16 Jan. 2019
Federation of Thai Industries

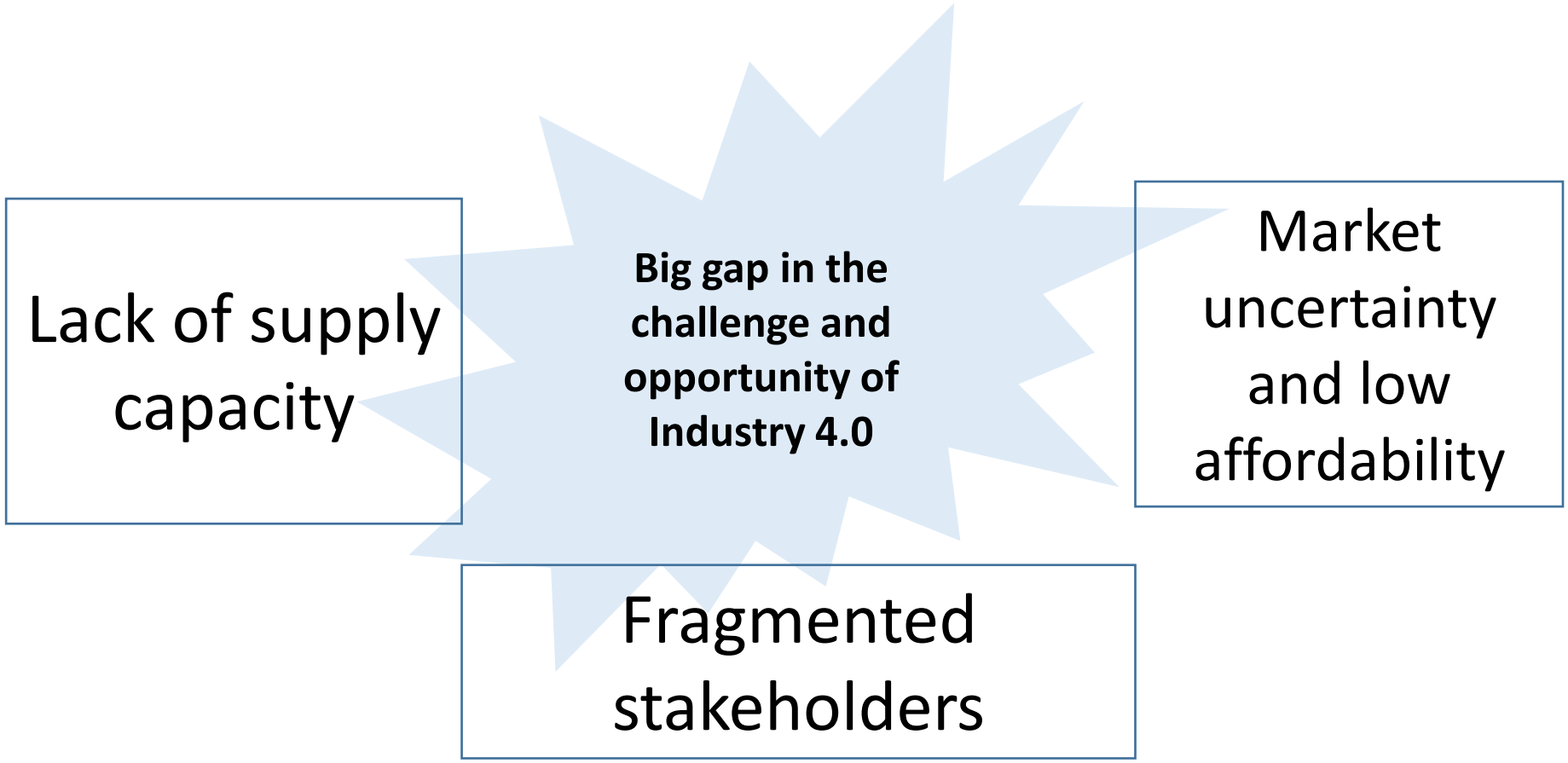
# Industry 4.0 in Thailand Template

Chaisung LIM, at STIPI, KMUTT/Korea Industry 4.0 Association/Konkuk Univ.

