



MINISTRY OF INTERNATIONAL  
TRADE AND INDUSTRY

DRAFT  
**NATIONAL INDUSTRY**  
**4.**  
**POLICY FRAMEWORK**

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MINISTRY OF INTERNATIONAL  
TRADE AND INDUSTRY







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# ACKNOWLEDGEMENTS

**Due to the breadth and depth of the manufacturing industry, this document is prepared through consultations with multiple ministries, agencies and industry players. The topics covered are linked to Malaysia's business and competitive advantages and the drivers, potential disruptors and technology developments in the manufacturing industry.**

This document targets a range of stakeholders, with the aim of encouraging manufacturing firms to work with the entire manufacturing ecosystem to address the challenges and act on the identified enablers.



## TECHNICAL WORKING GROUPS

Technical working groups were created led by respective ministries and agencies in the identified focus areas to facilitate discussion amongst the stakeholders.



## WORKSHOPS

A series of workshops were held to bring together government ministries, agencies, manufacturing firms from a range of sectors as well as representatives from the education and research community to discuss future opportunities and needs of the manufacturing sector over a 10 year horizon.



## INTERVIEWS

One-on-one interviews were held with top leaders within the manufacturing industry to supplement, test and refine the workshop outputs.



## Technical Working Groups Lead

Ministry of Communications & Multimedia  
 Ministry of Higher Education  
 Ministry of Human Resource

Ministry of Finance  
 Ministry of Science Technology & Innovation  
 SME Corporation Malaysia



## Contributing Organisations

Agensi Inovasi Malaysia (AIM)  
 Akademi Sains Malaysia  
 American Malaysian Chamber of Commerce (AMCHAM)  
 Bank Negara Malaysia  
 Collaborative Research in Engineering, Science and Technology (CREST)  
 DreamEDGE Sdn Bhd  
 Economic Planning Unit (EPU)  
 Federation of Malaysian Manufacturers (FMM)  
 German-Malaysian Institute (GMI)  
 Hanwha Q Cells  
 Honeywell  
 Huawei  
 IAT Solutions  
 Infineon  
 Intel  
 Invest KL  
 iPlast  
 Linde  
 Malaysia Automotive Institute (MAI)  
 Malaysian Communications and Multimedia Commission (MCMC)  
 Malaysia Digital Economy Corporation (MDEC)  
 Malaysia Investment Development Authority (MIDA)  
 Malaysia IoT Association  
 Malaysia Productivity Corporation (MPC)  
 Malaysia Technology Development Corporation (MTDC)  
 Malaysian German Chamber Of Commerce & Industry (MGCC)  
 Malaysian Industry-Government Group for High technology (MIGHT)  
 Malaysian Plastics Manufacturers Association (MPMA)

MARA Aerotech  
 MIMOS Bhd  
 Monash University Malaysia  
 MPU University  
 Multimedia University (MMU)  
 Nano Malaysia  
 National Instruments  
 National Professors Council (MPN)  
 Penang Skills Development Centre (PSDC)  
 Petroliam Nasional Bhd (Petronas)  
 Siemens  
 SILTERRA Sdn Bhd  
 SIRIM Bhd  
 Standards Malaysia  
 Strand Aerospace Malaysia  
 Taylor's Universty  
 Universiti Kebangsaan Malaysia (UKM)  
 Universiti Malaysia Perlis (UniMAP)  
 Universiti Malaysia Sabah (UMS)  
 Universiti Pertahanan Nasional Malaysia (UPNM)  
 Universiti Putra Malaysia (UPM)  
 Universiti Sains Islam Malaysia (USIM)  
 Universiti Teknologi Malaysia (UTM)  
 Universiti Teknologi MARA (UiTM)  
 Universiti Teknologi PETRONAS (UTP)  
 Universiti Tenaga Nasional (UNITEN)  
 Universiti Utara Malaysia (UUM)



## Special Consultations

Global Science and Innovation Advisory  
 Council (GSIAC)

A.T. Kearney

Global Federations of Competitive Council  
 (GFCC)





## GLOBAL OVERVIEW

The Inevitable Transformation  
Driven by Multiple Factors  
Advancement and Convergence of Technologies  
Competitive Response by Nations & Lessons Learned

## GLOBAL OVERVIEW



# THE INEVITABLE TRANSFORMATION

The world is currently amidst a technological transformation that will fundamentally change the way we live and work. It is difficult to predict precisely how this transformation will impact different industries and countries. However, we know that this transformation is unlike anything we have seen before due to the sheer pace and breadth of these changes.

Many see these changes as an ushering of new era of growth, change and opportunity. The ramifications it brings for manufacturing firms is forcing nations and governments to re-evaluate how the manufacturing industry operates and contributes to economic growth. Nations are now increasing their focus on developing advanced manufacturing capabilities by investing in high-tech infrastructure and quality education. These are done by facilitating the transformation of the manufacturing industry and its firms, advancing to the next technology frontier and raising their economic wellbeing.

The first industrial revolution started with the advent of steam and water power enabling mechanisation of production processes. The second industrial revolution was driven by electric power and mass manufacturing techniques. Information technology and automation brought in the third industrial revolution. The fourth industrial revolution is exploding on the back of a range of technologies that are blurring the distinction among physical, digital and biological spaces.

The fourth industrial revolution, or Industry 4.0, transforms how products are designed, fabricated, used and operated as well as how they are maintained and serviced. It will also transform the operations, processes, supply chain management, and energy footprint of factories.



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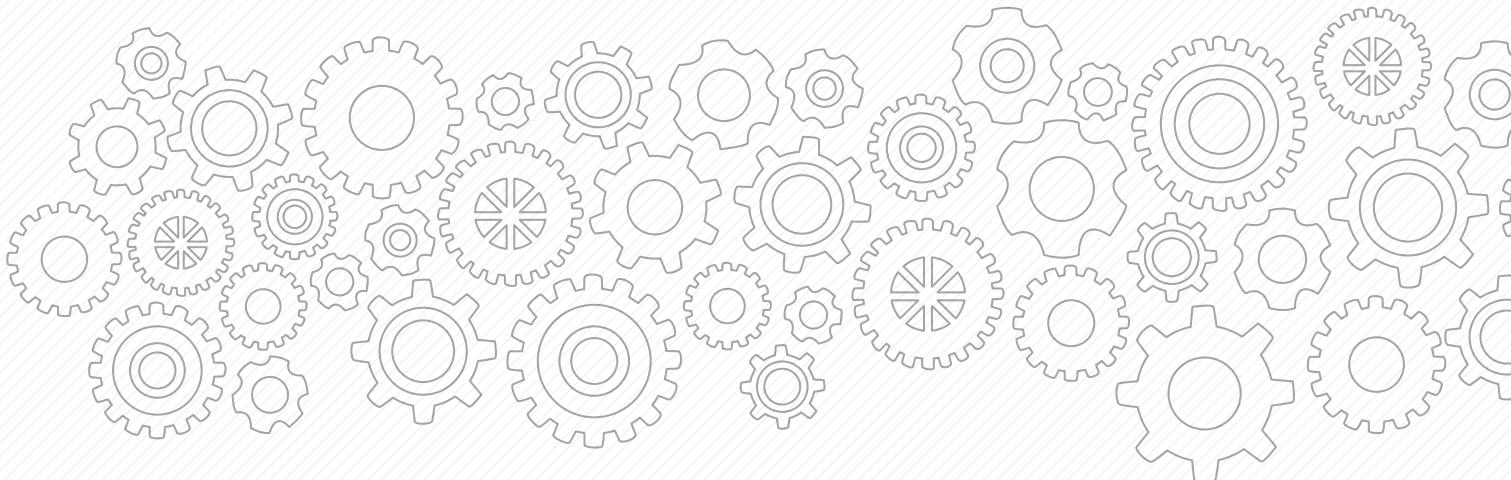


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Industry 4.0 changes the global landscape of manufacturing competition, reducing the relative competitive advantage of low-cost regions that rely on cheap labour. Nations and manufacturing firms that lead in embracing Industry 4.0 technologies and processes will gain over global competitors. This competitiveness hinges on the ability to transform by responding to market shifts and technology trends. The

transformation of the manufacturing industry, through Industry 4.0, is also in line with the United Nations' Sustainable Development Goals (SGDs), especially in support of Goals #9 and #12.



## GOAL #9

INDUSTRY, INNOVATION  
AND INFRASTRUCTURE



Build resilient infrastructure, promote sustainable industrialisation and foster innovation. Inclusive and sustainable industrial development is the primary source of income generation, allows for rapid and sustained increases in living standards for all people, and provides the technological solutions to environmentally sound industrialisation. Without technology and innovation, industrialisation will not happen, and without industrialisation, development will not happen.

Ensure sustainable consumption and production patterns. Sustainable consumption and production is about promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for all. Its implementation helps to achieve overall development plans, reduce future economic, environmental and social costs, strengthen economic competitiveness and reduce poverty.

## GOAL #12

RESPONSIBLE  
CONSUMPTION  
AND PRODUCTION



## GLOBAL OVERVIEW



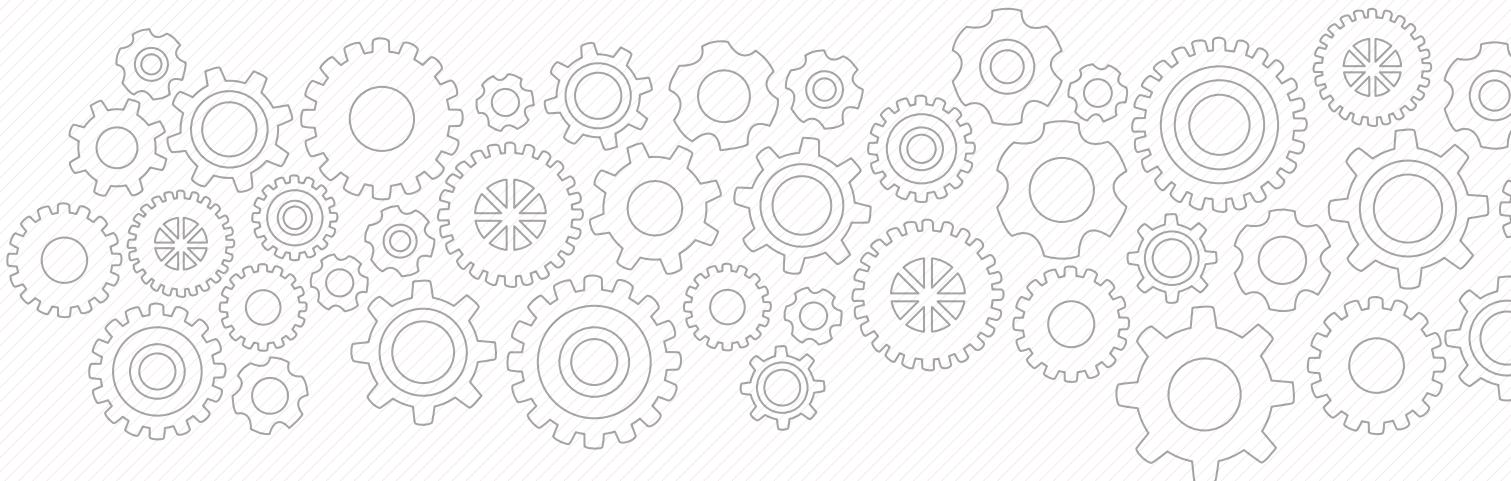
## DRIVEN BY MULTIPLE FACTORS

The manufacturing industry is increasingly shifting towards producing more technologically-complex products.

It is no longer enough for the manufacturing industry to make better things - creating innovative products and services that will meet customer needs - but also to make things better - facilitating the design engineering, service planning and execution as well as improving the management and production processes. Furthermore, despite steady improvements in the manufacturing output and employment in the sector, renewed investments will be needed to build the necessary infrastructure and increase resources to support the continuous growth.

