

# Digital Engineering in Thailand

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INCOSE SG PRESENTS

# 2024 SYSTEMS ENGINEERING DAY

September 27, 2024

York Hotel, Singapore

1:30 P.M. - 2:15 P.M.

Digital Engineering in Thailand

This talk embarks on Thailand's exciting journey towards a digital engineering future. It explores how a systems engineering approach, empowered by Model-Based Systems Engineering (MBSE), can unlock its potential for industry transformation. While digital engineering adoption is still in its early stages, we'll navigate the challenges and opportunities of implementing this approach. The discussion will explore the ongoing efforts of INCOSE Thailand in facilitating resources for digital engineering implementation.



Vorachet Jaroensawat |

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## Our voices at TSEC 2024

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At TSEC 2024, we host a panel discussion on "**SE Academic Programs in Thailand and the Role of INCOSE Thailand**," featuring some of the country's leading educators and researchers.

**Findings:** Leading Thai universities offer Digital Engineering programs; however, **most have not yet connected with the INCOSE Thailand chapter, limiting our access to their intended education program designs and backgrounds.**

At TSEC 2024, we were excited to host a panel discussion on "**SE Professional Programs in Thailand and the Role of INCOSE Thailand**," featuring key figures in the field of systems engineering.

**Findings:** There is significant potential to **promote SE/MBSE/DE to organizations with strong project management disciplines or those managing large projects.** Integrating Project Management (PM) and Systems Engineering is a highly sought-after area.

At TSEC 2024 on "**Systems Engineering in Thailand's Defense, Aerospace, and Energy Sectors: Updates and Movements in 2024.**" The session featured organization representatives who shared their insights on the latest developments.

**Findings:** The defense sector has **initiated SE department and actively applying SE** within its organizations. The aerospace industry **already teaches SE at universities and is seeking further collaboration** with the INCOSE chapter. Meanwhile, the energy sector has **launched its first SE program, focusing on training and piloting MBSE projects.**

# Collaborative Forces Shaping Thailand's Digital Engineering Future

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As we all know, the digital revolution is reshaping every industry around the world. But what about Thailand?

**Various stakeholders** play crucial roles in driving the digital engineering future

Guiding the Digital Future  
of Thailand

Government  
Agencies

Building Tomorrow's  
Engineering Leaders

Educational  
Institutions

Driving Change /  
Change Maker

Industry  
Leaders and  
Corporations

Connecting Professionals,  
Elevating Standards

Professional  
Associations

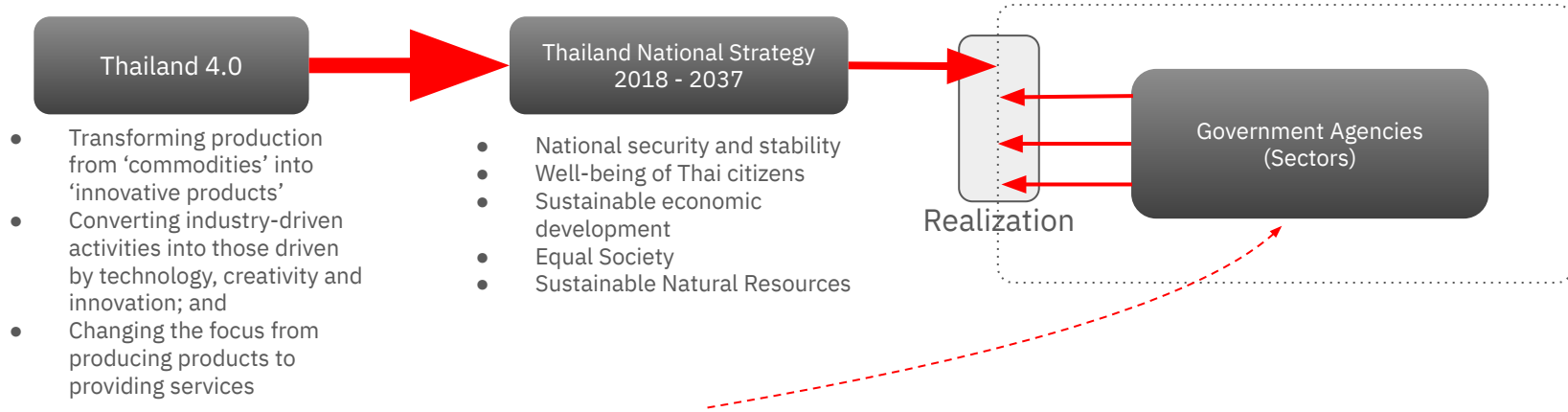
Connecting the World for  
Global & Local Progress

