

**DRIVING FORCES**



**CARDS**

**2035**



## DRIVING FORCES CARDS

These cards are intended to spark conversations about the key forces of change that will shape our operating environment in the next 20 years, and the possible ways in which they might play out. These explorations are not predictions and are not intended to be exhaustive. Rather, they offer alternative ways to think about the future.

## USING THE CARDS

The deck can be used in workshops to prioritise issues for further research, to examine the impact of the issues on public policy and to craft scenario narratives about the future.

## COMMENTS AND NEW IDEAS

We are always looking for new ideas to incorporate into the deck. Do write to us with comments and ideas at [pmo\\_csf@pmo.gov.sg](mailto:pmo_csf@pmo.gov.sg).

Best wishes,



Centre for Strategic Futures,  
Singapore

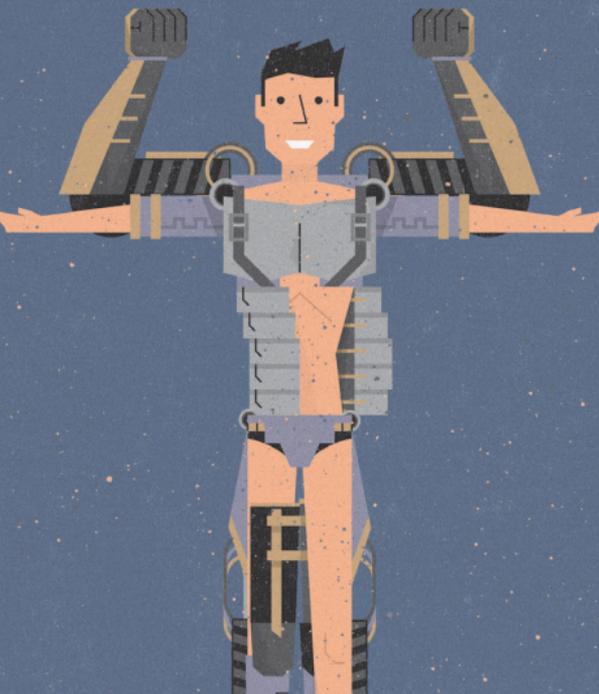
[www.csf.sg](http://www.csf.sg)

*Note: The views expressed in the cards do not necessarily reflect the views of the Centre for Strategic Futures or the Singapore Government.*



# FUTURE OF TECHNOLOGY

# HUMAN AUGMENTATION



**FUTURE OF TECHNOLOGY  
TECHNOLOGIES THAT MAKE US "BETTER  
THAN HUMAN" COULD RADICALLY  
TRANSFORM OUR LIVES**



## WHERE WE ARE

- Human augmentation technologies are those that make humans better, either by restoring an impaired function to average levels, or by raising it beyond the norm for humans
- Examples include cognitive-enhancing drugs (nootropics), bionic limbs and eyes, genetic screening to select for desirable traits and robotic suits with industrial and military applications



## WHAT WE KNOW

- With large research investments from major national and corporate players, human augmentation technologies look set to grow dramatically in efficacy and fall dramatically in price
- For example, the price for sequencing a person's genome fell from US\$95 million in 2001 to just over US\$1,000 in 2015, paving the way for genetic screening and selective modification in the mainstream



## WHAT WE DON'T KNOW

- How will economic, political and ethical issues affect the degree of adoption of and access to human augmentation technologies?
- As new technologies overtake human capabilities, which set of human skills and traits will remain relevant in the workplace? Will skills and traits such as empathy, integrity and the ability to connect matter more?

## HUMAN SUBSTITUTION

Employee of  
the Month

Employee of  
the Month

**FUTURE OF TECHNOLOGY  
TECHNOLOGY CAN HELP US OVERCOME  
LAND AND LABOUR CONSTRAINTS, BUT  
ALSO DESTROY JOBS**



### WHERE WE ARE

- Human substitution technologies are those that take over human jobs and roles by virtue of being physically, mentally or socially superior
- Examples include autonomous vehicles that can replace drivers, algorithms that can take the place of lawyers and artificial intelligences (AIs) that can substitute for friends and romantic partners