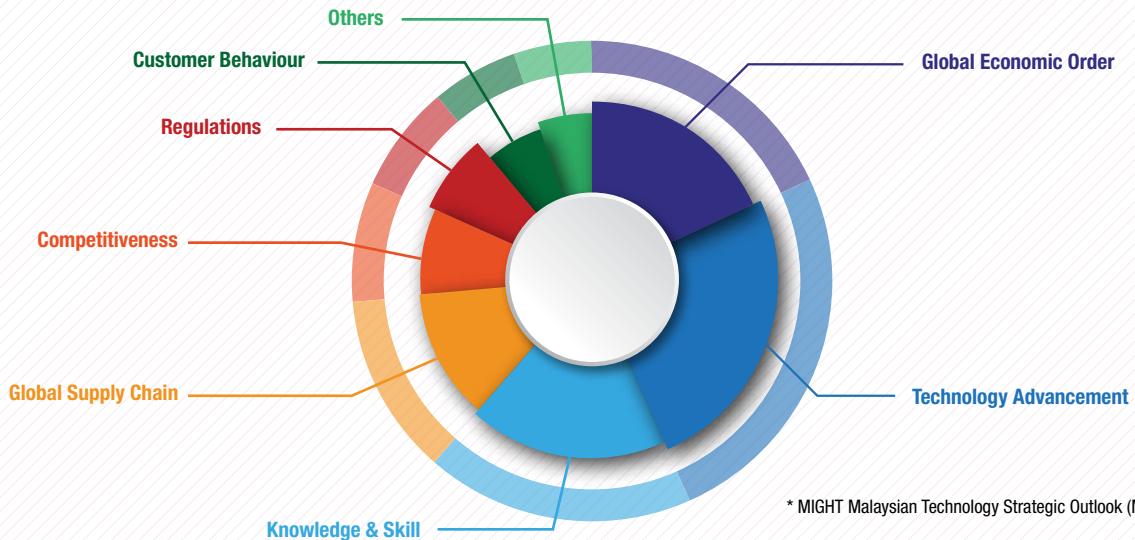
This emphasis on “making better things while making things better” is driven by the following factors:

- Shifts in the global economic order - the rise of China, economic realignment due to changes in the developed world, and the rise of fast-growth emerging economies;
- Rate of technology advancement and its convergence - technology changes driven by applications of these technology in the manufacturing industry such as but not limited to Big Data, the Internet of Things, and cloud computing;
- Knowledge & Skills for the future in retaining talent and producing future workforce by taking advantage of the opportunities of this transformation;
- Global supply chain dynamics – increasing complexity in the supply chain networks caused by distributed sourcing, engineering, and production, as manufacturing firms now manage partners in a borderless world not bound by geographical locations;



- Competitiveness of nations and firms - greater global competition as firms must defend their domestic markets while simultaneously tapping new market segments for long-term growth;
- Increased regulations - environmental concerns and standards-based factors like ISO compliance that apply across an increasingly interconnected world; and
- Changing customer behaviour – influenced by values, personalisation and customisation and the emergence of new products and new services attributes that are forcing manufacturing firms to reassess their manufacturing systems of production.

## Industry 4.0 Transformation Drivers

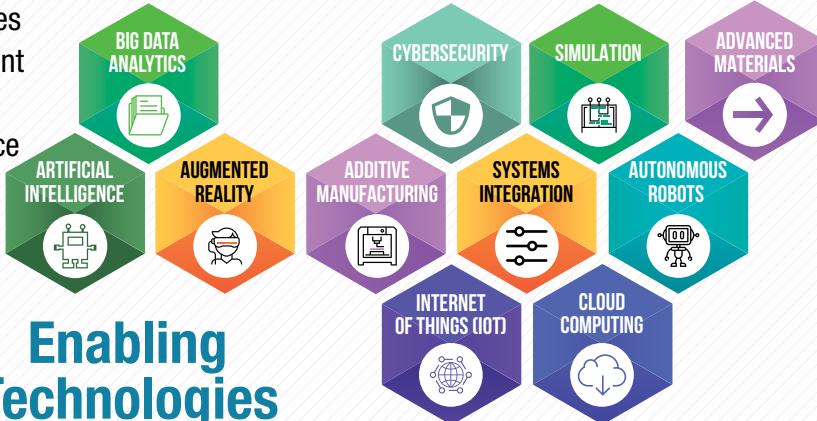


## GLOBAL OVERVIEW

# ADVANCEMENT AND CONVERGENCE OF TECHNOLOGIES

At the heart of Industry 4.0 is a set of rapidly evolving and converging technologies. These are pushing the boundaries of what can be manufactured through additive manufacturing and advanced materials. These technologies are enabling richer insights through big data analytics. They are blurring the lines between physical and digital realms through rich simulations and augmented reality. They are enhancing human capacity through artificial intelligence and autonomous robots. We are also seeing a shift in the way information technology is being used through cloud computing, system integration, and the Internet of Things (IoT). Last but not the least, cyber-security plays an important role in ensuring information systems and manufacturing lines are protected from cybercrime threats.

Technologies advancement and convergence



## Enabling Technologies

The digitalisation of the production-based industries are driven by these technological drivers

These enabling technologies bring a new dimension to the industrial environment resulting in a dramatic increase in industrial productivity.

### GREATER EFFICIENCIES

Changing the traditional manufacturing system production relationships between suppliers, producers, and customers as well as between humans and machines.

### INTEGRATION & AUTOMATION

The manufacturing systems would become fully integrated and automated as a result of the digital adoption that will transform the industrial environment.

### SELF ADAPTATION TO CHANGES

The environment will become unified by the connected systems that enable interactions within and between systems to allow self-configuration, failure prediction and be more adaptive to changes.



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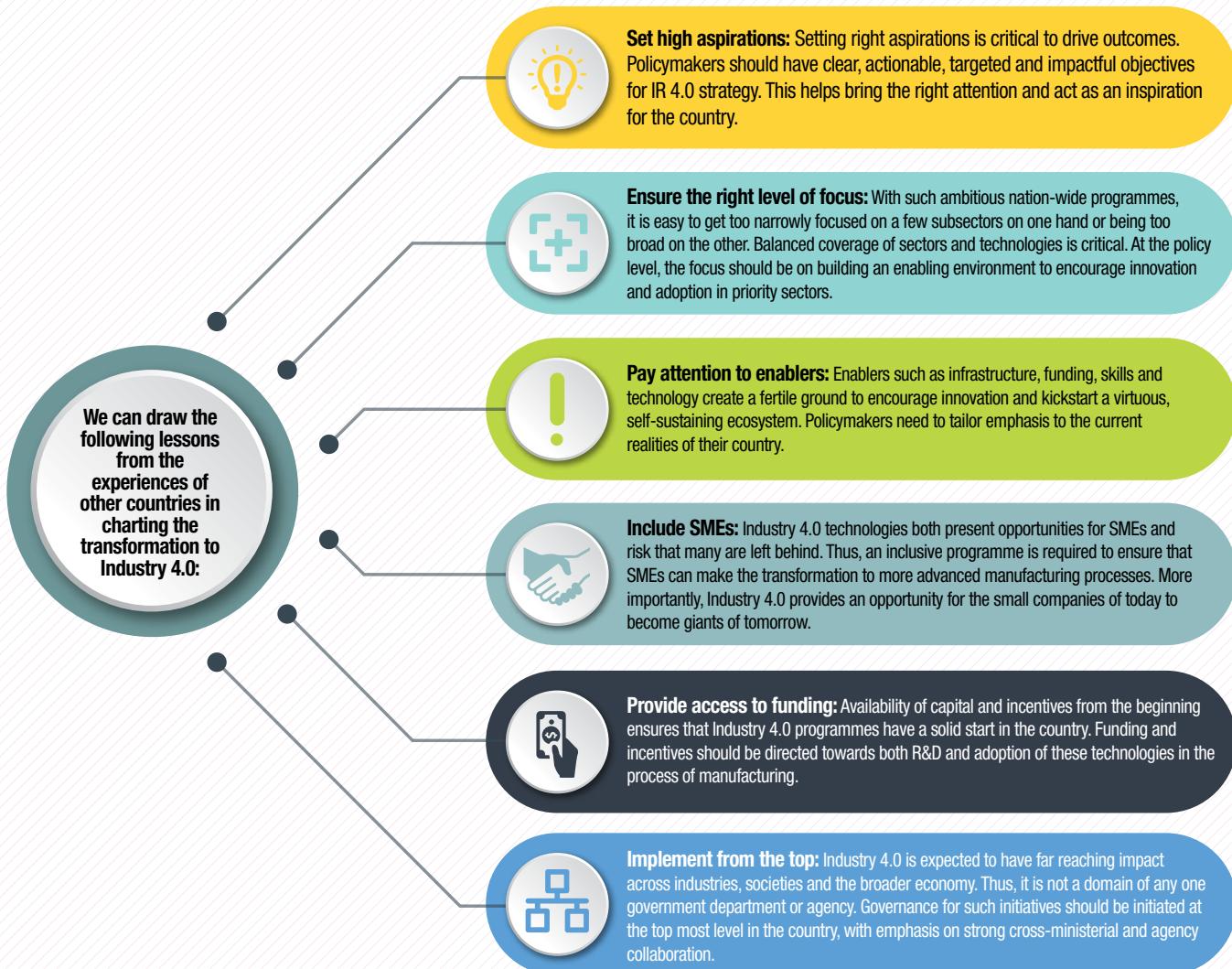
Additive manufacturing	Artificial intelligence (AI)	Big Data Analytics	Advanced Materials	Cybersecurity	
Additive manufacturing is advancing with the use of new materials opening completely new possibilities. For example, 3D printing of organic tissues has created opportunities for growing live organs. It is revolutionising traditional production, aided by a recent surge in metal additive printing.	AI is a concept that is made up of numerous subfields such as machine learning, which focuses on the development of programmes that can teach themselves to learn, understand, reason, plan, and act when exposed to new data in the right quantities. AI technology will supplement the smart factory towards networked factory, in which data from supply chains, design teams, production lines and quality control are linked to form a highly integrated and intelligent engines	Increasingly big data techniques are being applied in manufacturing industries to improve customer experience and product quality, realise energy efficiencies, and conduct predictive maintenance. It is now possible to collect masses of data from several different sources to direct decisions that anticipate product or equipment failure.	New materials and nano-structures are being developed that allow for beneficial material properties, e.g. shape retention or thermoelectric efficiency. Together with additive manufacturing technologies, it will allow for massive customisations and development of products that were not possible until now.	The industrial communication is expanding and strongly connected, digital security becomes a critical aspect that must not be overlooked in the industrial environment. It has now become more complex, as it consists of connected devices and environments that cannot be protected by traditional cybersecurity approaches. Current cybersecurity has largely been developed for IT-centric devices and environments. The system is now facing new challenge on how to embed security functionality into the IoT devices with sophisticated cybersecurity.	
Simulation	Cloud Computing	Augmented Reality	Internet of Things (IoT)	Autonomous Robots	Systems Integration
While many engineers are already familiar with simulations in the field of product design, the advent of augmented reality, artificial intelligence and big data is expected to take simulations to the next level. It will be possible to simulate manufacturing processes using different production settings to find the optimal way to manufacture a product. Simulations can also be used to test product usage under different operating environment using different types of materials.	Past industrial revolutions required significant capital as a ticket to entry. With Cloud Computing many of the Industry 4.0 technologies can be made available to even smaller companies as a utility with minimal upfront capital investment. Companies can leverage cloud based product design, simulation, artificial intelligence, and big data solutions to improve their production processes and build products better suited for their customers.	While the initial Augment Reality technologies are still in nascent stages, they are advancing at a rapid pace. Some of the first applications can be found in the delivery of information and training. For example, Augmented Reality can be used to deliver part replacement instructions to maintenance staff in the field.	Industry 3.0 brought in an era of computing and inter-connectedness, but it often relied on humans to make even the trivial decisions. Industry 4.0 technologies embody an unprecedented proliferation of sensors and connectedness among these sensors. Combined with other technologies such as artificial intelligence and Big Data, it is now possible to envisage entirely autonomous systems that revolutionise manufacturing.	Machinery and robots are transformed towards its next generation. Robots can do more on its own, including learning on the job and team up with other robots and humans. This technology allows systems to think, act and react autonomously as well as conduct remote decision making. This can help contribute to a company's competitiveness, productivity and profitability.	System integration occurs in vertical (within the industry value chain) and in horizontal systems (across multiple value chains) eventually achieving end-to-end digital integration across the entire value chains.

## GLOBAL OVERVIEW

# COMPETITIVE RESPONSE BY NATIONS & LESSONS LEARNED



Recognising the importance of the transformation of the manufacturing industry to their industrial future state, many countries have launched Industry 4.0 related policies and programmes to support the research, development and deployment of Industry 4.0 technologies and processes at their local manufacturers.



Several of the globally leading manufacturing countries have already embarked on their Industry 4.0 transformation and are in advanced stages of implementation, e.g., Germany, US, UK, China and Korea. It is critical for Malaysia to both learn from these experiences and to move fast in its own Industry 4.0 adoption to not fall behind in its own global manufacturing position.