International  
Organizations

Advisory and  
Implementation Support

Consulting  
Firms

# The Drivers



## Hierarchy of organizations

- **Thailand: Over 1 million government officials (Population: ~70 million, GDP: \$543 billion, GFCI Rank: 40)**
- Singapore: 80,000 to 90,000 government officials (Population: ~5.7 million, GDP: \$403 billion, GFCI Rank: 4)
- Japan: Around 1 million government officials (Population: ~125 million, GDP: \$4.2 trillion, GFCI Rank: 7)
- India: Over 5 million government officials (Population: ~1.4 billion, GDP: \$3.5 trillion, GFCI Rank: 75)
- Indonesia: Approximately 4 million government officials (Population: ~275 million, GDP: \$1.2 trillion, GFCI Rank: 56)
- South Korea: About 1.2 million government officials (Population: ~51 million, GDP: \$1.6 trillion, GFCI Rank: 10)

# Value-Based Economy – Thailand 4.0

Transforming production from **'commodities'** into **'innovative products'** and Converting the **current industry-driven** activities into those driven by **technology, creativity and innovation**

## How countries practically measure their development?

Global Financial Centres Index (GFCI)  
Global Innovation Index (GII)  
Ease of doing business (EoDB)  
Science, Technology and Innovation Scoreboard (STI)

**GFCI/GII/EoDB/STI is critical before starting digital engineering initiatives for several important reasons.**

The main stakeholder



Macroeconomic Analysts

## THAILAND'S ECONOMIC DEVELOPMENT MODELS

Thailand 4.0  
Technology-Driven

Thailand 3.0  
Heavy Industry

Thailand 2.0  
Light Industry

Thailand 1.0  
Agriculture

# How does having a robust financial system fostering a sustainable economy?

## Global Financial Centres Index (GFCI)

- Singapore (4/2023) - Global powerhouse in finance and trade !
- **Thailand (95/2023) - Raising financial hub, but with room for growth ?**

A strong **financial center is essential for sustainable economic growth because it attracts global investors**, offers diverse financial services, and encourages the development of high-value industries..

For Thailand (95), improving its ranking would mean attracting more foreign direct investment (FDI) and fostering financial ecosystems that support sustainability projects.

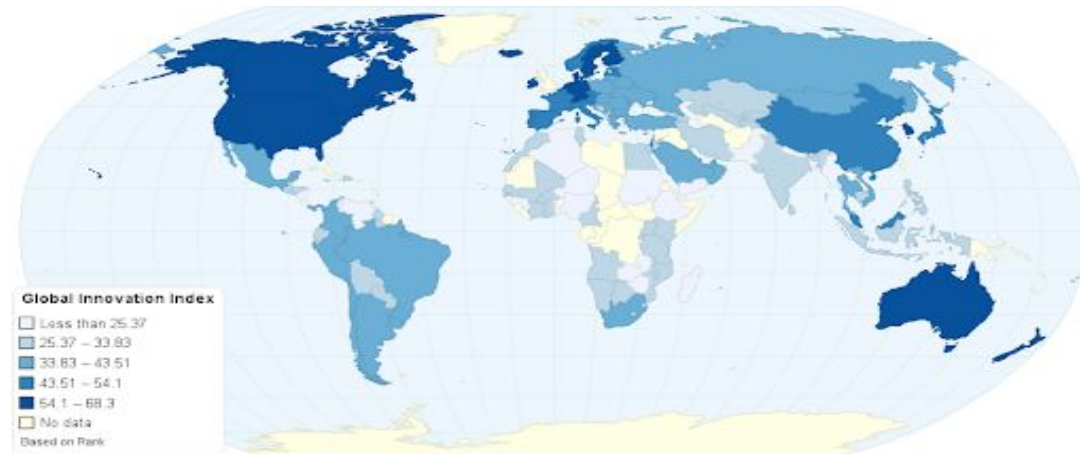
Centre	GFCI 33 Rank	GFCI 33 Rating	Rank(+/-)	Rating(+/-)	Region
New York	1	760	0	0	North America
London	2	731	0	0	Western Europe
Singapore	3	723	0	↓ -3	Asia/Pacific
Hong Kong	4	722	0	↓ -3	Asia/Pacific
San Francisco	5	721	0	↓ -3	North America
Los Angeles	6	719	↑ 1	↓ -3	North America
Shanghai	7	717	↓ -1	↓ -6	Asia/Pacific
Chicago	8	716	↑ 4	↓ -1	North America
Boston	9	715	↑ 5	0	North America
Seoul	10	714	↑ 1	↓ -4	Asia/Pacific
Washington DC	11	713	↑ 4	↓ -1	North America
Shenzhen	12	712	↓ -3	↓ -8	Asia/Pacific
Beijing	13	711	↓ -5	↓ -10	Asia/Pacific
Paris	14	710	↓ -4	↓ -9	Western Europe
Sydney	15	709	↓ -2	↓ -7	Asia/Pacific
Amsterdam	16	708	↑ 3	↓ -2	Western Europe
Frankfurt	17	707	↑ 1	↓ -4	Western Europe

