# การปรับตัวของวงการวิจัยสู่การแข่งขันในระดับโลก

*การประชุมโครงการ Chair Professor Grants ประจำปี 2561*

ณ ห้องแกรนด์บอลรูม ชั้น 7 โรงแรมฮอลิเดย์ อินน์ แอนด์ สวีทส์ระยอง ซิตี้ เซ็นเตอร์ จังหวัดระยอง

วันเสาร์ที่ 30 มิถุนายน 2561
ดร.ไพรินทร์ ชูโชติถาวร
รัฐมนตรีช่วยว่าการกระทรวงคมนาคม

KVIS
โรงเรียนกำเนิดวิทย์

POWER OF LEARNING
FOUNDATION

VISTEC
สถาบันวิทยสิริเมธี

POWER OF INNOVATION
FOUNDATION

# Phases of Human Society Evolution



**AGRARIAN**
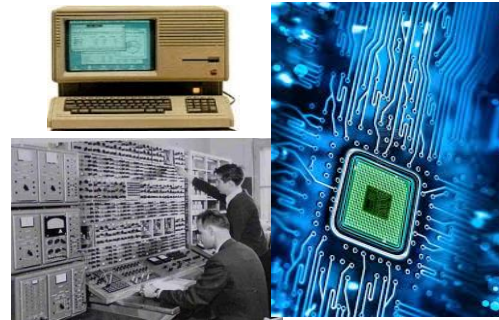
**INDUSTRIAL**
*Benjamin Franklin*
*Michael Faraday*

**ELECTRICITY**
*Thomas Edison*

**ANALOG ▶ DIGITAL**
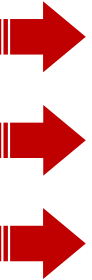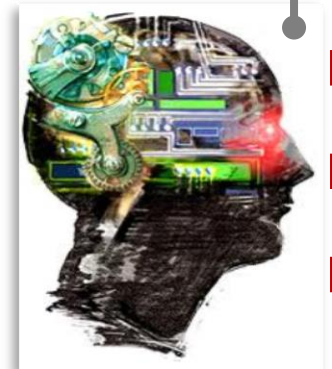*Thomas Watson, Steve Job, Bill Gates, etc*

**CONVERGENCE & MULTIDISCIPLINARY**

**PRESENT**

10,000 (years)

**1850**

**1897**

**1975**

**2000**

World 0.0 ❯ World 1.0 ❯ World 2.0 ❯ World 3.0 ❯ World 4.0 **?**

By Pailin Chuchottaworn

# Civilization and Education



**Critical Thinking, Debate**
**Philosophy**

## Education 0.0

*Platonic Academy*

e.g.
Taxila, Nalanda

**Teaching, Catechism**
**Social Sciences**

## Education 1.0

*Cathedral School, Religious Institution*

e.g.
Cambridge, Oxford, Harvard, Florence

**Teaching & Research**
**Social & Natural Sciences**

## Education 2.0

*Public University, Polytechnics*

e.g.
MIT, TokyoTech, Tokyo Uni., Chulalongkorn

**?**

## Education 3.0

**?**

600 B.C. to 1200 A.D.
Pre-Religious
ปรัชญานิยม

1200-1950 A.D.
Religious
จิตนิยม

1950-2000 A.D.
Industrial Revolution
วัตถุนิยม

# Education 2.0

## Segregated Universe of Knowledge

### Social Sciences

**นิติศาสตร์**
- กฎหมายการค้าระหว่างประเทศ
- กฎหมายธุรกิจ
- กฎหมายเศรษฐกิจ
- กฎหมายมหาชน

**พาณิชยศาสตร์และการบัญชี**
- บัญชี
- สถิติศาสตร์
- การเงิน
- บริหารธุรกิจ
- การตลาด

**ศิลปศาสตร์**
- ทัศนศิลป
- นฤมิตศิลป์
- ดุริยางคศิลป์
- นาฏยศิลป

**อักษรศาสตร์**
- ภาษาไทย
- ญี่ปุ่น
- ศิลปการละคร
- บาลีและสันสกฤต
- จีน
- เยอรมัน
- ประวัติศาสตร์
- สเปน

### Natural Sciences

**แพทยศาสตร์**
- จักษุ
- กุมารเวช
- อายุรศาสตร์
- มะเร็งวิทยา
- ศัลยศาสตร์
- ประสาทวิทยา
- โสตนาสิก
- หัวใจ

**วิศวกรรมศาสตร์**
- เคมี
- อุตสาหการ
- ไฟฟ้า
- คอมพิวเตอร์
- โยธา
- สิ่งแวดล้อม
- เครื่องกล
- ยานยนต์

**วิทยาศาสตร์**
- ชีวเคมี
- เทคโนโลยีชีวภาพ
- จุลชีววิทยา
- พยาธิชีววิทยา
- เคมี
- พฤกษศาสตร์
- เภสัชวิทยา
- คณิตศาสตร์

# พัฒนาการทางด้านการศึกษา – ปรัชญาการศึกษาในปัจจุบัน (Education 2.0)

## ▸ Primary Education

ระดับประถมศึกษา ตอนต้น  - เพื่อการสื่อสาร

ตอนปลาย - เพื่อการดำรงชีวิต

## ▸ Secondary Education

ระดับมัธยมศึกษา  ตอนต้น/ปลาย - เพื่อเตรียมความพร้อม
สำหรับอุดมศึกษา

อาชีวะ     - เพื่อการเข้าสู่ตลาดแรงงาน (Job)

## ▸ Tertiary Education

ระดับอุดมศึกษา

ตอนต้น (ตรี)    - เพื่อเข้าสู่วิชาชีพขั้นสูง (Profession)