## CASE FOR ACTION

Importance of the Manufacturing Sector in Malaysia

Need to Embrace Industry 4.0

Propelling SMEs Forward

Malaysia's Readiness for Industry 4.0

Addressing Malaysia's Issues & Challenges

## CASE FOR ACTION

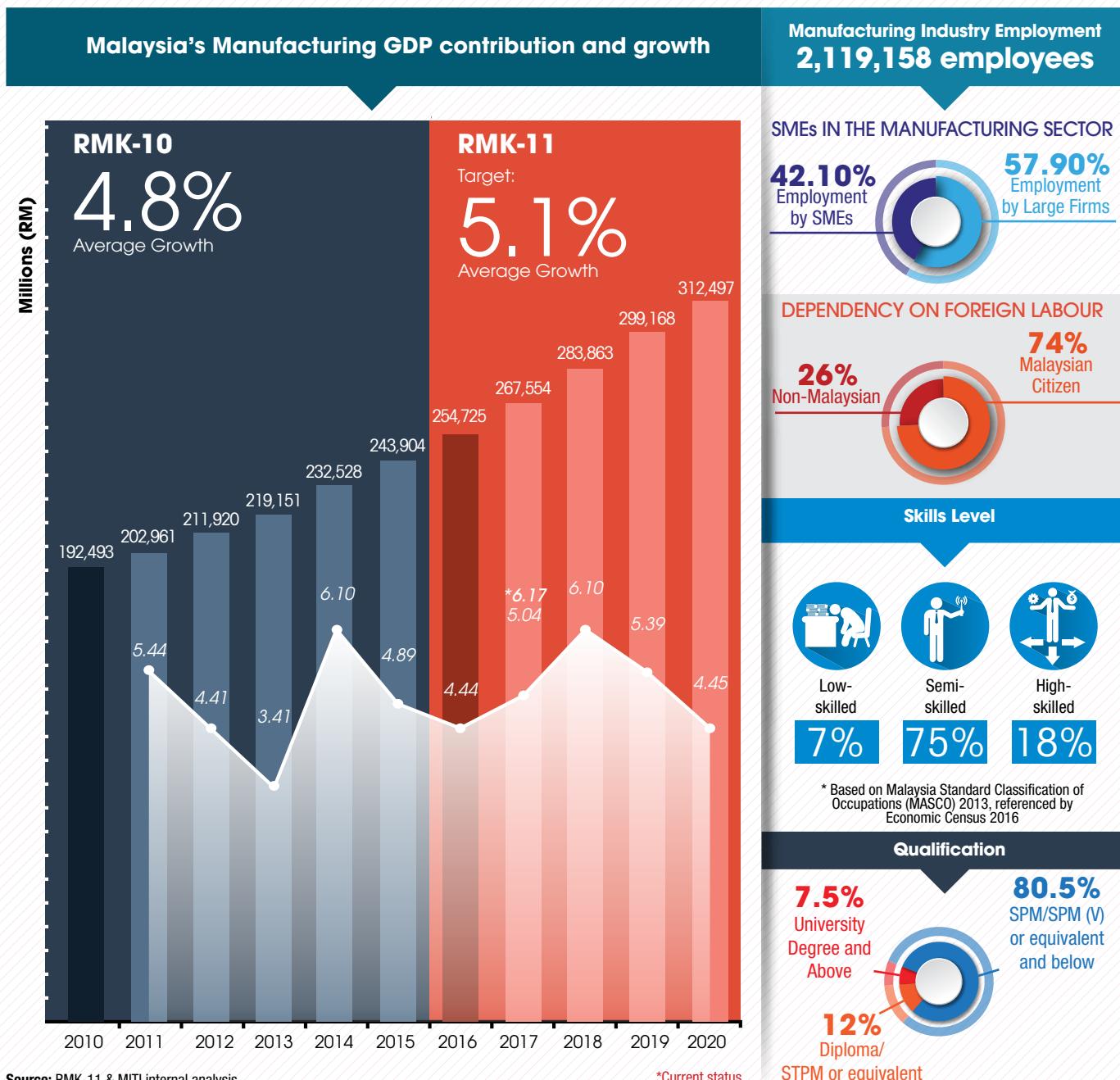


# IMPORTANCE OF THE MANUFACTURING SECTOR IN MALAYSIA

The Malaysian manufacturing industry is an important economic sector contributing about 22% to the GDP in the last 5 years. To date, its growth has had the effect of stimulating jobs, attracting investments and creating business opportunities in the downstream activities and related services sectors. The manufacturing sector is expected to remain resilient and is on track to achieve the targeted annual GDP growth rate of 5.1% under the 11th Malaysian Plan (RMK-11).

It is important to note that the sector is made up of a large number of SMEs, which account for 97% of the manufacturing firms. Although most of these SMEs do not have a strong global presence, many have the potential to be global exporters. Together with other ongoing initiatives like the eCommerce Strategic Roadmap or the Digital Free-Trade Zone (DFTZ), the Government is trying to provide the right platform for SMEs to reinvent themselves and adopt the latest technologies to be globally competitive.

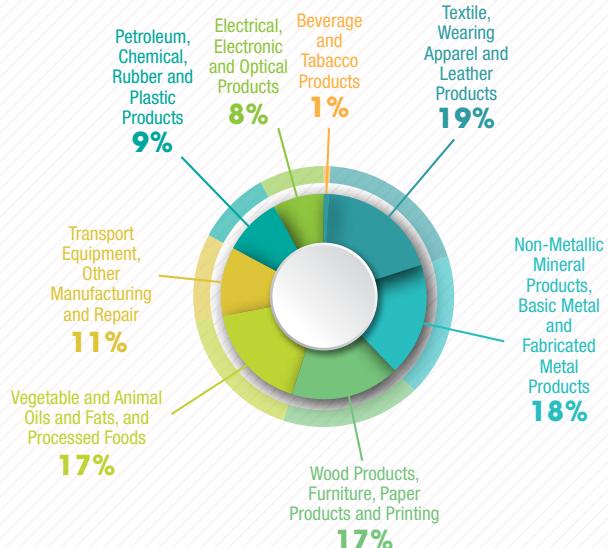
On a global level, Malaysia has enjoyed a fairly strong and competitive position in both manufacturing and the use of technology. The Global Manufacturing Competitiveness Index 2016 (by Deloitte Touche Tohmatsu) ranked Malaysia at 17th place among 40 countries. The report also projected Malaysia to climb four notches to 13th by 2020. On the technology and innovation side, the Global Innovation Index 2017 (by Cornell University, INSEAD and WIPO) ranked Malaysia at 37th globally among 127 countries and 8th in Asia. Further, the recent Readiness for the Future of Production Report 2018 (by WEF and A.T. Kearney) highlights that Malaysia is positioned well to benefit from the future of Industry 4.0.



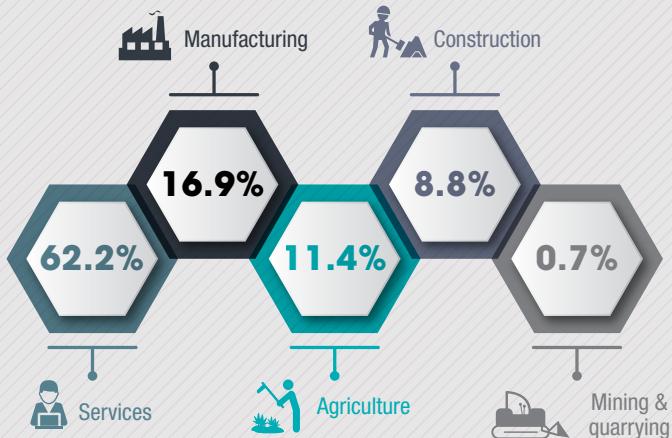
## CASE FOR ACTION

### NUMBER OF ESTABLISHMENTS BY MANUFACTURING SUB-SECTOR

Manufacturing Sector **49,101** Establishments



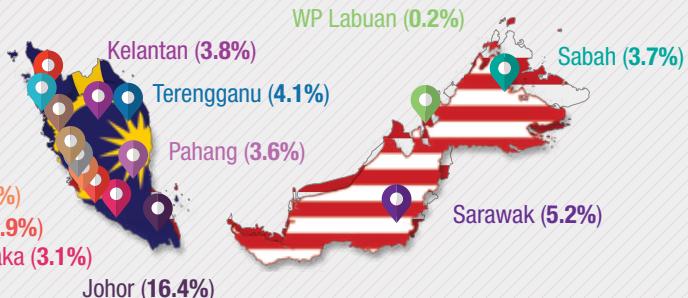
### PROFILE OF EMPLOYED PERSONS, MALAYSIA, 2016



Source: Labour Force Survey Report 2016, Department of Statistics, Malaysia

### CONCENTRATION OF MANUFACTURING ESTABLISHMENTS IN MALAYSIA

Perlis (0.8%)  
 Kedah (6.7%)  
 P. Pinang (8.5%)  
 Perak (8.9%)  
 Selangor (20.4%)  
 Kuala Lumpur (10.7%)  
 N. Sembilan (3.9%)  
 Melaka (3.1%)



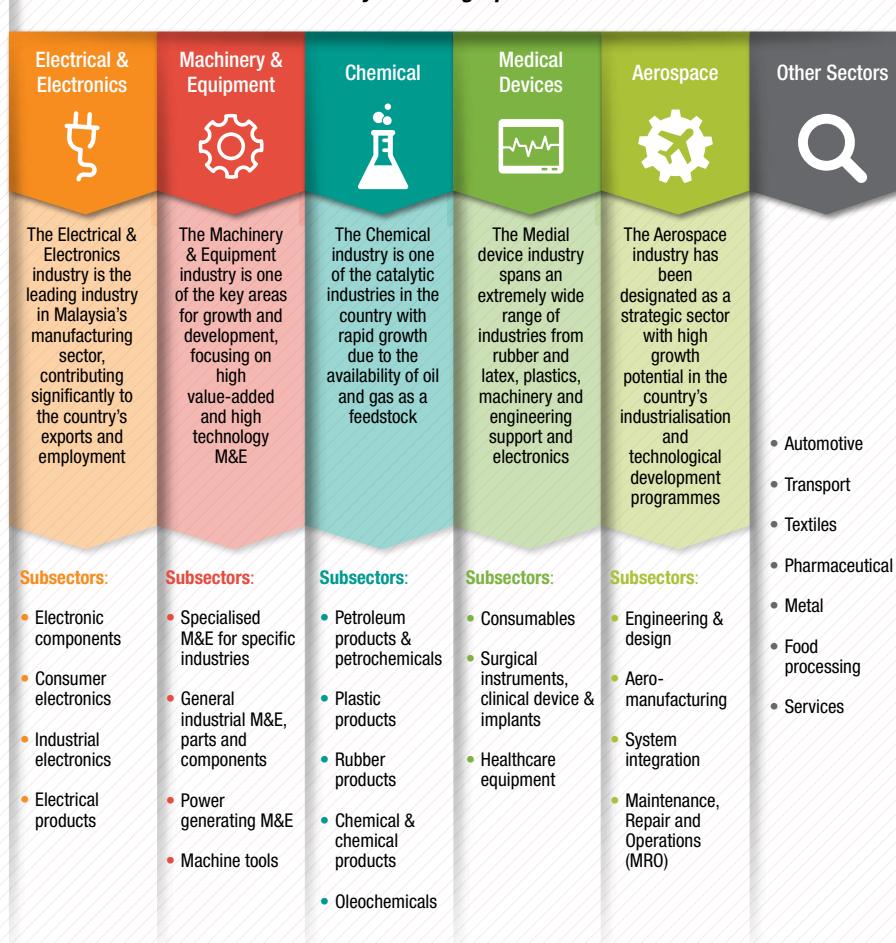
Source: Analysed by ASM, Economic Census 2016 Manufacturing Sector, Department of Statistics, Malaysia

## NUMBER OF EMPLOYMENT BY MANUFACTURING SUB-SECTOR, 2015

	Employees (persons)	% Share	Value Added (RM Billion)
Electrical, electronic and optical products	528,913	25.0	77.6
Petroleum, chemical, rubber and plastic products	376,084	17.8	68.7
Non-metallic mineral products, basic metal and fabricated metal products	331,643	15.6	34.3
Wood products, furniture, paper products and printing	298,437	14.1	27.8
Vegetable and animal oils and fats and food processing	256,908	12.1	22.1
Transport equipment, other manufacturing and repair	207,959	9.8	17.2
Textiles, wearing apparel and leather products	102,243	4.8	5.0
Beverages and tobacco products	16,971	0.8	4.4
Number of employees	2,119,158	100	RM 257.1 billion

## FOCUS SECTORS OF INDUSTRY 4.0

### RMK11 catalytic and high-potential sectors



## CASE FOR ACTION



# NEED TO EMBRACE INDUSTRY 4.0

Despite its strong current position, the state of the manufacturing industry has been a case for concern in the last few years. Malaysia has moved away from being an investment destination for low cost labour manufacturing activities and is challenged by lower cost competitors from emerging economies and rapidly changing technologies.

In line with the global trends outlined before, three major factors are impacting the future of manufacturing in Malaysia and its competitive position, offering opportunities for growth, but also challenging its position:

- Global value chains and geographies of production are continuing to shift, especially as China and other Northeast Asian countries are relocating production to ASEAN. This is opening up new opportunities for Malaysia, though Malaysia will need to transform itself fast, as other countries in the region like Indonesia, Thailand and Vietnam are catching up.
- Quality of labour and higher productivity, not low labour cost will be the new source of competitive advantage. Although Malaysia's labour productivity has grown at 3 to 4% over the last few years, its relative global position and use of higher skilled labour has not moved forward: Malaysia's labour productivity was ranked only at 44th position in 2016, a position that has remained unchanged since 2009 where Malaysia was also ranked 44th. The relative share of highly skilled labour declined from [...]% in 2010 to 18% in 2017.
- New technologies are disrupting and fostering a technology-based model of production. Barriers of adoption have come down with key Industry 4.0 technologies maturing and cost declining. Application of technologies to improve efficiency and product quality are becoming the new normal, requiring Malaysian manufacturing firms to innovate and invest in new technologies to remain competitive.

