerge—one that has little agency over their behavioural data, manipulated in the mutually-reinforcing cycle of the attention economy.

THE PLATFORM MAKES—OR BREAKS—THE DIGITAL IDENTITY

Social media-powered digital communities have been likened to various things at various moments: a new source of social resilience, a digital sanctuary for the physically disabled, or even a wellspring of social change. On many levels, this is true; we have witnessed the power of a hashtag to spark significant shifts in social debates—the #MeToo movement is a case in point.[10] The Overton Window has shifted rapidly in this age of hyper-connectivity—absolutist political rhetoric and extreme political vocabulary have become normalised in our social consciousness.[11] Words and ideas once taboo mere years ago have become acceptable utterances at a politician's whim. In another instance of empowerment through connectivity, a disabled teenager living a near-solitary life created a vast network of close friends as he became a virtual mentor to them in an MMORPG—a fact that only became known to his friends in the real world on the occasion of his funeral, when some of these "virtual" friends flew in to pay their respects.[12]

Even as the power of digital communities and identities has been transformative, it also has limitations. At the community level, it is up for debate whether digital communities would confer solidarity amongst its members in real life—would your affiliation to your local World of Warcraft group be so strong that it compels you to help a fellow player during a real-world terror attack?

Games, in fact, have long been viewed as promoting antisocial behaviour and being detrimental to real-life communities, which is not always true. In *The Proteus Paradox*, psychologist Nick Yee taps on extensive research into the lives of MMORPG gamers to

show that social norms and leadership skills are equally, if not more strongly, expressed in-game compared to real life.[13] Norms and irrational behaviours, such as superstition, are also observed in the game world, as are courtship and rivalries. In Second Life, an online game where users create and inhabit virtual worlds, users were inclined to replicate real world places rather than imagine fictitious ones. But not all games amplify real world identities—new games where many functions and narratives are automated, and where players can easily be self-sufficient, are limiting the need for social interaction and the formation of new communities. These types of games not only minimise social interactions online, but could worsen loneliness in the longer term—a growing concern in many countries.[14]

In "The Sound of Breaking Up" by Felicity Savage, an isolated yet hyper-connected world has given rise to a culture that professionalises real-life interactions.[15] The protagonist, for example, works as a virtual divorce broker. Science fiction aside, the idea of physical social skills becoming a rarity is not implausible. Might a pervasive internet culture render analogue skills and experiences a mark of privilege, helping to distinguish the elites from the masses?[16]

IDENTITY BASED ON COMMON HUMANITY

Identity is complex, malleable and ever-evolving. While driving forces like technology and hyper-connectivity could drastically reshape them, states should also appreciate the profound role they play. States, communities and individuals must appreciate the "hyphenated" and ever-changing nature of identity. Nonetheless, we should also not lose sight of the underlying continuities driving identity. As Haidt says:

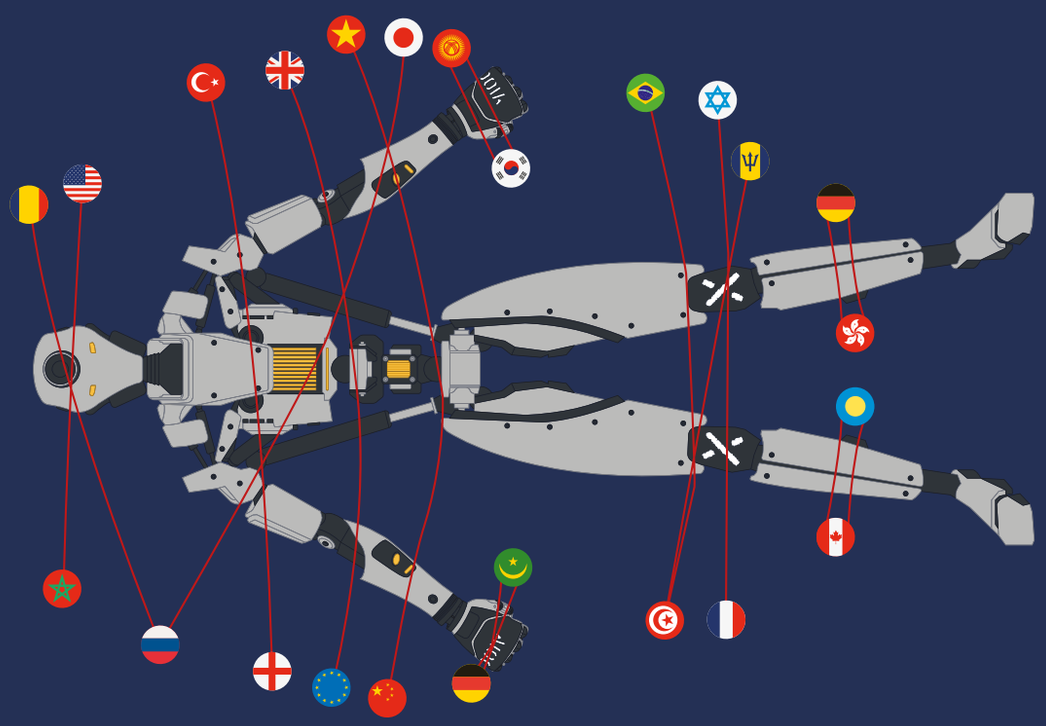
> "Identity politics is not bad; you have to have a politics of identity. But you can have one based on a common humanity, which is what we say works. Or you can have one based on a common enemy .... That may feel good and there may be some truth to it, but it is not an effective way to bring about change."[17]

A Shared Fate: Key Takeaways from the Risk and Artificial Intelligence Workshop

By Leon Kong, Manoj Harjani and Lim Pei Shan

The Centre for Strategic Futures (CSF), the Centre for the Study of Existential Risk (CSER) and the Leverhulme Centre for the Future of Intelligence (CFI) jointly organised the Risk and Artificial Intelligence (AI) Workshop from 5–7 September 2018. The workshop brought together an international group comprising Singapore government officials and thought leaders from academia and industry for in-depth discussions about foresight, strategic risks and existential risks. The workshop also discussed opportunities and risks in AI development, present and future, as well as AI governance and the importance of international cooperation for beneficial and responsible AI.

The Risk and AI workshop was the first event that CSF co-organised with these international partners and was designed to be a meeting of minds across cultures, disciplines and sectors. The diverse profile of the participants resulted in fruitful conversations that generated new insights about risk and AI. The workshop also brought together CSF, CSER and CFI's networks, facilitating the building of bridges between thinkers from Asia and the West. These new connections have been greatly enriching and have provided us here at the Centre with much food for thought. The following paragraphs summarise the key takeaways from the workshop.