ตอนกลาง (โท)  - เพื่อเรียนรู้วิธีการสร้างความรู้ใหม่ โดยวิธีการวิจัย

ตอนปลาย (เอก) - เพื่อสร้างองค์ความรู้ใหม่ ผ่านกระบวนการวิจัย

หลังปริญญาเอก (Post Doc) - เพื่อสร้างทักษะการสร้างองค์ความรู้ใหม่
ผ่านการทำวิจัยอย่างเชี่ยวชาญ

*Conventional Education*
*A Reversed Silo*
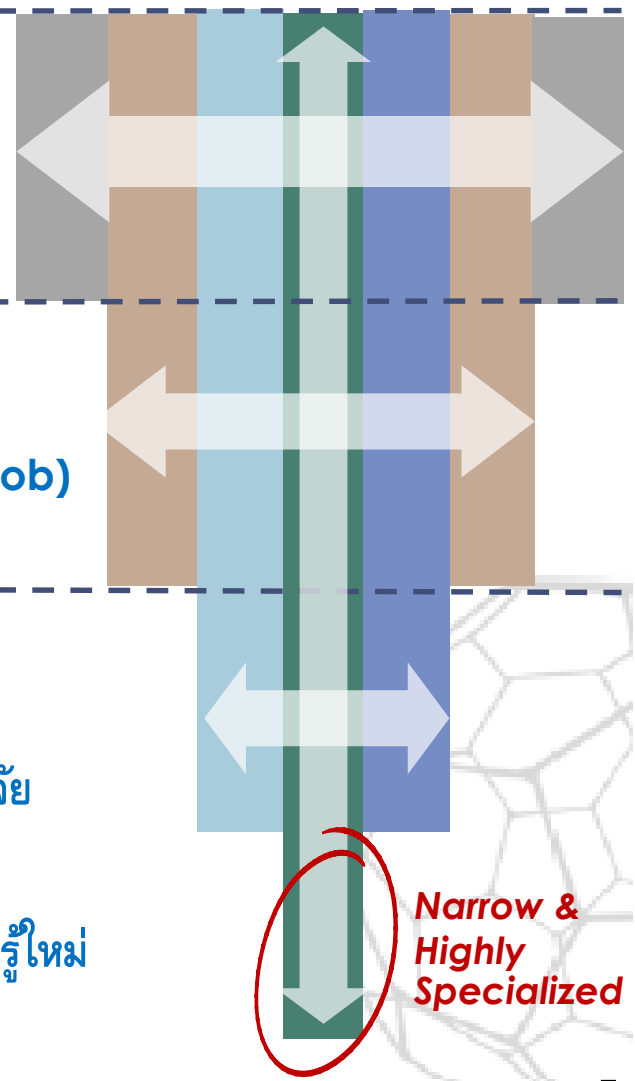
*Narrow &*
*Highly*
*Specialized*

## Tech Creator vs. Tech Consumer

**Tech Creator (Supply Side)**　　　　**Tech Consumer (Demand Side)**

*Technology Community*　　　　　　　*Consumers*

"Product for Few"　　　　　　*Yesterday*

*Supply creates Demand*

*(Supply Push)*

**Few**　　　　　　　　　　　　**Unified Many**

"Value for Many"　　　　　*Tomorrow*

*Demand creates Supply*

*(Demand Pull)*

*Disruptive and Convergence*　**Many**

*Pluralism, Individualism*　　**Discreted Many**

By Pailin Chuchottaworn

# พัฒนาการทางด้านเทคโนโลยี (4)
## Supply Push vs. Demand Pull
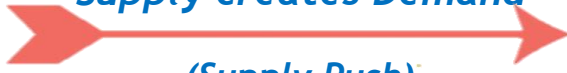
**1** **Supply Push**

*Yesterday*

Technology Lead ⇨ Market Follow



"Product for Few"

*"New Technologies create NEW MARKET"*

*"Innoventor is King"*

**2** **Demand Pull**

*Tomorrow*

Market Lead ⇨ Technology Follow



"Value for Many"