As such, it is imperative for Malaysia to transform itself, at an accelerated pace, and embrace Industry 4.0 as a critical cornerstone to propel and sustain its future manufacturing competitiveness. Specific attention needs to be given to four overarching goals:

- Drive continuous growth in manufacturing GDP
  - Increase national productivity
  - Create higher skill employment opportunities
  - Raise innovation capabilities and competitiveness
  - This will require a new and comprehensive policy framework that guides the transformation, systematically addresses potential barriers, and fosters urgency and action across the industry and all other stakeholders.

SMEs stand to gain the most from the policy framework. The aim is to optimise the framework conditions and support structures accordingly, so that manufacturing SMEs will be able to meet the challenges of Industry 4.0 and take full advantages of the benefits and opportunities it presents.

# PROPELLING SMEs FORWARD

In Malaysia's transformation, particular attention needs to be paid to SMEs, as they account for the bulk of manufacturing companies (97%) and a major part of employment (42%).

While most of the large manufacturing firms are already anticipating the benefits and risks of adopting Industry 4.0 practices, Malaysian SMEs appear to be cautious in taking the leap. Most worryingly, despite the enormous economic potential of Industry 4.0, SMEs in the industry remain relatively unaware about it. There is a risk that Malaysian SMEs might be left behind.

Industry 4.0 has the potential to transform manufacturing SMEs in multiple ways: improving productivity, efficiency and cost; enhancing organisational, management and production capabilities; enabling better quality and quality monitoring; and developing innovators and producers of Industry 4.0 technologies.

The level of transformation required is, however, very substantial for SMEs. It will not just be about adopting industry 4.0 technologies, but also about changing business processes and operating models. For example, SMEs will need to collaborate and participate in broader production networks with other SMEs, large firms or multinational corporations. Digitalisation of the manufacturing system will be important to build direct links to end customers and produce innovative and customised products. Scale effects are also being redefined, as SMEs are making headways in many markets and outperform larger corporations due to their agility and adaptability. As such, manufacturing SMEs will need to learn how to deal with these disruptions, be more resilient, and embrace the rate of change as an opportunity.



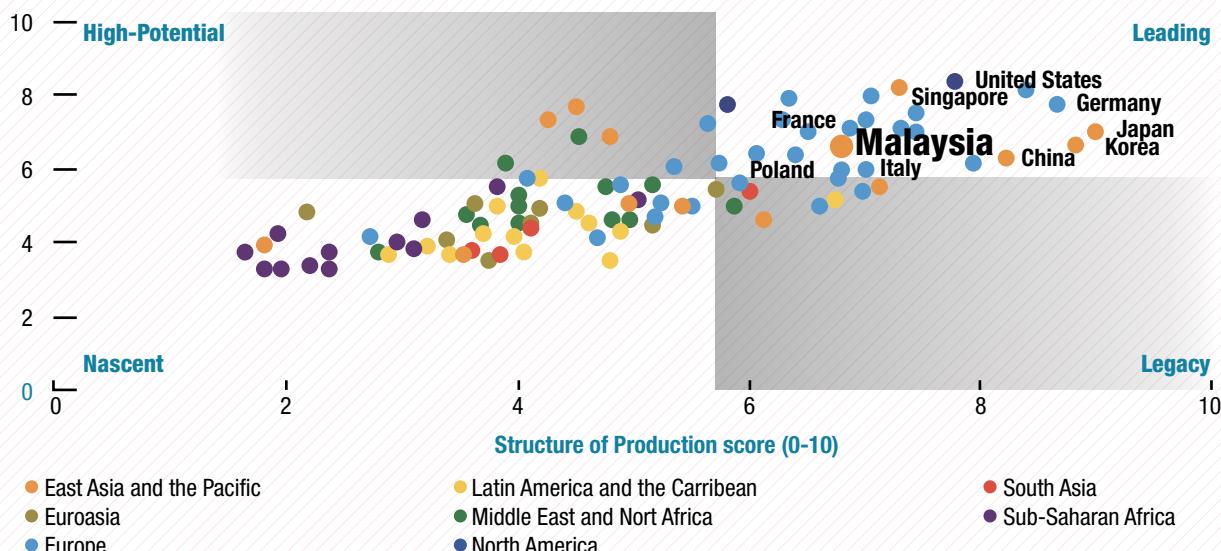
## CASE FOR ACTION

# MALAYSIA'S READINESS FOR INDUSTRY 4.0

A key question is how ready Malaysia is for Industry 4.0. The recent report on the Readiness for the Future of Production Report 2018, jointly published by the World Economic Forum (WEF) and A.T. Kearney, provides a global assessment of 100 countries and positions Malaysia in the “Leader” quadrant. These are countries with a “strong current production base” and who are “positioned well for the future”. It is also interesting to note that Malaysia and China are the only two countries in the “Leader” quadrant, who are not high-income countries.

This is both an enviable and a challenging position for Malaysia. On the one hand, it underscores Malaysia's strong current manufacturing position and its readiness for Industry 4.0. On the other hand, it also highlights the economic value at stake if Malaysia is not able to transform itself in an accelerated manner. The gap to global leaders like Japan, Korea, Germany, Switzerland and China is still significant and other regional countries like India, Indonesia, Singapore and Thailand have aggressive plans and are moving fast in their implementation.

### Drivers of production score (0-10)



**Note:** Average performance of the top 75 countries is at the intersection of the four quadrants.

**Source:** Readiness for the Future of Production Report, World Economic Forum, 2018

WEF's analysis identifies technology, human capital, global trade & networks, and institutional frameworks as key drivers of production for Industry 4.0. Malaysia's rankings in each of these drivers emphasises priorities in technology, human capital and institutional frameworks (21st to 30th position out of 100 countries), consistent with some of the challenges highlighted previously:



Technology adoption and diffusion are particularly important for SMEs and underscore the importance of creating production networks and collaborations with MNCs and large companies



Human capital focus is key to creating an accelerated shift in productivity, especially as Malaysia has been relying on low labour cost in the past, with a declining share of skilled labour

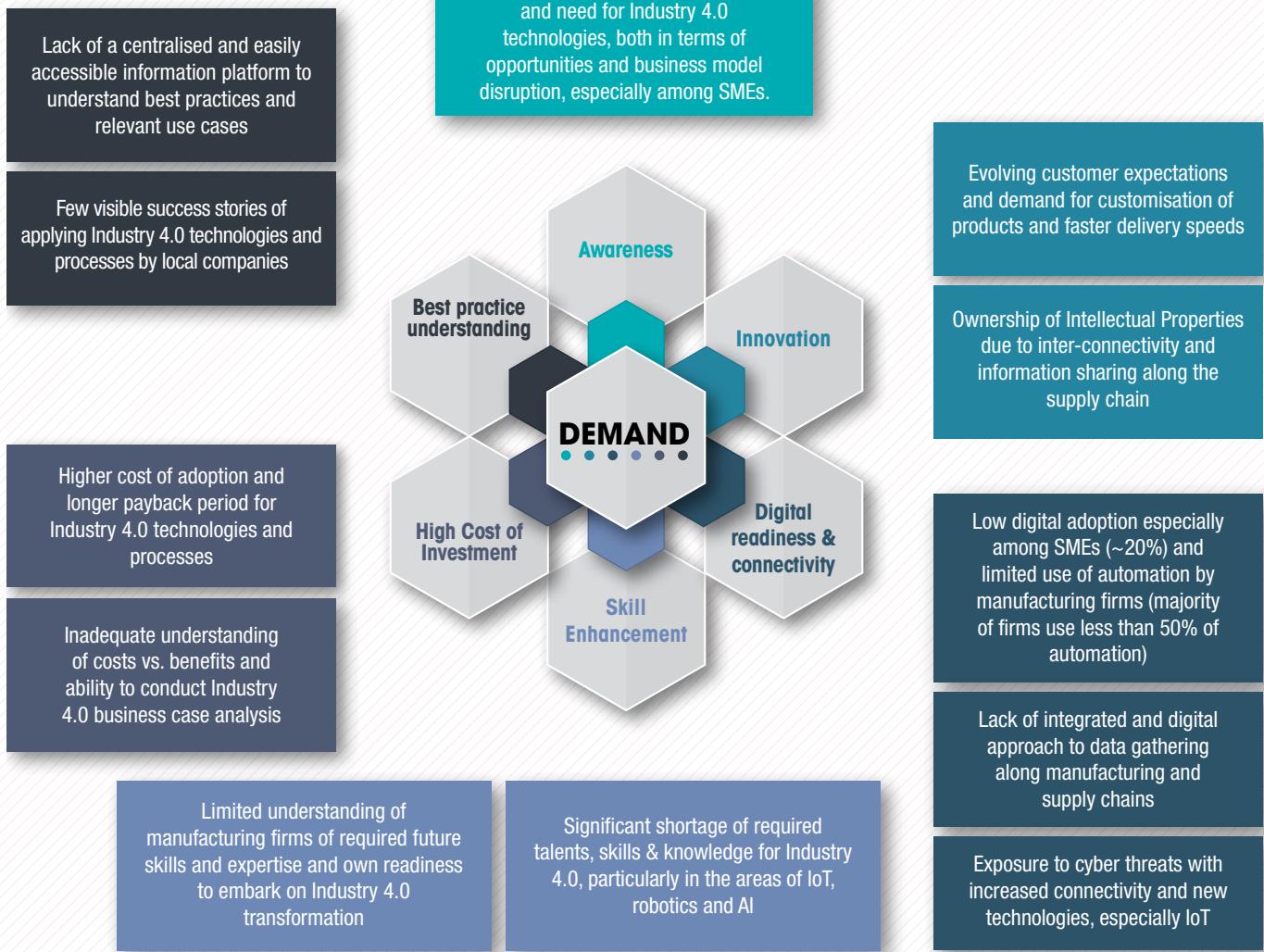


Strengthening institutional frameworks underpins the role of government in creating the right ecosystem and facilitating collaboration platforms



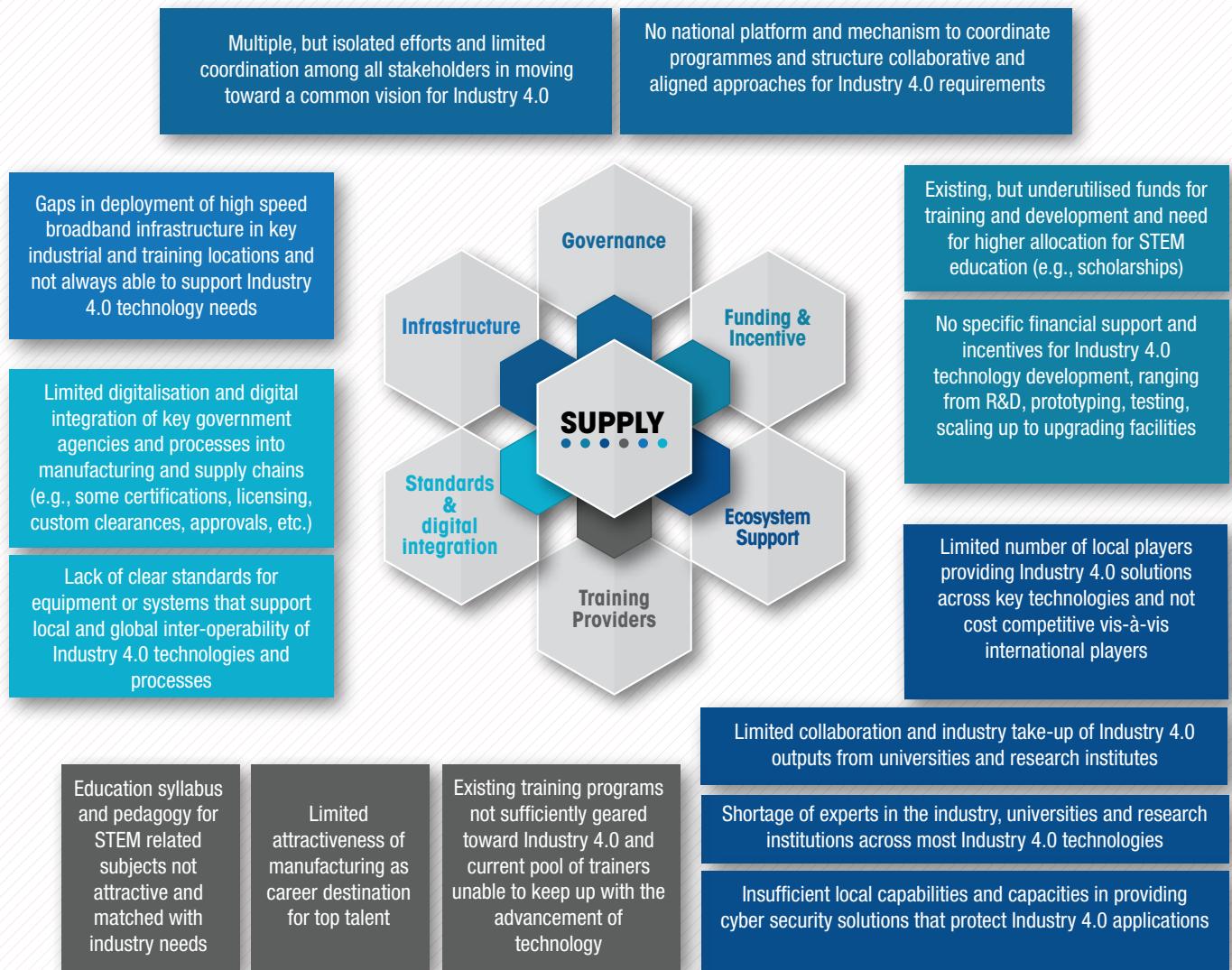
On global trade & investment, Malaysia is already well integrated into regional value chains and exhibits a very good trade infrastructure, which is reflected in its strong global ranking (7<sup>th</sup>).

