KEMENTERIAN SAINS, TEKNOLOGI DAN INOVASI
MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION

NATIONAL SCIENCE, TECHNOLOGY AND INNOVATION POLICY 2021-2030

Technology Driving the Nation's Future

CONTENT

Foreword

Minister of Science, Technology and Innovation

The National Science, Technology and Innovation Policy (NSTIP) 2021-2030 is the government's commitment in harnessing, utilising, and advancing science and technology towards driving the country's socio-economic growth. Despite the rapid advancements of science and technology, the world today is also plagued by various crises such as health, hunger and unemployment, which contribute to the larger crisis, namely the global economic crisis. The country must always be on high alert, by taking advantage of the existing opportunities, when the rises hit. In this regard, we need to see Science, Technology and Innovation (STI) as enablers in addressing and solving the issues and challenges of the country.

Thus, NSTIP was formulated to strengthen the position of STI in the development and growth of an innovation-based economy. In response to this, the policy introduced the concept of Science, Technology, Innovation and Economy (STIE) to emphasise the importance of STI, as a basis to support economic growth and to achieve the goal of becoming a high-tech nation. STIE will be able to create and strengthen the foundation to innovate and to apply science and technology for the benefit of various levels of the communities and the whole country.

Malaysia should aspire to be a country that innovates, creates and develops its own technology and no longer exists as merely consumers of technology. Therefore, this policy also outlines the agenda to strengthen the development of local technology and STI culture to create a society that is able to apply science and technology in daily life.

Over the next 10 years, various strategies and initiatives as outlined in the comprehensive action plan of the NSTIP policy will be implemented to ensure that the goal of becoming a high-tech nation will be achieved. This effort requires strong commitment and support from various parties, involving government agencies at the federal and state level, industry, academia and society.

I hope that the NSTIP 2021-2030 will be able to bring reform to the country, especially in driving the development and application of local technology, towards achieving the status of a high-tech nation.

YB KHAIRY JAMALUDDIN
Minister of Science, Technology and Innovation

Foreword

Secretary General
Ministry of Science, Technology and Innovation (MOSTI)

The National Science, Technology and Innovation Policy (NSTIP) 2021-2030 is formulated to outline strategic directions for the national Science, Technology, Innovation and Economic (STIE) development agenda, further ensuring STIE as the key element in the preparation of major government policies and master plans, in particular, via promoting innovation towards economic growth. Thus, the NSTIP will mobilise the STIE sector through the strengthening of responsive STI governance, developed industries' technological development via Research, Development, Commercialisation & Innovation (R&D&C&I) towards increasing the number of adaptive STI talent, as well as to mainstream the enculturation and adoption of technology. In addition, this policy will propel Malaysia to be a high-tech nation by encouraging locals to become technology developers, rather than being merely consumers of technology.

NSTIP sets a vision to create a sustainable, inclusive and scientific society towards a high-tech nation. In realising this aspiration and to attain the status of a developed country by 2030, this policy has outlined 6 key thrusts supported by 20 robust strategies and 46 realistic and comprehensive initiatives that cover the implementation of STIE in various sectors.

The success in implementing this NSTIP certainly depends on the support, commitment and dedication of all parties involved. In this regard, the full cooperation of the public and private sectors, academia and the community is very important in addressing national issues and challenges, as well as implementing strategic measures to achieve the goals of the national STIE agenda. I am confident that the successful implementation of NSTIP will lead the country towards a developed and high-tech nation as dreamed of by all.

DATUK IR. DR. SITI HAMISAH BINTI TAPSIR
Secretary General
Ministry of Science, Technology and Innovation


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CHAPTER 1: **INTRODUCTION**

1.1 STI for Shared Prosperity

Shared Prosperity

Malaysia has embraced sustainable development as a significant part of its national agenda since the first Malaysia Plan in 1966 and continuously implemented in the subsequent national plans. This effort has been continued through the Shared Prosperity Vision (SPV) as a new direction for the country's development. SPV, which replaces the Vision 2020, aims to ensure that all Malaysians may enjoy the nation's economic wealth and prosperity together in a more just and equitable manner by the year 2030.

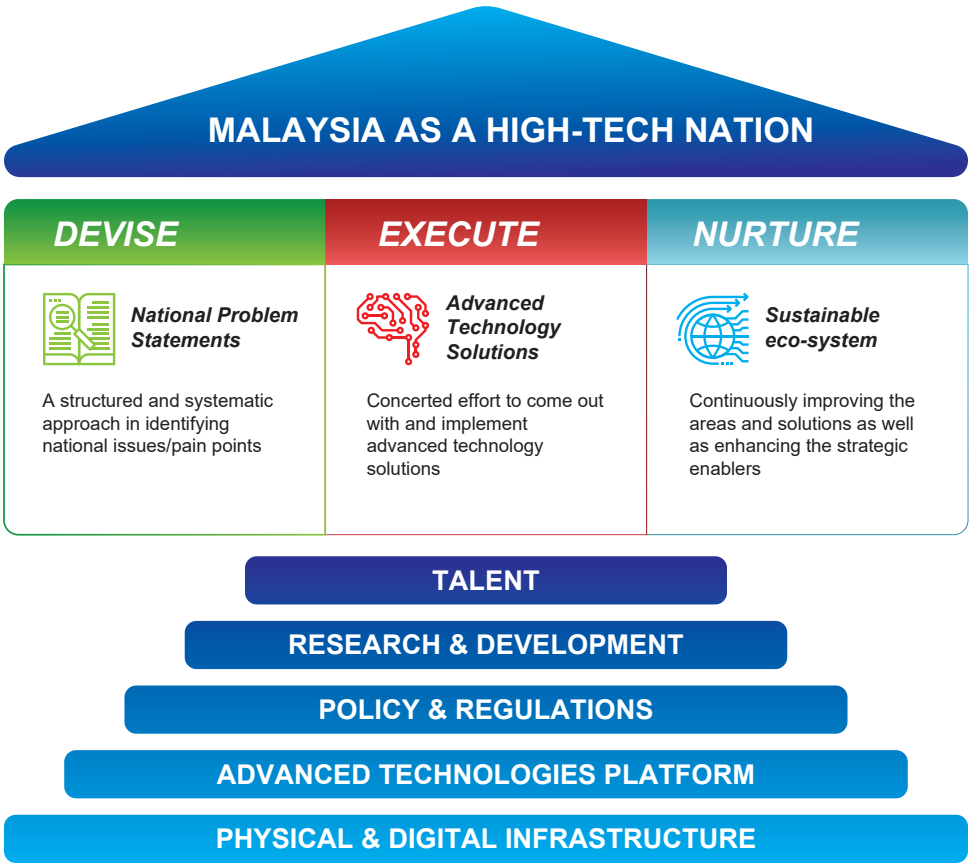
To achieve this vision, the government outlines seven (7) strategic thrusts, which are restructuring and improving the business and industry ecosystems; main economic growth activities; human capital; labour market and employee's compensation; societal well-being; inclusive regional development and enhancing social capital. This new direction will ensure that Malaysia continues in its path of sustainable development in line with the Agenda for Sustainable Development 2030 (Agenda 2030). It could be seen that the goal of Agenda 2030 has similarity with the Shared Prosperity Vision 2030, which is to achieve a fair and equitable economic distribution and at the same time to foster racial harmony among the people.

Science, Technology, Innovation and Economy (STIE)

STI plays an important role as an enabler to drive economic growth, especially in addressing national issues and challenges and achieving the SPV's goals. In this case, STI could be seen as an important aspect of economic growth either as an input to economic growth or as an outcome to the economic situation. Therefore, National Science, Technology and Innovation Policy (NSTIP) 2021-2030 introduces the concept of STIE to highlight the importance of STI development as a basis in supporting economic growth. To strengthen the role of STIE, the need for coordination, understanding and development in various fields of science and technology across various sectors is vital as it can create and strengthen the foundation to innovate and the application of science and technology in driving the nation's economy, thus propelling Malaysia to become a high-tech nation.

1.2 A High-Tech Nation

Malaysia Sebagai Negara Berteknologi Tinggi



The NSTIP 2021-2030 aims to shape Malaysia to be a high-tech nation by the year 2030. Just like other developed countries in the world, such as Japan, South Korea and China, which utilise local technology as the fundamental of their national development, Malaysia too, via the NSTIP 2021-2030, will further strengthen the development and adaptation of local advanced technology to drive the nation's economic stability, which will be strongly based on science, technology and innovation (STI).

The empowerment of local talent supports efforts towards achieving the NSTIP targets, research and development (R&D) focuses on national strategic areas, legislations and regulations by reinforcing STI development as well as upgrading technological infrastructure including digital technology.

Technology Developer Transformation

Malaysia urgently needs to transform from industries and a society that is merely a technology user, to a technology creator and developer by leveraging existing resources. R&D on new technologies can assist in solving national issues as well as driving the country towards a more innovative and competitive economy.

The creation and communication of new knowledge are just as crucial as producing technology developers to be more competitive and less dependent on external technologies. In fact, the high competitiveness of our economy and the ability to depend on local technology developers, will open up more business opportunities for technopreneurs in various sectors such as the industrial and agricultural sectors. These efforts have been practiced by developed countries that continuously generate new knowledge in developing their technologies.

Talent Development and the Enculturation of STIE

Talent development is the backbone of technology development efforts. A talent pool that is competent, agile and adaptive will encourage the invention and innovation of new products and technologies. In addition, highly skilled, competitive, innovative and productive human capital is needed to encourage the adaptation of advanced technology, further driving the transition from conventional methods to high technology in various sectors.

The development and utilisation of science and technology need to be viewed in a broader context, not only in industrial sectors, but also other aspects of life, such as addressing poverty, health and societal well-being. Therefore, efforts on enculturation and application of science and technology in daily life need to be enhanced to benefit the people ranging from rural to urban areas. Furthermore, the digital revolution and technological innovation need to be fully utilised to increase information sharing among the people. This will assist society in becoming high tech and scientific-minded to easily adapt to the changes of technology.

Digital Technology

Digital technology and infrastructure are the main enablers to push the STIE agenda based on high technology in line with the transition towards 4th industrial revolution (4IR) that will scale down the employment of workforce. To support the implementation of 4IR policy in Malaysia, existing industries and businesses should change their business models in order to stay relevant and sustainable via digitalisation.