*"Consumer's needs create INNOVATIVE products and services"*

*"Consumer is King"*

# Five Generation of R&D (1)

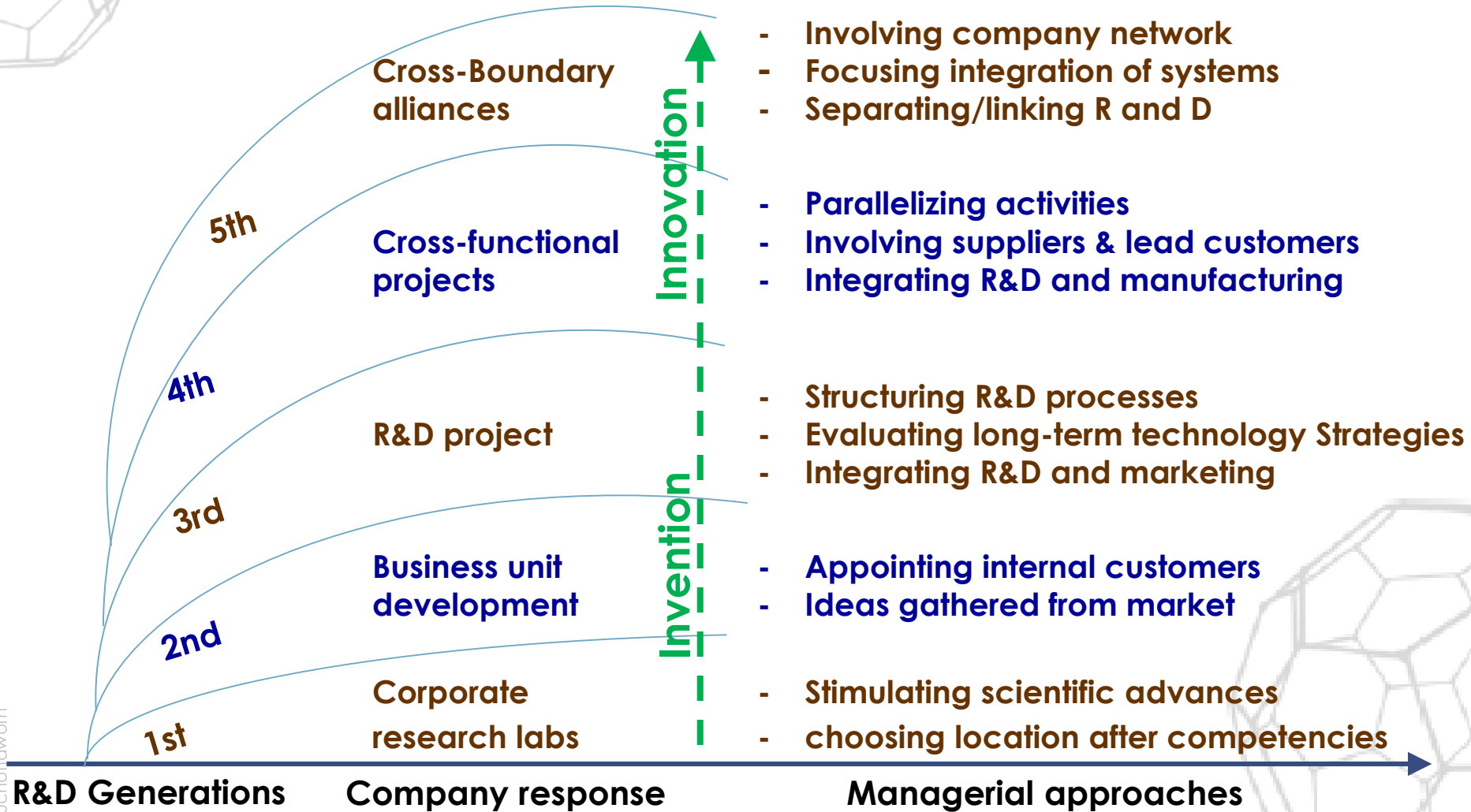| R&D Generations | Context | Process Characteristics |
|---|---|---|
| **First Generation** | Black hole demand 1950 to mid-1960s | **R&D as ivory tower**, technology-push oriented, Seen as an overhead cost, having little or no interaction with the rest of the company or overall strategy.  Focus on scientific breakthroughs |
| **Second Generation** | Market shares battle (mid-1960s to early 1970s) | **R&D as business**, market-pull oriented, and strategy-driven from the business side, all under the umbrella of project management and the internal customer concept. |
| **Third Generation** | Rationalization efforts (mid-1970s to mid 1980s) | **R&D as portfolio**, moving away from individual projects view, and with linkages to both business and corporate strategies.  Risk-reward and similar methods guide the overall investments. |
| **Fourth Generation** | Time-based struggle (early 1980s to mid 1990s) | **R&D as integrative activity**, learning from and with customers, moving away from a product focus to a total concept focus, where activities are conducted in parallel by cross-functional teams. |
| **Fifth Generation** | Systems integration (mid 1990s onward) | **R&D as network**, focusing on collaboration within a wider system – involving competitors, suppliers, distributors, etc.  The ability to control product development speed is imperative, separating R from D. |

Source: D. Nobelius, 2004

# Five Generation of R&D (Visualization) (2)



| R&D Generations | Company response | Managerial approaches |
|---|---|---|
| 5th | Cross-Boundary alliances | - Involving company network<br>- Focusing integration of systems<br>- Separating/linking R and D |
| 4th | Cross-functional projects | - Parallelizing activities<br>- Involving suppliers & lead customers<br>- Integrating R&D and manufacturing |
| 3rd | R&D project | - Structuring R&D processes<br>- Evaluating long-term technology Strategies<br>- Integrating R&D and marketing |
| 2nd | Business unit development | - Appointing internal customers<br>- Ideas gathered from market |
| 1st | Corporate research labs | - Stimulating scientific advances<br>- choosing location after competencies |

Innovation

Invention

Source: D.Nobelius, 2004

# Process From Research to Commercialization



**Idea** → **$$** → **R** (Research) → **D** (Development) → **E** (Engineering) → **M** (Manufacturing) → **Mass Product**
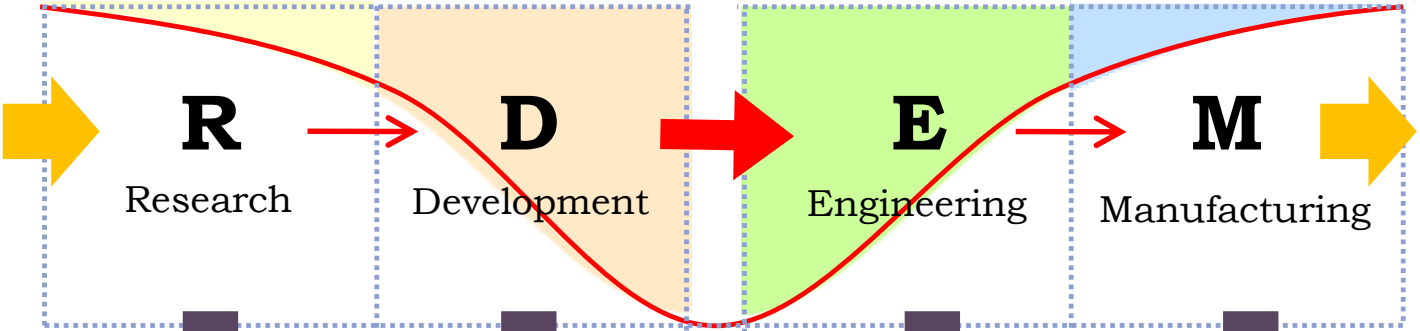
*Supply Side* ... *Demand Side*