### WHAT WE KNOW

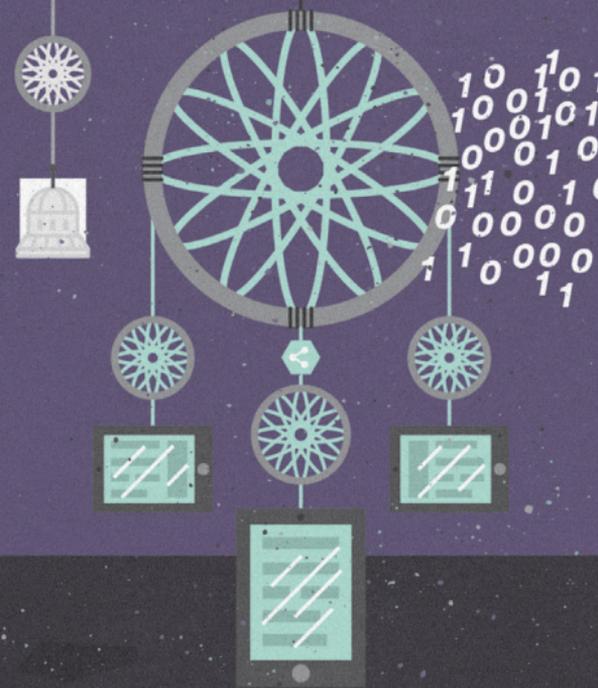
- With huge investments in human substitution technologies, we can expect continued increase in capabilities and reduction in costs
- For example, AIs such as IBM Watson can already achieve levels of diagnostic accuracy comparable or superior to that of human doctors, and looks set to improve further as investments and research continue



### WHAT WE DON'T KNOW

- Will humans be displaced higher up the value chain or replaced entirely?
- Will governments, unions and society push back?
- Which countries will have the talent and know-how to stay relevant and competitive?

## INFO-FLOWS - CONTROL AND OPPORTUNITIES



### FUTURE OF TECHNOLOGY

INFORMATION IS MORE VALUABLE THAN EVER, HARDER FOR GOVERNMENTS TO CONTROL AND WILL RESHAPE STATE-MARKET-SOCIETY RELATIONS



### WHERE WE ARE

- Information control is shared among individuals, corporates, communities and the Government
- Digital technology makes geography less of a constraint for state and non-state actors to expand their reach
- Information now has unprecedented commercial opportunity: the Big Data market is projected to be worth US\$122 billion by 2025
- Singapore's connectivity and digital readiness make it well-poised to benefit economically from information flows



### WHAT WE KNOW

- Non-state actors with extensive data access (e.g. digital corporations) have become more influential
- Virtual communities based on shared interests have begun to challenge governments
- Countries are forming new alliances based on their approaches to the digital space (e.g. Digital 5 network)
- Increasing connectivity is driving digitisation of people's lifestyles and the growth of virtual space



### WHAT WE DON'T KNOW

- Who will control information and how will it be used?
- Will states successfully exploit digital technologies to maintain their relevance vis-à-vis digital giants?

# THE FUTURE OF THE INTERNET

## FUTURE OF TECHNOLOGY

THE FUTURE OF THE INTERNET WILL GREATLY IMPACT OUR SECURITY, ECONOMY AND SOCIETY



## WHERE WE ARE

- The Internet currently relies on openness and standardisation. Isolated networks (e.g. “Dark Web” and intranets) exist, but are not in mainstream use
- As we advance towards an “Internet of Things”, more devices than ever are being plugged in, with the potential for catastrophic cyberspace breakdown



## WHAT WE KNOW

- Technological development will continue, with advances in consumer electronics, computation, miniaturisation, telecommunications, energy and data storage
- These fields continue to receive large investments, and are likely to greatly impact how we live in the future



## WHAT WE DON'T KNOW

- Will the Internet remain open and standardised or will it fragment into incompatible blocs?
- Will data remain secure? Will code-breaking technology outpace encryption technology?
- Will governments be able to keep up with the digital technology capabilities of non-state organisations?