Continuous exploration of digitalisation in the service and business sectors may include activities such as research and development of technologies such as big data analytics (BDA), Internet of Things (IoT) and artificial intelligence (AI). In addition, there is an urgent need for the adaptation of digital technology to reduce dependency on the workforce, especially on foreign labour. This adaptation will be needed in many sectors such as agriculture, finance, health, manufacturing, etc. It will also encourage the application of local technology in both the public and private sectors.

1.3 The Challenges in STI

The implementation of STI policy will transform the structural development and growth of productivity in driving the country's economic development. In fact, STI policy is not only supporting economic growth, but also expanding the access to knowledge, technology and innovation that enhance societal well-being. Most developed countries have successfully transformed from a traditional manufacturing-based economy to an innovation-led economy via the effective implementation of STI policies.

Thus, the government must formulate STI policy that could resolve several fundamental challenges in ensuring successful implementation. By resolving the challenges, the transformation of STI in our country from a traditional manufacturing-based economy towards an innovation-led economy could be achieved. The challenges need to be overcome cover a wide range of STI issues, from governing the STI ecosystem, managing STI talents, to encouraging industry participation. This can be summarised as follows:

The Challenges in STI

Lack of coordination in governing STI

i. Unclear overarching & agile governance for STI to synergise actions across ministries, agencies, industries & communities.

ii. Misalignment of research priority areas with research and development (R&D) output, imports and exports, and Intellectual Property (IP).

iii. Ineffective resource allocation and lack of suitable funding to drive innovation capacity.

Incomprehensive talent development

i. Lack of centralised S&T talent planning and development to move the STI agenda.

ii. Low science engagement to encourage the involvement of society in STI.

iii. Marginalised and under-served communities are left behind in STI development.

Insufficient public-private collaboration and international engagement

i. Inadequate public-private partnership outcomes.

ii. The majority of industries are not innovators.

iii. Non-commercialised home-grown technology, talent, industries, products and services.

iv. International STI strategic alliances are not fully leveraged.

v. Sustainability is not an inherent part of the STI ecosystem.

1.4 Primary Focus of NSTIP 2021-2030

In line with the above STI challenges, socio-economic changes and global issues on STI; NSTIP 2021-2030 is formulated to strengthen science, technology and innovation in the national development in supporting SPV and SDG 2030 towards achieving a high-tech nation. Thus, this policy focuses on:

4 Main STI Focus

1. Strengthening Science, Technology and Innovation (STI) governance.
2. Making STIE as an enabler in addressing national issues and challenges.
3. Accelerating local technology development & application toward and hi-tech nation.
4. Promoting innovation for economic growth, societal well-being & quality of life.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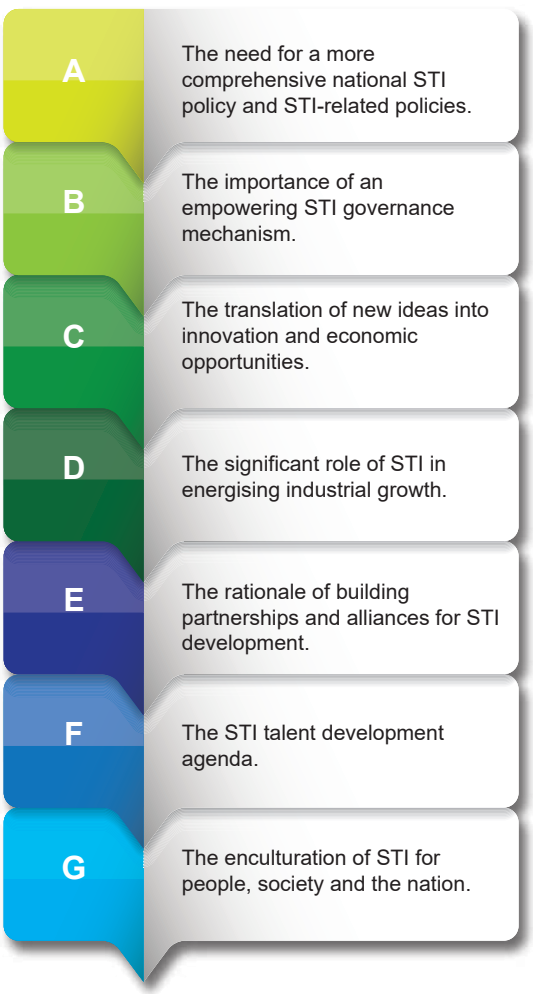
CHAPTER 2: THE NATIONAL STI POLICY AND FRAMEWORK

2.1 The National STI Policy

The commitment of Malaysia in harnessing, utilising and advancing science and technology is reflected with the formulation and implementation of the First National Science and Technology Policy (1986-1989), The Industrial Technology Development: A National Action Plan (1990-2001), The Second National Science and Technology Plan and Plan of Action (2002-2010) and National Science, Technology and Innovation (2013-2020). Various initiatives and programmes have been implemented under these policies, including the enhancement of national capabilities and capacities of Research and Development (R&D), the forging of a partnership between public-funded research organisations and industries and the development of new knowledge-based industries has accelerated the development of STI in the country.

The new NSTIP focuses on driving this country towards an innovation-led economy taking into account the intensive technology which supports industrial revolution development. The NSTIP emphasises a national agenda to strengthen the national STI ecosystem, empowering development and the application of local technology and foster innovation toward ensuring economic growth, societal well-being and quality of life. This policy is also formulated to ensure that STI is made as a central element in all significant national policies formulation and national development plans through effective communication and application by all stakeholders. The NSTIP 2021-2030 is not only for the government but also for industries, institutes of higher learning (IHLs), both public and private research institutes and the whole STI ecosystem including the people.

In response to the STI challenges, the NSTIP will also outline a better governance mechanism towards tangible and consistent outcomes for the short and long term. Thus, this new policy will address the following areas:



2.2 The NSTIP 2021-2030 Framework

The NSTIP framework focuses on the pivotal role of STI in the context of shared prosperity and innovation-led economy to propel Malaysia towards sustainable development based on equitable and inclusive growth. The NSTIP approach is grounded by two key policy foundations that support the six thrusts to drive STI towards achieving NSTIP vision and mission.

Key Policy Foundations

The NSTIP 2021-2030 emphasises that STIE is a powerful socio-economic instrument that will enhance the generation of knowledge, innovation, creation of wealth, inclusivity and societal well-being. This will be achieved through the adoption of a comprehensive approach incorporating the following key policy foundations:

a) STIE as the Main Enabler for Policy and National Development

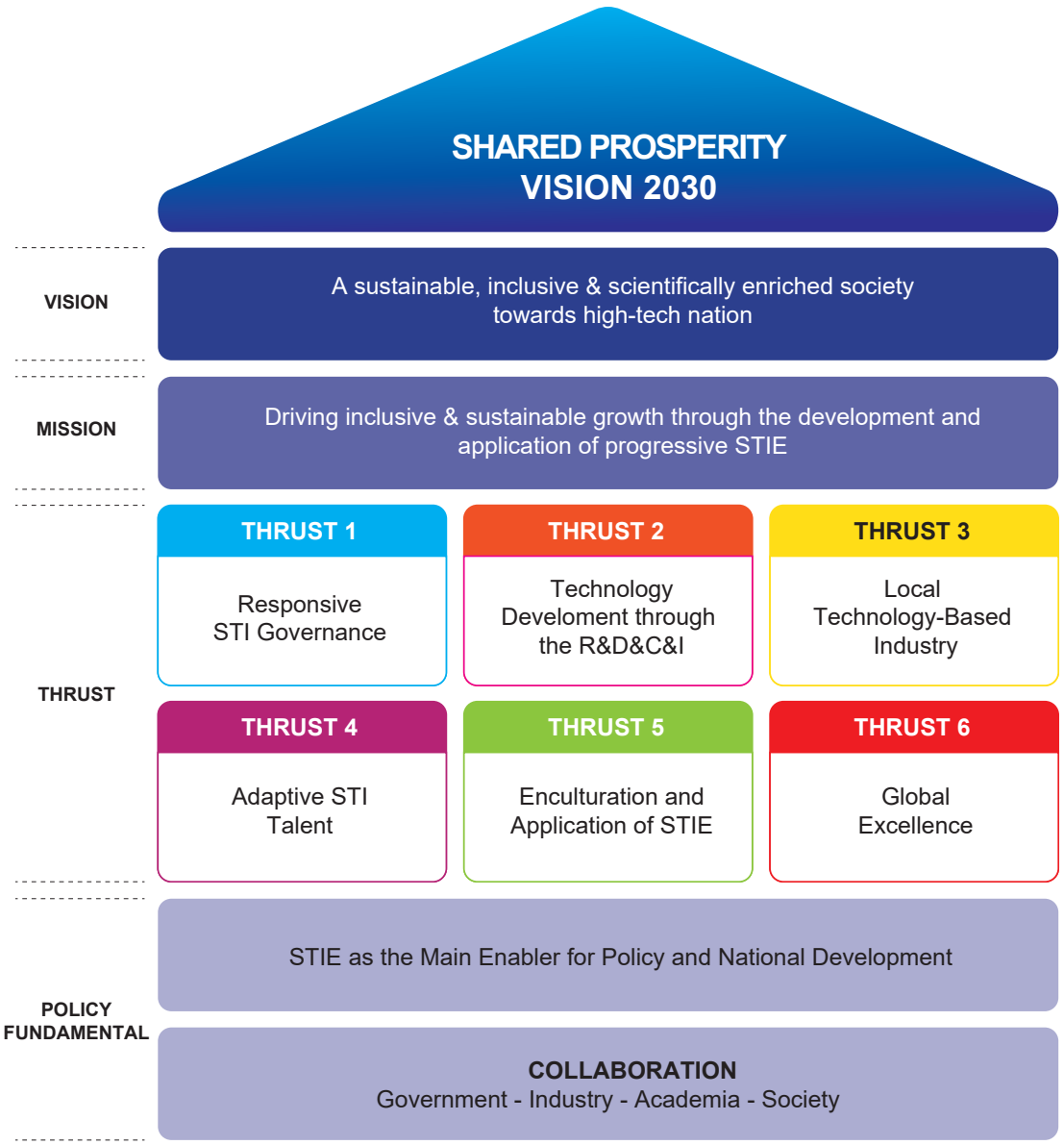
NSTIP 2021-2030 encompasses the need to leverage STIE in the context of shared prosperity and sustainable development. STIE will be an enabler in addressing and resolving national issues and challenges, especially for the benefit of the people. In supporting this STIE foundation, the country needs to improve its STIE capabilities in governance infrastructure, mandate, management, human resources, financial allocation, and productivity.

