

POLICY BRIEF

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## Improving Sectoral Productivity Using Industry Transformation Maps

Prepared by the Chandler Institute of Governance



### CONTENTS

Background	2
The process of developing ITMs in Singapore	8
Steps for Developing an ITM	11
Communication of ITMs	13
Example of ITMs for different sectors	17

### **Key Points**

- Productivity is key to growth. Many governments seek to design strategies and policies to improve their economic productivity
- To address the specialised challenges and needs of different economic sectors, Singapore has taken a customised approach, by developing Industrial Transformation Maps (ITMs) for each key sector or industry
- Each ITM focuses on a single sector, and integrates different restructuring initiatives and programmes to be undertaken by the government and companies
- Each ITM is developed in close consultation with industry and investors, as well as experts and unions. The ITMs identify specific focus areas, where interventions could have maximum benefit, rather than attempting to restructure the entire industry or sector

# Background

## Improving Productivity is Key for Sustained Economic Growth

Productivity growth is an important part of sustainable economic development. A firm or a worker raises its productivity when it is able to generate more value added per hour of work. At the level of the whole economy, productivity can also improve when less productive industries are replaced by more productive, higher value-added industries. More productive workers can also be paid a higher wage by their employers, since they are creating more value for their companies. Productivity growth therefore benefits the entire economy and country.

Because productivity is key to growth, governments have sought to design strategies and policies to improve the productivity of their economies. As a small and resource scarce country, Singapore needs to rely strongly on continued productivity growth to raise the living standards of its citizens in the long term. Education and human capital are key, to ensure that Singapore's residents can perform the jobs generated by diverse, knowledge- and innovation driven sectors.

The Singapore government adopts a multi-level approach to improving productivity. This ranges from training and skill development programmes for individual workers, to macro-level strategies like simplifying the tax system, as well as grants that promote innovation and the use of technology.

One key insight that has underpinned Singapore's productivity strategies since the 2000s is the recognition that the drivers of productivity growth vary between industries and sectors. For instance, the construction sector may be less productive due to a failure by companies to adopt or adapt to new technologies, while the food and beverage sector may be unproductive due to poor training and frequent jobhopping among the kitchen workforce. There is no "one size fits all" framework that can explain changes in the productivity of every industry.

Hence, improving sector-level productivity requires a customised approach. Policymakers need to think like entrepreneurs, to work with investors and businesses to understand the trends, challenges and opportunities that each sector faces. This will enable the government to design specific policies to support that sector.

To increase productivity, most governments and companies tend to focus on "whole economy" and worker training measures. Broad macro measures such as changes in taxes and regulations tend to be more within the control and purview of governments, and changes can be more easily implemented, compared to changing the organisational culture and practices of private companies.

Macro measures can also impact a large proportion of the economy, but this is a double edged sword, as they also tend to be more generic and less customised for the specific needs of different types of companies.

Workforce training is sometimes done by the private sector, but companies may not always provide sufficient training for their employees, and skills development may not be the top priority for businesses. Governments often try to improve productivity by subsidising or organising vocational and professional training for workers. Vocational and workforce training programmes are easily understood and executed by governments, and therefore have broader appeal compared to more abstract and complex policy measures.

Singapore uses macro level measures (such as the Productivity and Innovation Credit), as well as individual worker training programmes (such as SkillsFuture) to improve productivity. Beyond these policies, Singapore has also developed medium term, industry-specific plans to raise productivity in various sectors. These plans are called Industry Transformation Maps (ITMs).

## **Approaches to Productivity Improvement**

National	Healthcare, security, housing and social policy, immigration policies, international co-operation
Whole of Economy	Simplify tax system, remove excessive bureaucratic processes, Improve macroeconomic environment
Sector or Industry	Understand why there is low productivity, Tailor customized solutions for each sector
Firm or Company	Improve corporate processes, optimize organizational structure, Install better IT system and production equipment
Industrial Worker	Incentives, Training and Skill Development

### **Productivity Improvement Strategies**

Diagram I

Diagram I shows different levels where the government can support productivity growth. ITMs are considered sectoral measures, as highlighted in the red box. Sector-specific measures can be powerful if well designed, but governments need enough knowledge and data to propose good measures. They also need to work in close partnership with the private sector to learn about the challenges and trends in the industry, and to convince private firms to participate in the schemes and programmes.