## Addressing Malaysia's Issues & Challenges



To ensure the new policy comprehensively addresses potential issues and challenges faced by Malaysian manufacturing firms, a series of industry and government agency workshops were conducted, involving a broad range of stakeholders.

The issues are summarised in the following, both on the demand and on the supply side.



## CASE FOR ACTION



# MALAYSIA MOVING FORWARD...

From the stakeholder interactions and issue analyses, five themes emerge that drive the development of an end-to-end Industry 4.0 ecosystem in Malaysia. They have also been guiding the development of the new Industry 4.0 policy framework and the four key Industry 4.0 goals of GDP contribution, national productivity, higher skilled employment, and innovation capabilities.



**Upskilling and reskilling** existing and future labour pools need to be at the heart of Malaysia's transformation



**Inclusive involvement of SMEs** is critical to power a holistic step up in labour productivity across the economy



**Significant evolution in innovation** capabilities and collaboration platforms is essential to foster the development of and access to cost-effective technologies that address specific sector needs



**Focused funding support** is needed to kickstart the adoption and complement private sector investments



**Good digital infrastructure** is required to enable reliable and secure Industry 4.0 operations







# MOVING FORWARD

Policy Objectives

The National Framework – My-i4.0

Strategic Enablers & Actions

Implementation Approach

## MOVING FORWARD



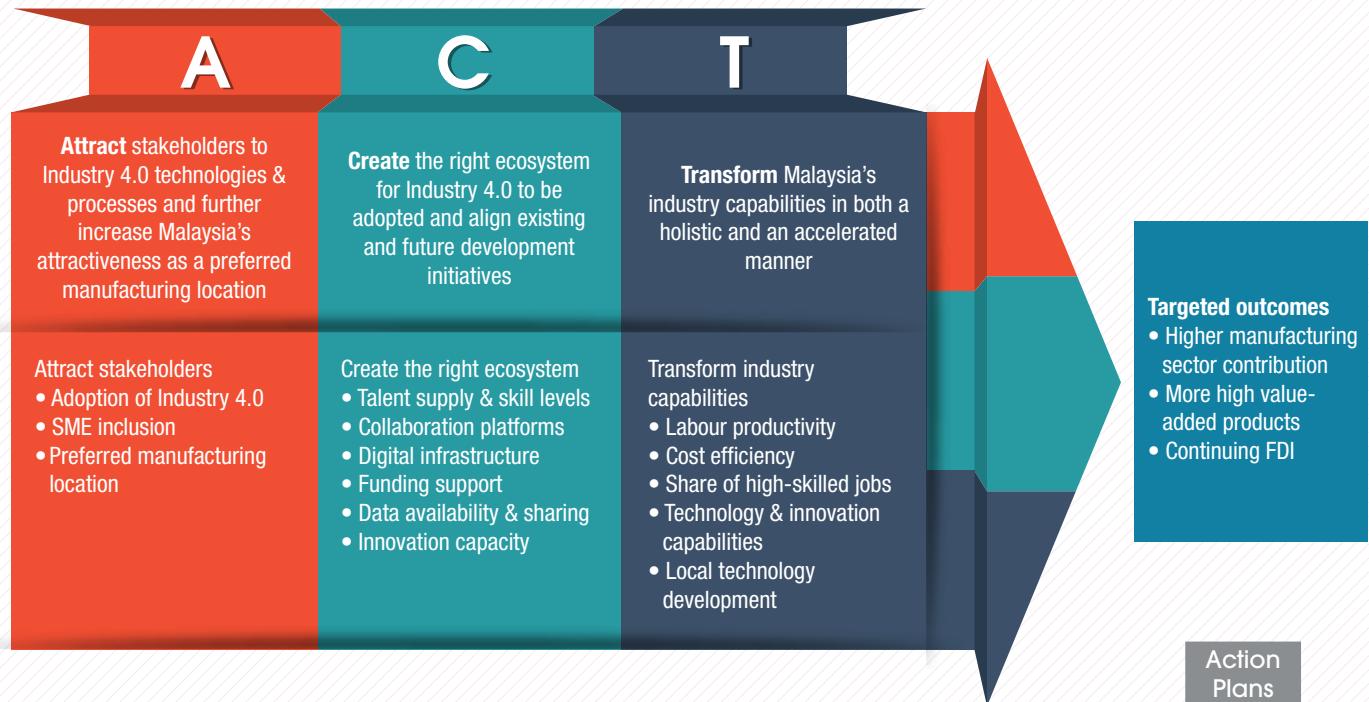
## POLICY OBJECTIVES

Already, a number of initiatives and organisations have been established at the national, state and regional level by both the Government and industry to develop plans and actions to strengthen various manufacturing industries. This support for and focus on manufacturing firms are important and create a strong platform. However, these programs have largely been developed independently and often have overlapping objectives and industry audiences.

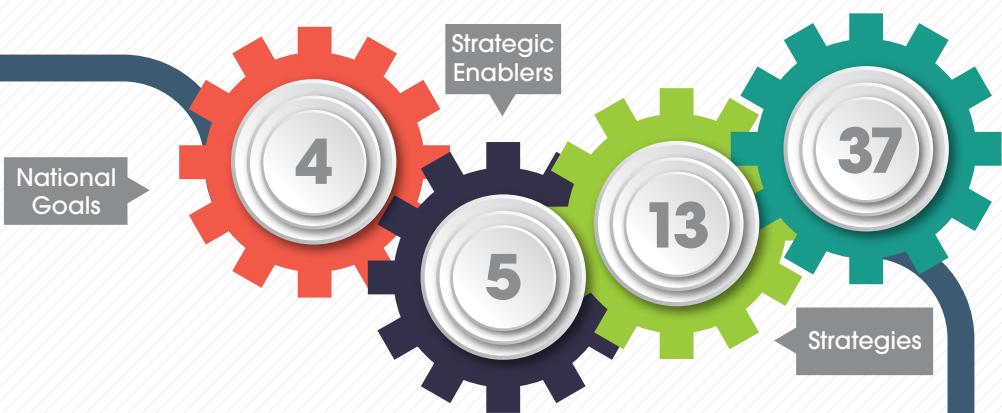
There is a need for a more streamlined and cohesive national agenda under which these initiatives and organisations can be integrated to accelerate Malaysia's transformation into a smart and modern manufacturing system. This will also include the need for a greater alignment across government, research and academia regarding priority industries, specific goals, enabling actions, and their funding. Countries like Germany and Japan provide examples of best practices where government, research and academia are tightly integrated with the manufacturing industry through collaborative Public Private Partnerships (PPP) that develop innovative solutions for specific industry needs.

With this in mind, Malaysia has put in place the National Industry 4.0 Policy Framework – My-i4.0 – that provides a concerted and comprehensive transformation agenda for the manufacturing sector.

## THE OBJECTIVES OF THE INDUSTRY 4.0 POLICY ARE THREEFOLD – ACT:



### NATIONAL FRAMEWORK BY THE NUMBERS



# THE NATIONAL FRAMEWORK



**My-i4.0**



## The Vision

Malaysia's **vision** for the manufacturing sector in the next 10 years

**Strategic partner**  
for smart manufacturing & related services in Asia Pacific

Primary destination for high tech industry

Total solution provider for advanced technology



## The National Goals

Specific **goals** to guide and measure the progress of transformation

Labour Productivity Growth

Manufacturing Contribution to Economy

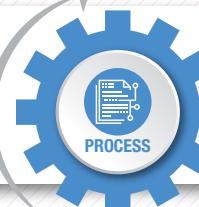
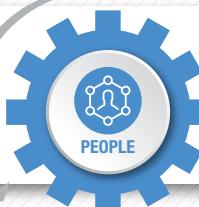
Innovation Capacity

High Skilled Jobs



## The Shift Factors

A set of **shift factors** that need to be optimised in a balanced manner



## The Enablers

Specific **enablers** that determine the strategies, policies and action plans





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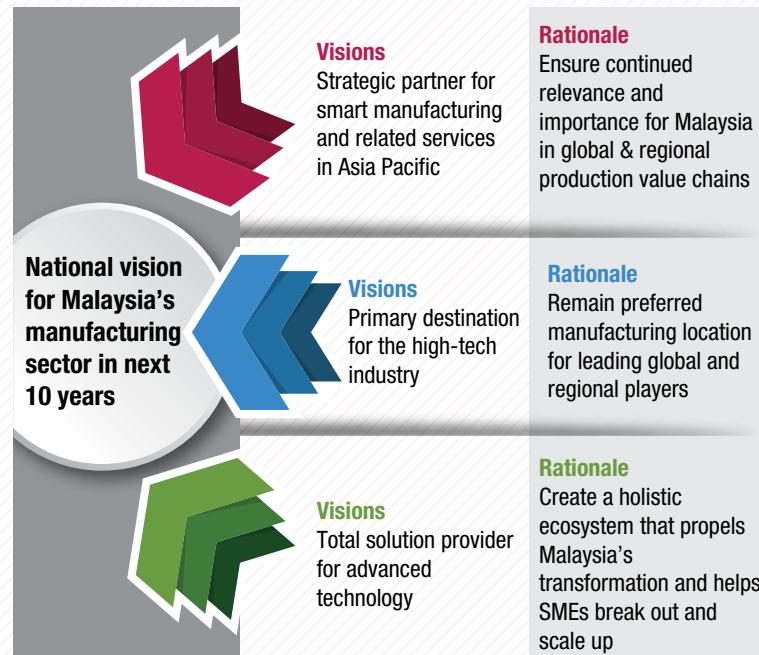
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# ENVISIONING THE FUTURE OF MALAYSIAN MANUFACTURING INDUSTRY

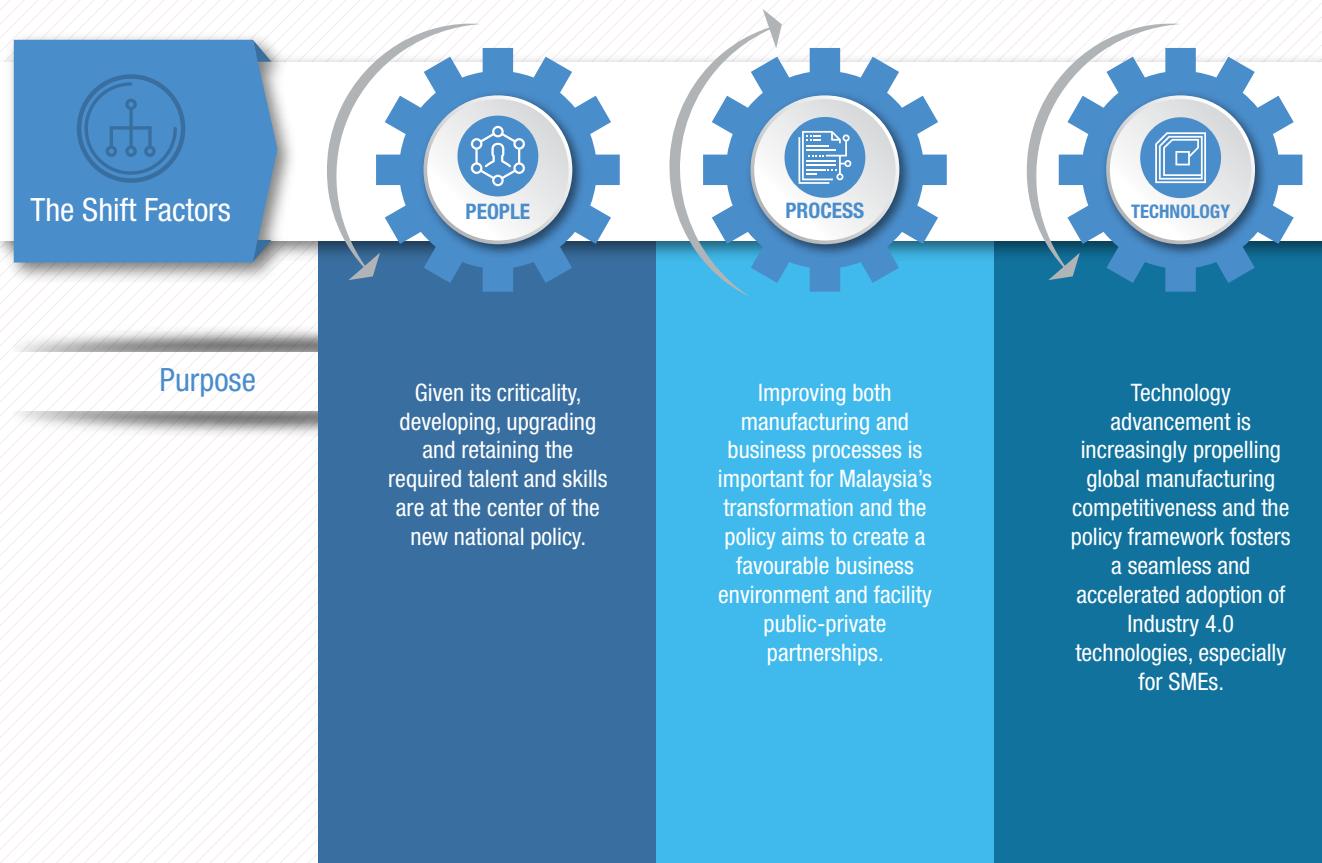
The development of these visions is made in full realisation that there is a need to transform the manufacturing industry to embrace Industry 4.0. This is due to the fact that global trends point towards the ability to master and adopt to the new technology development will which will then drive Malaysia towards greater competitiveness.



