



ENGINEERING THE FUTURE

Presented by:

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ENGINEERING THE FUTURE

Membina Kesiapsiagaan Masa Depan

**Academician Tan Sri Dr. Ir.
Ahmad Tajuddin Ali FASc.**

**BEM CONVENTION 2022
25th October**





**The best way
to predict the
future is to
invent it**



MASA DEPAN YANG
DIIDAMKAN

MAKMUR

PROSPEROUS

SEJAHTERA

HARMONIOUS

MAMPAN

SUSTAINABLE



PEMACU UTAMA BERSINERGI SECARA HARMONI



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If you'd like to know more about this work, please go to www.akademisains.gov.my to contact us.

Sumber: ASM Envisioning Malaysia 2050 Foresight Narrative, 2017

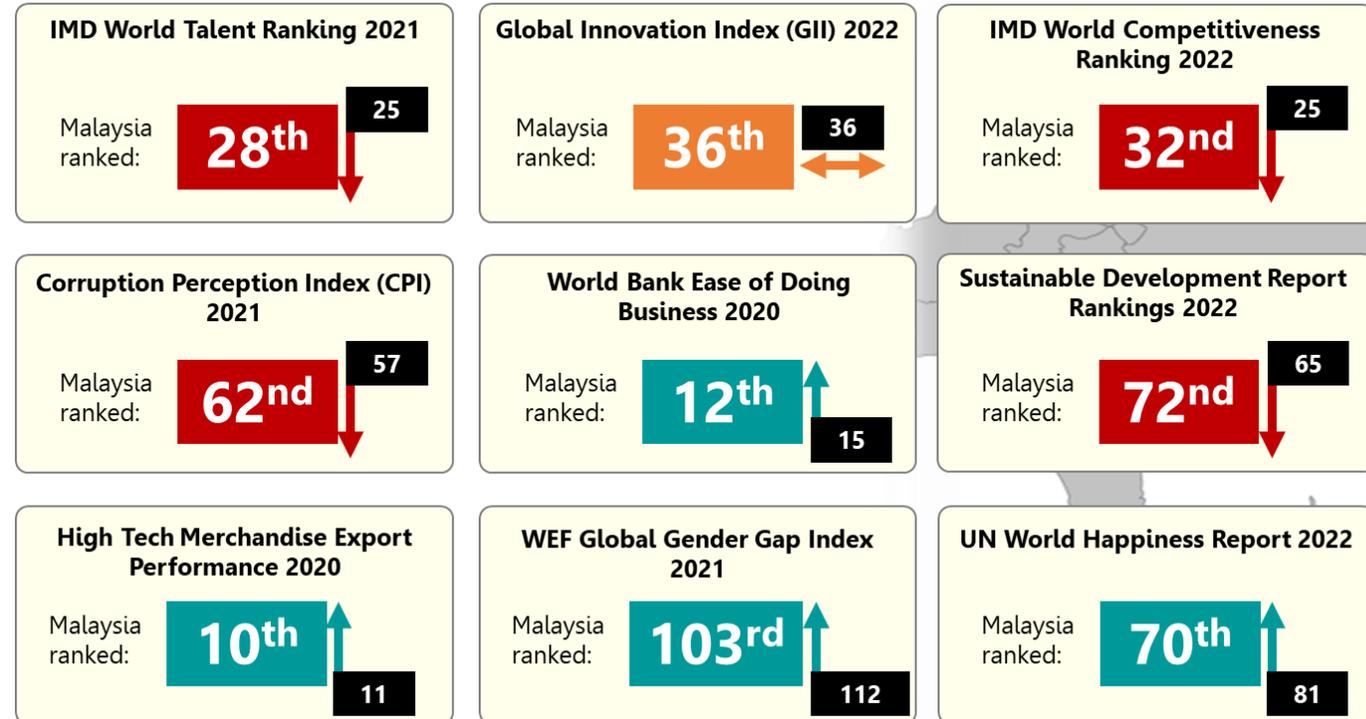


NAMUN BEGITU...