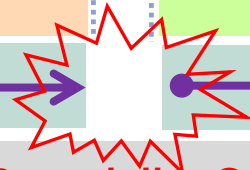| | | | |
|---|---|---|---|
| **Activities:** | Basic / Applied Researches | Bench Scale Test | Pilot Plant Test |
| **Output:** | Theory | Prototype | Marketable Specimen |
| **Intellectual Property:** | Technical Paper, Copyright | Patent | Process License |

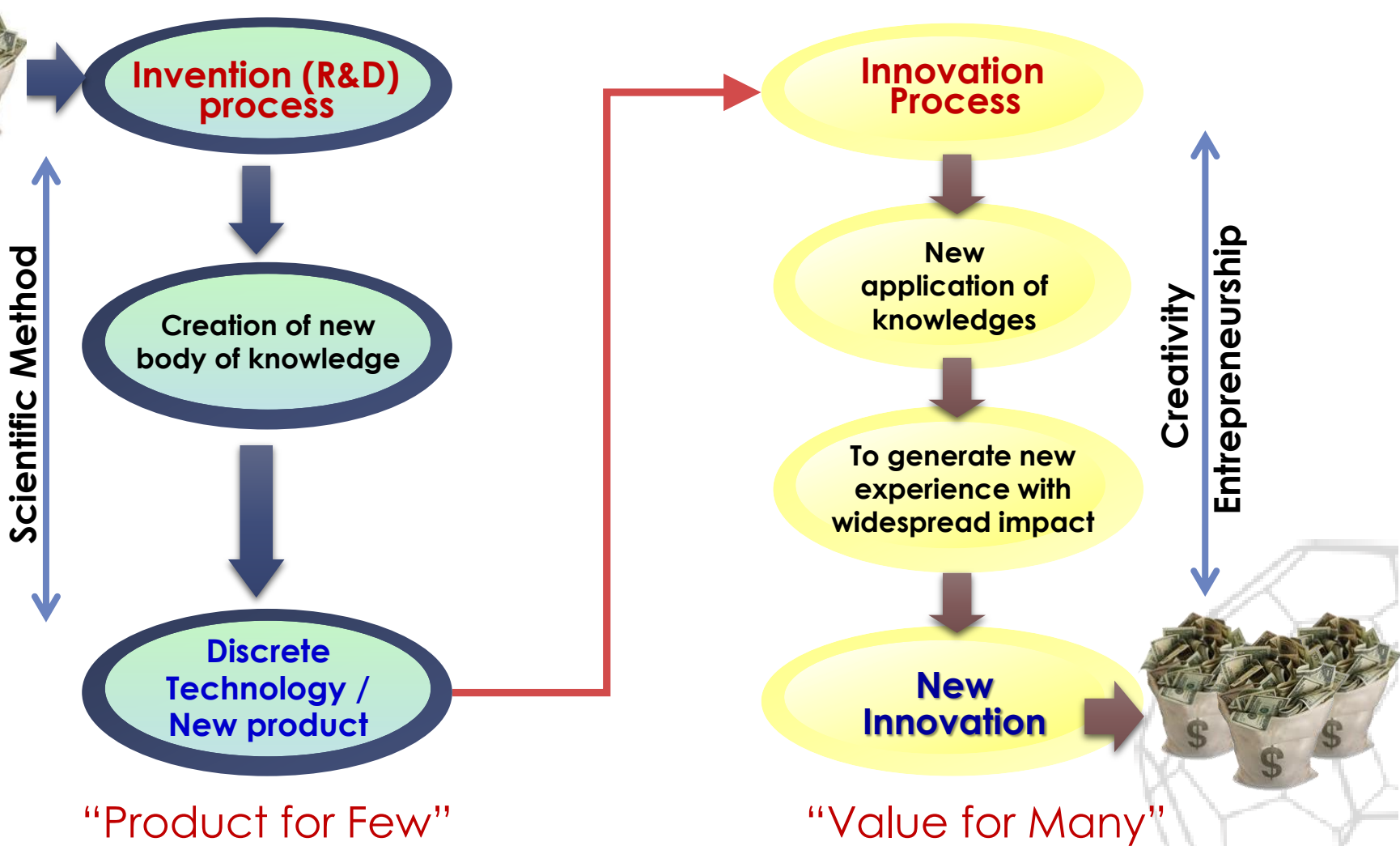Commercial Plant Production — Mass Products — Brand, Receipt

**Education 2.0** — Science → Engineering (Technology)

**Education 3.0** — *To Breach the Gap !* — Incubator, Venture, Entrepreneurial, Start up, etc.

By Pailin Chuchottaworn

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# From Invention Process to Innovation Process



**Invention (R&D) process**

↓

**Creation of new body of knowledge**

↓

**Discrete Technology / New product**

**Scientific Method**

"Product for Few"

**Innovation Process**

↓

**New application of knowledges**

↓

**To generate new experience with widespread impact**

↓

**New Innovation**

**Creativity Entrepreneurship**

"Value for Many"