# FUTURE OF THE ECONOMY



# CHANGING ASPIRATIONS AMIDST ECONOMIC UNCERTAINTY



**FUTURE OF THE ECONOMY  
THE JOBS THAT THE ECONOMY  
PRODUCES MAY NOT BE THE  
JOBS THAT PEOPLE DESIRE**



## WHERE WE ARE

- With higher qualifications and a richer set of school and work experiences, Singaporeans' aspirations are rising and broadening beyond the material
- While some still value their careers, others desire a more fulfilling pace of life and are more willing to pursue altruistic purposes
- More globalised and mobile, Singaporeans with unfulfilled aspirations have exit options



## WHAT WE KNOW

- More young graduates may be under-employed if growth in the number of degree and diploma holders outpaces the growth of jobs they expect to get when they graduate
- Young-old tensions might be thrown into sharper relief in a multi-generational workforce as the values gap widens
- Aspirations can fuel the economy but unmet aspirations can damage the social compact between the Government and the people



## WHAT WE DON'T KNOW

- How well can our economy harness the diverse aspirations, educational backgrounds and experiences of our youth, middle class and elderly?

## CIRCULATING TALENT



**FUTURE OF THE ECONOMY**  
TALENT MAY FIND SINGAPORE LESS  
ATTRACTIVE; LOCALS WILL NEED  
OVERSEAS WORKING EXPERIENCE  
TO REMAIN COMPETITIVE



### WHERE WE ARE

- Singapore has been able to attract foreign talent and workers so far as it offers a good living environment, job opportunities and higher wages
- Singaporeans will increasingly need to have a global mindset, such as a readiness to live/work abroad, in order to remain internationally competitive.



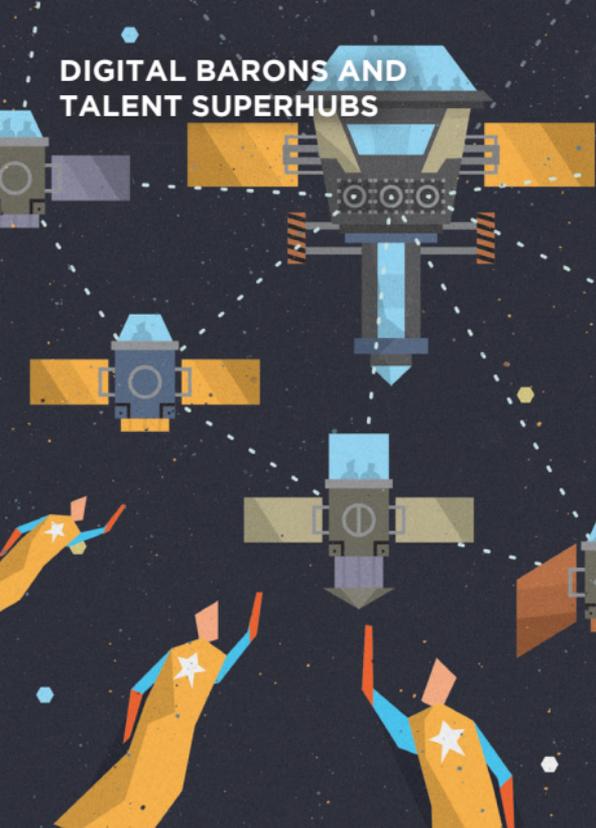
### WHAT WE KNOW

- Low birth rates and an ageing population mean the local workforce will shrink, suggesting the need to tap into foreign workers, unless companies in Singapore rely less on labour and more on technology
- Traditional sources of labour are likely to grow wealthier and offer more competitive economic opportunities, affecting our labour supply



### WHAT WE DON'T KNOW

- Can Singapore's economy outcompete other countries and offer higher-paid jobs that attract foreigners?
- Will Singaporeans accept workers from unfamiliar places, such as Africa and Latin America?
- Will the regional economy become more integrated, reinforcing Singapore's position as a hub and creating opportunities for Singaporeans to gain regional exposure?



## DIGITAL BARONS AND TALENT SUPERHUBS

**FUTURE OF THE ECONOMY**  
DIGITAL FIRMS CAN NOW SCALE UP  
WITHOUT MANY PHYSICAL ASSETS AND  
ARE ATTRACTED TO TALENT “SINKS”



### WHERE WE ARE

- Digital corporations (e.g. Google and Alibaba), use algorithms and platforms to grow quickly without many physical assets
- They benefit from scale: the more sellers on a platform, the more buyers join, and vice versa
- Due to this virtuous circle and their ability to grow with a small asset footprint, digital corporations could become the next railroad barons, serving global markets from a few locations