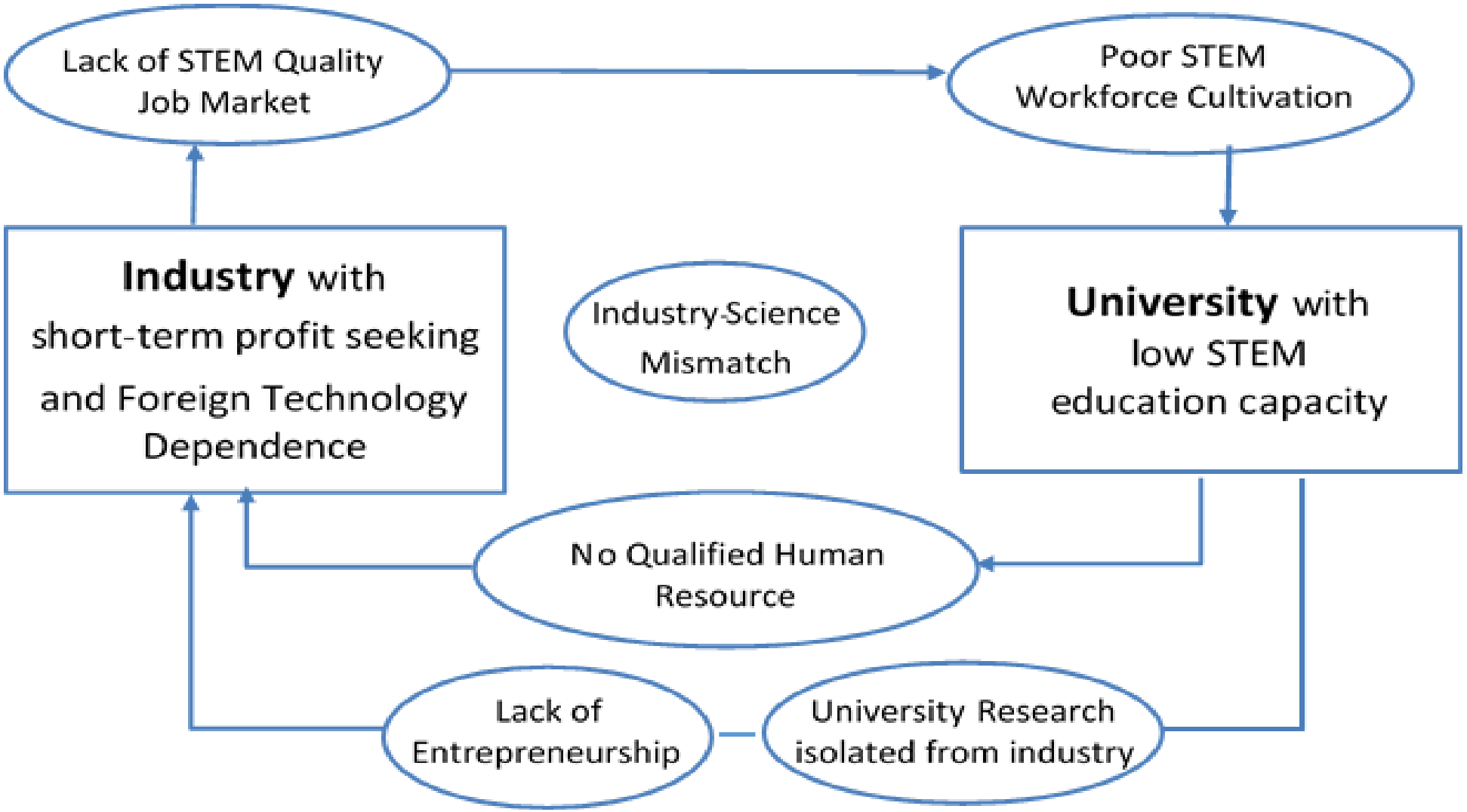
Jeong Hyop LEE at STIPI, KMUTT

# 1. Thailand context

Conceptual framework conditions of Thailand industry 4.0



# 1. Thailand context



# Major talking points


- Gap between Thai industry and target market
- Gap between Thai industry and required capability

Thailand Template?

# 2. Discontinuity vs. continuity driven by Industry 4.0 in Thailand context

## Service driven manufacturing with business model innovation

- product innovation
- process innovation

## Internet business driven manufacturing

- Connectivity of customers,  suppliers, partners, employees, objects and systems
- Availability of relevant data in real time basis
- Platforms

# 2. Discontinuity vs. continuity driven by Industry 4.0 in Thailand context

Pressures of radical busines models to global leaders (e.g. Bentz)

-driven by platform leading companies

Reshoring

-threats to developing countries' cost advantage production

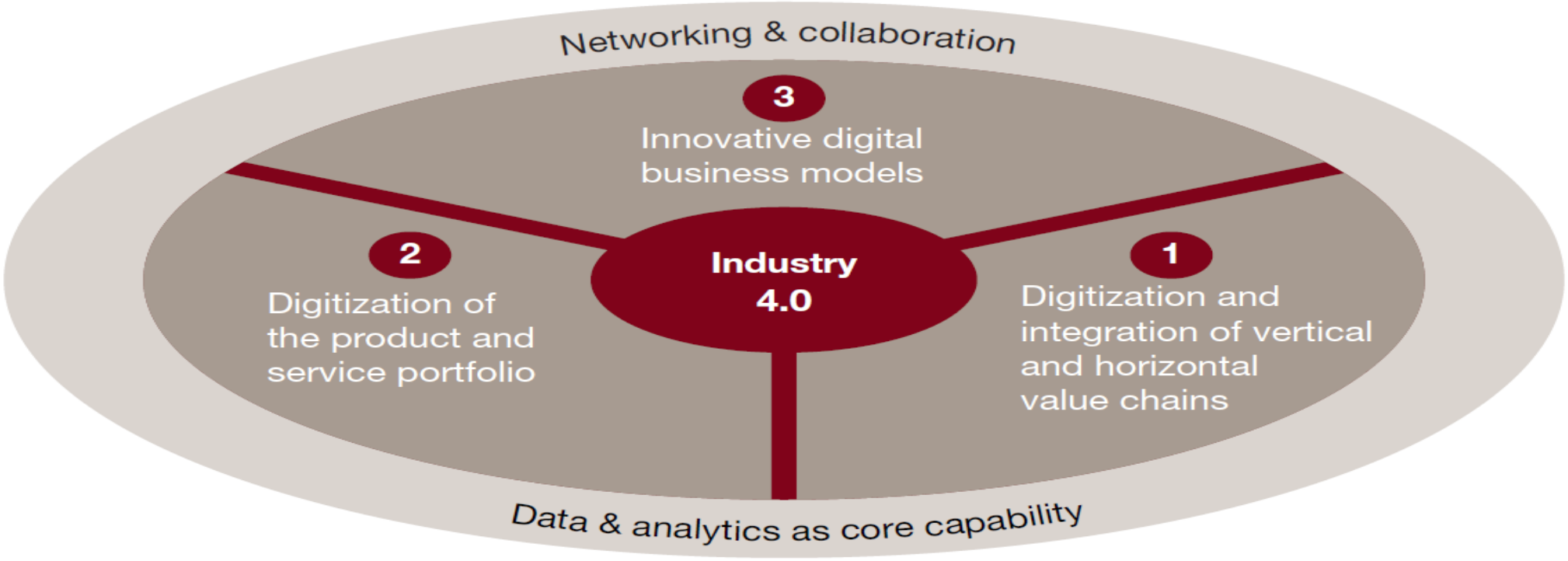
# 2. Discontinuity vs. continuity of Industry 4.0 in Thailand context