RISK

Three tensions in risk

There are three tensions in addressing risk that need to be articulated from the start. The first tension is that every risk comes with opportunity; these upsides need to be recognised and taken advantage of. For example, ageing is a challenge faced by many countries that also presents significant opportunities for new products and services that could shape social norms and behaviour in the long run. Governments, businesses and third sector organisations may respond to and manage risk well, but may not capitalise on opportunities and potential innovations generated by risk.

The second tension is the need to balance between immediate demands and longer-term concerns. Climate change, for example, is a difficult risk to address because it is a long-term issue requiring immediate responses. For such risks, it is normal for people and organisations to make short-term decisions resulting in ignorance or neglect of broader concerns that gain importance in the long run.

The third is the tension between strategic and operational risk, where one may be identified and mitigated at the expense of the other.

Diverse perspectives and abstract elements

Risk assessments are often unconventional and dependent on the inclusion of diverse and even contrarian perspectives. In addition, relevant expertise at various stages of the process is also essential. For example, risks have traditionally been dealt with at the governmental or organisational level, but digitalisation has made risk a more widely understood issue in society.

Risk assessment can therefore use the methods and findings of other fields, such as behavioural science, to achieve greater insight into the management of risk appetite. In addition, it is difficult to find leaders who can manage a team of diverse individuals that brings together a range of perspectives. Leaders should not be too quick to dismiss contrarian views as stupid, sinister or slothful, simply because they feel uncomfortable confronting those views.

Abstract elements related to risk—including meanings, relationships, processes and experiences—also merit attention. A participant observed that an individual's perception of identity, allegiances, commitments and motivations precedes action. However, organisational risk management often neglects such considerations. Paying more attention to the abstract elements of risk could help organisations and governments better understand why individuals often respond to risk in seemingly illogical

ways. For example, the take-up rate for life insurance is much higher than for travel insurance, even though risks from taking a flight are greater.

Managing unprecedented or surprising risks

The likelihood and impact framework to assess risks may fail to accurately ascertain the likelihood of unprecedented situations—such as a terrorist attack, which has not happened in Singapore's recent history. Nonetheless, it should not be necessary to have experienced an attack in order to predict future ones; existing infrastructure such as data and AI may give insight into unprecedented situations.

How can we put a spotlight on issues of AI risks to start conversations without causing unnecessary panic?

Another way to manage such surprises in risk assessment is by over-resourcing. Thus, when allocating manpower, budget and attention, risk managers cannot operate on lean optimisation models. National risk portfolios should therefore be treated like investment portfolios. This means that projects can be systematically prioritised, even when there may not be any guarantee that the crisis situations calling for these projects to be implemented will actually materialise.

Co-owning risk, neutrality and the license to operate

The public should not be perceived and treated as the weak link in relation to risk management. Instead, the goal should be to achieve informed decision-making across groups in society to encourage social resilience and co-ownership of risks. Alongside this, introducing the idea of an individual or corporate "risk quotient" similar to existing ideas of intelligence or emotional quotients could highlight the importance of understanding and dealing with risks.

In addition, it is important to be neutral in communicating and educating the public about risk. Advocacy or sensationalism leads to a loss of trust and ineffectual risk communication. One participant lamented the tendency of the media to exaggerate risks, referencing "Skynet" and "Terminator" as caricatures of the future risks of AI. He noted the challenge

inherent in generating an appropriate amount of attention for the right issues without causing unnecessary panic.

Another participant referenced the notion of a "license to operate" that is implicitly granted to organisations by the public, which acts as an imperative for organisations to communicate risks to the public. The failure to communicate risks appropriately can undermine public trust in the organisation, removing this implicit license. Organisations therefore have to be in tune with public sentiments and concerns, and work actively to address and discuss them.

Communicating risk to the public

Baruch Fishchhoff's widely cited 1995 paper outlines the following developmental stages in risk management:

A. All we have to do is get the numbers right
B. All we have to do is tell them the numbers
C. All we have to do is explain what we mean by the numbers
D. All we have to do is show them that they've accepted similar risks
E. All we have to do is show them that it's a good deal for them
F. All we have to do is treat them nice
G. All we have to do is make them partners
H. All of the above[1]

Participants used this framework to illustrate the evolution of risk communication and the challenges involved in getting it right. For example, participants spoke about the "lived experience" of National Service as a means to give everyone a stake in understanding and dealing with the risk of military conflict. One participant said it was important for such issues to "touch the lives of people" in some way, in order for the public to develop a deep understanding and appreciation of managing these risks. Giving the public a personal stake in risk is a practical example of achieving Stage G in Fishchhoff's framework.

Attention to "risk as a feeling" with an awareness of the affect heuristic is also a significant component of risk communication.[2] A participant spoke about the "arithmetic of compassion" and how the same statistics can have substantially varying effects on the same audience depending on how they are represented. For example, a "10% probability" is not as convincing to an individual as a "one in 10 chance". A call to give $300,000 to save one life is more effective at attracting donations, compared to another to give the same amount but for eight lives. Moving beyond the individual to the group, therefore, tends to weaken the effect of compassion.

There was much discussion about the power of gaming as a simulation and experiential tool to communicate risk. While war games and simulations to deal with crises or worst-case scenarios are more commonplace, games can also effectively communicate more abstract concepts such as complexity to the public. One participant cited how a variation of rock-paper-scissors was used to teach individuals about complexity and the importance of additional variables to enhance password strength.

Communicating risk internally

While identifying the right risks in an organisation is an important concern, a more fundamental question to ask is whether communicating such risks actually leads to any action and change. A participant noted that the latter involves understanding the mind-sets and assumptions of decision-makers. Beyond presenting the facts about a risk, it is also important to uncover preconceptions and build conversations around identified risks in order to embed new ideas and ways of thinking about the issue.

The need to deal with pushback and defensiveness from internal stakeholders regarding the credibility and urgency of identified risks is a significant challenge. In particular, the notion of "deep regret" was raised by a participant in a discussion about the hindrances and potential sources of failure to identify risks. "Deep regret" refers to being so crippled with anxiety that one is unable to think beyond conventional ways in which the future can develop.

By removing humans from the knowledge-creation process, AI is fundamentally altering the way we experience "knowing" things.

ARTIFICIAL INTELLIGENCE

The future of intelligence

AI already affects every aspect of our lives, from smartphones to healthcare and transportation, and its pervasiveness will only increase in the future. Participants generally believed that this pervasiveness will change fundamental aspects of humanity and thus effect significant changes across society. When speaking about AI's effect on individuals and society, however, they tended to focus narrowly on present-day AI technologies.