### WHAT WE KNOW

- Digital corporations will locate their few physical offices, which they use to serve global markets, where there is talent
- Talent, in turn, will locate where digital corporations locate
- This virtuous circle suggests that a few locations will become super-hubs, stiffening competition among cities



### WHAT WE DON'T KNOW

- Will more Singaporeans become entrepreneurs and develop the skills to use emerging technologies such as artificial intelligence (AI)? Will our pool of home-grown tech talent be sufficient to attract digital corporations?
- How will the rise of digital corporations and their new business models disrupt traditional industries in Singapore? (e.g. impact of e-commerce on brick-and-mortar retailers)

## INNOVATING PLATFORMS



**FUTURE OF THE ECONOMY**  
FUTURE INNOVATION DEMANDS  
CROSS-DISCIPLINARY COLLABORATION,  
NETWORKS AND MARKET AGILITY



### WHERE WE ARE

- Firms today develop not just technology, products and services but also business processes and platforms. They integrate different forms of innovation to create new business models
- For example, Uber successfully combines innovations in product (mobile app), process (ability to locate customer and driver) service (matching and rating system) and platform (network of cars)
- Businesses now experiment with new models of innovation, using data analytics, internal and contract R&D, and external and cross-sector collaborations



### WHAT WE KNOW

- Businesses will compete to innovate across different areas
- Collaboration will become more cross-disciplinary and involve players from different fields and market segments
- The ability to scale, bring products to market quickly and acquire a large user base will become more important



### WHAT WE DON'T KNOW

- What combinations of disciplines will lead to the greatest innovations?
- What forms of innovation will generate the greatest economic value?
- Can existing companies innovate as quickly as new firms or their digital counterparts to keep up with them?

## PEOPLE AS BUSINESSES



FUTURE OF THE ECONOMY  
NEW WORK ARRANGEMENTS  
MAY REPLACE MANY TRADITIONAL  
EMPLOYEE-EMPLOYER RELATIONSHIPS



### WHERE WE ARE

- Instead of working full-time for a single employer, individuals can increasingly sell skills or expertise by time or by job (e.g. project or task)
- The sharing economy offers opportunities to monetise under-utilised assets (e.g. leasing out spare rooms), and create new markets for goods and services (e.g. enabling more people to rent a room)



### WHAT WE KNOW

- In some instances, it is cheaper to hire contract workers than salaried ones and use newer and unconventional services over established businesses (e.g. AirBnB accommodation, versus hotels)
- People may choose to have a portfolio of different individual tasks for pay, instead of holding a “secure” job
- As work-matching and asset-sharing platforms become more important, there will be great demand for deep expertise to design such systems



### WHAT WE DON'T KNOW

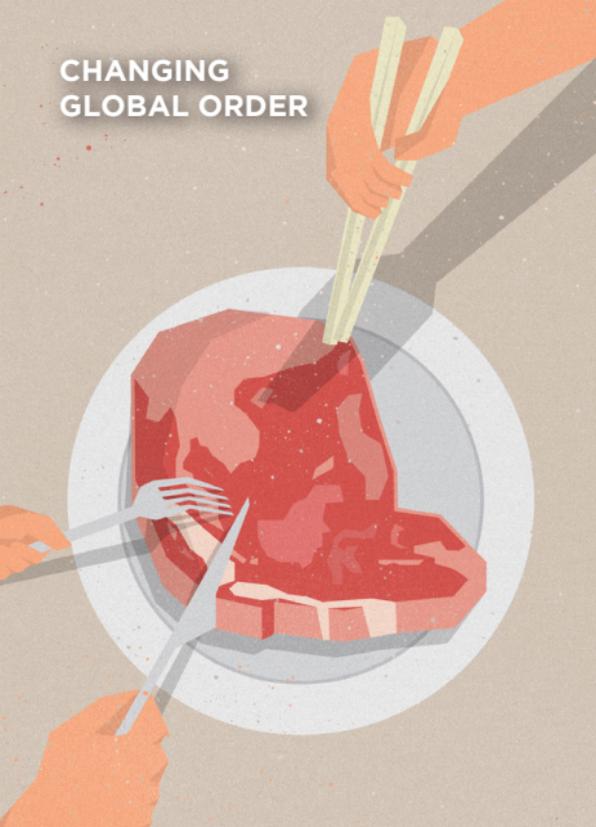
- How pervasive will new work arrangements be?
- Will there be more frequent bouts of underemployment or unemployment for those who no longer hold a single, full time job?
- How will citizens respond to new labour arrangements?