Existing problems of Thai manufacturing industries continue, possibly likely to get worse

# 3. Challenges and opportunities: new product, process and business model innovation driven by Industry 4.0

**Industry 4.0 comprises the networking of value chains, the digitization of products and new business models**

Framework for Industry 4.0




Koch et al. (2014)

# Product

## What is Smart, Connected Product?



Smart, connected products have three core elements :

| Physical components | Smart components | Connectivity components |
|---|---|---|
| Mechanical | Sensors | Networks |
| Electrical | Electronics and Controls | Protocols |
| Parts | Software | Wireless connections |
| | Enhanced UI | Connectivity Interface |

Physical Product → Smart Product → Smart, Connected Product

Inrease of the Value of The product

Inrease of the Value of The product

SOURCE : "HOW SMART, CONNECTED PRODUCTS ARE TRANSFORMING COMPETITION," HBR, NOVEMBER 2014

# Process

SIEMENS

Source : SAP

| | 1989 | 2015 |
|---|---|---|
| Workforce | 1,000 | 1,000 |
| Size | 10,000 | 10000 |
| Annual production | 1.5 Million | 12 Million |
| Quality | 500 PPM | 12PPM |

- **Automation** : Automation rate 75%
- **Digitalization** : Everyday 50 million information collected from Manufacruring Execution System
- **Employee Ideas** : Selecting 13,000 ideas in 2014. Increase 40% productivity
- **Connection of process information** : prevention of problems by passing contents of a work process to the following work process
- **Individualized production** : capable of processing individualised order

## Automated factory

- Mass production
- Automation

## Smartized factory

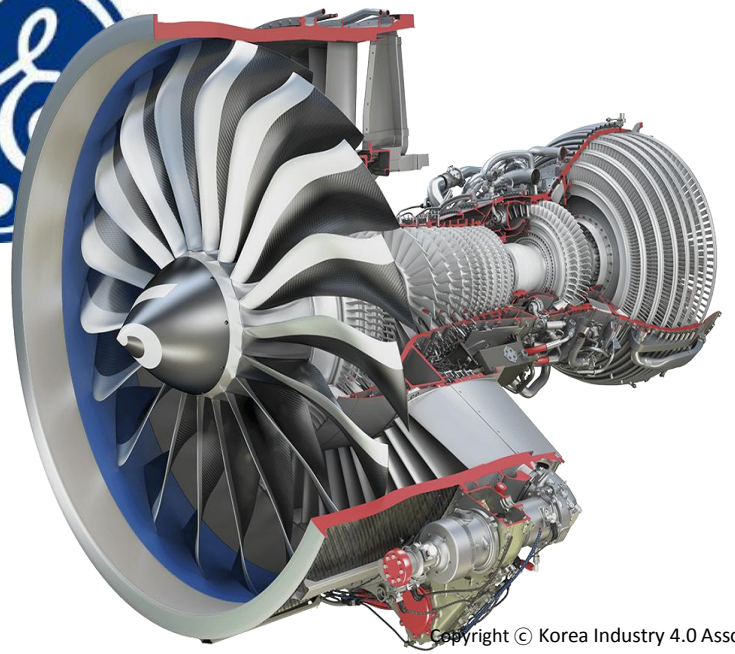
- Personalised mass production
- Smartization: real time data analytic
- Cyber- physical system
- Reduced assembly & molding

# Business model

## GE Aviation

- New value proposition
- Speedy products/services delivery - individual problems of customers
- Close network with customers
- Platform

Product



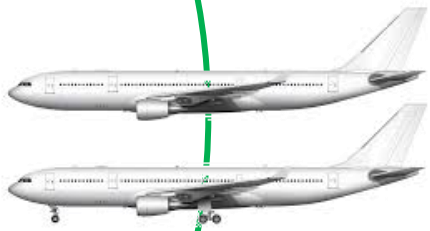
**Cont. operating of engines without problem**