KEDUDUKAN MALAYSIA DI PERSADA DUNIA MASA KINI **KURANG** MEMBERANGSANGKAN

Persepsi berkaitan daya saing sesebuah negara adalah berdasarkan indeks global



Sumber MIGHT, 2022



Persekitaran dunia
yang semakin

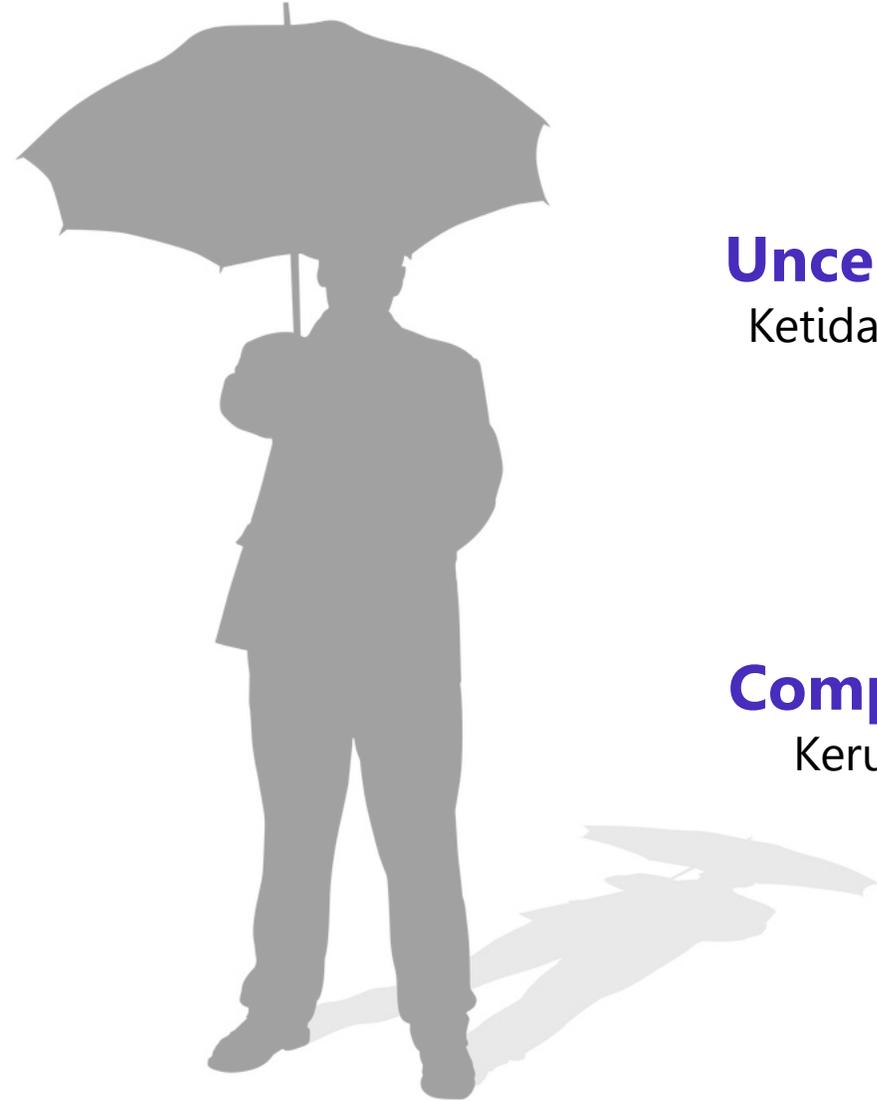
MENCABAR
& **SENGIT**
TOUGH & CHALLENGING

Volatility
Ketidakstabilan

Ambiguity
Kekaburan

Uncertainty
Ketidakpastian

Complexity
Kerumitan





Persekitaran dunia
yang semakin

MENCABAR
& **SENGIT**
TOUGH & CHALLENGING

Volatility Ketidakstabilan

Kecepatan perubahan...

- **Pasaran kewangan**
 - RM vs USD, KLCI
- **Harga komoditi**
 - CPO, Minyak mentah, Gas
- **Trend sosial**
 - Popularism, Generasi sanwic





Persekitaran dunia
yang semakin

MENCABAR
& **SENGIT**
TOUGH & CHALLENGING



Uncertainty Ketidakpastian

Ketidaktentuan isu dan peristiwa...

- **Kesan alam sekitar**
 - Perubahan iklim
- **Globalisasi & desentralisasi**
 - Russia vs Ukraine
 - US vs China
- **Kemajuan teknologi**
 - Hyper-connectivity



Persekitaran dunia
yang semakin

MENCABAR
& **SENGIT**
TOUGH & CHALLENGING



Complexity Kerumitan

Kesalingbergantungan
ekosistem...

- **Perubahan demografi**
 - Penuaan & depopulasi
 - Penurunan populasi warga kerja
- **Penumpuan teknologi**
 - Automasi & kepintaran buatan
 - Perpindahan kerja
 - Ketaksamaan digital



Persekitaran dunia
yang semakin

MENCABAR
& **SENGIT**
TOUGH & CHALLENGING

Ambiguity Kekaburan

Kekaburan potensi kesan
dan implikasi...

- **Kepimpinan dan arah politik**
 - GE15
- **Pembangunan bakat**
 - Bakat tidak sepadan keperluan industry
 - Kemahiran masa hadapan





ISU & CABARAN YANG KITA HADAPI

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ISU & CABARAN YANG KITA HADAPI

FUNDING & FINANCING

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TREND UNTUK DANA DAN PEMBIAYAAN MENUJU 2030

POINT US IN THE DIRECTION OF:

Advancements in digitalised Infrastructure allow for tapping into new market opportunities and foreign investments. The ease of doing business is improved with the cashless economy and increased labour productivity to spur innovation and improve livelihoods in Malaysia.