One way that AI is changing humanity is through its role in the production of knowledge. AI removes humans from the knowledge-creation process, fundamentally altering the way we experience "knowing" things. In the past, humans explored various phenomena through the "human experience" of inductive and deductive reasoning. Today, however, the process of seeking knowledge involves a far greater reliance on technology, especially on AI with algorithms that we may not fully understand. Taken to the logical extreme, this threatens to turn humans from participants in the knowledge-creation process into mere spectators of it.

Following from this, the development of AI (and digital technologies more generally) may prevent humans from developing certain intellectual capabilities. Studies have shown that people consume literature on digital screens differently than in print and that reading off a screen may inhibit "type 2" or slow, deliberate, conscious thinking.[3] If digital reading is in fact inferior to analogue reading, Singapore has particular cause for concern, as our online borrowing rates are increasing while physical loan rates are falling.[4]

More or less diversity? More or less equality?

Participants were divided on whether AI and digital technology are eroding diversity in societies. Some said that AI and digital technology allow for greater diversity, given that AI enables a greater personalisation of services. However, another participant observed that on a deeper level, these technologies are based on mostly uniform operating systems and processes, which results in an increasingly ubiquitous digital experience. With the pervasive adoption of such technologies, there could be a real risk of the "homogenisation of thought."

AI's erosion of human capabilities and diversity could make society less resilient. If it is true that "type 2" thinking is impaired by reading exclusively digital literature, then one day, when the entire world is made up of "digital natives", countries may suffer from a structural lack of "type

2" thinking, with many potential unforeseen consequences. A participant observed that diversity in a society allows for adaptation, in the same way genetic diversity in a species promotes evolutionary fitness. Thus, reduced diversity opens up a risk of society being less able to adapt to the future.

Participants were also divided on whether increasing adoption and development of AI would lead to a democratisation of service delivery, or widen and further entrench socioeconomic inequality. One participant observed that in the banking industry, AI and data allows banks to provide services to individuals who would otherwise not have access to financing. In the same vein, another participant said that further development of AI would automate costly processes such as analysing tumour imagery, driving prices down and democratising service delivery in the developing world. However, a third participant thought that AI might result in greater socioeconomic inequality between those who were able to exploit it and those who were not.[5]

As AI removes more sources of human agency, might we lose meaning and purpose in our lives?

Social pressures resulting from resentment against AI adoption and development may lead to a backlash against AI and to social conflict more generally. Potential sources of discontent are varied, and could include the aforementioned widening of inequality due to unequal adoption of AI. A participant suggested that a more interesting source of discontent could arise from an increasing sense of "disenchantment" with life due to human functions being ever-increasingly driven by technology. He said this could result in a sense of aimlessness and alienation. He observed that many youth joining terrorist groups are in fact seeking a sense of meaning in their lives, which they cannot find in consumeristic secular societies seemingly unable to provide its members with a higher purpose. If AI increasingly removes sources of human agency, it may exacerbate this sense of alienation.

Geo-economics and data protection

Instead of thinking about the socio-economic impact of AI in terms of haves and have-nots, one participant suggested thinking of it in terms of exports and imports. Robust AI markets, such as those in the West and in China, may export their AI to weaker markets, creating a technological

dependency of those weaker markets on the stronger ones, leading to a sort of "tech colonialism". Another participant responded that the ship has sailed on this issue: the US and China are already the chief exporters of AI technology and their dominance will almost certainly persist. The key question is not around which country would drive the development of AI in the future, but around how countries can guard and maintain control over their data, which is critical to the development of AI algorithms.

Conversations about the ethics of AI currently lag way behind its technical development.

The ethical and the technical

Given the wide-ranging social implications of AI, it may be desirable to consciously embed ethical values into AI and technology more generally. This rests on the assumption that the way AI and technology are designed can ameliorate their negative social consequences. This requires tech companies to be more involved in AI ethics conversations.

One AI practitioner, however, observed that attendees at the workshop were not representative of those developing Machine Learning Systems (MLS). MLS developers have technical concerns and do not give much thought to wider questions of philosophy and ethics. As a result, he doubted that MLS developers are consciously designing technology with a view to its wider social ramifications. Thus, the conversation around AI ethics lags far behind the technical development of AI. As a start, he thought it might help if the social concerns and philosophical positions outlined at the workshop could be translated into practical, technical guides for AI developers.[6]

Teaching AI to serve humans

Discussion about the long-term trajectory of AI revolved around Artificial General Intelligence (AGI). In particular, participants were preoccupied with the extent to which AGI would be human-like, and the implications this would have on our treatment of AGI, including broader safety considerations.

For AI to be most useful to humans, it has to be human-centric, understanding human needs and motivations, social and cultural norms,

and common sense. Some participants thought that for this to happen, AI needs to learn like humans do, which is not the case at present.[7] AI today learns from large data sets, is unable to learn "on the fly" and finds it difficult to adapt to a situation in real time. While AI today is capable of a range of functions, such as emotional recognition, it is incapable of understanding emotions the way humans do. Additionally, developing AGI without a sense of self is a potentially dangerous approach. AGI requires self-recognition, motivations and values in order to empathise with humans.

One panellist opined that to create AGI with human-like intelligence, we need to start by understanding the human brain before applying it to AI. True human "intelligence" is not found in current data-based intelligence technology, which relies on big data analytics. Big data analytics simply fit data to expected output. They do not reveal the underlying principles of intelligence which are important in rectifying the current deficiencies of AI.

When discussing humanising AGI, we need principles to guide the way we relate to AGI in order to prevent it from becoming a social risk. One participant observed that training AGI entities to be benign to humans must involve more than providing them with goals, which would simply turn AGI entities into "savants", uncompromisingly putting all their energy into tasks. Like humans, he thought it necessary to raise AGI entities much like we raise children, allowing for a similar amount of time (about 15 years) for the entity to learn and grow before becoming autonomous. He also noted that autonomous beings would have to be treated as moral agents and could not therefore be treated as "slaves". This poses a conundrum, however, given that such entities would presumably be created to serve humans.

Domestic governance and self-regulation

Ethical principles vary regionally and are heavily influenced by history and culture. Consequently, different national AI governance frameworks have different focal areas. In some countries, the focus is on human rights. In Singapore, the Infocomm Media Development Authority's (IMDA) model AI governance framework emphasises economic considerations. The economic value of big data and AI is in the opportunity they provide for more personalised services to consumers. However, if improperly handled, implementing AI and big data could lead to consumer pushback, which may hinder further adoption and development. Therefore, it is important to establish platforms that encourage dialogue among tech providers, users and consumers to determine the eventual form of an AI governance framework.