*" Innovation is a Journey not a Destination "*

# Marketing 3.0 By Philip Kotler (2010)  1

| | MARKETING 1.0<br>**Product-centric Marketing** | MARKETING 2.0<br>**Customer-oriented Marketing** | MARKETING 3.0<br>**Value-driven Marketing** |
|---|---|---|---|
| **Objective** | Sell products | Satisfy and retain the consumers | Make the world a better place |
| **Enabling Forces** | Industrial Revolution | Information Technology | New Wave Technology |
| **How companies see the market** | Mass Buyers with Physical Needs | Smarter Consumer with Mind and Heart | Whole Human with Mind, Heart, and Spirit |
| **Key marketing concept** | Product development | Differentiation | Values |
| **Company marketing guidelines** | Product specification | Corporate and Product Positioning | Corporate , Vision, Values |
| **Value propositions** | Functional | Functional and Emotional | Functional, Emotional, and Spiritual |
| **Interaction with consumers** | One-to-Many Transaction | One-to-One Relationship | Many-to-Many Collaboration |

Invention

Innovation

Source: Thriving with Marketing 3.0, Philip Kotler

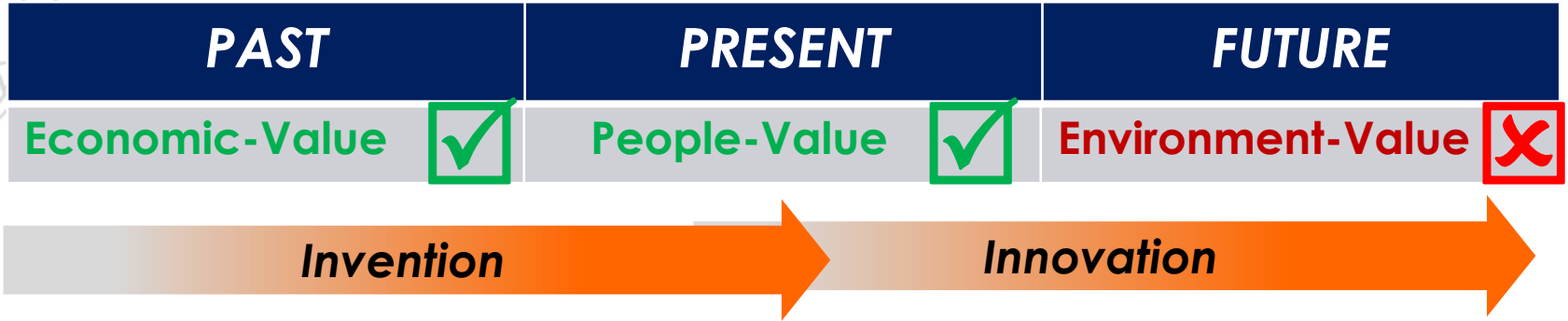# Marketing 3.0 By Philip Kotler (2010) 2

**THE WAY WE <u>WILL</u> DO BUSINESS**

| PAST | PRESENT | FUTURE |
|:---:|:---:|:---:|
| Mind | Heart | Spirit |
| Product-Centered | Customer-Oriented | Values-Driven |
| Economic-Value | People-Value | Environment-Value |
| Profits | Social Progress | Sustainability |

*Invention* → *Innovation* →

Source: Thriving with Marketing 3.0, Philip Kotler

# Example :

| PAST | PRESENT | FUTURE |
|---|---|---|
| Economic-Value ✅ | People-Value ✅ | Environment-Value ❌ |

*Invention* → *Innovation* →



"It's 6 grams of coffee in 3 grams of packaging"

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NATIONAL NEWS AND WORLD

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Home  News  Nation and World

**Hamburg just became the first city to ban coffee pods**

Keurig Green Mountain Inc. K-Cup coffee packs, March 5, 2015 in Miami, Florida. Joe Raedle/AFP/Getty Images
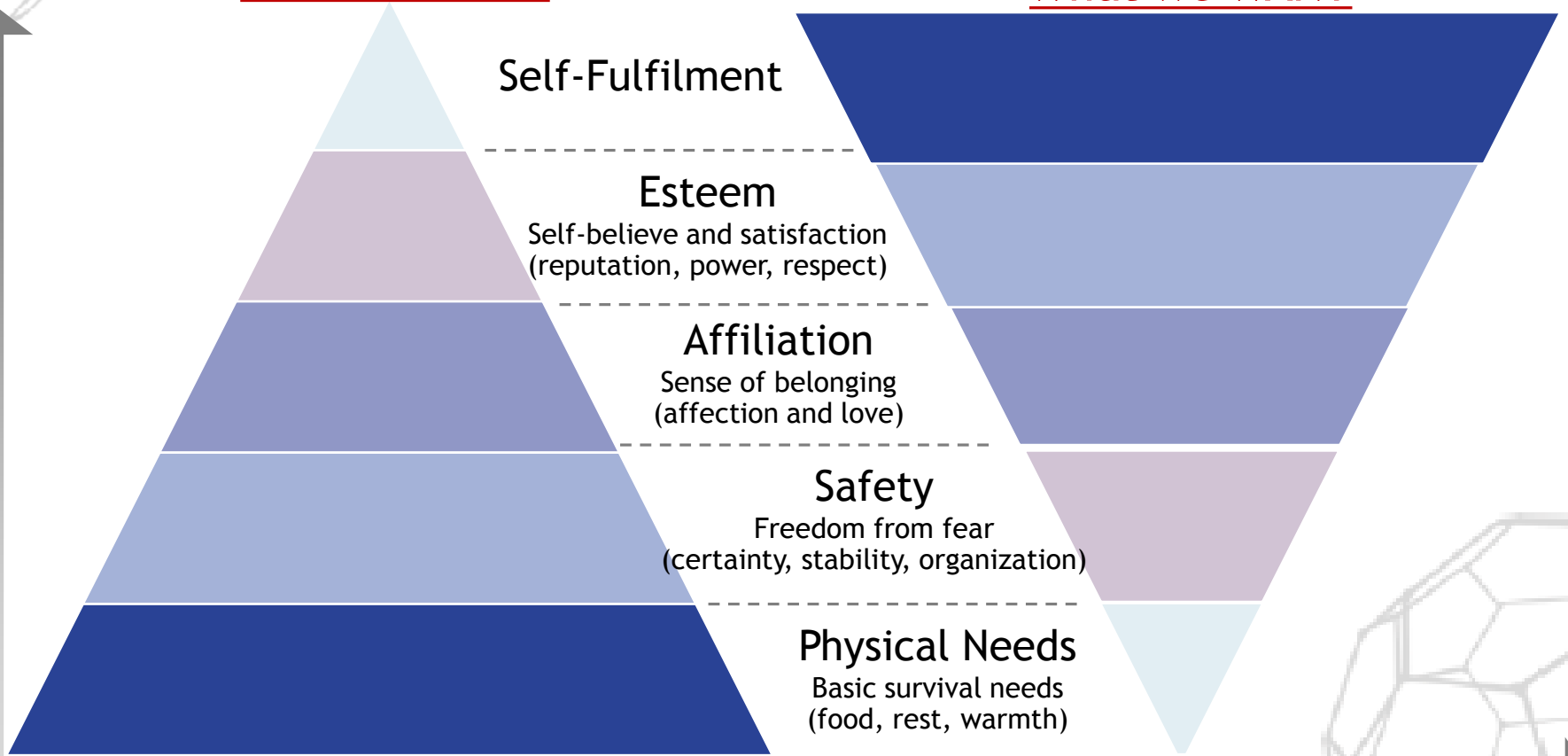
*Aren't environmentally friendly ?*