Lastly, policymakers are usually hesitant to intervene at the firm level, as this would require direct government intervention in the business processes, organisational structure and management quality of the company. Many would see this as an excessively intrusive approach, and in any case governments may not understand enough about the operations of the companies to propose changes that have positive impact.

## Singapore's Industrial Policy Approach

Hong Kong and the USA are market driven economies with a tradition of allowing the private sector to operate freely with minimal restrictions. While some regulation is necessary to ensure public health and other standards are met, their governments do not play a major role in structuring and guiding the evolution of the economy.

In comparison, countries like Singapore believe that the government should play an active role in facilitating and supporting economic growth and transformation. Government policies are often designed to incentivise certain types of firms or corporate behaviour, and to encourage specific industrial sectors in growth areas to develop.

For instance in the 1960s, Singapore actively implemented industrial policies that fostered the growth of industries such as logistics, shipbuilding, tourism and electronics. Some of these initiatives resulted in the successful creation of industrial clusters where Singapore had no intrinsic competitive advantage. For instance, Singapore does not produce any crude oil, but has built up a multi-billion-dollar petrochemical and oil refining cluster that exports refined products and chemicals worldwide and creates a significant number of high-paying engineering and technical jobs for Singaporeans.

Active industrial policies are seen as controversial, with some experts believing that governments cannot know more or do better than the market, and others (like Harvard's Dani Rodrik) believing that sensible and balanced industrial policies can accelerate the process of economic transformation. The latter argue that left to its own, a country's economy may gradually develop and grow in sophistication over time, but good industrial policies can speed up this process and generate more value added and better jobs in a shorter period of time.

Well-designed industrial policies may also help companies within a sector develop more evenly, and avoid creating a "two speed" sector that is polarised into a highly efficient, globally competitive cluster of firms, and another group of firms that is lagging behind and unable to progress. For instance, Singapore's legal sector consists of a number of highly efficient, sophisticated global law firms that are proficient in the use of legal technology and systems. However, there is another cluster of small family law firms that is unable to keep up with changing industry needs and utilise legal software and technology. The latter group of firms is hence vulnerable to technological and policy changes, and if their firms are forced to close, their owners will find it difficult to find work in other sectors, because of their specialised legal skills.

## Productivity Growth Strategies in Singapore

In the 1960s and 1970s, Singapore's economy primarily depended on less capital and skill-intensive industries, and its workforce was relatively lower skilled compared to more advanced economies in Japan, Europe and the USA.

Under these circumstances, the Singapore Government introduced various broadbased economic development and productivity measures, such as mass education and training. These measures were largely generic and were not specially customised for any individual industry or sector.

However, this approach was no longer sufficient by the 2000s. By then, Singapore's economy had developed into a more knowledge- and technology-intensive mix of sectors, including biotechnology, aerospace, chemicals, business services and finance. These sectors were more specialised, and a generic approach would not have been able to meet the diverse needs of different sectors.

Furthermore, some older industries that had been in Singapore for decades, such as food manufacturing, retail and wholesale trade were suffering from low productivity levels compared to their counterparts in more advanced economies. On a broader level, Singapore also faced challenging external economic conditions, such as rising global competition and disruption from technological

changes. With Singapore's domestic land and manpower constraints, it was not realistic to sustain growth through the constant addition of more economic inputs such as workers or land.

To address these challenges and the needs of different industries, Singapore decided to take a customised approach and develop Industry Transformation Maps (ITMs) for key economic sectors.

### What are Industry Transformation Maps?

ITMs were first launched as part of a S\$4.5 billion (US\$ 3.1 billion) industry transformation package in the 2016 Budget. Singapore has developed 23 ITMs thus far (see diagram below), each focusing on a single major economic sector. Each ITM is an integrated roadmap to drive transformation in a specific industry.

An ITM first identifies the challenges, opportunities and needs of a sector. It then specifies measures to deepen collaboration between the government, trade association and chambers, unions and firms, to raise the productivity of that sector.

There are various lead agencies for the 23 industries. Each lead agency is responsible for the implementation of their respective ITM. Some lead agencies are responsible for more than one ITM (as seen in Diagram II).

In general, the lead agency is a government organisation whose mandate is related to that sector (for instance, the Singapore Tourism Board is the lead agency for the Hotel sector ITM).