Even when emphasising economic considerations, different commercial sectors have different priorities and will therefore prioritise the same set of ethical principles differently in ways that best fit their respective business needs. To accommodate this diversity, guidance on AI ethical standards should be kept simple enough to capture the essence of existing risk management and compliance. Additionally, many companies already have internal ethical standards that go beyond what is required by regulations. Instead of developing new ethical standards for AI, regulators could make sure that AI complies with companies' existing internal ethical standards. Ideally, AI ethics would be largely self-regulatory.

Global governance challenges

The growing rhetoric of a race for national strategic dominance in AI poses significant risks. Such rhetoric may incentivise corner-cutting on safety and governance, and dampen the kind of thoughtful and multi-stakeholder international collaboration required to achieve broadly beneficial AI. Additionally, a "race for technological advantage" could increase the risk of competition in AI causing real conflict, as this may encourage countries to see competitors as threats or even enemies. Emphasising the global benefits of AI and of international cooperation in AI development can help to counteract this rhetoric.

The goal of such cooperation is to establish international AI norms to mitigate these risks. In general, shared understandings of right and wrong conduct, or norms, are established over time by those who participate in shared practices. These norms are principles that represent collective expectations that are both widely accepted and internalised by an international community. Proposing general principles is important, but norms cannot be imposed and will only result from shared interests, deliberation, consensus, the evolution of a common language and the development of a collective sense of responsibility.

Establishing international AI norms requires a shared language, shared risks and ultimately, a shared fate.

Establishing international norms will be challenging, given the plurality of cultures and languages in the world. Some participants pointed out that it is not impossible, as evinced by a range of existing international norms. Others, however, felt sceptical about the notion of successful international cooperation. One participant noted that there is no international agreement on values related to a range of issues, from human to animal rights, and we are unlikely to reach a consensus in the foreseeable future. Yet another participant observed that "East" and "West" often do not see eye to eye, especially when it comes to cyber conflict regulation. He observed that many in the West erroneously believe that governments in the East utilise technology to control their populations. Nonetheless, he said Singapore could and should seek to facilitate the emergence of a distinct viewpoint on AI cooperation amidst the clash in Eastern and Western discourse.

In general, participants agreed that we should look to existing and successful areas of international cooperation in risk management in order to develop solutions for AI risk. For instance, a participant mentioned that there is successful international cooperation on containing pandemics. This involves "creating communities of shared risks and transiting them to communities of shared fate." Appreciation of risk alone is insufficient to bind a community; an effective response can only be achieved through "staying together," or creating this community of shared fate.

Time is an abstract concept that defies a singular definition. This morning, I will take a random walk through different perspectives of time to show some of its complexities.[1]

Complexities of Time

By
Peter Ho

Research Support
Hannah Chia

TIME AS A CONSTRUCT OF THE BRAIN

The sense of time plays an essential role in many of the cognitive processes that shape our daily lives. Time perception, just like vision, is a construction of the brain. Just like vision can be distorted through optical illusions, our brain's perception of time can be distorted as well.

For example, the brain constructs a coherent narrative by keeping a sensory window open for 80 milliseconds. Therefore, as long as a TV or film soundtrack is synchronised within 80 milliseconds of the movie track, you will not notice any lag, but if the delay gets any longer, the disjoint becomes apparent.

If our perception of time is not as absolute as we believe, how can we ensure that our conclusions about reality are not affected by these perceptual biases? The author and neuroscientist David Eagleman wrote that "our physical theories are mostly built on top of our filters for perceiving the world, and time may be the most stubborn filter of all to budge out of the way."[2]

Maybe conditions like schizophrenia are not disorders of the mind, but disorders of time.

Some neuroscientists are now beginning to consider conditions like schizophrenia—and even dyslexia—not as psychological or cognitive disorders, but as time disorders. For example, research shows that the internal clock in patients suffering from schizophrenia runs at an irregular speed.[3] The hypothesis is that errors in temporal information processing could give rise to some of the symptoms of schizophrenia such as hallucinations, or the disconnect between thought and action.

TIME AS A CONSTRUCT OF SPEED

According to the World Economic Forum's *Global Risks Report 2017*, "the Fourth Industrial Revolution is creating new global risks and exacerbating existing risks."[4] Klaus Schwab, the founder of the World Economic Forum, argues that that the Fourth Industrial Revolution is evolving at an exponential rather than a linear pace.[5] His point is that speed—or more precisely, acceleration—increases the challenge and complexity of these risks. Ray Kurzweil, the futurist and author of *The Singularity Is Near*, calls it the Law of Accelerating Returns, explaining that "we won't experience 100 years of progress in the 21st century—it will be more like 20,000 years of progress."[6]

Charles Fine, an MIT professor of management, first applied the term "clockspeed" to describe the faster pace of life in an industrial context. Then a new term emerged, "risk clockspeed", which is "the rate at which the information necessary to understand and manage a risk becomes available."[7] Artificial Intelligence (AI) and the Internet of Things fall into the category of fast clockspeed risks, because there is insufficient time and information available to understand and manage the risks that they could pose. Bill Gates, Elon Musk and Stephen Hawking have famously warned of the dangers of AI.

"Time banking" proposes a parallel marketplace where we exchange time instead of money. When each person's hour is valued equally, it may seed the mind-set shift we need to better challenge income inequality.

What new frameworks and competencies do governments need for effective risk management in a world of accelerating change and heightened risk clockspeed? Fast clockspeeds of the Fourth Industrial Revolution give little time for government and society to adapt.

TIME AS THE ARBITER OF VALUE

Nick Szabo, a computer scientist who designed a mechanism for a decentralised digital currency called bit gold—a precursor to the Bitcoin architecture—argues that the ability to measure and verify clock time was a game-changer for medieval Europe.[8] The advent of the mechanical clock provided an authoritative measurement of time duration, which in turn led to the creation of time-rate wage, resulting in serfdom and slavery giving way to worker choice, and transforming in a fundamental way the economic institutions of the Middle Ages.

E. P. Thompson, in his classic 1967 essay "Time, Work-Discipline and Industrial Capitalism," wrote that with the industrial revolution, "time is now currency: it is not passed but spent."[9]

Time as a basis of value runs deep within our social structures. However, time measures input rather than output. Clock time measures effort, not the results of one's effort. While this made sense in the Industrial Age where workers functioned as units of labour in the wider machinery of production, the changing nature of work and the advent of task-based platforms are shifting the measurement and reward for work away from time (input) towards outcome (output).