# FUTURE OF THE GLOBAL ENVIRONMENT



## CHANGING GLOBAL ORDER



FUTURE OF THE GLOBAL ENVIRONMENT  
FUTURE DEVELOPMENT PATHS AND  
CHANGING RELATIONSHIPS BETWEEN  
POWERS WILL DETERMINE THE NEW  
GLOBAL ORDER



### WHERE WE ARE

- International rules and norms today provide more predictability and a more level playing field, both of which are particularly beneficial to small states
- Strategic rivalry between powers will affect global leadership and impact strategic space for smaller nations
- The politicisation of religion has increased global instability and the potential for radicalisation in the region



### WHAT WE KNOW

- Demographic change will reshape the global economy
- Developing economies will be the most populous, with Nigeria overtaking the US as the third most populous nation after China and India
- Over the next decade, Northeast Asia will have an ageing population and a shrinking labour force. China's median age will rise to 49 by 2050 and its cities will be even older
- But technological developments (e.g. automation and genetic engineering) could help ageing economies overcome their manpower constraints



### WHAT WE DON'T KNOW

- How might the US-China relationship evolve?
- How will middle powers seek to expand their influence?
- How will political Islam play out in Southeast Asia?

# CLIMATE CHANGE AND THE GLOBAL CARBON REGIME



**FUTURE OF THE GLOBAL ENVIRONMENT  
CARBON CONSTRAINTS WILL RESHAPE  
THE WORLD, BUT MAY NOT AVERT THE  
WORST CONSEQUENCES**



## WHERE WE ARE

- Studies indicate that global warming will cause rising sea levels and more extreme weather
- Second-order effects on food chains, biodiversity and even disease patterns are not well understood, but will almost certainly be disruptive
- The post-2020 global climate agreement was concluded in Paris to keep warming below 2°C



## WHAT WE KNOW

- Climate change is likely to intensify environmental and socio-political stresses, and even destabilise countries (e.g. food and water shortages, disease and climate refugees)
- As an island-state, Singapore is vulnerable to the effects of climate change – rainfall patterns are already more volatile
- Singapore pledged in the 2015 Paris Agreement to cut 2030 emissions intensity by 36% from 2005 levels and reduce overall emissions from 2030



## WHAT WE DON'T KNOW

- How will global cooperation progress in reality? Will Singapore be held to greater commitments over time?
- How might international rules and pressure affect Singapore's economic competitiveness?
- What if climate change projections exceed worst-case scenarios?

## EVOLUTION OF THE WATER-ENERGY-FOOD-LAND NEXUS



**FUTURE OF THE GLOBAL ENVIRONMENT  
THE INTERCONNECTIONS BETWEEN  
RESOURCES POINT TO A GROWING  
NEED TO BALANCE TRADE-OFFS  
AND CAPITALISE ON SYNERGIES**



### WHERE WE ARE

- Population projections suggest that there will be enough water, energy and food at the global level, though the distribution will be uneven
- Singapore is resource-constrained in many ways and therefore subject to supply and price fluctuations
- Our use of energy-intensive water recycling and desalination technology will increase our exposure to energy price shocks
- But there are synergies too – co-locating desalination and power plants saves land, water and energy



### WHAT WE KNOW

- The growing global population and its rising affluence will increase the demand for resources
- Climate change will affect the distribution of resources
- Water in particular will be unevenly distributed, which will have a major impact on food production



### WHAT WE DON'T KNOW

- What new forms of shocks and disruptions might affect the resource supply chains that Singapore relies on?
- How might advances in the fields of alternative energy or water treatment be game-changers?
- To what extent might the unlocking of one resource alter the resource nexus?

## OVERRULED GLOBALLY



FUTURE OF THE GLOBAL ENVIRONMENT  
CHANGING INTERNATIONAL RULES AND  
NORMS CAN SIGNIFICANTLY AFFECT  
SINGAPORE'S ECONOMIC SPACE



### WHERE WE ARE

- A rules-based international order preserves space for small states to manoeuvre, mitigating the risks that “might makes right”
- Public pressure against unfettered movement of goods, services, funds people and ideas has been building up, especially in advanced economies
- Countries are pushing for stricter international rules, especially over tax and carbon



### WHAT WE KNOW

- The Paris Accord signals growing global agreement on measures to tackle climate change
- Developed Western economies continue to struggle with fiscal imbalances
- New institutions, such as the Asian Infrastructure Investment Bank and the New Development Bank, have formed as emerging powers come to the fore



### WHAT WE DON'T KNOW

- How will international organisations adapt to changing global power structures?
- How will new technologies change the influence of international rules?