## MOVING FORWARD

# SHIFT FACTORS

Malaysia's transformation will require an approach and ecosystem that optimises and balances the relationships between people, processes and technology. Industry 4.0 adoption will only be as good as the processes that are implemented around it, and the processes are only as good as the people who execute them.



To bring the shift factor gears together and achieve optimal results, a well-coordinated orchestration and top-level driven implementation will be important.



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## MOVING FORWARD

# NATIONAL GOALS & TARGETS

The specific goals and targets are in support of the national vision for the transformation of the manufacturing industry. They guide and measure Malaysia's progress in improving productivity, strengthening the innovation capacity and capabilities, driving the shift to a higher skilled workforce, and expanding the overall contribution of the manufacturing sector to the national economy.

To increase the level of productivity in the manufacturing sector;

To elevate the contribution of the manufacturing sector to the economy;

To strengthen our innovation capacity and capability, reflected in the global innovation ranking; and

To increase the number of high-skilled workers employed in the manufacturing industry

**The targets for the goals are developed from the 2016 baseline figures:**

Productivity of the manufacturing industry per person

From **RM106,647**  
To increase by **30%**

Absolute contribution in Ringgit Malaysia (RM) term from the manufacturing sector to the national economy

From **RM 254** billion  
To **RM 392** billion

Global Innovation Index ranking

From **#35**  
To top **30** nations

Numbers of skilled workers employed in the manufacturing sector

From **18%**  
to **50%**



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# THE STRATEGIC ENABLERS



## The Strategic Enablers F.I.R.S.T



### Funding & Outcome - Based Incentives

The development and adoption of Industry 4.0 technologies and processes may require substantial investments by manufacturing firms. Questions will arise on what incentives and funding options are available by both Government agencies and private entities, especially for SMEs.

The funding strategies are aimed at encouraging companies to adopt new manufacturing technologies and processes and invest in R&D, specifically to develop local solutions targeted at Malaysia's needs and priorities. Special attention will be given to collaborative efforts in developing and deploying Industry 4.0 technologies.

To ensure progress and impact, the incentives will be linked to specific outcomes. These strategies are applicable to both manufacturing firms as the users and adopters and to service providers of Industry 4.0 technologies and solutions.



### Infrastructure

### Enabling Ecosystem & Efficient Digital Infrastructure

Fast and secure data connection is a basic requirement for the realisation of Industry 4.0. A good and reliable internet speed rate is needed for implementing internet-based production technologies or services, be it IoT solutions, use of augmented reality and wearables in production, or the evaluation of real-time data. Although Malaysia has deployed High Speed Broadband and 4G technologies on a wide-spread basis, there are still some gaps in key industrial and training locations.

A digitalised and connected infrastructure across supply and manufacturing value chains is critical to foster a seamless movement of goods, data and services, drive efficiency and resource optimisation, and support joint development efforts. Currently, a number of value chain elements are still not to be digitalised across many ministries and agencies, ranging from various approval, licensing, certification, to good clearance and other processes.

Service providers will play an essential role in helping Malaysian companies accelerate their transition to Industry 4.0, particularly in developing people, transforming processes and adopting technologies. As such, involving service providers and linking them to manufacturing firms, especially SMEs, is important to create a holistic and effective Industry 4.0 ecosystem.

**Regulations****Regulatory Framework & Industry Adoption**

Regulation is a key enabler of Malaysia's Industry 4.0 transformation. Special emphasis will need to be on increasing the awareness of the need and benefits of adopting Industry 4.0 technologies and processes. This is particularly important for SMEs who still have a limited understanding of digital and Industry 4.0 and often are concerned about the cost and level of change required.

Moreover, to foster an accelerated transformation, mechanisms will need to be put in place to help manufacturing firms understand their current capabilities and what it will take for them to transform and implement Industry 4.0 technologies and upgrade processes and skills.

Data integrity, security and analysis are another important area of focus to ensure seamless data flow across value chains. This will also help the Government understand priority issues across initiatives, ministries and agencies and, consequently, can chart effective programs and regulatory support.

**Skills & Talent****Upskilling Existing & Producing Future Talents**

Industry 4.0 is fundamentally reshaping the jobs landscape and will foster significant changes in how industrial worker perform their jobs. Entirely new jobs with very different skill requirements will be created, while others, especially manual tasks, will become obsolete. The shifting employment landscape has significant implications for industry, education systems, and the Government.

A qualified and skilled workforce is indispensable for the introduction and adoption of Industry 4.0. The technical knowledge required is high, and will be primarily recruited from the STEM (science, technology, engineering, mathematics) subjects. However, for some years the number of STEM graduates has fallen below expectations.

There is an urgent need to create a skilled and diverse workforce, with high salary, both by up-skilling the existing labour pool and by attracting and developing future talent in the manufacturing sector. Particular attention also needs to be given to re-skilling and re-deploying lesser skilled workers to other sectors and activities.

**Technologies****Access to Smart Technologies & Standards**

Understanding of and access to advanced, cost-effective and interoperable Industry 4.0 technologies are at the core of unlocking the potential of Industry 4.0. At present, the majority of Malaysian manufacturing firms surveyed adopt less than 50% automation.

The experiences from other countries demonstrate the importance of digital/technology labs and collaborative platforms, especially public-private partnerships (PPP), in disseminating Industry 4.0 technologies and transferring knowledge. The Government aims to work with global and local industry majors to set up digital and Industry 4.0 demonstration and collaboration labs.

Moreover, standards compliance that fosters interoperability of systems, both nationally and internationally, is important to support seamless value chains, optimise resources, and improve productivity.

Finally, developing and commercialising new technologies and processes that address specific needs in priority sectors will be crucial to retain Malaysia's position as a preferred high tech and manufacturing hub and supply chain partner.

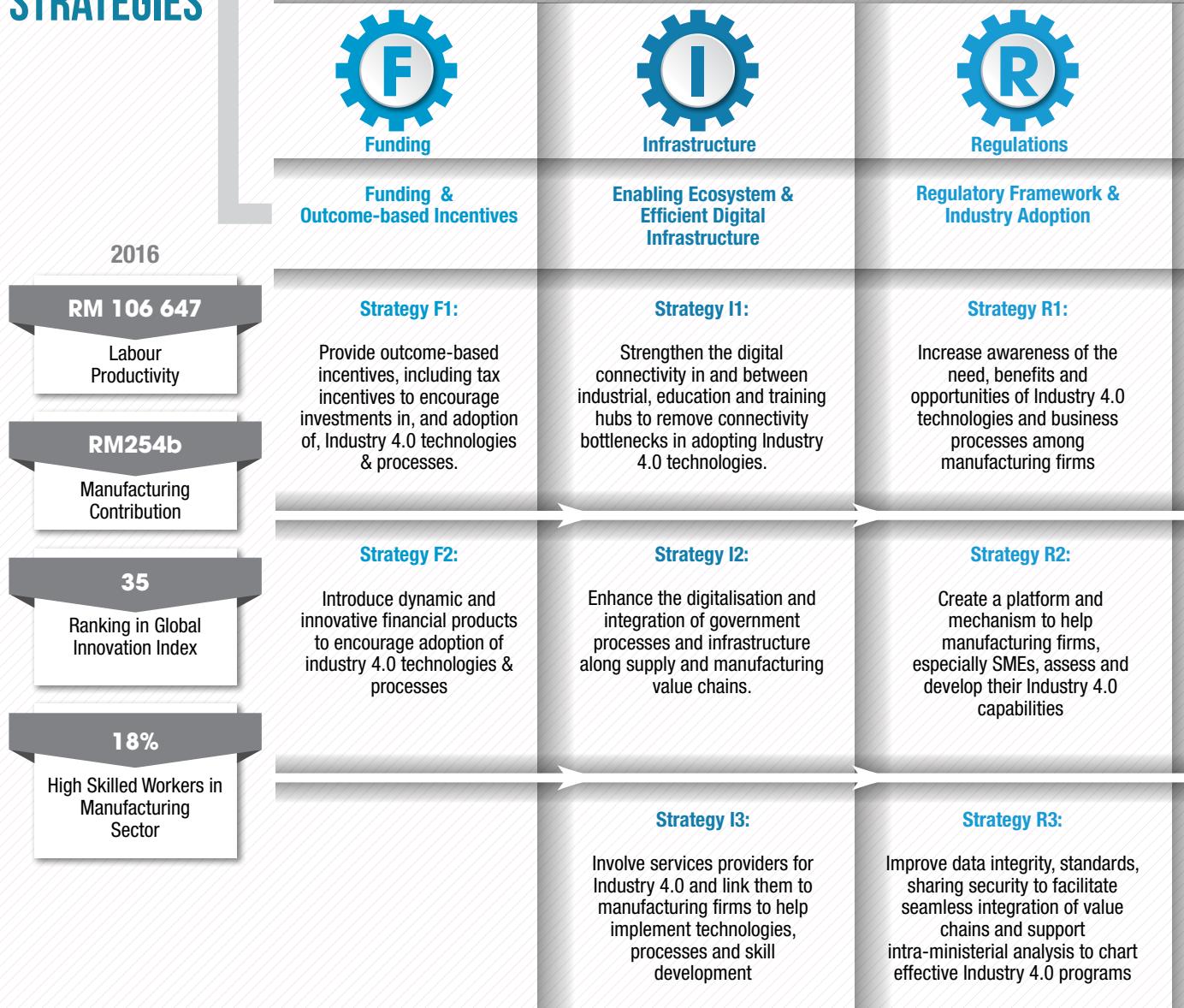
# THE NATIONAL STRATEGIES

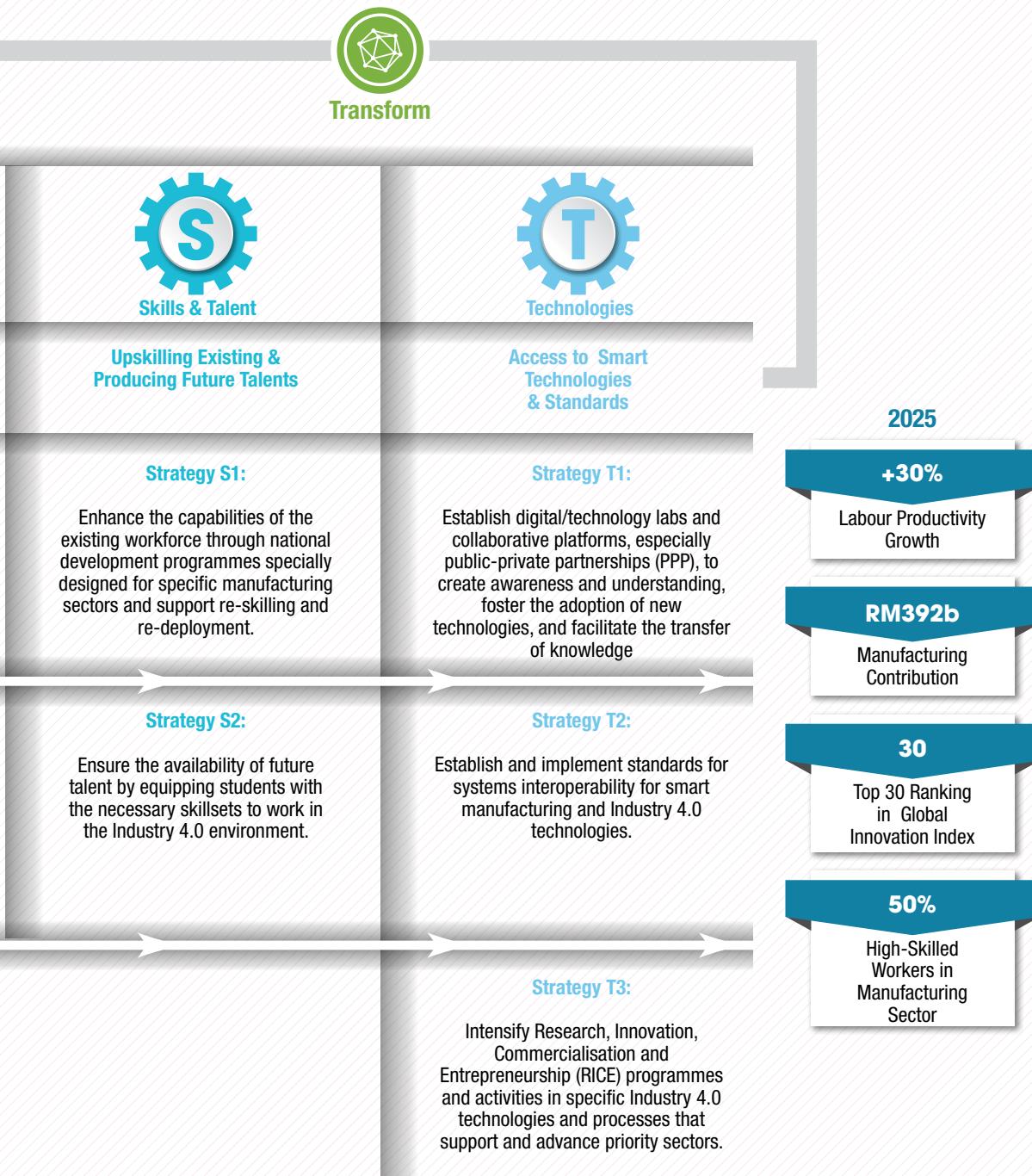


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## FUNDING & OUTCOME-BASED INCENTIVES



**Provide outcome-based incentives, including tax incentives to encourage investments in, and adoption of, Industry 4.0 technologies & processes.**

### RATIONALE

The Government aims to support industry transformation and develop local technology development by providing and aligning incentives with targeted outcomes to manufacturing firms and solution providers.