I suspect that this shift will prove to be a radical one and will lead to changes in many social institutions that are today based on time as a unit of value. Today, work and employment are still tied to time while some companies have fully embraced work-from-home arrangements, the notion of working hours and taking vacation leave are still based on time-based notions of work. What will be the impact of greater gig-based work platforms, and the disruption of the time-based model of employment?

The modern notion of time-banking is also built on this basis of measured units of time as a common currency or unit of value. In time-banking, the members of the community earn, collect and spend time credits. Time-banking builds on the notion of time as a unit of value that is collectively endorsed. In a climate of increasing inequality and decreasing trust in financial institutions, time-banking promotes equality and the building of trust. When everyone starts out with 24 hours, and where one hour of a doctor's time is of the same value as one hour of a blue-collar worker's time, there are fewer opportunities for inequality. In Singapore, two start-ups, Hourvillage and Kuiddle, have launched time-banking platforms.[10] Could time return as an important arbiter of value that mitigates inequality?

At the same time, the progress of science and technology can disrupt the value and importance of time. For example, scientists have now found a way to use ultrasound to age whisky in days rather than years.[11] This overturns the time-based value of whisky and challenges time as the main arbiter of value, at least in the whisky business.

TIME AS POWER

The standardisation of international time was both an important act of globalisation as well as a parable of power. It provides a glimpse into the complexity of achieving greater inter-connectivity in a world messy and fraught with geopolitical and cultural complexities. For example, in 1875, American railways recognised an astonishing 75 different local times, three of which were in Chicago alone. And before 1918, Russia was 13 days behind Western Europe because they used the Julian calendar instead of the Gregorian calendar.[12]

In 1884, the Prime Meridian Conference in Washington DC agreed to adopt the Greenwich mean time system with 24 time zones centred on the Royal Observatory in Greenwich. The standardisation of international time was arguably the exercise of global power by the British who were then at the height of their imperium. Of course, this was not universally accepted. The French felt it was an indignity to set French time with reference to an English observatory. So, in 1891, France adopted a nationwide mean time and refused to adopt the Greenwich meridian until 1911.[13]

TIME AS A CULTURAL AND LINGUISTIC CONSTRUCT

Different languages frame time differently. English and Swedish speakers tend to think of time in terms of distance—*what a long day or a short break*. Time is an expanse to be traversed. However, Greek and Spanish speakers tend to think of time in terms of volume—*a full day*. For them, time is a container to be filled.

While we may speak about time in spatial terms, do we think about it in spatial terms as well?

In 2015, researchers in Belgium scanned the brains of participants as they answered questions about the order of events that had recently happened or were about to happen.[14] They found that these tasks engaged parts of the brain that support spatial imagery. The reference to spatial concepts is our way of dealing with the abstract nature of time.

As a linguistic—and therefore cultural—concept, time is intrinsically tied to our humanity. How do our language and culture bias or predetermine our view and understanding of time? Does this limit our understanding of abstract concepts like time and space?

TIME AS A TOOL

Time perception is a powerful tool which can be used to influence decision-making and behaviour. The cognitive bias of hyperbolic discounting shows that humans tend to be more present-oriented than future-oriented, more inclined to choose a smaller-sooner reward over a larger-later reward.

If we experience time via a 10,000-year clock, might we feel a deeper responsibility for a future we know we will never see?

Perhaps, shifting our perceptionof time to incorporate a greater future-orientation holds the potential for better decision-making, and greater readiness for unpredictability in the future. At an

organisational level, this is the role of foresight and futures thinking, to tell stories about the future in order to "manipulate" people into being open-minded. Pierre Wack, the father of scenario planning, calls scenario planning "the gentle art of re-perceiving" in order to achieve better collective outcomes 30–40 years in the future.[15]

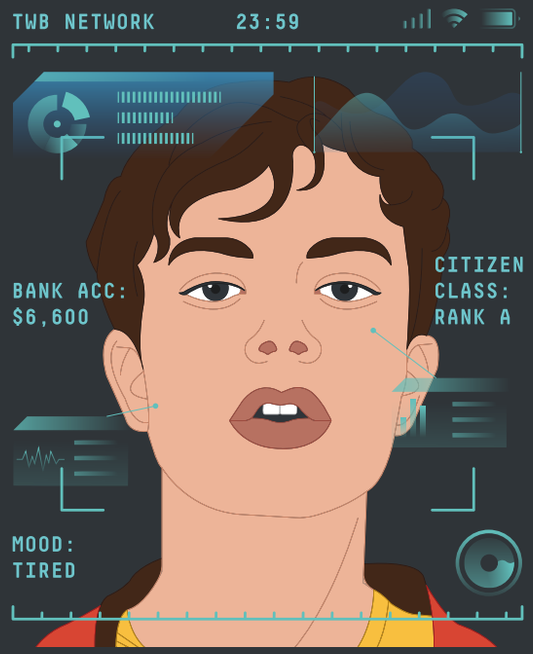
The Long Now Foundation is building a 10,000-year clock inside a mountain in western Texas owned by Jeff Bezos, the founder of Amazon.[16] The clock is literally a monumental attempt to shift our perception of time. Built to run for ten millennia with minimal maintenance and interruption, it provides a representation of how to think and talk about the future. The project asks questions such as: "If you have a clock ticking for 10,000 years, what kinds of generational-scale questions and projects will it suggest? Why not attempt other projects that require future generations to finish? Are we being good ancestors?"

It behoves us to think about such questions. Time may be a complex concept, but it can stretch our perceptions and enable us to re-evaluate our present actions by manipulating our ability to project into the future and imagine new possibilities.

The Lives We Do Not Own: 5 Stories from the Future

CROSSING THE STREET

By Yip Jia Qi



As I cruised along coastal highway 84 having breakfast, I received a public announcement on the Common Phone. *<<Jaywalking will henceforth be enforced seriously>>*. I dismissed the notification—there is at least one every day. Jaywalking is illegal, and we shouldn't be doing anything illegal anyway. The ocean rolled by as I ran my thumb over the Words so reassuringly etched into the otherwise smooth aluminum back of my CP.

The CP is beautiful. Gone are those smartphones which cost a month's salary—and they were all incompatible with each other anyhow. Didn't even come with AI! All CPs are exactly the same, perfectly interoperable with one another and the whole internet of things. What's more, they're issued free of charge by the government upon adulthood. They help AI collect data for everything from urban planning and public health to transport and personal finance. They can even sense our emotions and provide us with friendly advice on how to be a better citizen.

As I approached the Central, I couldn't help but admire the view. It never gets old. What a magnificent city! The skyscrapers were teeming with urban wildlife, their sky bio-domes gleaming in the morning sunlight as they absorbed its energy. Beyond the light fog, I saw the massive silhouette of the space elevator piercing the sky.