The essence of this policy will lead to other policies and strategies that will strengthen the development and application of local technology in various sectors. Therefore, STIE needs to be mainstreamed, adopted and implemented by all relevant ministries, agencies and stakeholders, especially in formulating key policies and national development programmes. Furthermore, the implementation of the policy will be supported by technology enculturation and adaptation programmes that will ensure the developed technologies can be accessed and utilized for the benefit of various levels of the community.

b) government-industry-academia-Society Collaboration

The NSTIP 2021-2030 will help to strengthen linkages and collaborative action among government-industry-academia-society to play an effective role in sustainable economic growth and prosperity. The industrial sector and academia are at the forefront in generating and translating ideas into new or improved products, processes, services or solutions. Meanwhile, the voice of society should also be considered in this process. Therefore, government assistance plays an important role to re-energize and reinvigorates the industry through various incentives and measures.

National Science, Technology and Innovation Policy (NSTIP) 2021-2030 Framework

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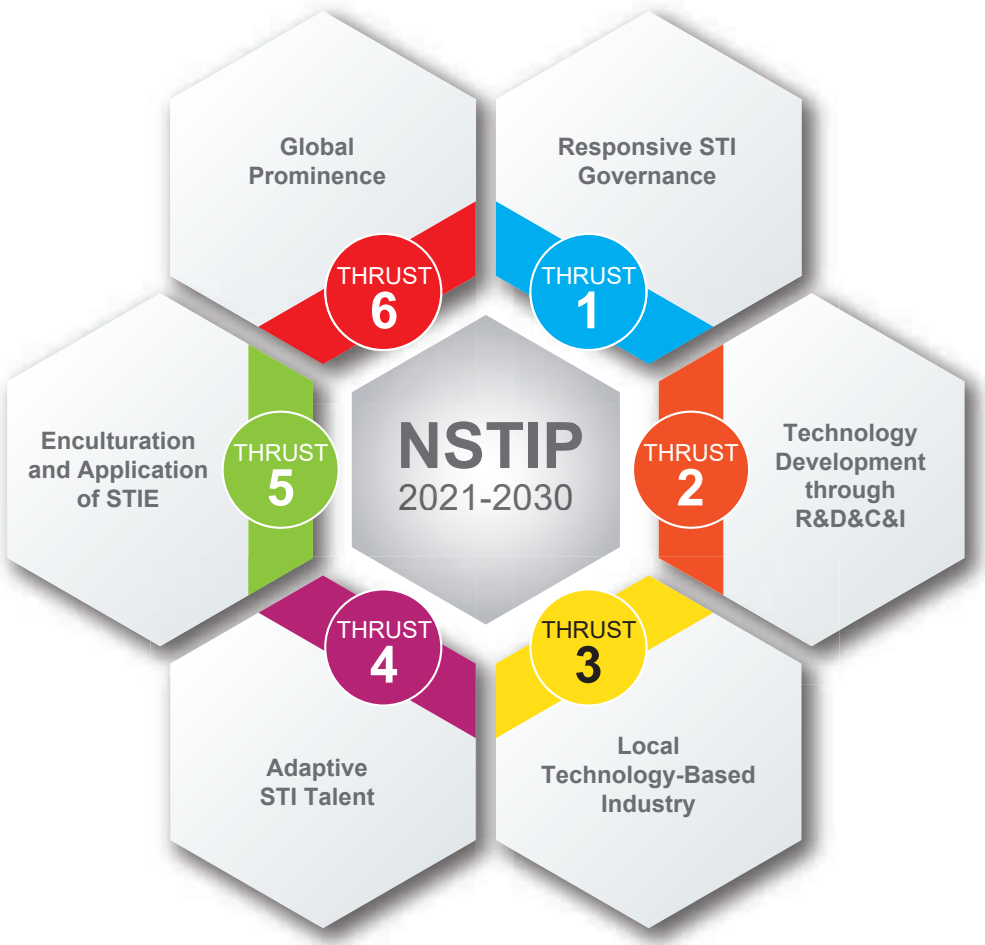
CHAPTER 3: **NSTIP THRUST**

3.1 NSTIP SIX THRUSTS

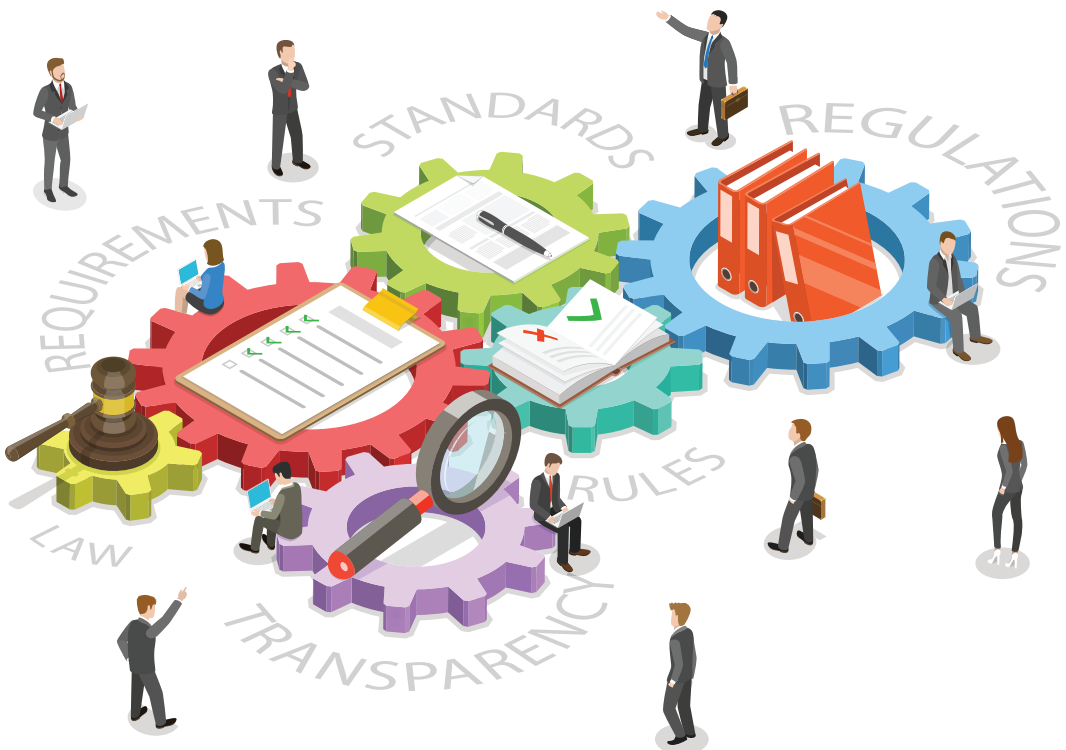
The NSTIP 2021-2030 encompasses six thrusts, 20 strategies, 46 initiatives and 10 game changer programmes to support an inclusive and equal national economic growth in line with Shared Prosperity Vision 2030.

NSTIP 2021-2030 Six Thrusts



THRUST 1

Responsive STI Governance



3.2 Responsive STI Governance.

3.2.1 Objective

The objective of this thrust is to realign the complex governance landscape of STI that involves various public and private entities. The realignment involves restructuring STI-related functions of various ministries and agencies for more efficient and effective management while monitoring and evaluating the STIE activities.

3.2.2 Strategy:

Two strategies are outlined to achieve the objective of this thrust.

Strategy A: Strengthening the Governance of the STI ecosystem

The STI ecosystem involves various stakeholders from ministries, agencies, industries and communities who played essential roles in developing STI. Thus, a strategic direction and a clear and comprehensive STI governance structure must be in place to manage and coordinate the country's complex STI ecosystem and landscape. In addition, all stakeholders need to work together to ensure comprehensive coordination that is efficient and effective.

Initiative A1: Formulating Legal Provision for STI

To strengthen the country's STI governance, Malaysia should formulate legal provisions covering institutional frameworks, decision-making instruments, infrastructure, and fund management of Research, Development, Commercialisation, and Innovation (R&D&C&I). Legal provisions such as an STI act should be gazetted to ensure STI governance is regulated.

Initiative A2: Establishing a platform for discussion at the parliamentary level.

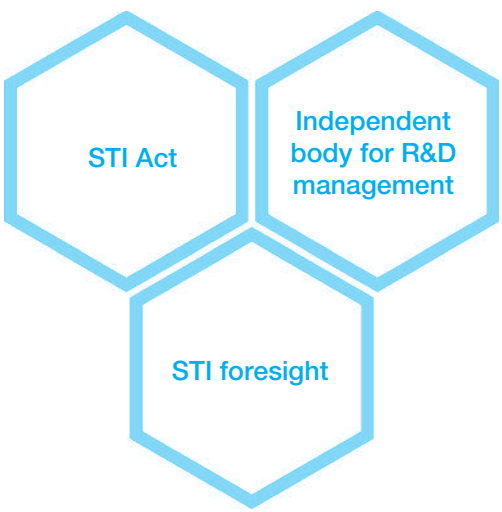
The objective of this thrust is to realign the complex governance landscape of STIE that involves various public and private entities. The realignment involves restructuring STIE-related functions of various ministries and agencies for more efficient and effective management while monitoring and evaluating the STIE activities.

Initiative A3: Identifying the a supreme council to determine the national strategic direction of STI

STI Supreme Council should be reactivated to determine and monitor the direction of the STI policy implementation. The council comprises experts in various fields of science, including social sciences to provide views and advisory services related to the direction of STI in this country.

Initiative A4: Institutionalising a central independent body for R&D management

An independent body needs to be created which is responsible for planning, managing, evaluating and monitoring the country's R&D activities. This body will also be responsible for formulating the national direction of R&D, coordinating STI resources, managing and distributing existing funds, implementing and monitoring the direction and decisions made by the STI Supreme Council, and monitoring and reviewing the national R&D&C&I activities.