Sourcehttp://www.dailybreeze.com/general-news/20160222/hamburg-just-became-the-first-city-to-ban-coffee-pods/

# MASLOW's Hierarchy of needs theory
## *vs.* Invention/Innovation

*What we NEED*

*What we WANT*

**Self-Fulfilment**

**Esteem**
Self-believe and satisfaction
(reputation, power, respect)

**Affiliation**
Sense of belonging
(affection and love)

**Safety**
Freedom from fear
(certainty, stability, organization)

**Physical Needs**
Basic survival needs
(food, rest, warmth)

# MASLOW's Hierarchy of needs theory vs. Invention/Innovation

*What we need*

**Self-Fulfilment**

**Esteem**
Self-believe and satisfaction
(reputation, power, respect)

**Affiliation**
Sense of belonging
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**Safety**
Freedom from fear
(certainty, stability, organization)

**Physical Needs**
Basic survival needs
(food, rest, warmth)

**Innovation**
**In response to Spiritual Needs (Education 4.0)**

**Invention**
**In response to Physical Needs (Education 2.0, 3.0)**

By Pailin Chuchottaworn

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# Thailand 4.🇹🇭

*Start with*

⬇
⬇

# Thai 4.🇹🇭

# Education 2.0 ~~2.0~~ 3.0

**Industry**

## Universe of Knowledge

### Social + Natural Sciences
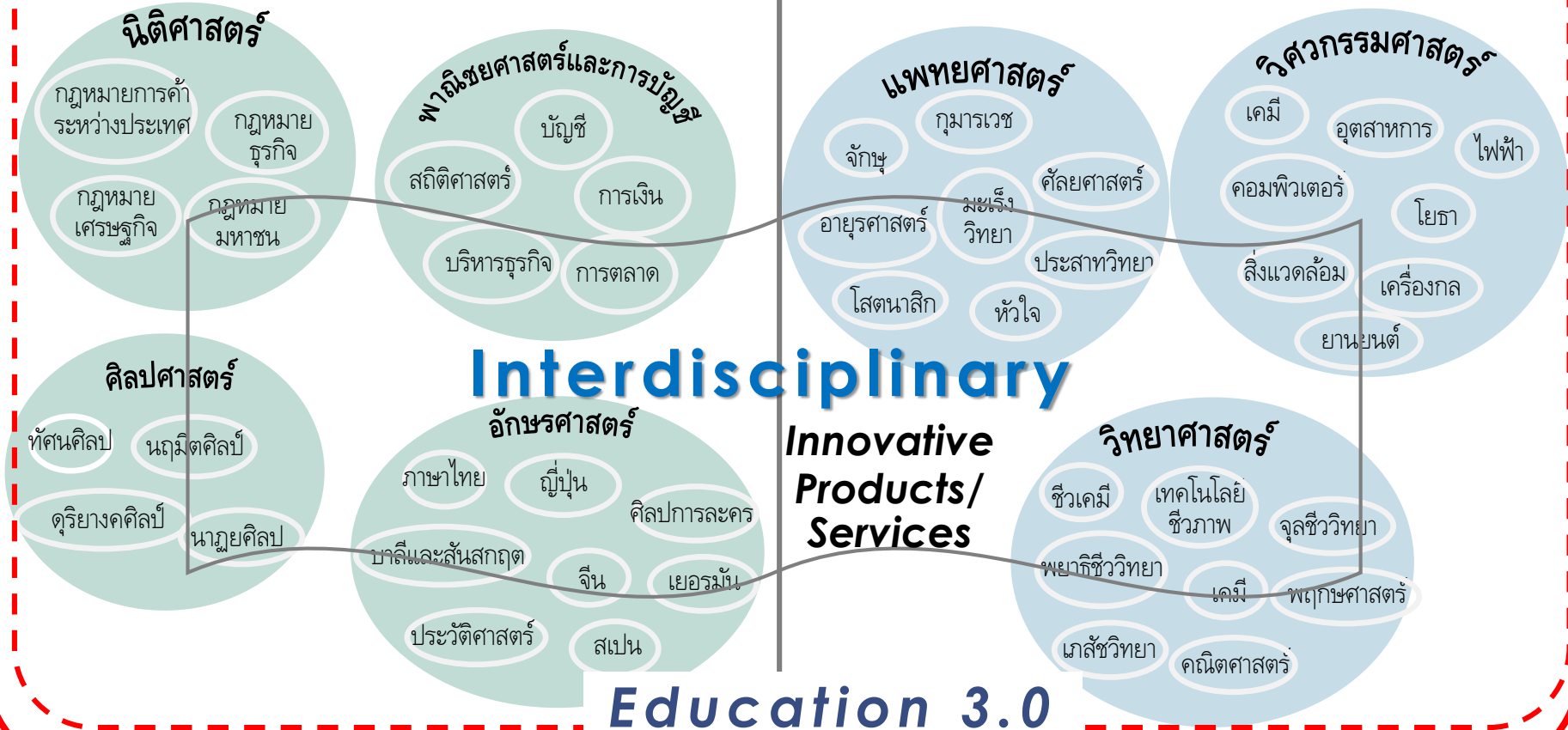
**นิติศาสตร์**
- กฎหมายการค้าระหว่างประเทศ
- กฎหมายธุรกิจ
- กฎหมายเศรษฐกิจ
- กฎหมายมหาชน