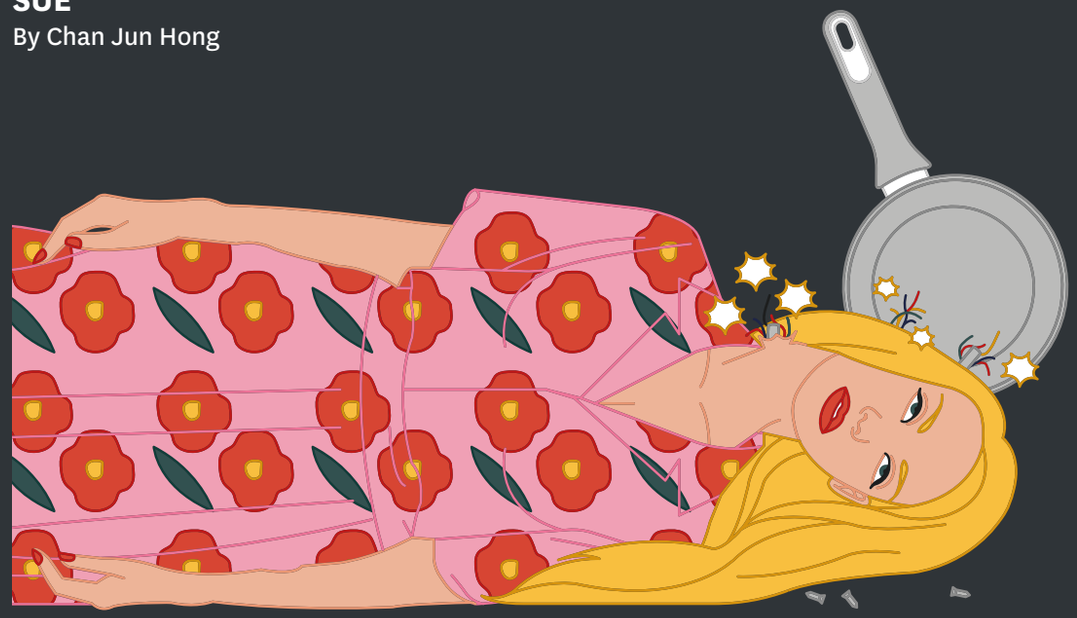
Just as I was getting dropped off, I saw a young man trying to catch his bus. He was dressed up, suit and all, shirt flapping behind him as he ran frantically across the street. His CP started to beep. Everybody was staring! Maybe he was too focused on catching the bus or maybe he was late for something really important. He got halfway across before the brilliant flash.

By the time my eyes readjusted, the medical drones were already next to the body. The orbital laser had put a hole exactly one centimetre in diameter through the top of his skull. Bloodless. Seconds later the body was in the air, carried off by the drones, and the crowd dispersed shortly. Show over.

I walked into my assigned building, running my thumb over the Words etched into my CP—LIFE IS LAW.

SUE

By Chan Jun Hong



The apartment usually smelled clean, but tonight it was tinged with sickly sweet and sour three-hour old Chinese takeout. Eyes dry from fatigue, he straightened up, looked up at the ceiling and sank into the sofa. He was retrieving files from a "laptop" and converting them to a suitable format for storage at the National Archives. He was one of the few people left who could still operate one, but that at least gave him a niche. He was also arguing with Clara over the terms of their divorce. It was just one of those days.

The laptop went blank. He tried repeatedly and unsuccessfully to reboot. He flung it against the wall, and it fell to the floor, screen cracked, quiet. He cradled his head in his hands and let out a moan. Sue came in as if on cue to clear up the leftover food. He looked up and observed her as she went about tidying. He was struck by how beautiful she actually looked under the warm light—he had never noticed her that way before. He stood up, grabbed Sue by the waist and kissed her, as if making up for all the years he had ignored her. She resisted, but he refused to let go.

A voice called out from the doorway and it was Clara who walked into the study, just returning home from work. She quickly excused herself, soon returning with a large saucepan. Already contrite and slightly ashamed of himself, he stood in a corner, allowing Clara to repeatedly bash Sue's head in. Sue's screams soon died down and she crumpled to the floor.

A neighbour peeked in, looking concerned.

"Oh, it's fine," said Clara.

"She's just the robot helper."

THE KID

By Chow Kit Ying

The man on the radio said it was the biggest one ever. At first, we couldn't see anything, but each night the orange glow on the spine of the ridge north of our farm burned hotter. Every year, the trees got drier and drier, earlier and earlier. Dull needles were shaken from parched trees by a stiff southern wind. They stuffed the cracks in the mud trails where my parents took the herd and I for our evening walks. We hadn't gone in a week. The trails passed in the shadow of the ridge.

"Nak."

I turned from the window to my Ibu. Her hair, usually tucked neatly into her scarf, had come loose, and strands were plastered to her forehead. "Nak, put your books in a bag, we're going to Kakek's house."

Something in her voice had me scrambling off my bed and to my table. "But what about the kambing?"

"Ayah's opened the gates already. We can't take them!" She threw something over her shoulder as she continued packing hurriedly. My heart thudded painfully. Our goats were like family. How could we leave them behind? My empty bag felt too small in my hands—what should I take? How much time did I have?

"Nak please! We only have twenty minutes, don't just stand there!" Ibu snapped as she rushed past my room again, a set of clothes for her, Ayah and me in hand.

"What do I pack?" I cried helplessly. "Will the house burn down? Will the kambing die?"

"Only what's important!"

Fighting back tears, I tore open my drawers and cupboards. The family

photograph that Paman Ahmad had taken for us was peeled from the wall and went in first. My favourite book, given to me by Nenek, was next. Toothbrushes, underwear and a handkerchief went in next. My eyes danced across the room, trying to memorise it, while memories made in our home flashed through my mind. God help us!

"Anak." Ayah's voice rumbled through the open window. "Come help me with Bejo." I raced out, dropping my bag on our porch. At least Bejo could come, at least we would have her, I told myself.

Bejo was our youngest kid, born just two weeks ago as the fires over the ridge had begun to erupt. She was my favourite and she could barely walk. Bakti, our cat, ran after me to my father's truck as we bundled the animals in the back. Ibu joined us, my bag and hers in hand.

The engine roared, and Ayah pulled onto the dirt road leading out of our already-empty village. I turned to look back at our home, our fields. The furthest home at the village's edge had already been engulfed. Its empty windows, like eyes, screamed their agony silently in black billowing smoke to the sky.

WINNERS AND LOSERS

By Phyllis Ho

His family marvelled at his ingenuity at first. They hated waiting at the hospital, so Arnold would hack the queue numbers. He muted the intercoms of shopping malls if he didn't like the music they played.