# FUTURE OF SINGAPOREAN SOCIETY

## AGEING IN SINGAPORE



**FUTURE OF SINGAPOREAN SOCIETY  
AGEING PRESENTS NEW OPPORTUNITIES  
AND CHALLENGES FOR SOCIETY AND  
GOVERNANCE**



### WHERE WE ARE

- By 2035, one in four Singaporeans will be aged 65 years and above. By comparison, it was one in eight in 2015
- An ageing and shrinking workforce has the potential to hinder economic growth
- Families are the key source of support for the elderly



### WHAT WE KNOW

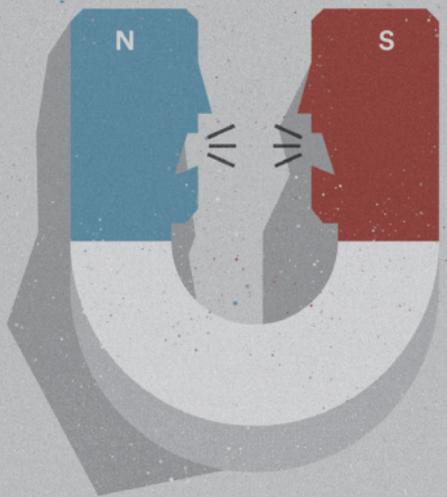
- Public spending will increase to meet the rising healthcare and infrastructural needs of an ageing population
- Improvements in standards of living mean that tomorrow's population will live longer and better
- The future elderly – being wealthier, more educated and financially better-off – will have greater purchasing power and may be more politically assertive



### WHAT WE DON'T KNOW

- Can society address the growing care gap and ensure the urban environment meets diverse needs?
- Can the economy adapt to a shrinking workforce and new consumption patterns brought about by our ageing demography?
- How will shrinking family sizes impact its role as a social institution that provides care to the elderly?
- Can a new social compact be forged to accommodate the emerging interests of the elderly?

## CHANGING TEXTURE OF SINGAPOREAN SOCIETY



**FUTURE OF SINGAPOREAN SOCIETY  
WIDENING AND DEEPENING DIVIDES -  
BOTH NEW AND OLD - COULD  
THREATEN OUR SOCIAL COHESION**



### WHERE WE ARE

- Singapore's multi-racialism and multi-culturalism is changing, as immigration and the rise in transnational and inter-ethnic marriages are leading to more diverse cultures and more Singaporeans with multiple identities
- Trust and social cohesion among different communities risk being eroded, if particular communities feel they give more than they take in this constant negotiation of identities and space
- As values and norms shift, more Singaporeans are joining advocacy groups and supporting international causes



### WHAT WE KNOW

- Political contestation over ideas, rights and interests will likely intensify
- Values-based conflicts, reinforced by fault lines such as race and religion, will also become more common



### WHAT WE DON'T KNOW

- How will our principles of meritocracy, equality, secularism and multi-racialism guide us, as our population becomes more diverse?
- How will we manage conflicts in a more contested space?

## NATIONAL IDENTITY



**FUTURE OF SINGAPOREAN SOCIETY**  
**NEW INFLUENCES WILL SHAPE OUR**  
**NATIONAL IDENTITY AND ITS ROLE**  
**IN SOCIETY**



### WHERE WE ARE

- As a young nation, Singapore's national identity is still in the process of being forged
- The growing presence of foreigners strengthens national identity by stimulating introspection and dialogue, but also creates and exacerbates fault lines
- Socio-economic stratification could reduce the number of common experiences among Singaporeans