# Why is innovation a critical driver for long-term economic sustainability?

## Global Innovation Index (GII)

- Singapore (6/2023) - Leading the charge in innovation and technology
- **Thailand (43/2023) - Making a walk in innovation, but still climbing**

**Innovation is the engine behind economic resilience and sustainability.** Countries that invest in research and development (R&D) and encourage technological innovation are better positioned to create industries based on renewable energy, clean technologies, and efficient resource use.



Thailand (43) is making progress but needs to boost its innovation capacity to support a more sustainable economy, including the development of any technology of interest and ability to develop those technologies in a sustainable way (SE/MBSE/DE).



# How does a business-friendly environment enabling the growth of sustainable enterprises?

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## Ease of doing business (EoDB)

- Singapore (2/2023) - Among the easiest places to do business globally
- Thailand (80/2023) - An improving environment for business, but challenges remain.

A high ranking in EoDB indicates that the country provides a favorable environment for businesses to thrive, reducing barriers for entrepreneurship and sustainable enterprises. Streamlined regulations, accessible markets, and efficient systems encourage more businesses to innovate in areas like sustainable agriculture, clean energy, and green manufacturing.

Thailand (80), while improving, **needs to further streamline business** regulations to foster green startups and innovation, particularly in sustainable industries.



## Ease Of Doing Business

# How important is investment in science and technology for creating a sustainable economy?

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## Science, Technology, and Innovation Scoreboard (STI)

- Singapore (13/2023) - Among the best country's commitment to investing in science and technology globally
- **Thailand (129/2024) - A need for accelerated progress in science and technology**