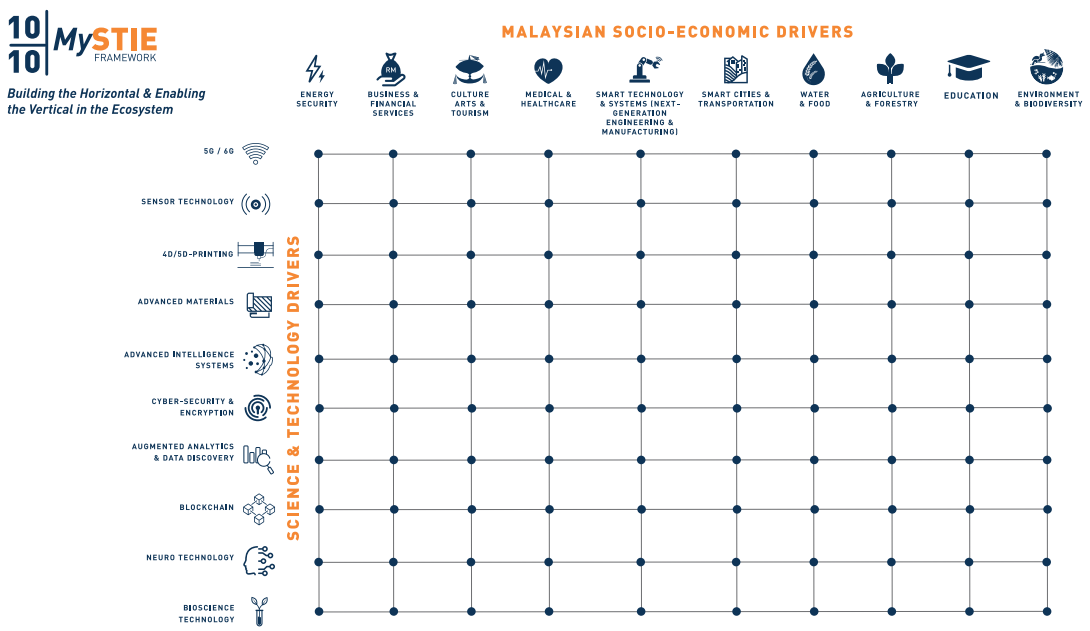


Strategy B: STIE as an enabler in addressing national issues and challenges

STIE could be used as a key enabler in resolving national issues and challenges. The application of STIE will assist in analysing and identifying actions needed to be taken to address any issues or challenges such as environment, health and education. Thus, the formulation of key policies and other national development initiatives should consider STIE related inputs as they are fundamental in socio-economic development.

Initiative B1: Increasing capacity development and application of STI Foresight

To ensure that STI related inputs is used as a main reference in policy planning and other national development initiatives, STI foresighting capabilities need to be improved and its implementation needs to be updated periodically. This effort involves the need to enhance existing expertise in STI foresighting, explore new mechanisms or methods in foresighting, establish public private partnerships in foresighting activities, as well as develop a guideline for policy formulation and legal provision using STI foresight.



3.2.3 STIE Game Changer Programmes

a) Technology Commercialisation Accelerator (TCA)

To accelerate the commercialisation of research products, a commercialisation platform needs to be initiated by modifying and repurposing existing government bodies to function as TCA. The role of TCA is as a commercialisation platform to facilitate and accelerate the commercialisation of R&D products and services. TCA is also responsible for facilitating, monitoring and reporting on performance, as well as activating the public-private collaborative network.

b) Malaysia Science Endowment (MSE)

A platform for promoting and coordinating alternative funds to reduce dependency on government fund in R&D activities needs to be established. This platform will play the role of MSE accountable for managing, collecting and coordinating non-governmental funds in the form of cess-funds, crowdfunding, industry grants, donations and endowments.

3.2.4 Initiative Implementation Action Plan

Strategy	2021-2022	2023-2025	2026-2030
Strategy A: Strengthening the Governance of the STI ecosystem.	• Malaysia Science Endowment (MSE). • Technology Commercialisation Accelerator (TCA).	• STI Act	• Reviewing and updating of STI legal provisions based on the findings of subsequent STI policy reviews.
Strategy B: STIE as an enabler in addressing national issues and challenges.	• Guidelines for the use of STI foresight in policy formulation	• Application of STI elements in national policies (new or updated).	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THRUST 2

Technology Development through R&D&C&I

3.3 Technology Development through R&D&C&I.

3.3.1 Objective

This thrust aims to mobilise a concerted effort of all stakeholders, including the public sector, industry, academia and the community in R&D&C&I activities towards enhancing the national development of technology capabilities.

3.3.2 Strategy

Six strategies are outlined to achieve the objective of this thrust.

Strategy A: Determination of National Research Priority Areas.

There is a need for the government to set national priority areas in R&D activities to keep in line with the national development needs. The determination of research priority areas will drive the industry's transformation from being technology users to becoming technology developers.

Initiative A1: National R&D Priority areas are set based on national development planning, research strengths, emerging technologies, future scenarios and required expertise.

Proper planning in the early stages of R&D implementation is crucial to ensure that the country's R&D meet the industrial needs. The government should set the priority areas for R&D and also need to review those priority areas periodically to ensure that they are in line with the national needs and global economic changes. A strategic method in setting and reviewing the priority areas should be used such as strategic planning and foresighting.

Strategy B: Enhancing R&D for high value outputs, high impact outcomes and new innovations.

The government needs to mobilise efforts to develop R&D activities capable of producing new products and services and new high-impact innovations. These efforts require close cooperation with the industrial sector and IHLs, also major contributors to the country's R&D activities.

Initiative B1: Advancing fundamental and applied research, empowering experimental-based research and strengthening future technologies.

Malaysia needs to develop fundamental and applied research whilst strengthening experimental development research by ensuring that these researches align with the needs of future industries and emerging technologies. Increased investment that meets the industrial needs in experimental development research will introduce more innovations to the market and translate innovations into products and services and further promote the development and use of local technologies.

Initiative B2: Enhancing the ability of researchers in R&D.

The Public Research Institutes (PRI) and the IHLs must be strengthened by sharing facilities, equipment, and expertise to ensure that the government's investment is fully utilised. This initiative will be supported by developing the Malaysia Open Science Platform (MOSP), encouraging the public sector, industry, researchers and the community to share and use data related to expertise, resources and facilities. This platform will enhance the cooperation of all stakeholders, avoid research duplication and enrich the entire R&D&C&I ecosystem.

Initiative B3: Fostering a culture of research ethics responsible in the local scientific ecosystem to ensure compliance with research integrity.

The government needs to cultivate a culture of research ethics with integrity in the local scientific ecosystem by adopting the Malaysian Code of Responsible Conduct in Research (MCRCR) certification and providing Responsible Conduct in Research (RCR) training to researchers and students in IHLs.

Strategy C: Improving R&D fund management and alternative funding sources.

Transparent, efficient and effective R&D fund management is vital to ensure that funds is only given to projects that fulfil the stipulated conditions. Any intransparencies or leakages in fund management should be avoided as it will affect the country's economic growth.

Initiative C1: Developing National Guideline on R&D Fund Management.

A National Guidelines related to R&D Fund Management should be prepared to determine the priority areas of R&D, types of research, evaluation criteria, monitoring and enforcement mechanisms. This guideline may also be used as a monitoring mechanism in managing government funds, including alternative funds.

Initiative C2: Obtaining alternative funds for STI.

To reduce dependency on government funding, ministries and agencies, including IHLs and PRIs are encouraged to obtain alternative funds to finance their respective R&D activities. This funding can be obtained through alternative funds from industry, donations, crowdfunding or research funds from international institutions.

Strategy D: Encouraging open data sharing.

Data sharing by various parties involved in R&D&C&I activities should be encouraged to drive national innovation. The collaborations will create stakeholder cooperation, prevent duplication in the implementation of R&D and facilitate the management of the STI ecosystem.

Initiative D1: Malaysia Open Science Platform (MOSP)

MOSP data-sharing platform aims to encourage the public sector, industry, researchers and the community in data sharing and use to stimulate innovation. The collection of data from IHLs and PRIs includes research data, expertise, facilities and equipment available at the institution that can benefit various parties.

Malaysia Open Science Platform (MOSP)

Strategy E: Encouraging efforts and cooperation to address national challenges.

The government needs to encourage the cooperation of various parties in addressing national issues and global challenges, especially issues and challenges that impact on the well-being of the people.

Initiative E1: Introducing high-impact initiatives to address national challenges.

The government also needs to stimulate and encourage multi-sectoral cooperation to implement high-impact initiatives in addressing national challenges such as health issues, environmental pollution, climate change, oceanography, digital tsunami and food security. Implementing these high-impact initiatives requires thorough planning and monitoring to ensure that their implementation benefit societal well-being.

Initiative E2: Intensifying knowledge integration and technological innovation development through transdisciplinary research approach.

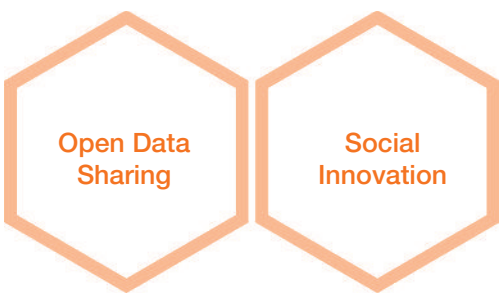
Negotiation platforms need to be established to accelerate knowledge integration and technological innovation development through transdisciplinary research approaches. Therefore, it is crucial that strategic planning be implemented for this initiative to address national challenges and promote technology innovation.

Strategy F: Driving social innovation for the benefit of the marginalised and underprivileged groups.

Malaysia strives to achieve the goals outlined in the Sustainable Development Goals (SDGs) by ensuring that inclusive society and less fortunate communities are given due attention and benefit primarily through the stimulation of social innovation.

Initiative F1: Empowering social innovation and social impact investment to find solutions through STI that are beneficial to the community.