**พาณิชยศาสตร์และการบัญชี**
- บัญชี
- สถิติศาสตร์
- การเงิน
- บริหารธุรกิจ
- การตลาด

**แพทยศาสตร์**
- กุมารเวช
- จักษุ
- ศัลยศาสตร์
- อายุรศาสตร์
- มะเร็งวิทยา
- ประสาทวิทยา
- โสตนาสิก
- หัวใจ

**วิศวกรรมศาสตร์**
- เคมี
- อุตสาหการ
- ไฟฟ้า
- คอมพิวเตอร์
- โยธา
- สิ่งแวดล้อม
- เครื่องกล
- ยานยนต์

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- ทัศนศิลป
- นฤมิตศิลป์
- ดุริยางคศิลป์
- นาฏยศิลป

**อักษรศาสตร์**
- ภาษาไทย
- ญี่ปุ่น
- ศิลปการละคร
- บาลีและสันสกฤต
- จีน
- เยอรมัน
- ประวัติศาสตร์
- สเปน

**วิทยาศาสตร์**
- ชีวเคมี
- เทคโนโลยีชีวภาพ
- จุลชีววิทยา
- พยาธิชีววิทยา
- เคมี
- พฤกษศาสตร์
- เภสัชวิทยา
- คณิตศาสตร์

# Interdisciplinary

*Innovative Products/ Services*

# Education 3.0

# Civilization and Education

**Critical Thinking, Debate**
**Philosophy**

## Education 0.0

*Platonic Academy*

e.g.
Taxila, Nalanda

**Teaching, Catechism**
**Social Sciences**

## Education 1.0

*Cathedral School, Religious Institution*

e.g.
Cambridge, Oxford, Harvard, Florence

**Teaching & Research**
**Social & Natural Sciences**

## Education 2.0

*Public University, Polytechnics*

e.g.
MIT, TokyoTech, Tokyo Uni., Chulalongkorn

**Innovation & Outreach & Entrepreneurial**
**Interdisciplinary**

## Education 3.0

*"New Model of Higher Education"*

e.g.
UNIST, OIST, KAIST, VISTEC

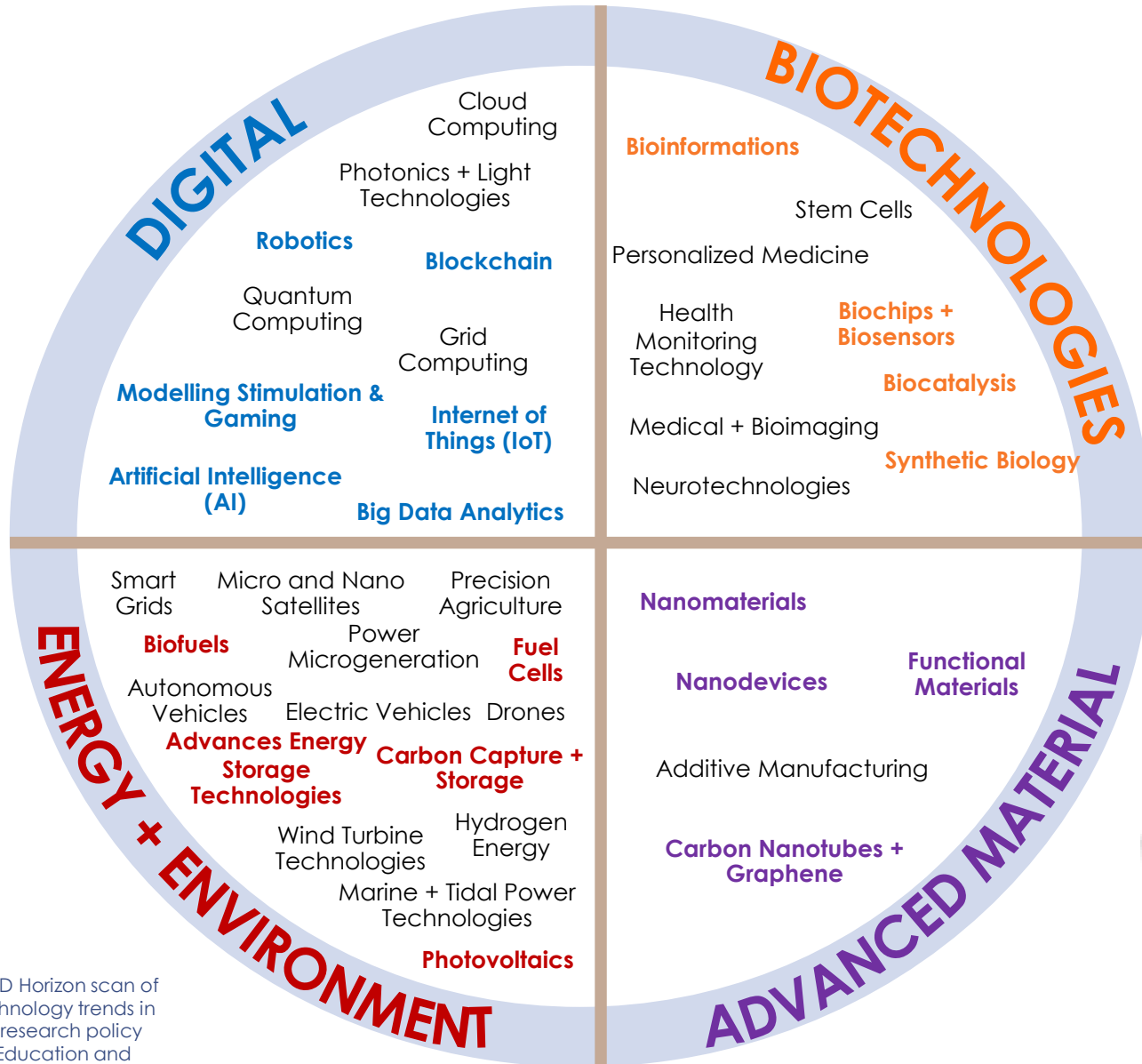| 600 B.C. to 1200 A.D. | 1200-1950 A.D. | 1950-2000 A.D. | 2000 A.D. |
|---|---|---|---|
| Pre-Religious | Religious | Industrial Revolution | Knowledge base society |
| ปรัชญานิยม | จิตนิยม | วัตถุนิยม | ปัจเจกนิยม |

# Reference: OECD 40 Key technologies for the future from Ministry of Higher Education and Science (www.ufm.dk)



**↗ Megatrends and technology trends**

# World 4.0 - World of interdisciplinary

## OECD 40 Key technologies for the future



**DIGITAL**

Cloud Computing
Photonics + Light Technologies
**Robotics**
**Blockchain**
Quantum Computing
Grid Computing
**Modelling Stimulation & Gaming**
**Internet of Things (IoT)**
**Artificial Intelligence (AI)**
**Big Data Analytics**

**BIOTECHNOLOGIES**

**Bioinformations**
Stem Cells
Personalized Medicine
Health Monitoring Technology