Predix

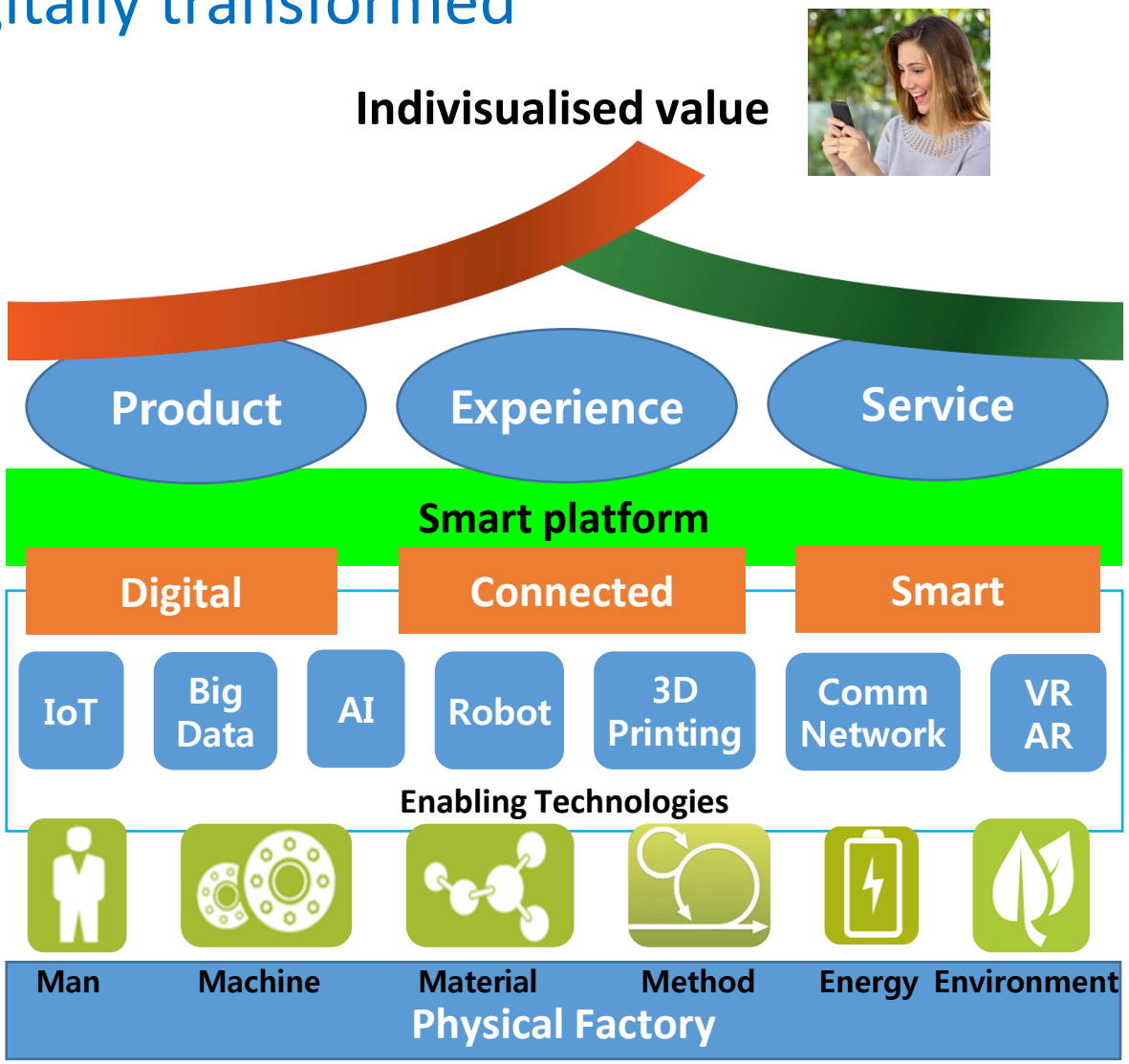
1 TB/flight
5 ~ 10 flights/day
10TB/day


11 PB

2200 aircrafts
in flight




# Industry digitally transformed



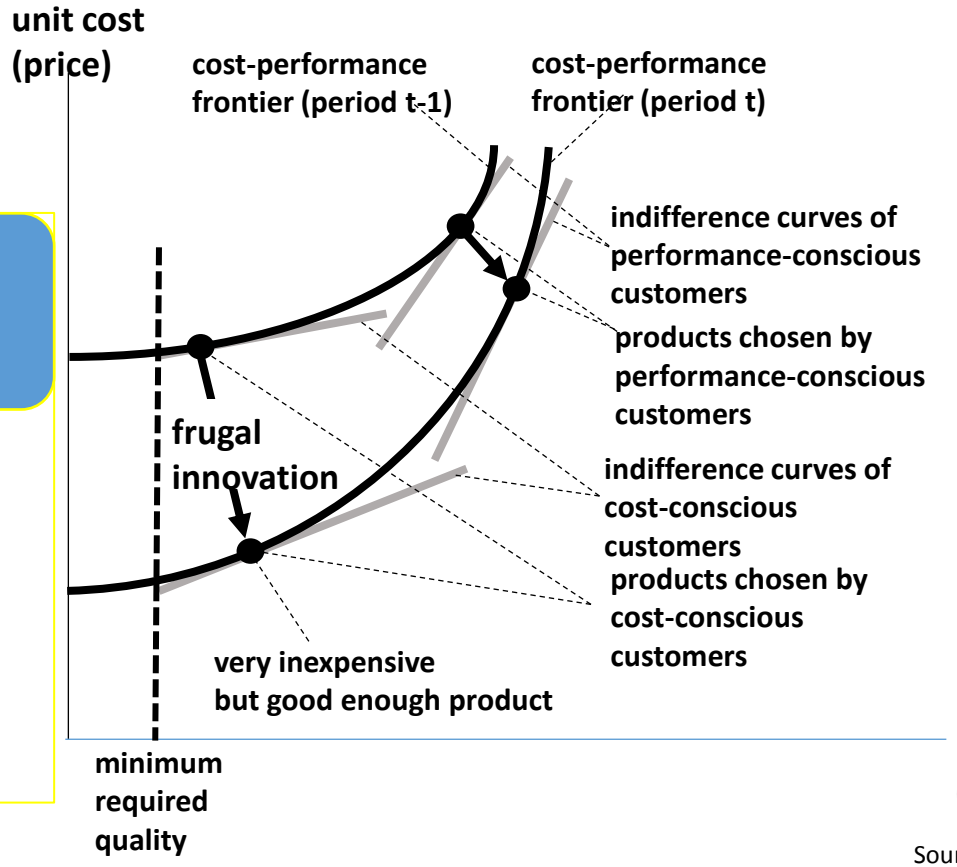
# 4. Two conceptual alternatives: frugal innovation and leapfrogging

## Frugal innov market

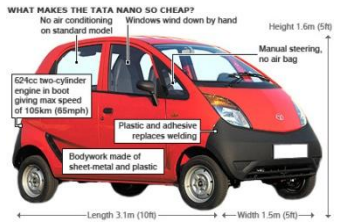
- Local Accessibility&Afford.
- Global Scalability

## Frugal innov. supply

- Local offerability leveraging global partner & affordable R&D, test
- Upgrading local tech. capabilities for high impact opportunitie of economic growth