## INDUSTRY TRANSFORMATION MAPS

	MANUFACTUING	
Sector	Lead Agency	Sector
Energy and Chemicals		Food Services
Precision Engineering		Rotail
Marine and Offshore	EDB (Economic Development Board)	
Aerospace		Food Manufacturing
Electronics		Hotel

	LIFESTYLE
Sector	Lead Agency
Food Services	
Retail	SPRING (Standard, Productivity and Innovation Board)
Food Manufacturing	
Hotal	STB (Singapore Tourism Board)



## PROFESSIONAL SERVICES



## ESSENTIAL DOMESTIC SERVICES

TRADE AND

Sector	Lead Agency
Professional Services	EDB (Economic Development Board)
ICT and Media	MCI (Ministry of Communications and Information)
Financial Services	MAS (Monetary Authority of Singapore)

Sector	Lead Agency
Healthcare	EDB (Economic Development Board)
Education(Early Childhood and Private Education)	MCI (Ministry of Communications and Information)



## BUILT ENVIRONMENT





To maximise synergy, the ITMs integrate different restructuring efforts which are undertaken by the companies as well as the government. This approach is necessary because the complex challenges in each sector require cross cutting solutions from multiple agencies and stakeholders working together. It is also more efficient to focus on strategies that will benefit a large number of firms in the sector.

It is not possible to develop ITMs for every sector in the economy. In general, ITMs were developed for sectors meeting the following criteria:

- Sectors with a high percentage of citizens in their workforce
- Sectors that account for a significant percentage of total GDP
- Sectors that that hire a significant percentage of the total national labour force
- Sectors where productivity growth or productivity levels have been lagging behind peer countries, and where there is potential for improvement

An example of a full ITM document is appended in Annex A.



### Who manages and oversees the ITMs?

The Future Economy Council (FEC) oversees the implementation of Singapore's economic transformation initiatives, including all the ITMs. It is a high-level tripartite body, chaired by Singapore's Deputy Prime Minister and Minister for Finance, and comprising members from the government, industry, unions, and educational and training institutions. Each ITM is endorsed by the FEC, prior to its implementation.

The Singapore Government allocates one specific government agency to take responsibility for implementation of each ITM. This ensures accountability and focus, so that companies in each sector know which government agency to approach. For instance, the Monetary Authority of Singapore (MAS) is tasked with implementing the Financial Services ITM, while the Civil Aviation Authority of Singapore (CAAS) in charge of implementing the Air Transport ITM. This ensures that each ITM is properly implemented, and the government agency is accountable for the ITM's progress.

The Council for Skills, Innovation and Productivity (CSIP) has set up six subcommittees on Manufacturing, Built Environment, Trade and Connectivity, Essential Domestic Services, Modern Services and Lifestyle. Each sub-committee will oversee a group of ITMs within the same broad cluster of industries. This helps with tracking progress and discussing issues that are relevant to a broader group of industries.

# The process of developing ITMs in Singapore

Each ITM has been developed through research and consultations with industry representatives, unions, universities and government agencies.

These consultations and research clarify the industry's challenges, needs and opportunities for improvement. The government then identifies targets and policies to support the industry, after feedback and comments on these proposals are sought from stakeholders and companies.

For example, the Precision Engineering (PE) ITM was designed and launched to support the growth and enhancement of the manufacturing sector. This ITM was prepared by the Singapore Economic Development Board (EDB) together with partners such as the National Robotics Programme (NRP), Agency of Science Technology and Research (A\*STAR), National Additive Manufacturing Innovation Cluster (NAMIC), International Enterprise Singapore and Skills Future Singapore (SSG). The relevant Trade Associations and Chambers comprising private firms and investors were also closely involved and consulted.

These consultations and collaboration with various organisations give the government a better understanding of the industry conditions and characteristics. In turn, this allows customised policies and measures to be developed, and specific target and goals to be agreed upon.

To implement the new initiatives of the PE ITM the EDB worked together with various organisations and agencies. Their respective roles and the value they brought to the process are summarised below.