SIGNALS OF CHANGE IN FUNDING & FINANCING



1. Drive in digital economy towards achieving high income nation
2. Growth in e-commerce
3. Towards cashless economy
4. Increase in non-traditional funding and financing options
5. Rising importance of gig economy
6. Increase in national debt
7. Declining attractiveness to investors

WHY DOES IT MATTER?

Future of Engineering

- Creation of hubs as a catalyst for innovation and R&D to support the industry and economic development towards diversified products and services and development of world-class start-ups.
- Improved regional collaboration where Malaysian companies focus on niche areas in the value chain.
- Increased business and industry competition with the increase in goods and services allows the business and industry to grow with better crowds and markets

Engineering the Future

- Improved Malaysia's industry landscape and change talent and skill requirements with improved digital infrastructure.
- Enhanced education system to produce students or talent with better fit-for-purpose skill sets that meet industry requirements.

Source: MIGHT, 2022



ISU & CABARAN YANG KITA HADAPI

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NFRASTRUCTURE & INSTITUTION

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TREND UNTUK INFRASTRUKTUR DAN INSTITUSI MENUJU 2030

POINT US IN THE DIRECTION OF:

Reducing the digital gap in society that bring better connectivity and information. At the same time improve the quality of life of the citizens by having a work-life balance and facilitate the elderly community to live in a harmonious environment with adequate physical and health facilities.

SIGNALS OF CHANGE IN SOCIAL



1. Any city to be smart cities
2. High-quality education with digitalised education
3. Improving social connectivity
4. Recovery for middle income class
5. Need for infrastructure for silver economy
6. Towards less working hours

WHY DOES IT MATTER?

Future of Engineering

- To have a work-life balance as digitalisation and automation reduce unnecessary tasks and improve efficiencies for people to live their life.
- Increased demand for health and well-being business and technology areas like therapeutic robots, telemedicine, AI in healthcare, prioritised care and mental health.

Engineering the Future

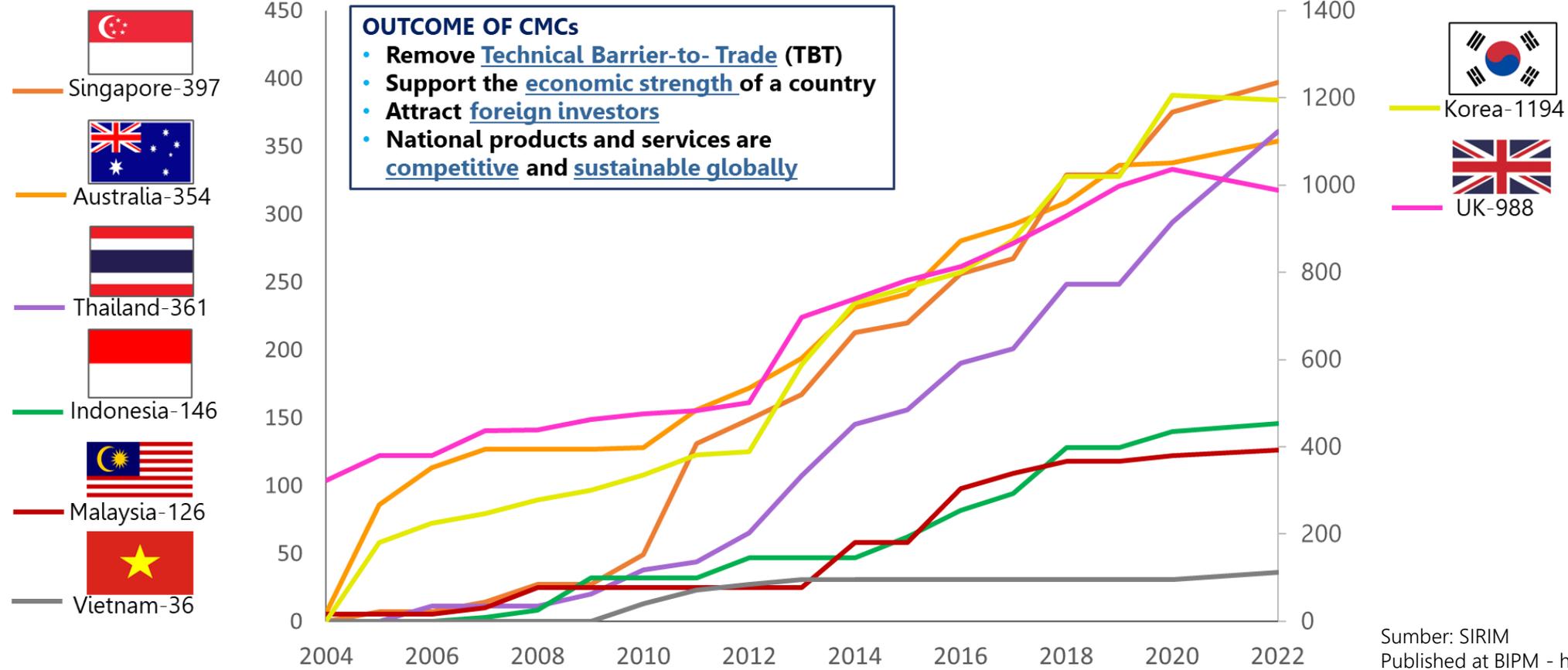
- Multi-generational workforce will consist of an ageing workforce and longer retirement age and retirees returning to work
- Facilities and arrangements will be required for a digital workforce
- The community is technologically savvy and enjoys a higher quality of life with easy access to education, knowledge, and information for developing talents.