### WHAT WE KNOW

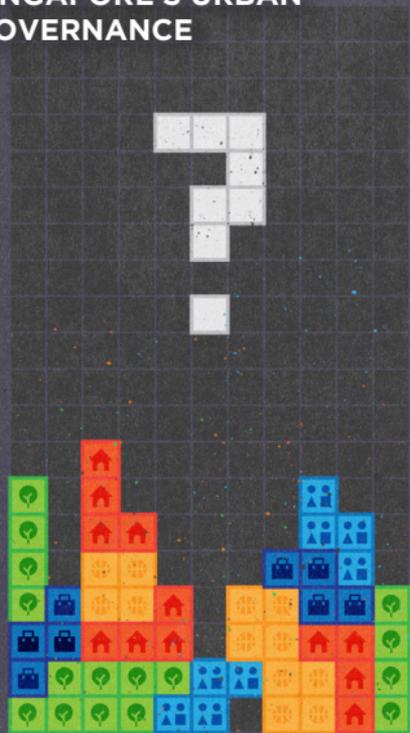
- Values, aspirations and experiences of Singaporeans will become more diverse due to external influences, socio-economic stratification and inter-generational differences
- Citizens will be better educated and will thus exert more influence on the construction of national identity



### WHAT WE DON'T KNOW

- Is our national identity distinct, important to and shared among Singaporeans?
- Will our national identity be inclusive by embracing a diversity of cultures beyond our multiculturalism, or exclusive?
- How will national identity contribute to society, such as in keeping Singaporeans rooted?

## SINGAPORE'S URBAN GOVERNANCE



**FUTURE OF SINGAPOREAN SOCIETY  
LAND CONSTRAINTS MAKE IT  
HARDER TO COMPETE WITH TOP  
CITIES; SUCCESS WILL REQUIRE URBAN  
AND TECHNOLOGICAL INNOVATION**



### WHERE WE ARE

- Compared with other top cities, Singapore has managed economic growth and the negative effects of urban density relatively well
- Singapore faces more acute land and labour constraints, due to a shrinking workforce and the absence of a hinterland. These could impact the flow of people and ideas into Singapore



### WHAT WE KNOW

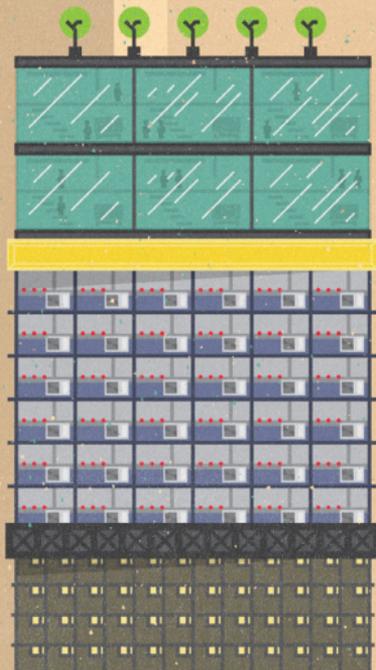
- As cities grow in population, their social and economic activities grow even more. In contrast, their infrastructural needs do not grow as much
- Competition for global, highly-skilled talent will intensify among cities, particularly as knowledge work grows



### WHAT WE DON'T KNOW

- How might cities of the future compete in power and influence, and in attracting talent? Will softer aspects such as cultural distinctiveness and values matter more?
- New technologies such as virtual and augmented reality are set to radically change the concepts of distance and geography. What new economic opportunities might emerge?
- How might well-connected cities plugged into the many flows (i.e. people, ideas, capital) manage their increased risk exposure?

## THE LIVED EXPERIENCE IN SINGAPORE



**FUTURE OF SINGAPOREAN SOCIETY  
DECISIONS ON HOW SINGAPORE'S  
LIMITED SPACE IS USED WILL SHAPE THE  
LIVED EXPERIENCE**



### WHERE WE ARE

- Singapore is one of the densest cities in the world and, with limited land, is approaching the natural limits to land reclamation and underground space
- Trade-offs between various needs over land have thus become more apparent
- Singapore will need to avoid the risks of spatial inequality



### WHAT WE KNOW

- There is growing civic activism and debate over urban development in Singapore, driven by factors such as growing environmental awareness



### WHAT WE DON'T KNOW

- How might technological advances, such as driverless cars and virtual working, reshape our urban landscape and help to relieve space constraints?
- How might new ways of using resources, such as the sharing economy, improve resource utilisation and ease space constraints?
- How might we avoid widening spatial inequality that leads to the emergence of two tiers of living experiences between the haves and have-nots?