### **Partners and Their Roles**

### Government and Government-Linked Bodies



Agency for Science, Technology and Research

National Robotics Programme (NRP)

To develop robotics technologies that can be applied to various industry verticals in addressing national challenges



Agency for Science, Technology and Research

Agency of Science Technology and **Research (A\*STAR)** 

Government science and technology agency that focuses on R&D and innovations. A\*STAR researchers collaborate closely with other public sector agencies, private companies and research communities



Singapore Standards Council (SSC)

International Enterprise Singapore

**International Enterprise Singapore** 

SKILLS Future SG

SkillsFuture Singapore (SSG)

Council that facilities the development, promotion and review of standards and technical references in Singapore

Government agency that supports enterprises and companies to develop their international presence and markets (this has now been merged into a new government agency called Enterprise Singapore)

A national skills movement that provides Singaporeans with support, financing and opportunities to develop new skills and knowledge through lifelong learning

### Professional and Corporate Bodies



Trade Associations and Chambers (TACs)

Associations of private companies that represent the interests and needs of business owners and employers. They play a key role in providing feedback on industry trends and needs, and are an essential partner in sectoral transformation



Singapore Precision Engineering & Technology Association (SPETA) An association that represents local companies dealing with the manufacturing and distribution of PE components, products, tools, equipment and machinery. SPETA also supports other industries e.g. aerospace, medical, automotive and semiconductors, and is supporting members in the adoption of advanced manufacturing technologies

#### Academic-Linked and Research Organisations



National Additive Manufacturing Innovation Cluster (NAMIC) Affiliated with the Nanyang Technological University, NAMIC acts as a connector between industry, research performers and public agencies. Its goal is to accelerate the research, progress, adoption and use of additive manufacturing technologies



# Steps for Developing an ITM

Each ITM is tailored to the needs of the industry. To develop ITMs the government will examine the following:

- Industry characteristics and challenges
- Future sector trends
- Barriers to productivity improvement
- Opportunities for the sector to improve, and support required from the government

### Identify focus areas for the sectors

Each ITM identifies areas of focus, where interventions would have maximum benefit, rather than attempting to restructure the entire industry or sector. For example, the Info-communications ITM identifies three priorities and areas of focus. These are specific to the sector, namely promoting a set of frontier infocomms technologies such as cybersecurity and artificial intelligence, training the next generation of infocomms professionals, and supporting other non-infocomms sectors to adopt more infocomms technologies.

The approach of identifying focus areas for each ITM enables resources and efforts to be more targeted, and operates on the principle that once key reforms are in place and the enablers and drivers are set in motion, there will be a multiplier effect on the rest of the economy.

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### Identify future sector trends and challenges

For each sector, the ITM then identifies upcoming industry developments as well as challenges faced by firms within the sector. For instance, the Retail Sector ITM predicts the vast growth in online sales, and the

prevalence of omni-channel marketing to promote products and services.

The challenge is that many Singapore SMEs do not have the capabilities to take advantage of these trends, due to lack of financing or know-how. The ITM therefore provides support and cost-sharing for SMEs to purchase high speed internet connections, and to design omni-channel marketing platforms. Each ITM will identify sector-specific challenges and opportunities. For instance, the Construction Sector ITM identifies the use of new lightweight and advanced modular building materials as an industry trend, and seeks to support local construction and building firms in the use of these materials and technologies.

## Identify barriers and focus areas opportunities for productivity improvement

Each ITM then develops a growth and competitiveness plan for the sector. This plan comprises policies and measures in the four areas below:



### Productivity

Supporting companies to move to higher value-added activities, raising operational efficiency and raising value added per worker hour



#### Jobs and Skills

Investing in people, and equipping them with deep skills to support greater value creation relatively small domestic market



### Innovation

Strategies to leverage R&D to develop new products and services and improve business processes and models



**Trade and Internationalisation** Support companies in expanding to overseas markets to support scaling up and growth, given Singapore's

# Communication of ITMs

Each ITM is sector specific and industry specific, there are in total six clusters and 23 industries. They are sophisticated platforms for the government to support and push for greater productivity growth.

Because the ITMs each contain multiple schemes, initiatives and policies, it may be difficult for firms to figure out how they can benefit from the ITM and how the ITM is relevant to their daily operations. It is crucial to communicate the reasons and benefits of ITMs simply and effectively, to convince companies and earn their support.