Source: MIGHT, 2022

TREND UNTUK INFRASTRUKTUR DAN INSTITUSI MENUJU 2030

Malaysia vs Regional Calibration and Measurement Capabilities (CMCs)

NUMBER OF PUBLISHED CMCs



Sumber: SIRIM
Published at BIPM - <https://kcdb.bipm.org/appendixC>



ISU & CABARAN YANG KITA HADAPI

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R REGULATORY & POLICIES

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TREND UNTUK REGULASI DAN DASAR MENUJU 2030

POINT US IN THE DIRECTION OF:

Enhancement in e-Governance for better service delivery. Processes are simplified and access to government information is easier allowing for society's participation in government initiatives. Potential opportunities from empowerment of youth in politics and cryptocurrency.

SIGNALS OF CHANGE IN POLITICS & GOVERNANCE



1. Decrease in military spending
2. Decrease trend in terrorism in Malaysia
3. E-government services to focus on citizen
4. Improvement in Global Peace Index
5. Lowering voting age for better Parliamentarians
6. Regulating digital and sharing economy

WHY DOES IT MATTER?

Future of Engineering

- Improvement in e-government in providing accurate information and data management to enable industry and business to make better decisions and investments.
- Better political stability that allows for improvement in handling internal conflict, low cases of violent crime and good neighbouring country relationships.
- Having the right incentives and strategic policies to sustain and attract new investment to Malaysia.

Engineering the Future

- Improved transparency of policies, regulations and standards for better development and management of resources and increase citizen participation in policy making.

Source: MIGHT, 2022

COVID-19 SPECIAL

Coronavirus: Flip-flops in aid policies dent faith in Malaysian govt as it looks to reopen economy





ISU & CABARAN YANG KITA HADAPI

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S KILLS & TALENTS

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TREND UNTUK BAKAT DAN KEMAHIRAN MENUJU 2030

POINT US IN THE DIRECTION OF:

Continuous learning workforce that will see the rise of gig workers and new jobs that previously did not exist. Roles that cannot be automated will continue to require increasing number of talents with the right skills that could be boundaryless

SIGNALS OF CHANGE IN SKILLS & TALENTS



1. Shrinking lifespan of skills
2. Entry of digital natives into the workforce
3. Decline in tertiary enrolment
4. Rise of gig workers and digital workforce
5. Increase in women labour force participation
6. Rise in mental health issues

WHY DOES IT MATTER?

Future of Engineering

- Need for constant reskilling and upskilling due to shorter lifespan of skills from 26 years to 5 years, with more technical skills at just 2.5 years.
- Increased importance on value-driven work in the new generation workforce
- Attracting and retaining skilled local talents while leveraging on digital global workforce
- Different teaching methods for future engineers

Engineering the Future

- Need for updates in education system for the development of future skills & talents
- Emphasis on benefits and social safety net
- Need to increase labour productivity

Source: MIGHT, 2022

TREND UNTUK BAKAT DAN KEMAHIRAN MENUJU 2030

Pertumbuhan guna tenaga dalam sektor tertentu akan menyusut atau merosot

Industries	CAGR 2005-2020	CAGR 2020-2030	Employment 2030	Share of Employment 2030
Research & Development Services Industry	22.4%	5.0%	31,127	0.3%
Medical Devices Industry	8.5%	4.9%	50,979	0.5%
Petroleum Industry	10.9%	4.3%	25,553	0.3%
Machinery & Equipment Industry	6.2%	3.3%	212,464	2.2%
Construction Industry	5.4%	3.3%	1,720,110	17.4%
Metal-based	4.4%	2.8%	351,365	3.6%
Information & Communication Technology Services Industry	6.4%	2.8%	298,900	3.0%
Automotive Industry	4.1%	2.7%	588,375	6.0%
Chemical Industry	3.3%	2.3%	322,853	3.3%
Electric & Electronic (E&E) Industry	1.7%	1.4%	650,210	6.6%
Shipbuilding & Ship Repair Industry	3.6%	-9.0%	86,141	0.9%
Rail Industry	3.9%	-15.6%	44,303	0.4%
Aerospace Industry	6.1%	-16.3%	34,796	0.4%