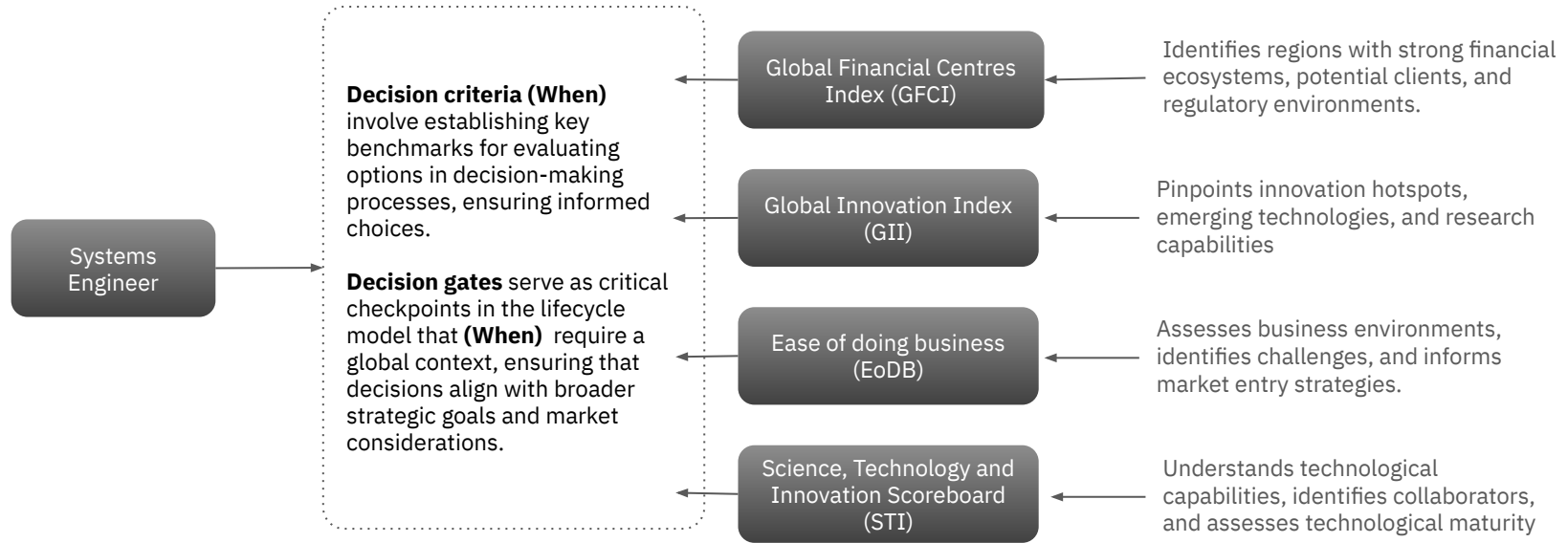
This indicator shows the **country's commitment to investing in science and technology**, essential for developing green innovations and sustainable solutions. Higher investment in STEM fields and R&D drives progress in areas like renewable energy, climate-resilient infrastructure, and circular economies.

Thailand (129) indicates a **need for more investment in science and technology** to build a knowledge-based economy that can drive sustainability initiatives, such as biotechnology for agriculture and green manufacturing technologies.



# Even if you're not a macroeconomic analyst, Systems engineers should be aware of

While these indices are primarily designed for macroeconomic analysis and policy making, they can indirectly provide valuable insights for systems engineers working in global contexts.



# What do macroeconomic stakeholders sound like? and the MDES's strategies

How is Thailand's **digital** transformation **contributing** to **overall economic** growth and development?

What are the expected **long-term economic benefits of digitalization**, such as increased productivity, job creation, and export growth?

How is Thailand addressing **the potential challenges and risks associated with digital transformation**, such as job displacement and income inequality?

How is **Thailand's digital** infrastructure and financial technology landscape contributing to **financial stability and resilience**?

Are there any concerns about **cybersecurity** risks or financial fraud **associated with digitalization**?

How is Thailand's digital transformation enhancing its **competitiveness** in the **global economy**?

What are the **key factors driving Thailand's attractiveness** as a destination for foreign investment in the digital sector?



## MDES's strategies (2023)

1. Drive the **new economy** with **digital** ecosystem, **digital** infrastructure and **digital** innovation
2. Create a society of the future and reducing inequality by using **digital** technology
3. Develop human resources to be ready for the **digital** age
4. Build confidence in the use of digital technology

# Royal Thai Government



## Systems (50+ entities)

**Judicial:** Constitutional Court, Supreme Court, Criminal Court, Administrative Court, Military Court

**Ministries:** Office of the Prime Minister, Agriculture and Cooperatives, Commerce, Culture, Defence Armed Forces (Army, Navy, Air Force), Education, Energy, Finance, Foreign Affairs, Digital Economy and Society, Industry, Interior, Justice, Labour, Natural Resources and Environment, Public Health, Higher Education, Science, Research and Innovation, Social Development and Human Security, Tourism and Sport, Transport

**Constitutional organizations:** Office of the Election Commission, Office of the Ombudsman, National Anti-Corruption Commission, State Audit Commission, Office of the Attorney General, National Human Rights Commission of Thailand

**Independent departments:** Bureau of the Royal Household, National Office of Buddhism, Office of the Royal Development Projects Board, Office of the National Research Council of Thailand, Royal Society, Royal Thai Police, Anti-Money Laundering Office