Investment in social innovation that benefits society, especially the marginalised and underprivileged community, needs to be intensified by the government and industry. Stimulation of these social innovations will accelerate technology and knowledge transfer to society and further enhance societal well-being. This will lead to a more solid societal unity in the nation.



3.3.3 STIE Game Changer Programmes

a) National Technology and Innovation Sandbox (NTIS)

NTIS is a platform that encourages innovation by creating a safe space for these activities to be implemented based on specific regulations without being bound by existing regulations that may hinder innovation outcomes. The implementation of NTIS focuses on high-impact projects, especially in addressing national issues and challenges. The implementation of NTIS will increase public and private procurement from local companies, increase the commercialisation of local innovation products and encourage innovation.

b) Digital Tsunami

The development of local digital technology needs to be strengthened to support digitalisation efforts in the government, service and business sectors. Exploration of this technology should be implemented by increasing R&D activities in related fields such as the Internet of Things (IoT), Big Data Analytics (BDA) and Artificial Intelligence (AI). The digital technology developed may be used in various fields across sectors including agriculture, finance, health, manufacturing, health, etc. This will drive digitalisation efforts and accomplish a digitally connected Malaysian nation.

NATIONAL TECHNOLOGY & INNOVATION SANDBOX

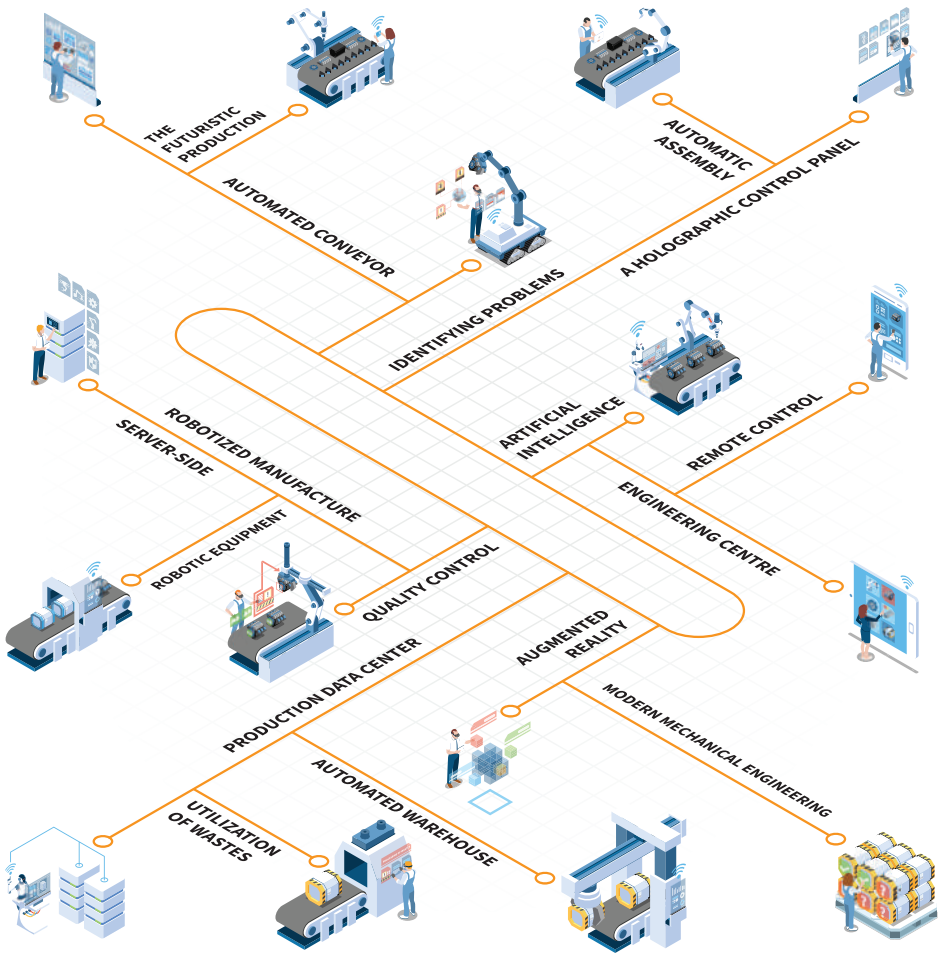
3.3.4 Initiative Implementation Action Plan

Strategi	2021-2022	2023-2025	2026-2030
Strategy A: Determining national research priority areas.	• Determining national research priority areas.	• Allocating specific funds for each of the national R&D priority areas.	• Reviewing national R&D priority areas. • Increasing GERD/GDP to 3.5%.
Strategy B: Enhancing R&D for high value output, high impact outcomes & new innovations.	• Prioritising allocation for experimental development research. • Evaluating and allocating fund for high impact fundamental and applied researches.	• Reviewing and updating the MCRCR certification.	• Increasing number of research projects involving international collaboration.
Strategy C: Improving R&D fund management & alternative fund resources.	• Formulating National Guidelines on R&D Fund Management.	• Funds from other alternative financing mechanisms.	• Imposing Responsible Conduct in Research (RCR) as compulsory subject to all students in IHLs.
Strategy D: Encouraging open data sharing	• Developing MOSP. • Collecting data in one common platform.	• Wider data accessibility to intensify innovation activities.	• Ensuring there is no / less overlapping in the R&D fund distribution.

Strategi	2021-2022	2023-2025	2026-2030
Strategy E: Encouraging collaboration in addressing national challenges.	• Identifying national challenges and high-impact initiatives. • Developing discussion and consultative platforms for high-impact initiatives such as: - Climate change. - Oceanography. - Polar. - Digital Tsunami - Zero-waste Malaysia. - Health & societal well-being • Developing a strategic plan to achieve the initiative goals.	• Reviewing the outcome of the strategic plan periodically.	• Improvement to the relevant SDG index.
Strategy F: Driving social innovation for the benefit of the marginalised and underprivileged groups.	• Developing smart partnerships for social innovation.	• Increasing social innovation projects funded through corporate social innovation.	• Increasing number of marginalised and underprivileged communities benefited from the programmes.

THRUST 3

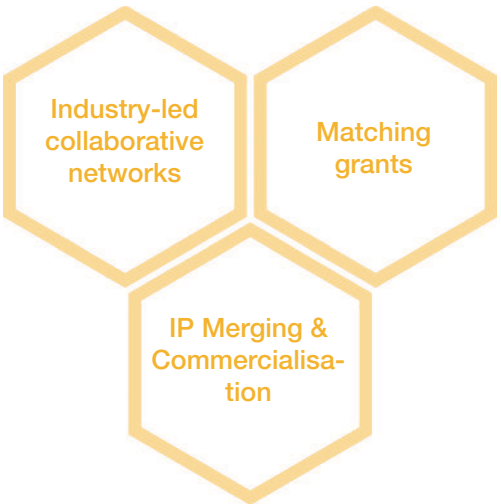
Local Technology - Based Industry



3.4 Local Technology-Based Industry

3.4.1 Objective

This thrust aims to stimulate the growth of the local industry through an effective network of cooperation by all stakeholders in order to drive economic development based on local technology and further increase the commercialisation of local products.



3.4.2 Strategy

Three strategies are outlined to achieve the objective under this thrust.

Strategy A: Encouraging demand-based industries through collaborative networks.

There is a need to encourage the involvement of all stakeholders (government-industry-academia-society) in a collaborative network to develop demand-based industries. This collaborative network approach will create more inventors and innovators in the development of value-added products and services. Indirectly, it will also stimulate innovation and increase commercialisation and hence, creating job opportunities and nation's wealth.

Initiative A1: Creating industry-led collaborative networks based on priority areas that drive the country's economic growth.

Industry-led collaborative networks based on the national priority areas that have the potential to be developed need to be created so that the Malaysian industry becomes more grounded on science and technology and more innovative using locally developed technologies. This collaborative network mechanism can be implemented through matching grants between government and industry in R&D&C. This method will ensure strong commitment from both parties in financing R&D based on market demand and facilitate commercialisation. In addition, this matching grant-based collaborative network will encourage broader partnership practices, including expertise among the academics that will help restructuring the economy and society.

Strategy B: Increasing the commercial value of Malaysian STI products and services.

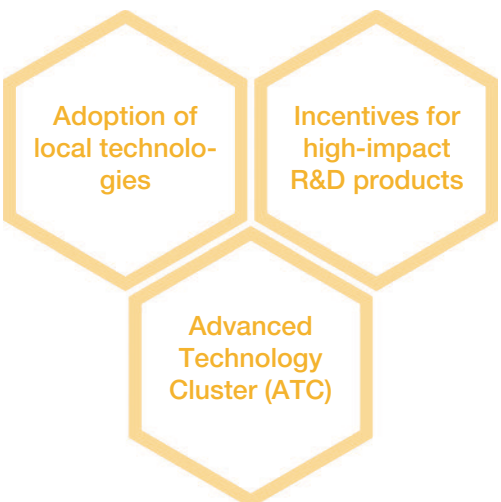
The government needs to mobilise efforts in increasing the commercial value of local STI products and services, especially among Small and Medium Enterprises (SMEs). The increase in commercial value is significant to enable SMEs to be more competitive and remain relevant in the country's economic development.

Initiative B1: Facilitating and providing incentives for product commercialisation.

A National Guideline for Commercialisation needs to be formulated to strengthen the commercialisation framework and facilitate local SMEs to produce high-potential products and services for commercialisation. This guideline will emphasise the implementation of specialised platforms to drive commercialisation and technology transfer activities and establish a framework to regulate the use of local products and services. In addition, incentives should be given to stakeholders, especially the industry to encourage them to produce more high-impact researches based on national priority areas of R&D.

Initiative B2: Increasing the value of intellectual property (IP) and invention.

The commercialisation of IP and innovations need to be improved to deal with the dumping of non-commercialised IP. This can be done through IP merging, and developing an IP evaluation mechanism. Individual IPs typically have low value, therefore, combining IP assets across institutions will increase asset value and accelerate commercialisation. Through the merger of IP, effective partnerships between stakeholders can increase commercial value and benefits innovation. In this regard, the development of IP professionals' capacity, such as IP officers and IP evaluators, is essential to improve their skills, especially in identifying IPs with high commercial value or IPs capable of solving problems and providing solutions.



Strategy C: Encouraging STI adoption by SMEs to increase competitiveness and productivity.