Source: MIGHT, 2021



ISU & CABARAN YANG KITA HADAPI

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T **ECHNOLOGIES**

TREND UNTUK TEKNOLOGI MENUJU 2030

POINT US IN THE DIRECTION OF:

Malaysia is gaining opportunities in adopting technology like automation, robotics, AI and IoT in industry. Also, exploring the potential in E-waste and autonomous vehicle development. At the same time, strengthening the effort to fight cybercrime to remain competitive.

SIGNALS OF CHANGE IN TECHNOLOGY



1. Adoption of online entertainment
2. Improvement in cybersecurity to curb cybercrimes



3. Increasing cloudification - public clouds.
4. Opportunities from the Internet of Things (IoT)



5. Autonomous vehicles
6. The rise of robots

WHY DOES IT MATTER?

Future of Engineering

- Increased investment in R&D and be open to more innovative technological products and services.
- More creative ideas and innovation with the use of technology and digitalisation.
- Use of real time big data to enable industry and business to make better decisions and investments.
- Evolving into the metaverse workplace.

Engineering the Future

- Increased accessibility to education in remote areas with improved industry awareness with the advancement in internet connection.
- Increased digitalisation technologies will create digital workforce and teams that is boundaryless.
- Increased policy and governance processes transparency with advanced technology features such as AI, blockchain, machine learning, and sensors.

Source: MIGHT, 2022

GLOBAL SKILLS INDEX 2022



OVERALL RANK

39th

43



-  CUTTING EDGE
-  COMPETITIVE
-  EMERGING
-  LAGGING

BUSINESS SKILLS

 27th

TECHNOLOGY SKILLS

 50th

DATA SCIENCE SKILLS

 42nd

Source: Coursera, MIGHT, 2022



BAGI MENCAPAI ASPIRASI KITA



MASA DEPAN YANG
MAKMUR
SEJAHTERA
MAMPAN
MEMERLUKAN...

1 PEMBANGUNAN EKONOMI

Kejayaan Malaysia terletak pada
kemampuan kita untuk
MENGINDUSTRIALISASIKAN
KEKUATAN DAN
KEMAMPUAN KITA



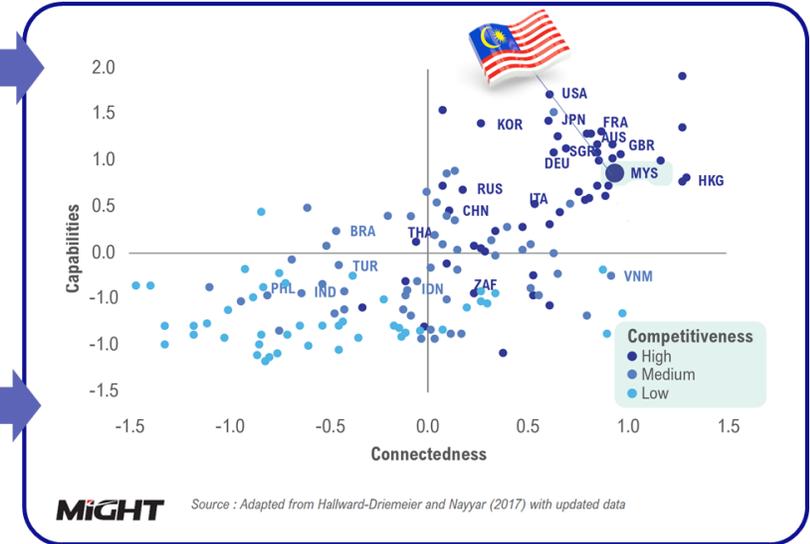
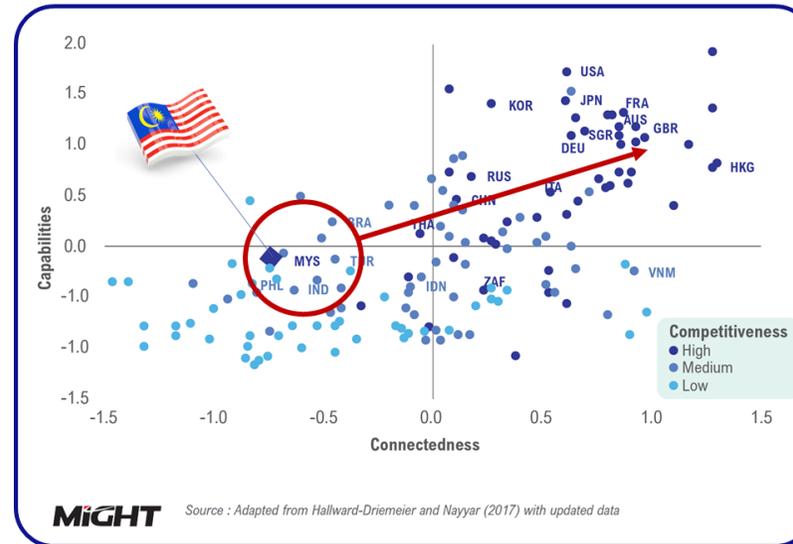
MASA DEPAN YANG MAKMUR SEJAHTERA MAMPAN MEMERLUKAN...