### STRATEGIC OUTCOMES

- ⚙️ Fiscal and non-fiscal incentives for local firms, SMEs and start-ups as well as multi-national corporations (MNCs) that deploy or develop Industry 4.0 technologies and processes.

### ACTION PLANS/PROGRAMMES

- ⚙️ To explore on realigning and leveraging incentive packages to encourage the adoption of Industry 4.0 among local firms, especially SMEs
- ⚙️ To explore on providing incentive packages to MNCs partnering with local firms, especially SMEs, to expedite the adoption and implementation of Industry 4.0



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## FUNDING & OUTCOME-BASED INCENTIVES



**F2**  
STRATEGY

**Introduce dynamic and innovative financial products to encourage adoption of industry 4.0 technologies & processes**

### RATIONALE

In fulfilling the needs of diverse and innovative businesses, the Government and private sector will spur the implementation of Industry 4.0 through dynamic and innovative funding options for local firms, SMEs and start-ups as well as multi-national corporations (MNCs).

### STRATEGIC OUTCOMES

- ➊ A suite of comprehensive financial products that local firms, SMEs and start-ups as well as multi-national corporations (MNCs) can leverage on in line with their needs in implementing and adopting Industry 4.0 technologies and processes, across all stages of business life-cycle
- ➋ Development funds for adoption, development or deployment of Industry 4.0 technologies and processes

### ACTION PLANS/PROGRAMMES

- ➊ To explore on creating Government-led development funds for Industry 4.0.
- ➋ To create awareness among local firms on the availability of various financing options to expedite the adoption and implementation of Industry 4.0 and encourage hybrid purchase or service arrangement for B2B in their financing agreements.
- ➌ To explore on aligning existing alternative financing including venture capital, crowd funding and other intermediaries to expedite the adoption and implementation of Industry 4.0.

## ENABLING ECOSYSTEMS & EFFICIENT DIGITAL INFRASTRUCTURE



**Strengthen the digital connectivity in and between industrial, education and training hubs to remove connectivity bottlenecks in adopting Industry 4.0 technologies.**

### RATIONALE

Fast and secure data connection is a basic requirement for the realisation of Industry 4.0 technologies and services. Malaysia already has deployed High Speed Broadband and 4G technologies on a wide-spread basis, but there are still some gaps in key industrial and training locations that could impact the adoption and development of Industry 4.0 technologies and processes.

The strategy aims to systematically address and remove key connectivity bottlenecks in priority locations.

### STRATEGIC OUTCOMES

- Ensuring high speed and reliable connectivity for industrial, education and training hubs
- Enabling adoption of digital and Industry 4.0 technologies and processes among manufacturing firms and related service providers

### ACTION PLANS/PROGRAMMES

- To prioritise and expedite the implementation of High Speed Broadband (HSBB) at key industrial areas and training centres
- To encourage the deployment of converged networks that are essential for Industry 4.0 technologies, especially IoT

## ENABLING ECOSYSTEMS & EFFICIENT DIGITAL INFRASTRUCTURE



**Enhance the digitalisation and integration of government processes and infrastructure along supply and manufacturing value chains.**

### RATIONALE

Digitalising and integrating government processes and infrastructure elements along value chains will be key to enable secure data flows, assure seamless goods movements, and drive improvements in efficiency and productivity.

A number of government processes are not yet digitalised and will need to be optimised, digitalised and integrated to support Malaysia's Industry 4.0 transformation. These include certain approval, licensing, certification, good clearance and other processes.

### STRATEGIC OUTCOMES

- ➊ End-to-end digitalisation of government processes along the manufacturing and supply industry value chains
- ➋ Seamless movement of goods and services between manufacturers, suppliers and supporting agencies with improved visibility and optimised resourcing

### ACTION PLANS/PROGRAMMES

- ➊ To assess priority government-related processes and elements that impact manufacturing and supply chains and Industry 4.0 transformation
- ➋ To support the accelerated digitalisation and integration of these processes, led by the respective government agencies

## ENABLING ECOSYSTEMS & EFFICIENT DIGITAL INFRASTRUCTURE



**Involve services providers for Industry 4.0 and link them to manufacturing firms to help implement technologies, processes and skill development.**

### RATIONALE

Services related to Industry 4.0 are an important element to help Malaysian companies accelerate their transition to Industry 4.0, especially in developing people, transforming processes and adopting technologies. Hence, Industry 4.0 service providers need to be involved as an integral part of the ecosystem and be connected to manufacturing firms, especially SMEs, who often have limited visibility.

### STRATEGIC OUTCOMES

- ➊ End-to-end ecosystem support and service provider visibility for manufacturing firms
- ➋ Improved performance of services providers in helping manufacturing firms adopt and transform to Industry 4.

### ACTION PLANS/PROGRAMMES

- ➊ To develop and disseminate a catalogue of service providers
- ➋ To link service providers to manufacturing firms and SMEs through collaboration platforms



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## REGULATORY FRAMEWORK & INDUSTRY ADOPTION



**Increase awareness of the need, benefits and opportunities of Industry 4.0 technologies and business processes among manufacturing firms**

### RATIONALE

Lack of awareness of digital and Industry 4.0 is one of the main issues and barriers to embark on the smart manufacturing transformation.

A greater understanding of Industry 4.0 is crucial for manufacturing firms to make informed decisions on investments, especially on assessing impact, determining cost and benefits of automation, and capitalising on data. Structured awareness programs are needed to educate and promote the understanding and need for action to local firms and particularly SMEs.

### STRATEGIC OUTCOMES

- Increased understanding of the need, benefits and opportunities of Industry 4.0
- More manufacturing firms adopting Industry 4.0 technologies and processes

### ACTION PLANS/PROGRAMMES

- To undertake a comprehensive Industry 4.0 awareness programme across all stakeholders with particular focus on SMEs
- To create a regulatory sandbox that enables firms to manage regulatory risks during the testing stage.



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## REGULATORY FRAMEWORK & INDUSTRY ADOPTION



The graphic features a large blue gear on the left containing a white circle with the letters 'R2' and the word 'STRATEGY' below it. To the right of the gear is a blue rounded rectangle containing text. Above the rectangle is a white button-like shape.

**Create a platform and mechanism to help manufacturing firms, especially SMEs, assess and develop their Industry 4.0 capabilities**

**RATIONALE**

For many companies, Industry 4.0 will be a major transformation, not only by investing in technology, but also by changing business processes and culture. The experiences of other countries show that assessment tools and platforms for learning and best practice sharing help companies, especially SMEs, pinpoint priorities of not only what to address, but also how to transform. Implementing this strategy will require a close collaboration with the different industry associations to ensure focus on the right sector priorities. This strategy will also help the Government assess better the broader needs, challenges and priorities of Malaysian manufacturing firms.

**STRATEGIC OUTCOMES**

- ➊ Better understanding among manufacturing firms of best practices, their own capabilities and transformation requirements
- ➋ Profile of the state of readiness of the local manufacturing industry in adopting Industry 4.0 for targeted technology improvement and support prioritisation

### ACTION PLANS/PROGRAMMES

- ➊ To create tools and processes to help manufacturing firms assess their capabilities and readiness to adopt Industry 4.0 technologies and processes
- ➋ To establish a national Conformity & Industrial Assessment as a platform for conducting this assessment, sharing global and local best practices, supporting the development of local firms, and identifying national Industry 4.0 priorities
- ➌ To establish collaborative programs with other countries that are leading the Industry 4.0 transformation to share best practices and help guide Malaysia's programmes for optimal impact

## REGULATORY FRAMEWORK & INDUSTRY ADOPTION



**Improve data integrity, standards, sharing security to facilitate seamless integration of value chains and support intra-ministerial analysis to chart effective Industry 4.0 programs**

### RATIONALE

A significant barrier to enabling seamless digital flows along manufacturing and supply chains is the lack of standards, inter-operability and governance for both data and intellectual properties.

Issues with data integrity and inter-operability can also affect intra-ministerial coordination and effective analysis in identifying program and regulatory priorities.

This will require both the development of standards and security protocols and integration especially across government ministries and agencies.

This strategy supports strategy I2, the digitalisation and integration of government processes into manufacturing supply chains.

### STRATEGIC OUTCOMES

- ➊ Integrated, standardised, secure and trusted data ecosystem that enables seamless data flows throughout major manufacturing and supply chains
- ➋ Better understanding and analysis of priority issues across initiatives, ministries and agencies, driving more effective programs and regulatory support

### ACTION PLANS/PROGRAMMES

- ➊ To identify and implement effective and streamlined, standardised data, regulation and compliance protocols within and between government ministries and agencies
- ➋ To collaborate with businesses to ensure suitable standards are in place for privacy of data, including appropriate handling, ownership and storage
- ➌ To create a manufacturing industry data depository that will enable sharing and analyses across all government ministries and agencies
- ➍ To establish a set of cybersecurity and IoT security guidelines for Industry 4.0 as part of Malaysia's broader development of cybersecurity capabilities



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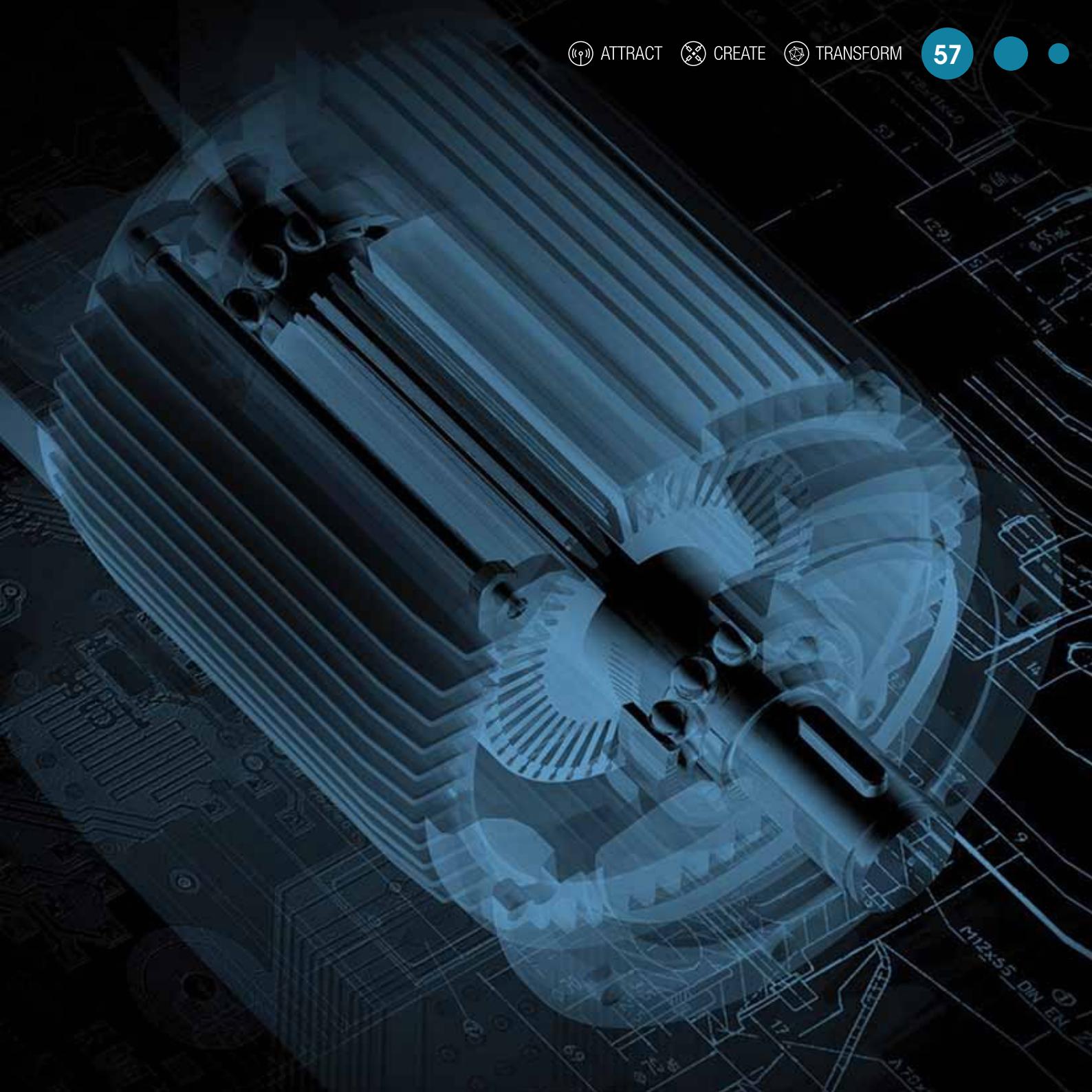


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## UPSKILLING EXISTING & PRODUCING FUTURE TALENTS



**S1**  
STRATEGY

**Enhance the capabilities of the existing workforce through national development programmes specially designed for specific manufacturing sectors and support re-skilling and re-deployment.**

### RATIONALE

The transition to smart manufacturing business models, technologies and processes is rapidly changing the required skillsets for the existing workforce. Many firms, especially SMEs, will require more structured and up-to-date training and skill development avenues for developing and maintaining world-class practices and capabilities within their workforce, including experts with advanced Industry 4.0 knowledge.