The government needs to encourage SMEs to change their conventional methods of working to the adoption of STI. The adoption of STI will increase their productivity, competitiveness and sustainability, especially in the era of the digital economy.

Initiative C1: Facilitating STI adoption in harnessing SME innovation potential and supporting local technology development.

Incentives should be given to SMEs to encourage the adoption of local technologies among them according to their level of readiness. Besides, coaching programmes on STI adoption and the development of SME's human capital should also be provided to enhance the capability and competitiveness of local SMEs.

3.4.3 STIE Game Changer Programmes

a) Advanced Technology Cluster (ATC)

ATC is a network of local and international collaborations for research and innovation to explore emerging technology. The establishment of ATC will catalyse the increase in productivity, competitiveness, development of products and services according to specific industry and economic needs. It can also develop talents and skills among the nation's workforce. Furthermore, ATC will expand innovation efforts and bridge the gap between research and commercialisation of technology in the country by ensuring that the R&D technology is suitable for Malaysian business and industrial sectors.

b) Precision Farming/Smart Agriculture

Precision Farming / Smart Agriculture is a management strategy that collects, processes, and analyses various agriculture data and information to support decision-making process. Management decisions are made based on multiple variables to ensure increased efficiency, productivity, quality and sustainability of agricultural production. An example of the implementation of Precision Farming is environmental monitoring by using technologies such as Internet of Things (IoT) sensors and wireless systems.

3.4.4 Initiative Implementation Action Plan

Strategy	2021-2022	2023-2025	2026-2030
Strategy A: Encouraging demand-based industries through collaborative networks.	• Creating industry-led collaborative networks based on priority areas that drive the country's economic growth.		
Strategy B: Increasing the commercial value of Malaysian STI products and services.	• Developing National Guidelines for Commercialisation. • Developing the capabilities and professionalism of officers involved in IP evaluation. • Developing and implementing mechanisms for IP evaluation. • Accelerating commercialisation for IP creation. • Combining IP for higher commercial benefits. • Establishing platforms and mechanisms for technology transfer.	• Strengthening regulatory framework to maximise the use of local products and services. • Providing incentives to all stakeholders, especially industries, to produce more high-impact joint research projects in national R&D priority areas.	

Strategy	2021-2022	2023-2025	2026-2030
Strategy C: Encouraging STI adoption by SMEs to increase competitiveness and productivity.	• Facilitating STI adoption in harnessing SME innovation potential and supporting local technology development.	• Increasing the number of companies receiving incentives.	• Increasing the number of companies trained.

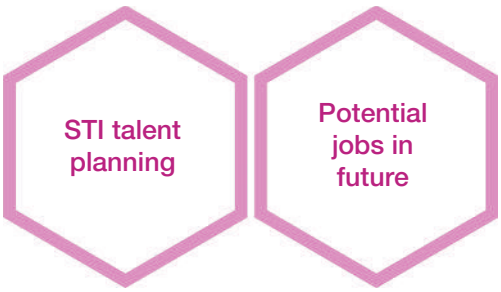
THRUST 4

Adaptive STI Talent

3.5 Bakat STI yang Adaptif

3.5.1 Objektif

This thrust aims to develop a competent and adaptive STI talent pool in various situations, especially in a rapid global economic and technology change.



3.5.2 Strategy

Four strategies are outlined to achieve the objective of this thrust.

Strategy A: Strengthening national planning for competent and adaptive STI talent.

Malaysia needs a competent STI talent pool that can easily adapt to various challenging situations. An adequate talent pool in STI can encourage the creation and translation of ideas into products, services and even problem solving that leads to the improved quality of life and well-being of the society.

Initiative A1: Formulating national STI talent planning at the central level through an integrated approach.

A comprehensive approach is needed by formulating STI talent planning at the central level. It can be implemented through an integrative approach by looking not only at the supply and demand of manpower in the future but also the need to look towards the possibility of potential employment in the future.

Initiative A2: Integrated approach in STIE career mapping planning.

Cooperation between the Ministry of Education Malaysia (MOE) and the Ministry of Human Resources (MoHR) is required for data mapping in education and employment. This data is then used for STI career mapping planning covering areas and tasks, related qualifications, competencies and technical skills.

Strategy B: Leading STEM Education.

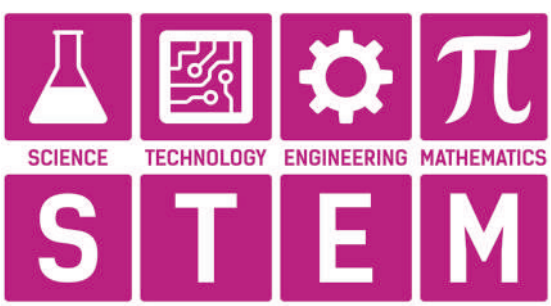
The government needs to strengthen STI-based education as STI will provide more job and better economic opportunities in the future. Education plays an important role for a country to transform into a knowledgeable and critical thinking society in the era of digital economy.

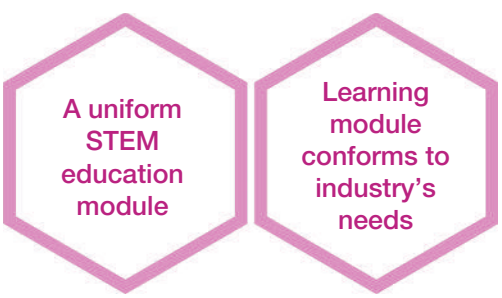
Initiative B1: Developing a transdisciplined STEM teaching and learning module.

STEM teaching and education modules need to be strengthened to be more effective and attract more students to choose this stream. The modules developed should bring more fun, experience building and effective in a standardised STEM teaching and learning. The curriculum designed for education should also take into account the views and needs of the industry.

Initiative B2: Streamlining the TVET Module in the education system.

TVET education modules need to be streamlined by applying them in the STEM curriculum, creating a more comprehensive STEM education. In addition, IHLs also need to work with the industry to design STEM and TVET curriculum based on industry needs. This will develop STI talent who are knowledgeable, skilled and positive-minded, in line with the needs of the industry. As a result, the country will have more STI talents that can adapt to the rapid challenges of the global environment and economy.





Strategy C: Expanding STI talent participation in the workforce.

The government needs to provide more STI workforce participation to accelerate the growth of industrial sector and economic development. Therefore, it is imperative to attract more STI talents and manpower into the job market and retain them in the industry.

Initiative C1: Upskilling and reskilling for adaptive STI talent to adapt to changing environments.

Lifelong learning should be encouraged through upskilling and reskilling programmes that can help to improve skills and maximise talent potential. Lifelong learning will also help existing talents to adapt to rapid economic change.

Initiative C2: Increasing women's participation in the STI workforce.

The participation rate of female workers in the STI workforce is still low compared to male workers and is very worrying because it is not in line with the number of new female graduates in the STEM field which is higher than the new male graduates. Efforts to attract women to work in the STI sector should be done by providing incentives in the form of upskilling and reskilling for them to return to work, and to create an advisory or mentoring platform.

Initiative C3: Encouraging re-entry of women into the workforce.

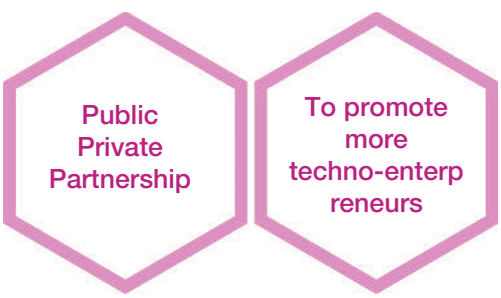
Women who have left the employment sector should be encouraged to return to work, as most of them in the STI workforce leave the employment sector due to family reasons. The move to provide support facilities in the workplace and introduce a policy of allowing the re-entry of women into the workforce will encourage them to rejoin the STI field of employment. It also needs to be strengthened by implementing programmes such as working from home, flexible working hours or both.

Strategy D: Increasing the demand for STI talent.

The government needs to increase the demand for STI talent in relevant employment sectors to ensure that highly skilled STI talents are not left behind in the sectors, and contribute to economic development.

Initiative D1: Strengthening public-private partnership to increase demand for STI talent.

Public-private partnership and collaboration should be strengthened through industry involvement in specific sectors to identify and understand the demand for STI talent in the employment sectors. Collaboration in financing programmes should also be encouraged such as creating scholarship programmes, industrial training and apprenticeships with industries for STI students and potential techno-entrepreneurs.



Initiative D2: Strengthening the mechanism that supports techno-entrepreneurship (STI-based entrepreneurship).

STI talent involvement in entrepreneurship should be encouraged to reduce dependency on the job market. Thus, the strengthening mechanism to support technology entrepreneurs (technopreneurs) among the STI workforce and researchers by building entrepreneurial skills is essential to translate their researches into products or services.

3.5.3 STIE Game Changer Programmes

a) Local Talent as the Technology Developer.

Malaysia needs to create local talent pool capable of developing technology to support the efforts of transforming the country from being technology users into technology developers. Human capital development among local scientists and researchers in the public and private sectors needs to be strengthened through upskilling and reskilling programmes and to provide exposure to emerging technologies in line with global economic developments.

3.5.4 Initiative Implementation Action Plan

Strategy	2021-2022	2023-2025	2026-2030
Strategy A: Strengthening national planning for competent and adaptive STI talent	• Providing a comprehensive directory of STI talent supply and demand for employers and job seekers. • STI is mainstreamed in the national talent planning. • All STEM jobs are in line with the skills / qualifications and competencies according to Malaysian Occupational Classification Standards (MASCO).		
Strategy B: Leading the STEM Education	• Formulating more fun, experience-building and effective modules in STEM teaching and learning. • Formulating industry-based TVET modules.	• Mapping of STEM teaching modules based on education level. • Designing an industry-based curriculum for educational and research purposes.	• Implementing standard STEM modules throughout the country. • Increasing in the number of jobs for TVET college graduates.