Driven by market affordable design with architectural change
i.e. Tata Nano car

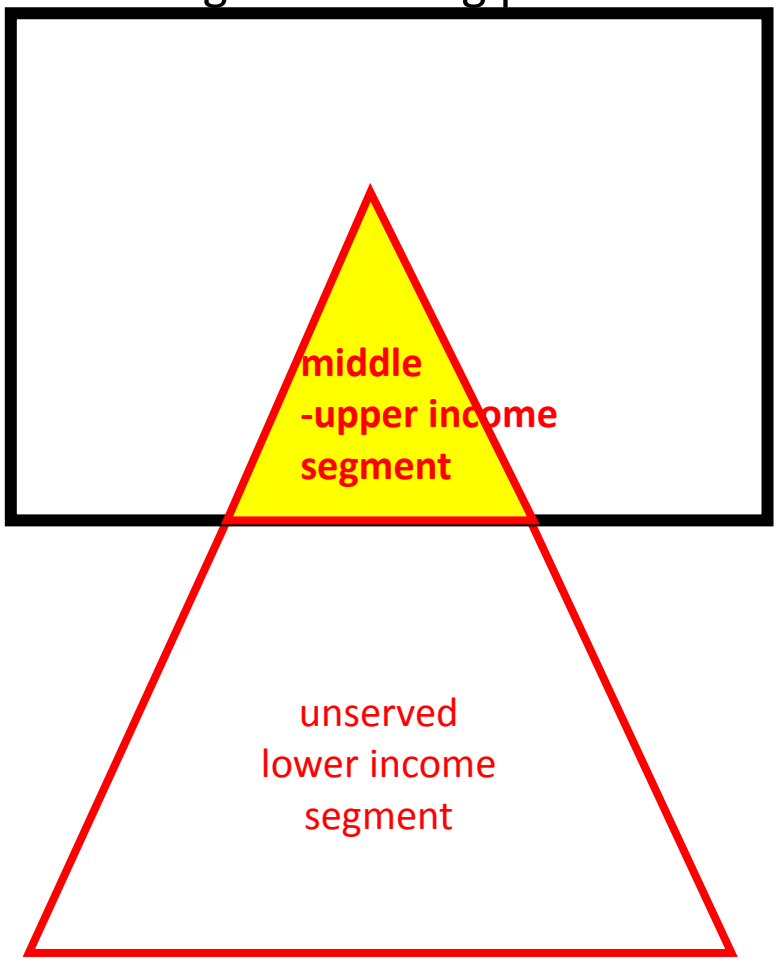



2,500 dollar car

Source: Lim and Fujimoto (2018)

1. Pre-growth stage

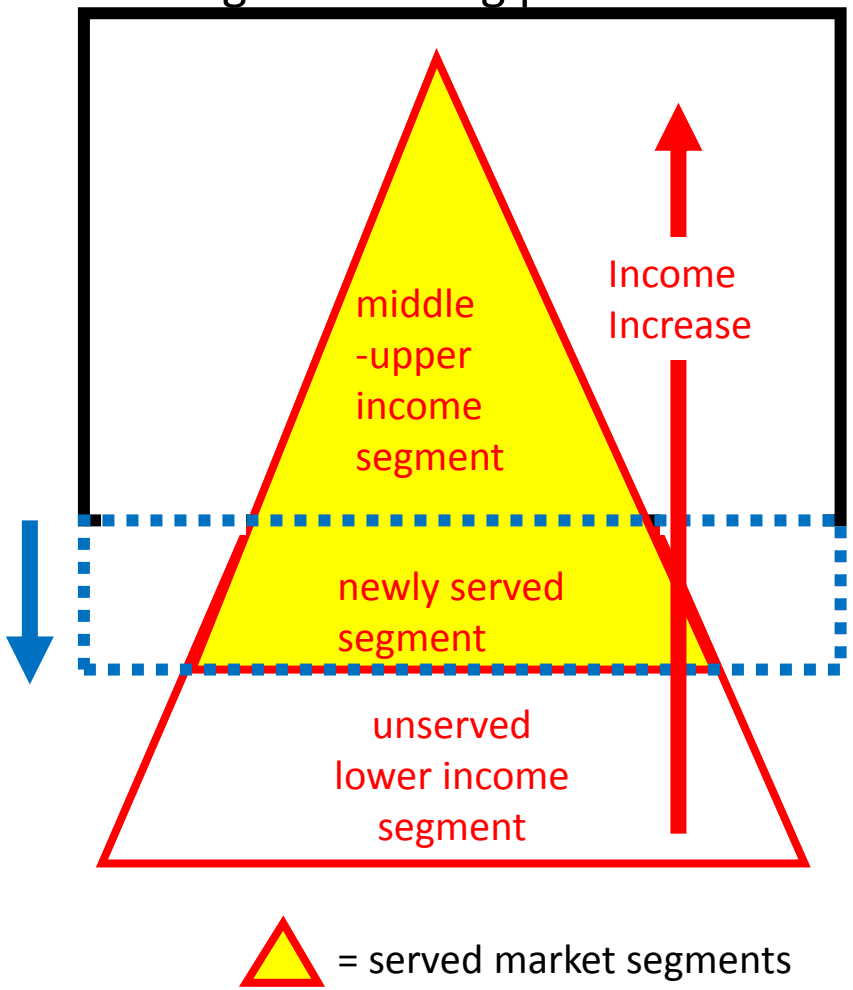
Price range of existing products offered