2 MENINGKATKAN 3Cs

2020 Capabilities = Low
Connectedness = Low
Competitiveness = High

If we are to enhance current 3Cs
and prepare for future 3Cs

2030 Capabilities = High
Connectedness = High
Competitiveness = High



3Cs

COMPETITIVENESS

Parameters

How well we adjust to changes

1. Products and Services
2. Business Environment
3. Sustainability and Inclusiveness

CAPABILITIES

Parameters

Our ability to adopt to new technologies

1. Skills and Knowledge Talents
2. R&D and Innovation
3. Productivity
4. Technology Advancement

CONNECTEDNESS

Parameters

How synergised we are in global value chains

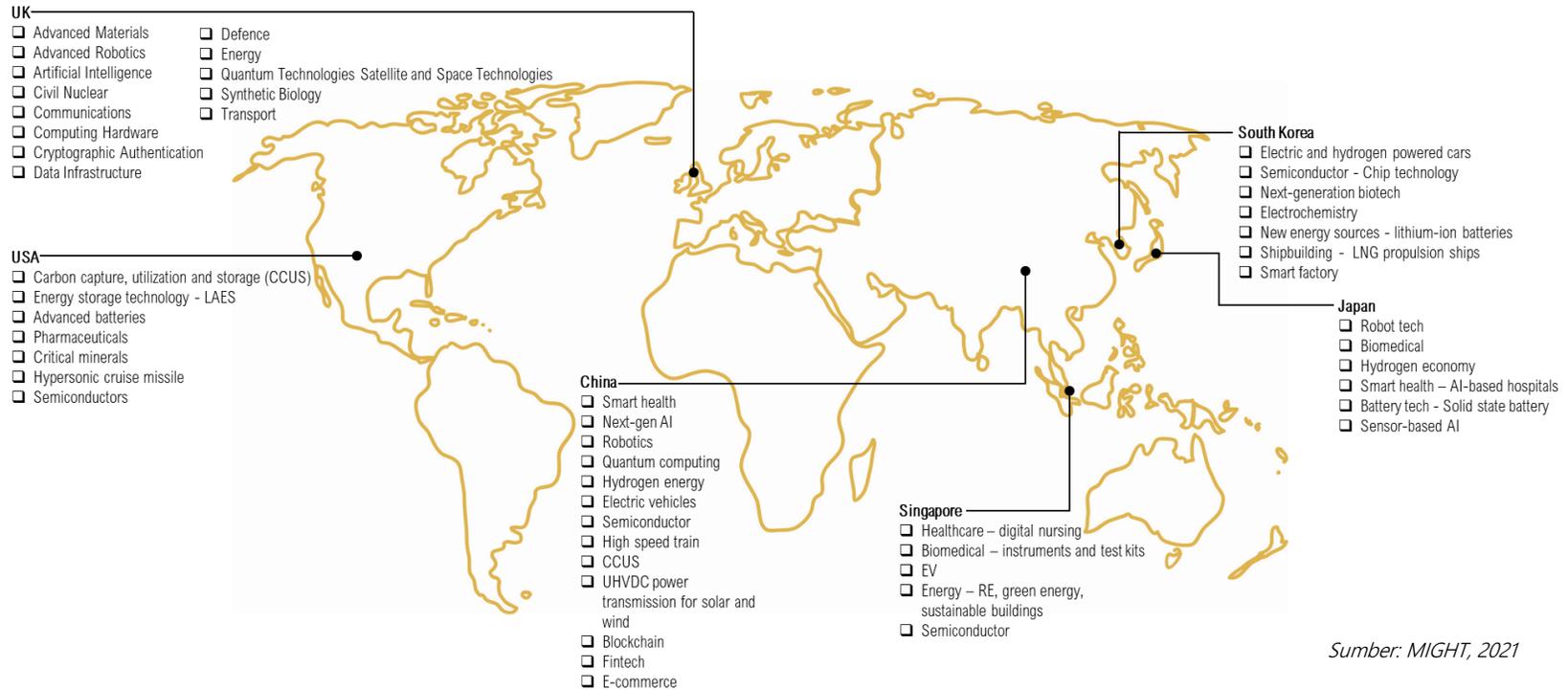
1. Trade and Logistics
2. Supply-chain
3. Infrastructure and eco-system support

Sumber: Future of Malaysian Manufacturing Report, World Bank, MIGHT, 2020



MASA DEPAN YANG MAKMUR SEJAHTERA MAMPAN MEMERLUKAN...