Strategy	2021-2022	2023-2025	2026-2030
Strategy C: Expanding STI talent participation in the workforce.	• Providing incentives to women in the field of STI such as: - Increasing the skills level. - Establishing support facilities. • Formulating a policy for re-entry of women into the workforce.	• Improving career paths and remuneration to make STI a top career choice.	• Increasing the number of women in the STI workforce.
Strategy D: Increasing the demand for STI talent.	• Gaining industry insights in specific sectors to identify and understand the demand for STI talent.	• Encouraging mutual funding in the form of scholarships, internships and pilot projects.	• Increasing the number of techno-entrepreneurs developed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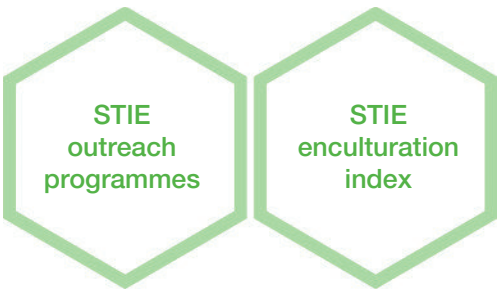
THRUST 5

Enculturation and Application of STIE

3.6 Enculturation and Application of STIE

3.6.1 Objektive

This thrust aims to integrate the elements of science and technology in the minds, beliefs, and habits of society, thus creating a 'technology-literate' society that can apply technology in their daily lives.



3.6.2 Strategy

Two strategies have been outlined to achieve the objective of this thrust.

Strategy A: Improving the effectiveness of the STIE outreach programmes.

The effectiveness of outreach programmes should be enhanced with the implementation of specific programmes or initiatives to disseminate information related to STIE and increase awareness of the latest technology available for use in the market.

Initiative A1: Coordinating, monitoring and evaluating national STIE enculturation initiatives centrally.

To facilitate the implementation of STIE enculturation programmes and activities, it is essential to centralise coordination of STIE enculturation initiatives including module development and STIE Enculturation Index. This initiative will facilitate the monitoring and evaluation of STIE enculturation by the government.

Initiative A2: Creating a network between the operators of private STIE enculturation centres.

Operators of private STIE enculturation centres should also be encouraged to promote the STIE enculturation. Smart partnerships between public and private science centres as well as among private entrepreneurs need to be created in order to mobilise STIE enculturation efforts.

Initiative A3: Assessing the level of STIE enculturation among the community.

The level of STIE enculturation needs to be assessed by developing the STIE enculturation index. Through this index, the government can monitor the achievement of STIE enculturation and literacy levels and the use of scientific knowledge with skills and creativity in society towards innovative problem solving in their daily lives.

Initiative A4: Improving scientific and critical thinking skills through informal learning.

Cooperation between the Central Government and the State Governments to create STIE in situ learning platform, needs to be carried out. In this regard, the state governments play important roles in enculturating STIE, especially in providing land or areas to develop STIE *in situ* learning places or use the existing facilities renovated as STIE enculturation centres in Parliamentary constituencies.

Strategy B: Mainstreaming science communication.

The communication of science to disseminate knowledge to the public needs to be further mobilised. The use of various media platforms should be increased to disseminate information related to STIE and increase public awareness.

Initiative B1: Improving communication and translation of STIE content including content in the media.

A virtual National Science Media Network needs to be developed in the effort to promote STIE and enhance STIE content in the media. It will also help to encourage more accurate STIE-related writing and reporting among journalists. In addition, science communication related modules should also be created in all STEM programmes in IHLs.

Initiative B2: Inspiring the community through STIE programmes and famous local science icons.

Government, private sectors, non-governmental organisations (NGOs) and individuals can work together to inspire community on STIE by using various existing technology platforms such as social media, blogs and online video networks.
STIE-related awards such as the Young Scientist Award, Outstanding Scientist Award, National Technologist Award, or other STIE-related awards should be created as incentives for scientists, technologists, and researchers to contribute to the country's development to become icons to popularise STIE.

3.6.3 STIE Game Changer Programme

a) Technology For All

Enculturation with regard to STIE needs to be expanded not only those related to informal STEM learning but to include the enculturation related to the application of technology at all levels of society; from the industrial society to the grass-root community. This is to ensure that the technology developed, benefits all.

MOSTI needs to work with various ministries, agencies, the private sectors, and IHLs to enculturate the use of technology among the industrial community, especially SMEs, to move toward becoming a high-tech nation. Therefore, information on the technology being developed by local researchers needs to be communicated to the industrial community to ensure that they obtain accurate information and understand the need for new technology and be ready to apply it once the technology has been developed.

The application of technology should also be nurture at the grass-root level by disseminating information and raising public awareness on the use of technology in their daily life. Easy and inexpensive access to technology needs to be created to enable the community to explore the use of technology especially in the era of digital economy. These efforts require the cooperation of the State Government to create a Technology Community Centre in the Parliamentary Constituencies.

3.6.4 Initiative Implementation Action Plan

Strategy	2021-2022	2023-2025	2026-2030
Strategy A: Improving the effectiveness of STIE outreach programmes	• Creating a STI Committee at the central level. • Developing STI Enculturation Index. • Empowering the National Science Centre as the enculturation centre of excellence.	• Developing a standardised STI enculturation module. • Establishing smart partnerships between operators of public and private STI enculturation centres.	• Establishing smart partnerships with the state governments to create STI centres based on *in-situ* learning.
Strategy B: Mainstreaming Science Communications	• Developing a National Science Media Network virtually to increase the content of STI in the media. • Making STIE communications as one of the focus of the Corporate Communications Unit in the science-related ministry. • Influencers' involvement and wider use of social media.	• Introducing Science Communications modules in all STEM programme in IHLs. • Creating the "Young Scientist Award", "Outstanding Scientist Award", "National Technologist Award" or other awards related to STIE. • Making individuals with excellent STIE achievement as icons to popularise STIE.	• Increasing STI content and programmes in the media.

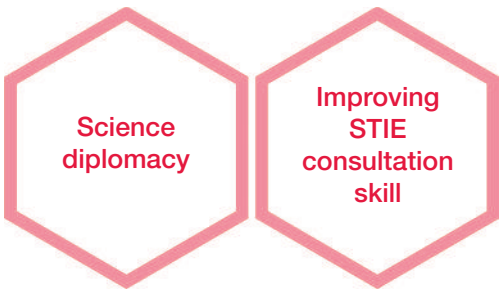
THRUST 6

Global Prominence

3.7 Global Prominence

3.7.1 Objective

This thrust aims to enhance domestic and international cooperation in the field of STIE and to make STIE one of the important elements in foreign policy which will further promote the country's STIE products and services globally.



3.7.2 Strategy

Three strategies are outlined to achieve the objective of this thrust.

Strategy A: Coordinating STIE collaboration at the international level

The establishment of international collaboration through scientific diplomacy is needed in foreign policy to resolve STIE-related issues and promote the country globally. Collaboration between these countries will help internationalise STIE, especially in improving the quality of education, funding of R&D, good governance and more transparent policies.

Initiative A1: Creating local entities to coordinate the ecosystem for international STIE cooperation.

The coordination of local and international STIE ecosystems needs to be implemented to link the strength of local STIEs with potential collaboration at the international level by establishing a special committee at the national level. This coordination needs to be further strengthened with the development of a centralised database for STIE-related international collaboration to further identify areas of priority and resources that can attract the cooperation of international STIE partners.

Initiative A2: Facilitating the network of international relations throughout STIE supply chain through Malaysian Representative Offices.

Every Malaysian Representative Office abroad has the opportunity to highlight the strength of domestic STIE to global arena. However, these individuals, should have specific skills to be able to carry out consultations, promotions and research on STIE products and services. Basic knowledge in science is important to ensure that these matching activities are effective and will benefit the country.

Strategy B: Strengthening marketing strategy for local STI innovation in the international market.

Malaysia needs to be more active in bilateral, multilateral trade and membership activities in international platforms such as the Association of Southeast Asian Nations (ASEAN), the Asia-Pacific Economic Cooperation (APEC), the Organisation of Islamic Cooperation (OIC), and various bodies under the United Nations (UN). This effort is important to stimulate commercialisation of local innovation, development of technology transfer and knowledge that contributes to the increase in the country's STIE capabilities.

Initiative B1: Increasing efforts to penetrate international market for local STIE innovation.

A mechanism and guideline need to be developed as references for local and international innovation marketing efforts. This mechanism will help to analyse and identify destinations, strategic partners and potential local innovation products to be commercialised and branded as international products.

Strategy C: Strengthening the network of international cooperation for research collaboration, strategic partnerships and business alliances.

Malaysia needs to establish a network of cooperation through international strategic relations at the institutional level with external organisations which have common interests. A network of international STI researchers and experts will open more partnerships that support a collaborative framework in addressing various issues involving universal interests.

Initiative C1: Strengthening the branding and position of innovation, expertise and international partnerships for local STIEs.

The bilateral and multilateral partnership networks of STI need to be further intensified to explore more research opportunities. This can be done by enhancing collaboration with leading international research institutions and the exchange of experts, researchers and students at international level. The empowerment of Higher Education Centres of Excellence (HICoEs), research institutes and innovation centres in the country is also important to attract more global strategic collaboration partners.

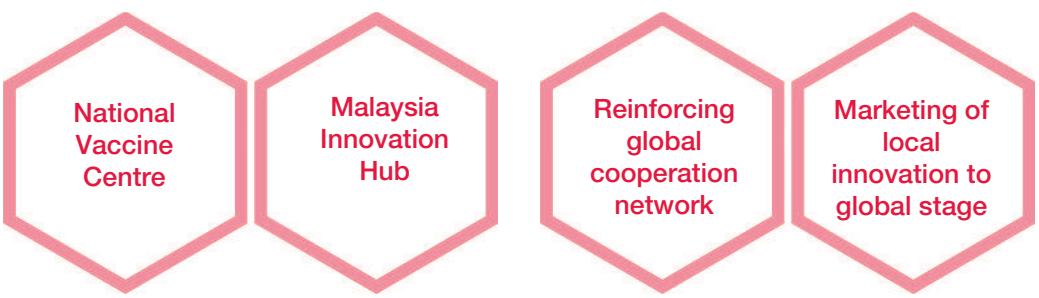
3.7.3 STIE Game Changer Programme

a) National Vaccine Centre (NVC)

NVC aims to develop and support the national health security ecosystem through local and international strategic collaboration platforms offering technical and infrastructure solutions for human and animal vaccine development. This ecosystem includes command & control management, epidemiology and data analysis, R&D, public health and health care as well as mental well-being. Regional and global cooperation will be implemented using infrastructure sharing methods, expertise development, research and transfer of related technologies that are beneficial to the country in facing the challenges of health management and disease outbreaks in the future. The development of this vaccine centre will be accomplish with the collaboration of the Ministry of Health Malaysia.

b) *Malaysia Innovation Hub*

Malaysia Innovation Hub is an effort to make the country an international innovation hub by upgrading Technology Park Malaysia (TPM) to Technology Park Malaysia International Innovation Hub. It is also an effort to support and increase the commercialisation of local innovation products, attracting more international strategic partners and marketing local innovation products across global market. This upgrade includes the development of a living lab, commercial centre, experimental lab (test bed) and continuous capacity and capability development aid (learning tools) and teaching materials (online / offline).