frugal
innovation

2. High growth stage

Price range of existing products offered

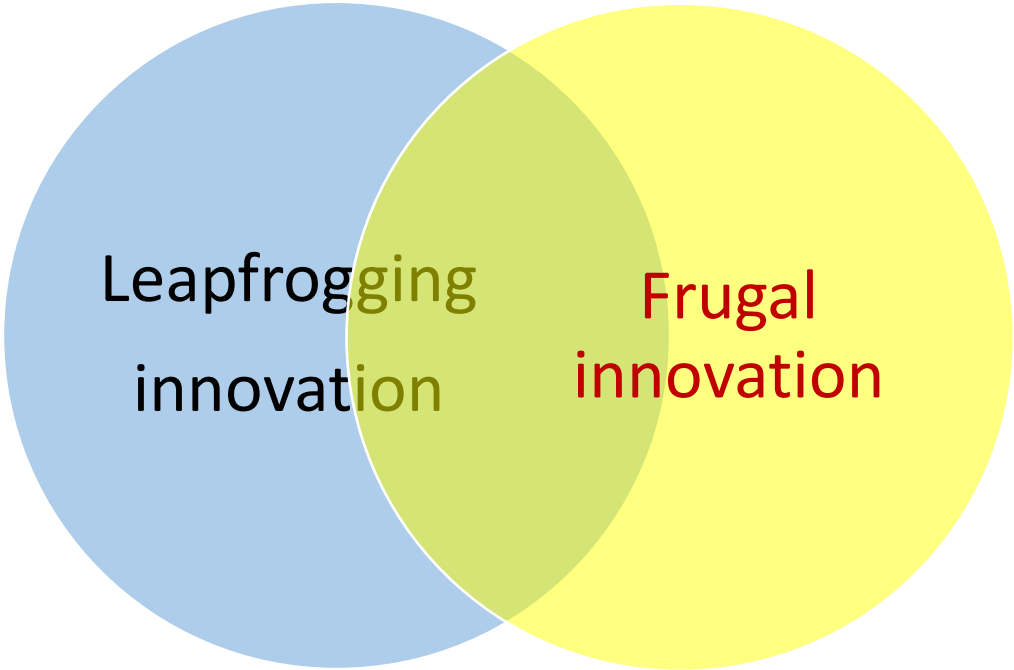



= served market segments

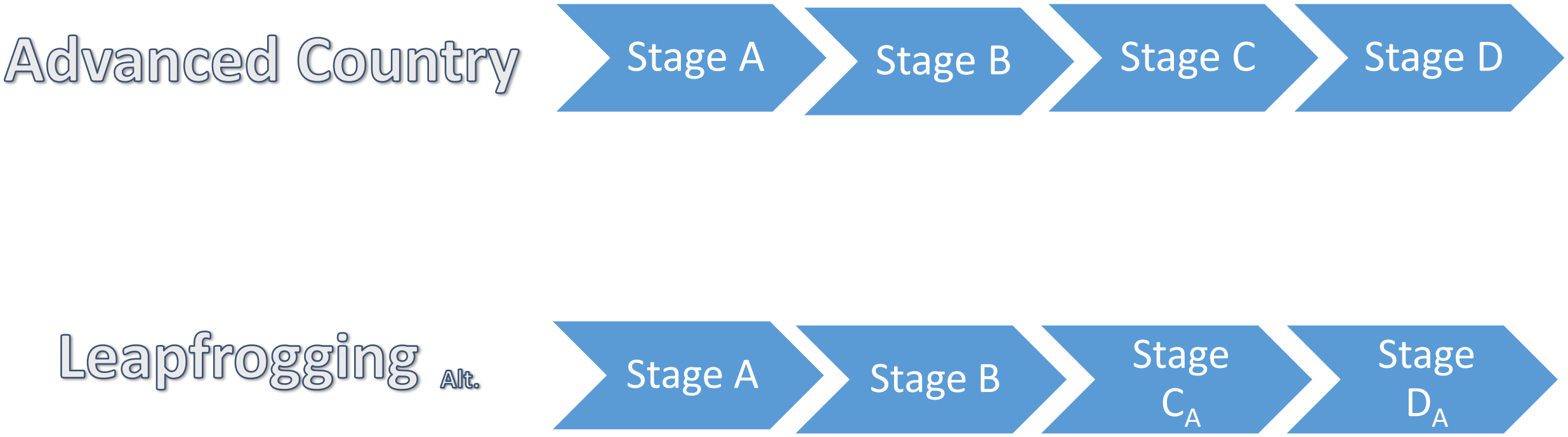
Source: Lim and Fujimoto (2018)

Leapfrogging $_{alternative}$ Innovation

- Frugal innovation : lower end market
- Leapfrogging$_{alternative}$ innovation : lower high and middle end of the market



# Leapfrogging$_{alterntive}$ innovation




Source: Lee and Lim (2001) modified

# Leapfrogging innovation

Leapfrogging Alt.

Stage A → Stage B → Stage $C_A$ → Stage $D_A$

Technology : original design often with different architectures

Market : different from dominant player's market

BYD gasoline engine car

BYD electric car

# Advanced country


- Automation Growth
- Automation Maturity
- Smart Factory Early_X type
- Smart Factory Growth+ Internet Service Early_U type

Siemens journey

Siemens Automated factory 2000

Siemens smart factory 2010s

Now

Siemens smart factory + Internet Service 2020s

Existing conjectures on Thai…

Thai firms 2010s

Now

Thai firms 2020s?

Thai firms 2030s?

# Advanced country

Stage A → Stage B → Stage C → Stage D

- Automation Growth
- Automation Maturity
- Smart Factory Early_C type
- Smart Factory D Growth+ Internet Service Early_D. type

Siemens journey → Siemens automaion 2000 → Siemens Smart Factory 2010s → Siemens Smart Factory + Service 2020s

Now

Existing conjectures on Thai… → Thai firms 2010s → Thai firms 2020s? → Thai firms 2030s?