On a basic level, communication through standard methods such as speeches, media releases and webpages can be used. Beyond this, more accessible and creative methods such as infographics and videos can be more engaging for different audiences. An example of ITM infographics for the precision engineering industry is shown below. These infographics clearly list out the various focus areas and measures in the four pillars of transformation.



Videos can also be used to target a broader audience group. Below are two different types of videos that can communicate and persuade people of the value of the ITMs.

## Security ITM



### https://www.youtube.com/watch?v=FAJnbmJUFUk

This story concept video focusses on the reasons why an ITM for the Security sector is necessary, and how companies can be involved and benefit from the ITM measures. The video uses a cinematic narrative to convey its points. It also provides broad knowledge about the ITMs.

## Infocomms ITM



### https://www.youtube.com/watch?v=db1AGWS08-g

The infocomms ITM video is an extension of the ITM infographic. This video shows the thinking and process of implementing the ITM. The use of similar visual elements and infographics improves cohesiveness.

Finally, after launching the ITM, the government agency in charge will organise a series of workshops, briefings to Trade Associations and industry groups, public roadshows and meetings to discuss the ITM, its benefits, and what action is needed from the private sector to take full advantage of the measures.

# #1 Case Study

## Infocomms Media Industry Transformation Map

With the rapid pace of technological development, many emerging and advanced economies are focusing on how digital technology and info-communications sectors can contribute to economic growth.

In Singapore, the Infocomm Media Development Authority (IMDA) worked with private and people sector partners to develop an Infocomms Media ITM in 2017. The ITM looks at ways to help companies in the digital, infocomms and media industries to grow more quickly and improve their productivity. Beyond this, the ITM also looks at how to develop the infocomms sector as a resource, to help other sectors (like manufacturing, tourism and financial services) to grow.

The ITM sets a target for the InfoComm Media (ICM) sector to grow by 6 percent annually, which is almost twice as fast as the overall Singapore economy.

## Structure and Key Elements of the Infocomms Media ITM

Area of focus	Measures and Policies
<ul> <li>Investing and building capabilities in frontier technologies, namely:</li> <li>Artificial Intelligence</li> <li>Data Analytics</li> <li>Cybersecurity</li> <li>Immersive Media</li> <li>Internet of Things</li> </ul>	Initiatives will be launched to build capabilities in each of these technological domain areas, to strengthen the Infocomms sector as a whole For instance, IMDA will work with research and industry accelerator AI Singapore to develop the AI ecosystem, and harness the potential of AI to support growth and job creation
• Strengthening the Human Resources core of the Infocomms sector, by training the next generation of Infocomms professionals for future industry needs	IMDA will partner with private companies to develop training programmes to strengthen human resource skills and talent in the sector, and to prepare Singaporeans for a variety of infocomms roles in other sectors, domestically and internationally
Guiding companies and employees from other economic sectors on how to adopt digital technologies to improve their productivity and efficiency	The Infocomms sector is not just seen as a revenue or GDP generator for Singapore. It is also an enabling factor to support other industries and sectors to grow, since the use of infocomms technologies is ubiquitous in knowledge-driven industries IMDA will work with various sector lead agencies to develop the Industry Digital Plans (IDPs) for small and medium enterprises
	The IDPs aim to guide these companies in technology adoption by helping them to understand the benefits of adopting relevant digital technologies, and by providing guidance to infocomms vendors to meet the companies' specific digital technology needs

## **Annex A: Examples of ITMs for different sectors**

## FOOD SERVICES INDUSTRY TRANSFORMATION MAP

### FUTURE ECONOMY

The food services industry has been offering a multi-cultural blend of flavours to local and global consumers. As more home-grown F&B companies establish their brands abroad, the industry needs to become more productive without compromising the food quality.

#### VISION

To build a highly efficient industry that delivers quality food and provides better jobs.

PILLARS OF TRANSFORMATION



### Food Manufacturing ITM



### Air Transport ITM

### AIR TRANSPORT INDUSTRY TRANSFORMATION MAP

**FUTURE** ECONOMY

Many countries are working to be the air hub of choice. It cannot be business-as-usual for Singapore's air transport industry. From air cargo handling to maintenance, repair and overhaul services, it needs to continue to be bold and forward-looking to stay head.



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Please direct all queries to:

Chandler Institute of Governance 20 Collyer Quay #10-03 Singapore 049319



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