3.7.4 Initiative Implementation Action Plan

Strategy	2021-2022	2023-2025	2026-2030
Strategy A: Coordinating STIE collaboration at the international level	• Identifying priority areas and resources that can attract international partners.	• Establishing a centralised database for Malaysia's STI cooperation internationally. • Trained and dedicated reference experts at each embassy / consulate.	
Strategy B: Strengthening the marketing strategy for local STIE innovation in the international market.	• Developing guidelines to upgrade local products as international brands.	• Identifying key destinations to market Malaysian STIE products and services. • Identifying and promoting potential local STI products and services for international branding.	• Increasing the number of STIE innovations that become global brands

Strategy	2021-2022	2023-2025	2026-2030
Strategy C: Strengthening the international cooperation network for research collaboration, strategic partnerships & business alliances.	• Enhancing STI bilateral / multilateral sharing network. • Increasing the number of joint researches with international research institutions.	• Providing incentives to Higher Education Centres of Excellence (HICoEs), Research Institutions & Innovation Centres to conduct experimental development research with overseas partners. • Intensifying international exchange programmes of experts, students and researchers.	• Increasing the placement of Malaysian students, researchers and experts in foreign institutions and industries.

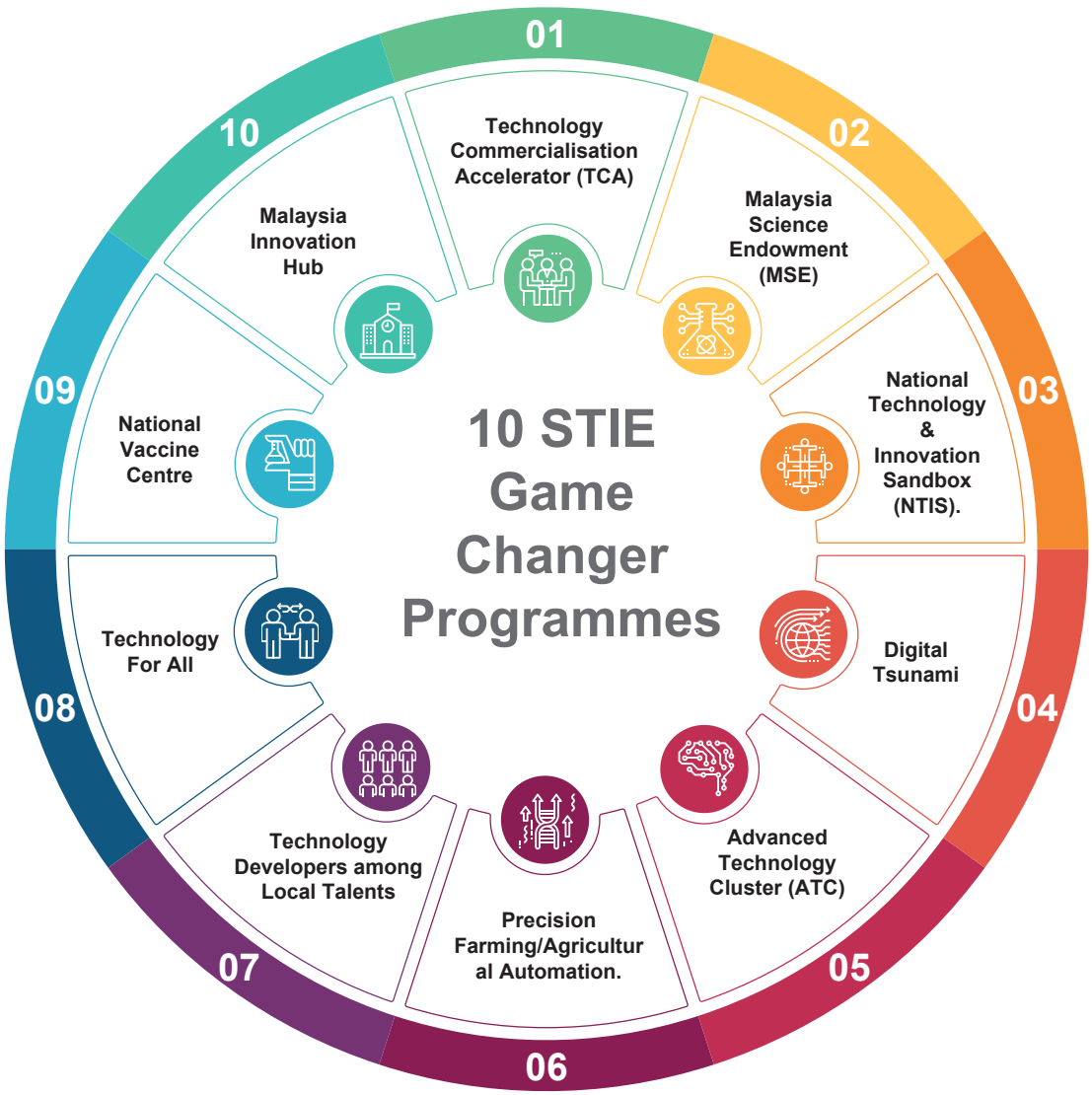

DSTN

CHAPTER 4: **CONCLUSION**

4.1 STIE Game Changer Programmes

Investment in social innovation that benefits society, especially the marginalised and underprivileged community, needs to be intensified by the government and industry. Stimulation of these social innovations will accelerate technology and knowledge transfer to society and further enhance societal well-being. This will lead to a more solid societal unity in the nation.

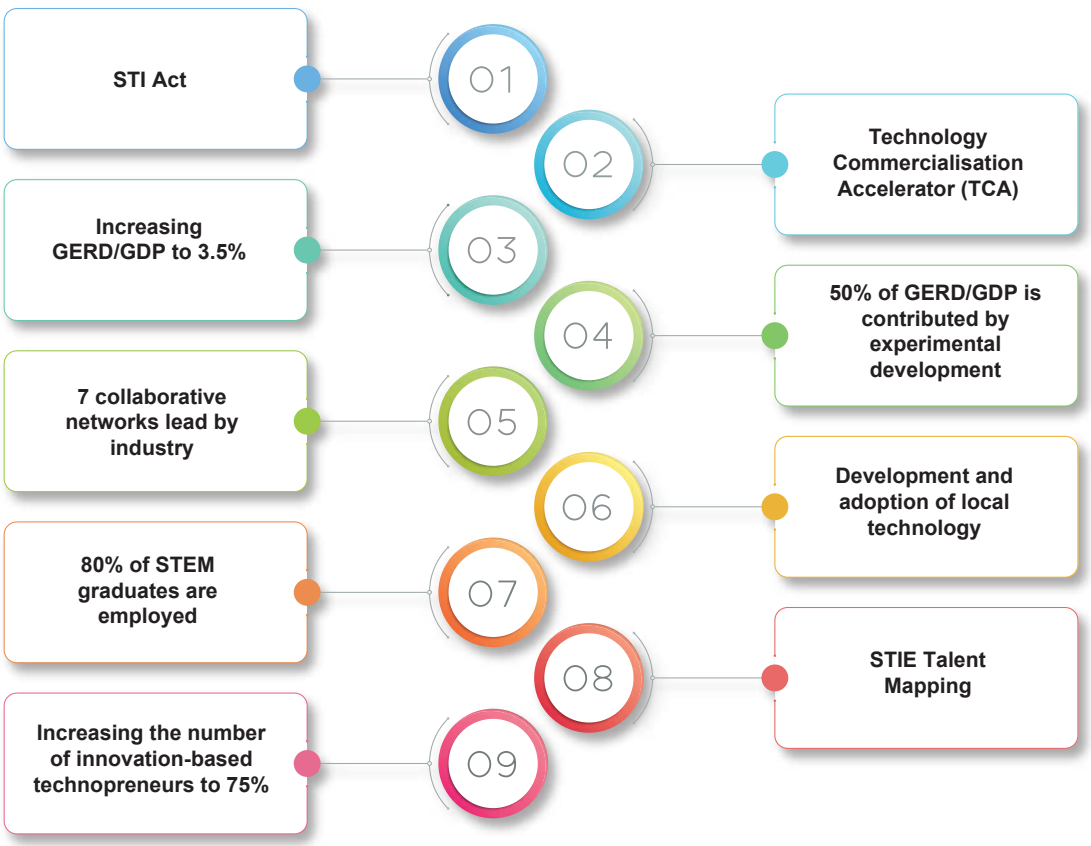
10 Program Lonjakan STIE



4.2 Main Target

This policy sets 9 key targets to be achieved in the period from 2021-2030. The achievement of these 9 key targets will support the achievement of the targets of other initiatives planned in this policy as set out in the NSTIP Action Plan 2021-2030.

9 Main Targets of NSTIP



4.3 Summary

Malaysia has the potential to develop and leverage STIE as it has achieved in previous development eras. The implementation of responsive STI governance will help to harness existing advantages and take the opportunity of the changing global landscape to achieve STIE-based socio-economic growth and development.

Considering the needs of the people and the future challenges, NSTIP 2021-2030 outlines the direction in which the government needs to play an important role in the form of leadership and influence to drive STIE towards high-tech nation. To ensure that Malaysia achieves this success, planning must be carefully implemented through collaboration, coordination and comprehensive commitments to ensure that every Malaysian can enjoy the maximum benefits from the technologies developed and achieve harmony, prosperity and sustainability through STIE in line with the Shared Prosperity Vision 2030.

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