# Leapfrogging Alt.

Stage A → Stage B → Stage $C_A$ → Stage $D_A$

- Automation Growth
- SkiP
- Smart Factory Early_ $C_A$ type +Internet service early_$C_A$ type
- Smart Factory Growth_$D_A$ type +Internet service Growth_ $D_A$ type

Leapfrogging journey of Thai… → Thai firms automation 2010s

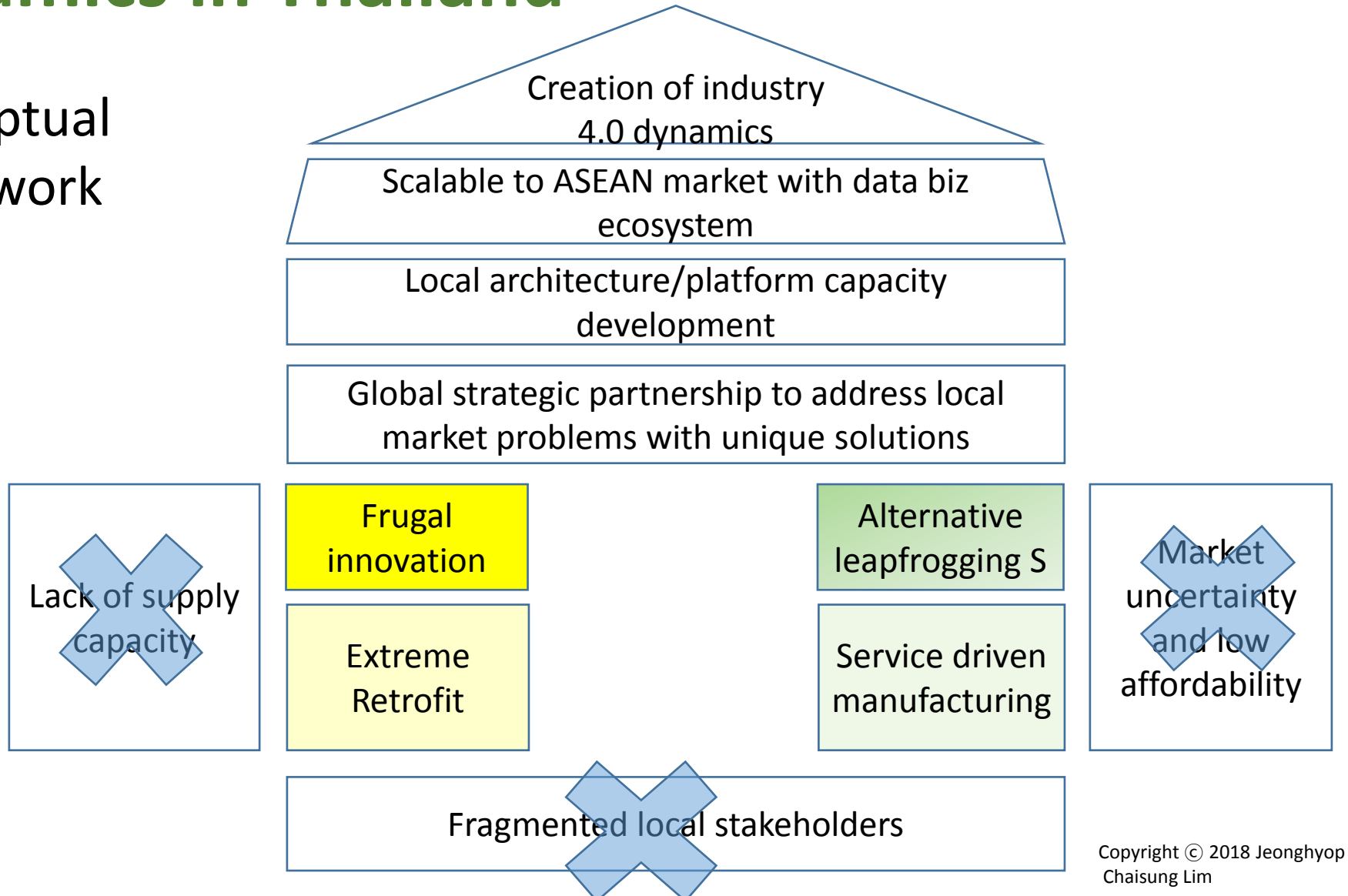
Now

Thai style Simplified Smart Factory Early + Thai Leadership Internet Service Early 2020s