Competitiveness 3 PELABURAN UNTUK INDUSTRI BAHARU



Sumber: MIGHT, 2021

Pelaburan baharu mempamerkan bagaimana negara menangani cabaran pembangunan perindustrian dalam era 4IR, penumpuan industri dan teknologi baharu



MASA DEPAN YANG
MAKMUR
SEJAHTERA
MAMPAN
 MEMERLUKAN...

Competitiveness

3 PELABURAN UNTUK INDUSTRI BAHARU



Moonshots have the potential to **accelerate development, leapfrog Malaysia's competitiveness** and **propel socio-economic mobility**.

Pursuing Moonshots requires **balancing**:

- i. **Transformative over Pragmatic**
- ii. **High Risk over Low Risk**
- iii. **Prioritising of Resources**
- iv. **Long Term over Quick Wins**



COMMODITIES FOR THE FUTURE



EVERYTHING-AS-A SERVICE



HYDROGEN ECONOMY



NEW ENERGY



NEXT-GEN MOBILITY



SMART MANUFACTURING



SUPPLY-CHAIN TRACEABILITY



URBAN MINING



MASA DEPAN YANG
MAKMUR
SEJAHTERA
MAMPAN
MEMERLUKAN...

Competitiveness

4 MEMANFAATKAN GELOMBANG TEKNOLOGI TINGGI



**PERNIAGAAN
MODEL BAHARU**



**PEMBUATAN
PINTAR**



**MOBILITI
PINTAR**



**PERANTI
PINTAR**



**EKONOMI
LESTARI**



MASA DEPAN YANG
MAKMUR
SEJAHTERA
MAMPAN
MEMERLUKAN...

Capabilities

5 PEKERJA
BERKEMAHIRAN



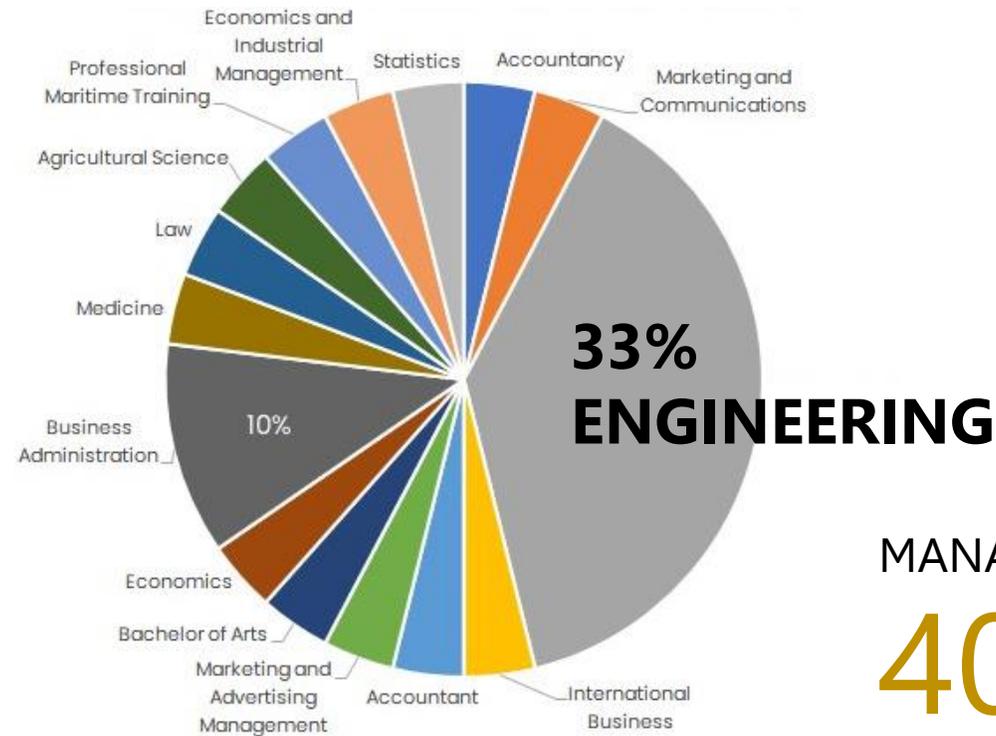


MASA DEPAN YANG
MAKMUR
SEJAHTERA
MAMPAN
 MEMERLUKAN...