Once, however, after barely avoiding an accident because Arnold had changed the traffic lights, his mother burst out:

"Dammit Arnold! You'll get us all killed!"

Arnold snarled, before deploying an alarm clock to continue screaming on his behalf.

***

Fifteen years later, Arnold was a software programmer in a multinational firm. Having developed a machine-learning algorithm to do his job, he passed the time by threatening his co-workers. He boasted that he could fiddle with a secretary's pacemaker to trigger heart attacks and that he could overheat the smart fridge compressors to start a fire. What he actually did, however, merely involved setting the sprinklers off and hacking into several devices. Yet, these were enough to ruin two marriages and scuttle an important deal.

Though the whole office wanted him in jail, nobody dared to report him. Finally, a whistle-blower leaked the details of the botched deal. Instead of running, Arnold reported to work as usual, smiling at everyone and calling them by their real names even though they all used privacy aliases. Most were too busy packing up to be frightened, as the company, certain of its impending bankruptcy, had let everyone go.

When the police arrived they came masked, nametags and badges removed—standard procedure when taking Type H

suspects into custody. The officers barely spoke to avoid being voice-recognised. Once a Type H identified you, your life was over, the veteran cops would quip, before sharing horror stories of officers having their bank accounts liquidated once vengeful suspects were released.

***

As with all Type H suspects, Arnold was released less than 48 hours later. The Syndicate sprang into action even before Arnold had reached the detention centre —while in the car, the police radio was intercepted by a female voice threatening to cyberattack the water treatment system if Arnold were not freed.

Arnold always won. He won when he sent rejection e-mails to other job applicants so that firms had no choice but to hire him. He won when he took on contracts for character assassination, because clients always paid up when he threatened to publish their incriminating data instead.

Arnold felt invincible walking out of the centre. Then, suddenly, the sharp pain in his head. Flat on his face, Arnold turned to meet the gaze of his recently-divorced colleague and found himself looking into the eyes of someone with nothing to lose.

THE LAMPS ARE GOING OUT

By Ow Yong Zhi Qi

"They're going out again," he says.

Your footsteps echo down the empty street as you watch the lamps blink out slowly, one by one. He's calm beside you.

"I wonder what it's about this time," you say.

The last time this happened, the lamps went out for two months over the fish wars. Before that, it had been over oil prices in the Other Empire. Before *that*, it had been over ideas. The reasons always change but they don't really matter.

He shrugs and both of you walk in silence for a while. In the distance, a lamp dims, then another. The rest of the street is shrouded in darkness, but you have walked this street so many times and do not need light when muscle memory will do. You wonder if the other nations turn off their lamps as well.

"Do you think it's about fish again?" he asks.

You know why he's worried. He hated his service at the front—smelled of goddamn trout, he had said. But his smile was thin and his eyes were dull, so you don't ask any questions. You hear the hesitation in his voice and you wonder if he's imagining the front again.

"I don't care what it's about," you say.

He leaves you alone. You don't mean to be short with him. If the lamps are going out again, it means the draft will start up, which means time's running out. The last time with the fish, he had been selected. You had gone for the one with the oil. The last one had only been six months ago, you think, it's not fair.

The next day, you'll read that this is an offshoot of the fish war. This time, it's about fish and oil. If it's any consolation, he doesn't get drafted for this war. But he gets drafted for the next.

The next time you're at the front, you'll wonder why wars are fought. For oil, for fish, for ideas. You'll start dreaming of brackish waters and coarse sand as you feel the smooth comb of the rifle against your cheek. The next time you're at the front, you'll wonder why wars are fought. For self, for country, for power.

You'll dream of lamps that stay on forever.

Our Team

ANGEL CHEW
Senior Strategist

Angel chanced upon futures while in search of a new challenge. Trained in English literature and having taught General Paper for close to 8 years, the sheer breadth of futures research and CSF's appetite for wacky ideas caught her eye. She is now the resident 'cher overseeing most of the centre's capability development functions, as well as the herder of her fellow futures creatures.

YULIA HARTONO
Manager, Information Research

Yulia was unwittingly co-opted into futures research as a librarian with the Ministry of Trade & Industry in the mid-noughties. She was lured from the Monetary Authority of Singapore into doing foresight scans full-time with CSF in 2016 and has been furiously brushing up on sci-fi references ever since. She is still coming to terms with futurists who craft plausible futures for 2039, but forget to carry an umbrella to lunch.

LEON KONG
Senior Strategist

Leon did not foresee moving from the Ministry of Finance to CSF in 2015, nor remaining a futurist to the present. Unlike others, however, he does have the foresight to carry an umbrella in perennially rainy Singapore. He is currently preoccupied with research in geopolitical and social topics.

HOE WEE MENG
Director, Futures

As a teacher, Wee Meng experimented with different pedagogies in the mid-noughties. At a time when homework was deemed necessary for academic achievement, he designed his lessons dispensing with it. His students' grades actually improved, in line with his belief that effective learning is about student motivation, not rote work. Wee Meng is drawn to foresight work as he believes in constantly challenging our mental models to improve public policy.

LEE CHOR PHARN
Principal Strategist

In his day job, he hunts for cognitive surplus to tickle future demand and sets aside time to identify asset-light modes of operating. His night job involves taxidermising butterflies and sketching Asian deities lost in a secular environment. CP is increasingly sentimental about reused futures. He has a robotic cat and three robotic butterflies, but they are all broken.

SEEMA GAIL PARKASH
Lead Strategist

Seema's diverse experiences in public policy and research have seen her grapple with global health disparities in Cameroon, implications of melting sea-ice in the Arctic, endless negotiations on sustainable development and its financing at the United Nations, and more. Little did she realise that her boundless curiosity was writing her future in futures. Having stepped through the foresight looking-glass, Seema looks forward to the world getting curiouser and curiouser.

LIM PEI SHAN
Head

Pei Shan's initiation into the wonderful world of foresight came early in her civil service career. As a member of CSF's previous incarnation, the Strategic Policy Office, she pondered imponderables and thought the unthinkable. It was such an addictive and exhilarating experience that she jumped at the opportunity to have another go. As CSF's Head, she has the profound privilege of shepherding an eclectic team of daring dreamers and creative thinkers.

INTHIRA MAILVAGANAM
Senior Executive

Indra facilitates the smooth running of meetings and events to ensure a well-organised environment for her teammates. She works with both the Futures and the Strategic Planning teams, who call her the resident superhero keeping the ship from grounding itself. Outside work, she enjoys entertaining family and friends. During most weekends, she can be found cooking something new for them.