Thai style Smart Factory Growth + Thai leadership Internet Service Growth 2030s

# 5. Strategic scenarios for creation of industry 4.0 dynamics in Thailand

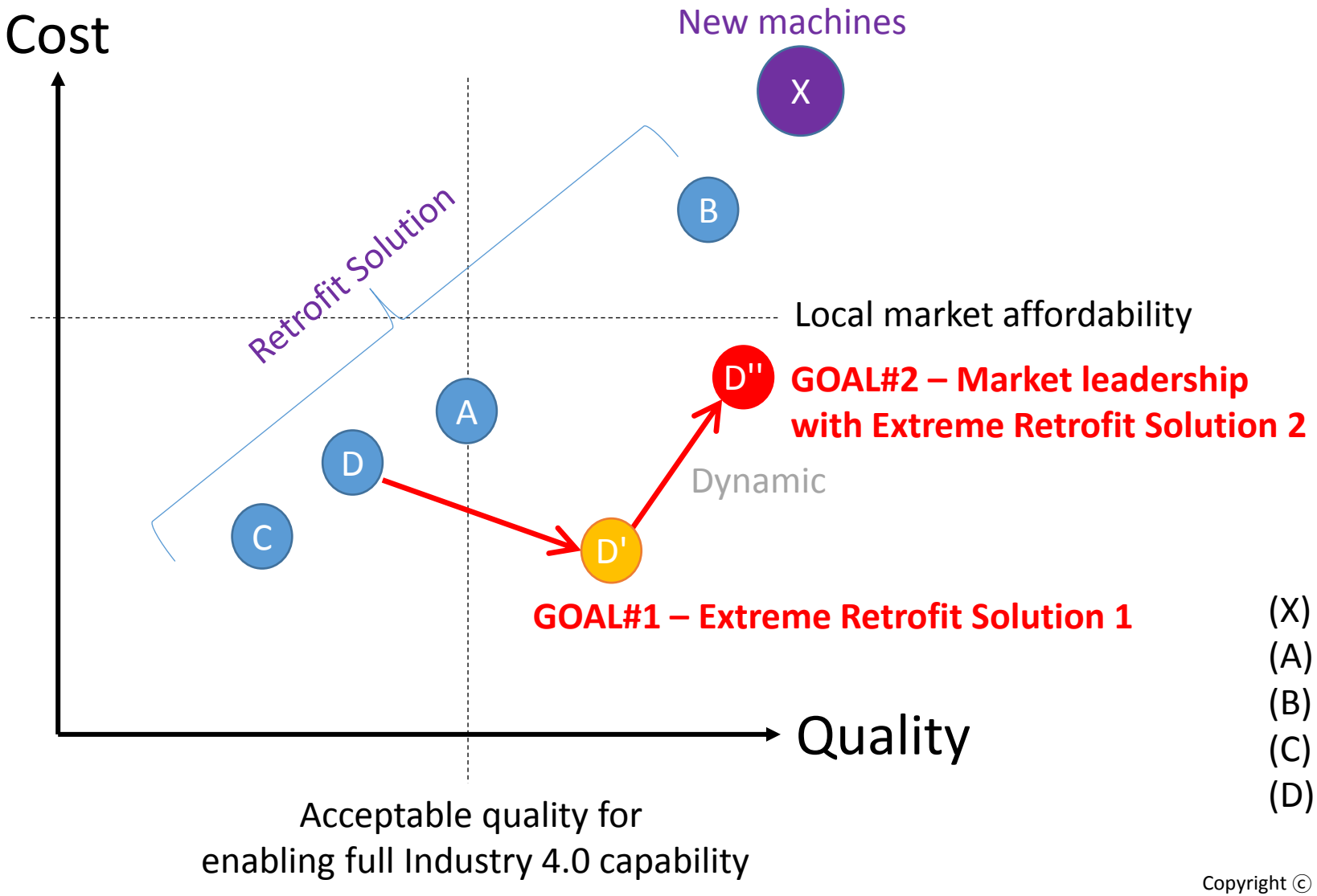
Conceptual framework



# Frugal innovation: Extreme retrofit IoT program

| | Description |
|---|---|
| Framework conditions | 85% of Thai factories are potential industrial robot and factory automation market. Retrofit can be leveraged for their market deployment since most of factory machines are old. The current retrofit solutions are expensive and alternative cheap solutions are not sufficient for industry 4.0 transition. |
| Goals | Industrial and market dynamics creation of industrial robot and factory automation with extreme retrofit solutions |
| Strategies | Development and deployment of market affordable and acceptable retrofit solutions (frugal innovation strategy) |
| Activities | • Market demand specification of cost and functions for retrofit solutions<br>• Architectural capacity development to integrate enabling technologies in partnership with foreign stakeholders (Thai market needs to be leveraged to incentivize foreign architecture providers to join the local capacity development process through local workshops and others)<br>• Industrial and market dynamics creation programs of technology localization and development, human resource cultivation, new business model design and others |

# Retrofit IoT Program – Goal




(X) Acquire new machines
(A) Change the controller
(B) Official unlocking controller
(C) Hack the exiting controller
(D) Added-on module

# Alternative leapfrogging S (service): Service driven manufacturing program

| | Description |
|---|---|
| Framework conditions | Thailand is lacking specific capacities of mechanical engineering, perception solutions with connectedness to properly address industry 4.0 challenges and opportunities |
| Goals | Service driven manufacturing industry 4.0 dynamics leveraging competitive local service sectors and cognitive technology based data ecosystem |
| Strategies | Existing capabilities are leveraged to build data business ecosystem in partnership with globally competitive local entrepreneurs in the areas of hospital, retailers(department stores), tourism, luxury condo development and others. |
| Activities | • Consortium for a platform for data driven business ecosystem in partnership with global technology providers and local service entrepreneurs<br>• Delivery of services through utiization of cognitive technology based service robt |

# Tentative implementation milestone

| | Foundation enabled by anchor programs | Domestic architecture/platform capacity development | ASEAN Scale-up |
|---|---|---|---|
| Targeting | A few globally competitive domestic sectors | Architecture to develop unique solutions to address local market problems | ASEAN market leveraging regional platform leadership to match global tech suppliers and regional market demand |
| Proposed strategic international partnership | Participation in the global test-bed programs, Industrial Internet Consortium and others | Architectural design capacity licensing joint venture partnership | Alliance with global platform leaders |
| Government supports (technology development/finance/regulation/human resource) | International consortia Local collective networking, leveraging FTI club proposal in partnership with other org. such as CORE, TARA | Technology localization and development | Regional product and service customization |

# 6. Recommendation to FTI for responding to Industry 4.0 challenge

New initiative of global Thai template Industry 4.0 test beds

Biz development workshop for the new initiative

e.g. Thailand-Korea Industry 4.0 business development workshop as a pilot global workshop for the new initiative

Develop ‘proof of concept’

architecture design, strategy and policy

# 6. Recommendation to FTI for responding to Industry 4.0 challenge

Strategic partnership with the global frontier

-e.g. Industrial Internet Consortium(IIC)

Annual conference for Industry 4.0 innovation

-For building international network for the Thailand template initiative

-For marketing activities of solutions

Executive course on Thai template Industry 4.0

감사합니다
Thank you~!

# ขอขอบคุณ