This strategy aims to both upskill the existing workforce and mitigate the potential impact on jobs.

### STRATEGIC OUTCOMES

- Increase in overall labour productivity due to upskilling and reskilling of the existing workforce
- Increase in number of high-skilled and multi-skilled workers with high wages in the manufacturing industry
- Mitigation of the number of potential job losses as a result of automation and technology adoption

### ACTION PLANS/PROGRAMMES

- To create an Industry 4.0 Talent Competency & Technology Mentoring Programme to drive broader workforce development initiatives in line with specific sector requirements
- To establish an Expert Certification Programme in Industry 4.0 areas
- To develop tailored training courses for the re-skilling of transitioning employees
- To enhance classroom programs for rapid upskilling programs by using augmented or virtual reality (AR/VR)
- To enable the availability of data on Industry 4.0 talent and labour pools for the government, academia and industry (in order to chart future action plans)

## UPSKILLING EXISTING & PRODUCING FUTURE TALENTS



**Ensure the availability of future talent by equipping students with the necessary skillsets to work in the Industry 4.0 environment.**

### RATIONALE

Ensuring the pipeline of future talents in the manufacturing sector is important as advances in manufacturing techniques and processes require a higher skilled and educated workforce.

The focus on technical vocational education & training (TVET) and STEM (science, technology, engineering, mathematics) education will be of priority as this will ensure a continuous supply of highly qualified talent.

There is also a need to raise the profile of the high technology manufacturing industry and firms as attractive work and career places and employers of choice. This will be key to attract more students to STEM subjects.

### STRATEGIC OUTCOMES

- ➊ Continuous availability of Industry 4.0 talents for the manufacturing industry
- ➋ Graduates equipped with relevant and practical Industry 4.0 skills
- ➌ Increased number of TVET & STEM students
- ➍ Increased industry-academia collaboration

### ACTION PLANS/PROGRAMMES

- ➊ To boost support for TVET & STEM education programmes, in part by increasing funding for vocational education and training programmes
- ➋ To integrate theory and practical Industry 4.0 applications into tertiary education curricula, including structuring industry placement opportunities
- ➌ To promote manufacturing as a preferred destination for high-skilled jobs to overcome public perception issues and attract both skilled labour and university graduates
- ➍ To enhance and increase the capacity and capabilities of educators, trainers and instructors in the manufacturing related education sectors

## ACCESS TO SMART TECHNOLOGIES & STANDARDS



**Establish digital/technology labs and collaborative platforms, especially public-private partnerships (PPP), to create awareness and understanding, foster the adoption of new technologies, and facilitate the transfer of knowledge.**

### RATIONALE

Digital/technology labs by manufacturing leaders create showcases for local companies, especially SMEs, to understand available and best-in-class technologies, practical use cases, and engage in collaborative deployment efforts. Public-private partnerships (PPP) are proven concepts to help expedite the adoption of new technologies in priority areas. The Government intends to work with local and global leaders to establish more digital & technology labs and collaboration platforms through PPP arrangements.

### STRATEGIC OUTCOMES

- ➊ Access for local companies, especially SMEs, to key enabling Industry 4.0 technologies and partners
- ➋ Stronger collaboration in deploying new technologies across value chains
- ➌ Public-private partnership platforms for industry, academia, government and other stakeholders to work for a targeted outcome in Industry 4.0

### ACTION PLANS/PROGRAMMES

- ➊ To support leading global and local industry leaders to establish digital/technology labs that showcase the potential applications, benefits and proof of concept of new technologies for industry adoption
- ➋ To create public-private partnerships and collaborative programs for manufacturing activities that foster digital adoption, collaborative deployment and development of local capabilities, especially in priority sectors and technologies
- ➌ To provide SMEs and local firms with open access to smart manufacturing research, tools and technologies and help them understand what can be applied in the early stages of adoption



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## ACCESS TO SMART TECHNOLOGIES & STANDARDS



T2  
STRATEGY

**Establish and implement standards for systems interoperability for smart manufacturing and Industry 4.0 technologies.**

### RATIONALE

Standards and interoperability of systems are important to facilitate a wide-spread adoption of Industry 4.0 technologies and processes, especially given the need for collaboration and integration along manufacturing and supply chains. These standards need to be understood, well documented, and allow Malaysian-based manufacturing firms to integrate both within local and global production networks and supply chains.

### STRATEGIC OUTCOMES

- ➊ Standardisation for interoperability of Industry 4.0 technologies and processes
- ➋ Seamless integration and interoperability in local and global manufacturing and supply value chains

### ACTION PLANS/PROGRAMMES

- ➊ To establish an inventory of Industry 4.0 related standards – consolidate, develop, harmonise, align with global standards, and enact
- ➋ To address interoperability barriers by implementing appropriate and advanced industry standards, in close consultation with the industry

## ACCESS TO SMART TECHNOLOGIES & STANDARDS



**Intensify Research, Innovation, Commercialisation and Entrepreneurship (RICE) programmes and activities in specific Industry 4.0 technologies and processes that support and advance priority sectors.**

### RATIONALE

Growth opportunities in the manufacturing sector will need to be supported by technological innovation from both private and public research communities. Sustained growth in the manufacturing sector will require proactive investments in advancing and enabling Industry 4.0 technologies and processes.

A further step up in Malaysia's innovation capabilities will be important to propel priority sectors and technologies and reinforce Malaysia's position as preferred high-tech manufacturing destination.

### STRATEGIC OUTCOMES

- ➊ Increase in capacity and capability of Malaysian firms, start-ups, universities and research institutes in Industry 4.0 technologies
- ➋ Production and commercialisation of high value and innovative products and services
- ➌ Position as primary destination for the high-tech industry

### ACTION PLANS/PROGRAMMES

- ➊ To prioritise technology development programmes on Industry 4.0 that strengthen the overall research, innovation, commercialisation and entrepreneurship capacity and provide solutions for priority sectors
- ➋ To improve understanding by and access for manufacturing firms of existing Industry 4.0 research facilities and ongoing research and development
- ➌ To create technology development and experimentation labs for collaborative Industry 4.0 technology and solution development



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# IMPLEMENTATION APPROACH

The strategies and actions plan outlined in the previous pages require a collaborative effort across multiple stakeholders and organizations. To accelerate or improve the intended outcome of these actions, a number of factors must be taken into consideration to identify the most efficient and effective implementation approach. This includes but not limited to:

## Multi-ministries jurisdictions

The strategies and action plans in this policy framework is a systemic solution for the manufacturing industry and its associated services.



## Not a one stop solution

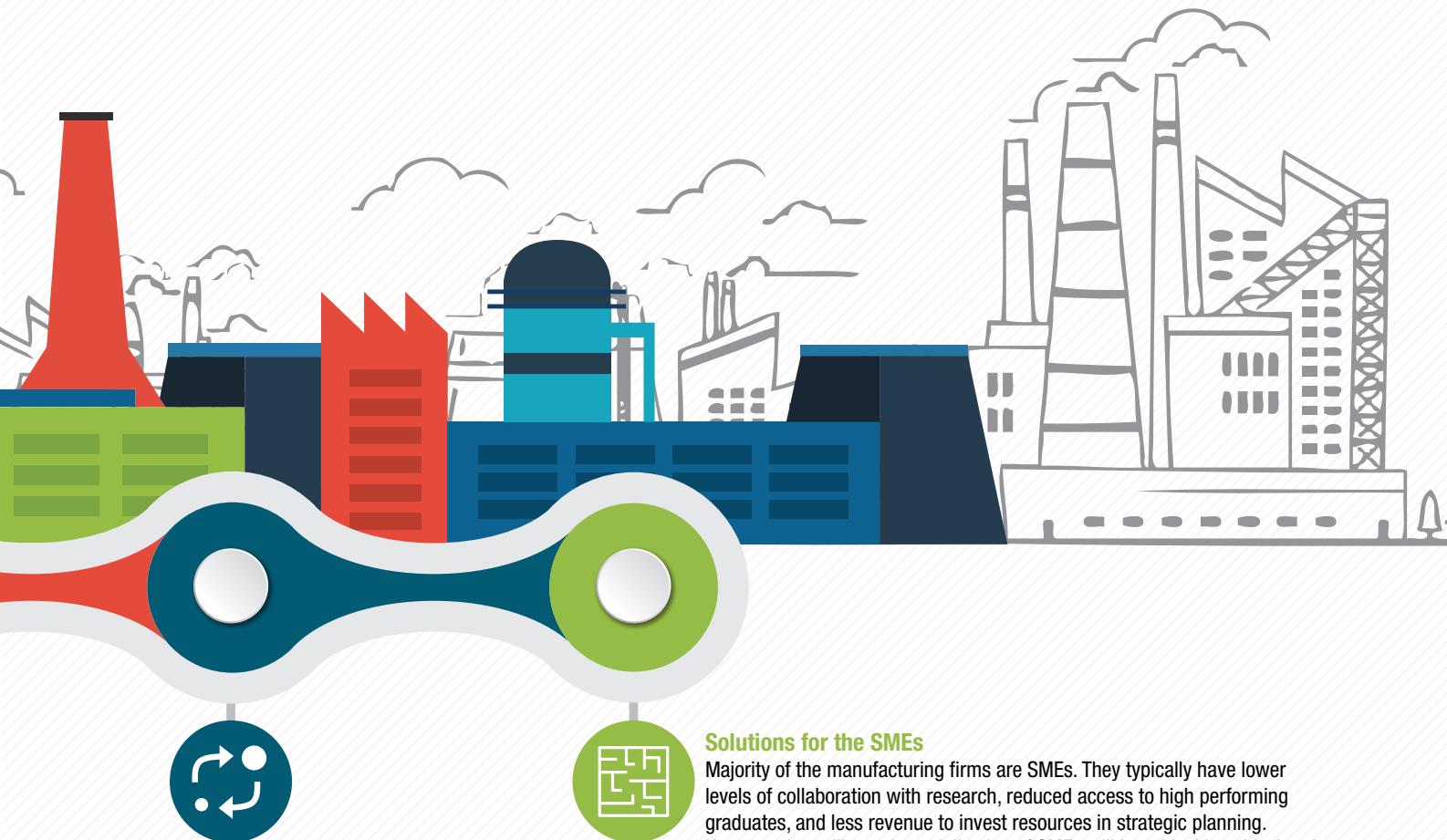
Although all efforts have been taken to incorporate all possible interventions, this policy framework is not a solution to all.



## One size fits all – breadth and depth

This documents provides broad strategies and action plans. It is premised upon the principle that each sector within the manufacturing industry has different level of readiness in embracing and adopting to Industry 4.0. Further work is required to customise these recommendations for each sector depending on their needs and priorities.





### Differentiating circumstances

In recognising the best practices among manufacturing ecosystems such as Germany and Japan, it is acknowledged that the needs and the driving factors of these countries are very much different from Malaysia's. An exact replication of their successful systems would not work that well in Malaysia's context due to these differences. As such, each manufacturing sector needs to consider which elements of these international benchmarks could be adopted.

### Solutions for the SMEs

Majority of the manufacturing firms are SMEs. They typically have lower levels of collaboration with research, reduced access to high performing graduates, and less revenue to invest resources in strategic planning. However the agility and specialisation of SMEs will be critical in achieving the 10-year vision for the manufacturing sector. In implementing the suggested actions, it is important to ensure solutions are valuable and accessible to SMEs, and that the research community and larger businesses are greater incentivised to collaborate with SMEs.

Transforming Malaysia manufacturing sector is not a short-term process, with many industries having experienced significant challenges for decades. Regardless of the actions of the sector over the next few years, a supportive policy environment is required over the next decade to provide businesses with stability and allow them to execute these long-term strategies.