KENNETH POON
Strategist

Kenneth wandered into the mystifying foresight clan from a research background in history, political thought and religion. He previously worked at Yale-NUS College and the Institute of Southeast Asian Studies. At CSF, he can be found ruminating about meaningful ways to apply his training in the history of ideas to the future of ideas. He aspires to a plausible future of hill-walking in the Scottish Highlands and hunting for fish ('n chips).

LIANA TANG
Deputy Head

Liana entered the weird world of foresight after a decade serving in various policy roles in public service. At CSF, her biology training proved useful as she explored various projects pertaining to biotechnology. A fan of science fiction and the arts, she constantly looks to creative sources for new futures ideas. Her obsession with nature helps her to regale horrified colleagues with tales (and pictures) of lurid insect rituals.

GURUBARAN SUBRAMANIAM
Senior Strategist

An avid explorer and chicken rice addict, Guru enjoyed stints as a social researcher at the Ministry of National Development and as a member of a Kazakh nomadic tribe before joining CSF. He was drawn to foresight work due to his penchant for questioning entrenched assumptions and ways of doing things, which has gotten him in trouble on several occasions since childhood.

TSE HAO GUANG
Strategist

Getting things the wrong way around, Hao Guang joined CSF after some years freelancing as a writer, editor, and most distressingly, poet. Ever since, he has tried to turn personal interests in *Black Mirror* and fringe political philosophy into professional assets. After a day deciphering public service acronyms and writing file notes, he can still be found writing equally incomprehensible poetry. He edits this issue of *Foresight* with apologies.

Our Alumni

CHAN CHI LING
Strategist, CSF (2015–2017)
Assistant Director, Ministry of Health

Chi Ling began her public service career with a team of futurists and had a blast researching science and technology developments in China, the future of ageing in Singapore and imagining possible futures for National Scenarios 2035, among the many curiosities that captured the team's imagination. She is patiently waiting to see which possible futures will unfold.

DERRICK CHAM
Strategist, CSF (2017–2018)
Data Scientist, Government Technology Agency

Derrick worked in the field of foresight for two years with a focus on horizon scanning, especially in the area of emerging technologies. He is now a data scientist in the Data Science and Artificial Intelligence Division of GovTech, applying data science and machine learning to policy and operational problems for the public good.

JOAN MOH
Head, CSF (2014–2017)
Director, University Policy, Higher Education Group, Ministry of Education

Joan looks back on her foray into the wonderful world of futures fondly and is appreciative of the generous licence that was given to CSF to explore unconventional futures and suggest that others do so too. These days, she spends her time thinking about the policies that concern Singapore's autonomous universities and about how they can best prepare their students for the future.

HANNAH CHIA
Assistant Director, CSF (2016–2019)
Special Project Officer, Ministry of Education

Hannah found a future in futures by exploring the past. As a history and literature teacher, she's always had a keen interest in time, how it endures at times and ruptures in places. Presently, she is back to the future, working on education policy. She responds to "nah-nah" in the office or when objects are thrown in her direction, because some don't have time for wit.

TALITHA CHIN
Strategist, CSF (2017–2018)
Product Manager, Open Government Products, Government Technology Agency

Talitha is currently a product manager at Open Government Products, an experimental unit in GovTech, where she works mainly on the Parking app. On the side-lines, she is helping to build her team through shaping its strategy, recruitment and processes. She is still exploring all plausible futures of technology (specifically the products she works on) and the organisations she works with.

JEANETTE KWEK
Deputy Head, CSF (2015–2018)
Deputy Director, Strategic Futures, Ministry of Defence

Jeanette thinks her day job shows that it doesn't really matter what you study in school and you can make a living doing what you would have done anyway for free. Team-mates frequently call her the team's resident cynic, though some claim she is really a closet optimist. Her professional life competes for space with a husband, two precocious children and a dangerous addiction to caffeine and the written word.

MANOJ HARJANI
Lead Strategist, CSF (2017–2018)
Senior Lead Analyst, Digital Workplace Programme Office, Public Service Division

Manoj began his journey in foresight at the Ministry of Trade & Industry's Futures Group before joining CSF in 2017. In his current role at the Public Service Division, he works on building up the digital capabilities of public service officers.

JARED POON
Lead Strategist, CSF (2014–2018)
Assistant Director, Office for Citizen Engagement Programmes and Partnerships, Ministry for Culture, Community & Youth

Jared's introduction to the Public Service was through CSF, a most weird and wonderful introduction. His work there centred on society, norms and technology, with a special focus on annoying his teammates. None of this has changed in his current role. Before his durance at CSF, Jared was trained as a philosopher in meta-ethics and biology. None of this explains why his cat thinks she's a puppy.

TERENCE POON
Assistant Director, CSF (2013–2017)
Associate Director, Futures Office, National University of Singapore

Terence loves thinking beyond the confines of his messy desk, a symbol of our complicated and sometimes complex world. Since 2013, he has been mired in futures, starting with CSF, then the Ministry of Trade & Industry and now NUS. Before futures, he spent seven years in Beijing reporting on the Chinese economy and arranging training for Chinese government officials to learn about EU trade and economic regulation during the worst of the Euro crisis.

JOANNE WONG
Strategist, CSF (2015–2017)
MBA Candidate, INSEAD

Joanne is a strategy professional focusing on technology and its societal impact. She is skilled in all aspects of the strategy spectrum—research, strategy formulation, strategic planning, facilitating implementation and change management. Her child-like, persistent curiosity inadvertently accumulates eclectic experiences leading to cross-cutting futures insights, from conducting social experiments in online games to chatting with the mafia in a São Paolo favela and hanging out at mystical Christian trance parties.

Our Research Assistants

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Endnotes

THE FUTURE: GOVERNANCE, UNINTENDED CONSEQUENCES AND THE REDEMPTION OF HOPE

1 This article is adapted from the fourth and final lecture of the 2016/2017 IPS-Nathan lecture series, delivered at the Institute of Policy Studies at the Lee Kuan Yew School of Public Policy in Singapore on 17 May 2017

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THE NEVER-ENDING PURSUIT OF PROGRESS: SCIENCE, TECHNOLOGY AND SOCIETY

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DIGITAL SHAKEUP: 4 BIG SHIFTS FOR WORK AND SOCIETY

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COMPLEXITIES OF TIME

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ABOUT

The Centre for Strategic Futures (CSF) was established in early 2009, and since 1 July 2015 has been part of the Strategy Group in the Prime Minister’s Office. CSF serves as a focal point for futures thinking within the Singapore Government and seeks to support a Public Service that operates strategically in a complex and fast-changing environment.

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