Capabilities

6 JURUTERA SEBAGAI PEMIMPIN

Kelayakan MD/CEO Syarikat 30 Teratas di Malaysia



MANAKALA
40% DI PERINGKAT
 GLOBAL



MASA DEPAN YANG
MAKMUR
SEJAHTERA
MAMPAN
MEMERLUKAN...

Connectedness

8 PENGUKUHAN
INFRASTRUKTUR & EKO-SISTEM





MASA DEPAN YANG
MAKMUR
SEJAHTERA
MAMPAN
MEMERLUKAN...

Connectedness

9 RANTAIAN BEKALAN
(SUPPLY CHAIN)
YANG MAMPAN





ANJAKAN TRANSFORMASI DIPERLUKAN...

FROM

TO

LEADERSHIP & GOVERNANCE

- | | |
|---------------------------------|---|
| Administrative delivery | • Innovative services |
| Post-truth decision making | • Evidence-based decision making |
| Gradual governance and policies | • Agile and responsive governance and policies |
| Centralised decision making | • Empowered, facilitative and decentralised decision making |

ECONOMIC GROWTH & EQUITABLE DISTRIBUTION

- | | |
|---------------------------------------|--|
| Industry-driven economy | • People-driven economy |
| Resource intensive | • Knowledge intensive |
| Mass production of goods and services | • Mass customisation of goods and services |
| Low wage employees | • High wage employees |
| Low value-added products and services | • High value-added products and services |

EDUCATION & TRAINING

- | | |
|--------------------------------|---|
| Classroom and curriculum based | • On-demand learning and democratisation of knowledge |
| Rote learning | • Critical thinking and problem solving |
| Formal education | • Informal life-long learning education and skills |

STI CAPACITY & COMPETENCY

- | | |
|--|--|
| Scientifically aware society | • Scientifically engaged society |
| Consumer of goods and services | • Prosumers of goods and services |
| Silo approach in research, development and commercialisation | • Collaborative network approach in R, D & C |

Source: ASM Malaysia 2050, 2017



ANJAKAN TRANSFORMASI DIPERLUKAN...

FROM

TO

PEOPLE & VALUES

- | | |
|---|--|
| Tolerant of the differences in a plural society | • Respect and understanding of the differences in a plural society |
| Focuses on the bad | • Highlights the good |
| Individualistic and materialistic worldview | • Societal and for the greater good worldview |
| Wait-and-see attitude towards changes | • Proactive attitude towards changes |

TALENTS

- | | |
|-----------------------------|--|
| Job seekers | • Job creators |
| Low skilled migrant talents | • High skilled local talents |
| One skillset for a lifetime | • Many skillsets for lifelong through reskilling |
| One job for one career | • Different roles for one career |
| Permanent employment | • Freelancers in a gig economy |

POPULATION & DEMOGRAPHICS

- | | |
|---|---|
| Centralised services | • Decentralised services |
| Services and infrastructure catered to a young growing population | • Services and infrastructure catered to ageing slow population |
| Reactive healthcare | • Preventive healthcare |
| Social protection for a young and productive population | • Social protection for a rising dependency ratio |

URBANISATION & RISE OF MEGACITIES

- | | |
|--|--|
| Concentrated development | • Well-balanced and well-spread development |
| Disconnected infrastructure and services | • Well-connected infrastructure and services |

GREEN & SUSTAINABLE PRACTICES

- | | |
|--|--|
| Practices towards short-term gains | • Practices towards long-term sustainability |
| Waste and linear economy | • Circular and shared economy |
| Over-consumption society | • Sustainable consumption society |
| Green & sustainable practices out of enforcement | • Green & sustainable practices out of awareness |

Source: ASM Malaysia 2050, 2017



JURUTERA MASA DEPAN

MEMERLUKAN

- 1 Upaya BERADAPTASI
- 2 PENGAJARAN & PEMBELAJARAN yang berbeza
- 3 ANTARA DISIPLIN
- 4 PEMBELAJARAN BERTERUSAN

UNTUK

- Mewujudkan industri baharu
- Menyelesaikan masalah
- Mengubah kehidupan

*The future isn't a choice... it is inevitable!
It is how we face the future and its challenges, and do
what is needed to rise above the competition in a
future we engineer to succeed*





PENGAMBILAN UTAMA

- 1 Masa depan yang diidamkan
- 2 Cabaran yang perlu ditangani
- 3 Persekitaran yang mencabar
- 4 Tidak ada pilihan kecuali membina kejayaan bersama
- 5 Peluang keemasan bagi yang bersedia ke hadapan
- 6 Membina masa depan sendiri

*At this point I am pessimistic.
But I hope my pessimism will lead to
actions being taken, actions that will
prove 30 - 50 years from now –
although I may not be around to see it
– that I'm wrong... then I will be happy.*



THANK YOU



Committed to Engineering Excellence

BOARD OF ENGINEERS MALAYSIA

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