Over 1 million government officials

Individual Strategy

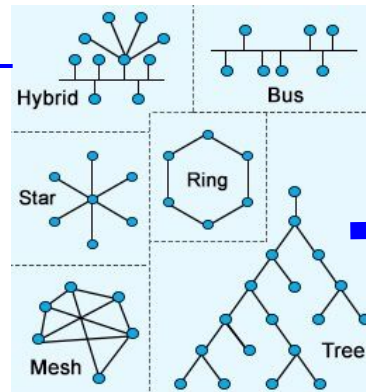
### Way of Working

### Strategy

### Validation

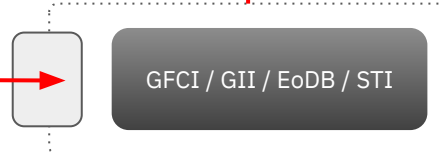
### Verification

### Comm.



### MOE (Macroeconomic)

### Macroeconomic Aspects (Quantitative)



**Q:** What method will we apply to assess the current status of Digital Engineering ?

# Predicates extracted from the Digital Engineering definition

## Digital Engineering (DE)

According to the US Defense Acquisition University Glossary, Digital Engineering is an integrated digital approach that uses authoritative sources of systems' data and models as a continuum across disciplines...See *INCOSE SEHB v5*

DE as triple statements  
(Subject-Predicate-Object, SPO)

$S = \{\text{Digital Engineering, Digital System Model, Digital Twin, Digital Thread}\}$

$P = \{\text{Uses, Supports, Includes, Executes, Communicates, Emphasizes, Maximizes, Places Emphasis, Requires, Integrates, Defines, Serves, Leverages, Enables, Incorporates, Evolves, Controls, Informs, Produces, Emulates, Addresses}\}$

< The initial set that enables a task-based relationship model for writing SOPs/Taxonomy/Ontology

Predicate	Digital Engineering	Digital System Model	Digital Twin	Digital Thread
Uses	System data and models	X		
Supports	Life cycle activities	X		
Includes	Engineering disciplines			
Executes	Engineering discipline processes with well-defined models	X	X	X
Communicates	System designs	X	X	X
Emphasizes	Continuity of models	X		
Maximizes	Use of models and computers	X		
Emphasizes	Consistent and rigorous engineering, strong data management practices			
Requires	Supporting infrastructure, environment and a capable workforce and culture that is committed to working in accordance with process, following methods, and using tool the organization supplies them			
Integrates				
Defines				
Serves				
Leverages	MBSE and Digital System Model			
Enables	Digital Thread and Digital Twin			
Incorporates			System data and models	X
Evolves		X	System's mission and definition	X
Controls		X		
Informs		X		
Produces				
Emulates			Actual systems	
Addresses		X	X	Stakeholder's perspective

Generative & Computational methods

Traceability for decision variables

Design stage:  
<views/viewpoints>

O&M stage: Reliability ,  
Asset Performance, Failure Rate, MTTF, MTBF, Bathtub Curve, Exponential and Weibull Distribution

fits

fits MBSE

MBSE and technical data  
System aspects  
Authoritative source of truth

Interplay of digital artifacts  
Decision-makers  
Digital artifacts

X = can be involved or interwoven

**The Right Data, The Right Quality, The Right Time, The Right Cost, The Right Effort, The Right Strategy, The Right Communication**

# Digital-Focused Government Agencies



1. Drive the **new economy** with **digital** ecosystem, **digital** infrastructure and **digital** innovation
2. Create a society of the future and reducing inequality by using **digital** technology
3. Develop human resources to be ready for the **digital** age
4. Build confidence in the use of digital technology



# Key Stakeholders in local engineering communities

As of September 2024, **we need more time to engage Thai organizations in assessing the current state of Digital Engineering (DE) across sectors**, which is why TSEC2024 is scheduled for August 2024. **We're observing that most stakeholders positioned in microeconomics also have a global presence**, emphasizing the value of international organizations. The **INCOSE Thailand chapter can support these stakeholders in enhancing their global presence** while also **attracting new community members towards becoming a chartered chapter** in the near future