**Biochips + Biosensors**
**Biocatalysis**
Medical + Bioimaging
**Synthetic Biology**
Neurotechnologies

**ENERGY + ENVIRONMENT**

Smart Grids
Micro and Nano Satellites
Precision Agriculture
**Biofuels**
Power Microgeneration
**Fuel Cells**
Autonomous Vehicles
Electric Vehicles
Drones
**Advances Energy Storage Technologies**
**Carbon Capture + Storage**
Wind Turbine Technologies
Hydrogen Energy
Marine + Tidal Power Technologies
**Photovoltaics**

**ADVANCED MATERIAL**

**Nanomaterials**
**Nanodevices**
**Functional Materials**
Additive Manufacturing
**Carbon Nanotubes + Graphene**

By Pailin Chuchottaworn

# A World of Interdisciplinary
# OECD 40 Key technologies for the future &

**Thailand 4.0**

**VISTEC**
สถาบันวิทยสิริเมธี

**4** *School of Information Science & Technology (IST)* ✓

**3** *School of Biomolecular Science& Engineering (BSE)* ✓

**1** *School of Energy Science& Engineering (ESE)* ✓

**2** *School of Molecular Science & Engineering (MSE)* ✓

**5** *School of Liberal Arts & Management Science (LMS)* ✗

**0** Frontier Research Center (FRC) ✓

**DIGITAL**
Cloud Computing
Photonics + Light Technologies
Robotics
Blockchain
Quantum Computing
Grid Computing
Modelling Stimulation & Gaming
Internet of Things (IoT)
Artificial Intelligence (AI)
Big Data Analytics

**BIOTECHNOLOGIES**
Bioinformations
Stem Cells
Personalized Medicine
Health Monitoring Technology
Biochips + Biosensors
Biocatalysis
Medical + Bioimaging
Synthetic Biology
Neurotechnologies

**ENERGY + ENVIRONMENT**
Smart Grids
Micro and Nano Satellites
Precision Agriculture
Biofuels
Power Microgeneration
Fuel Cells
Autonomous Vehicles
Electric Vehicles
Drones
Advances Energy Storage Technologies
Carbon Capture + Storage
Wind Turbine Technologies
Hydrogen Energy
Marine + Tidal Power Technologies
Photovoltaics

**ADVANCED MATERIAL**
Nanomaterials
Nanodevices
Functional Materials
Additive Manufacturing
Carbon Nanotubes + Graphene

Hard Science

Hard Science

Soft Science

# VISTEC 6 Distinctions



6 FRONTIER RESEARCH

1 RESIDENTIAL RESEARCH LOCATION

2 FULL-TIME POSTDOCTORAL SYSTEM

5 SMALL SIZE, BIG ADVANTAGE

4 CURRICULUM DESIGN

3 TENURE-TRACK SYSTEM

VISTEC
VIDYASIRIMEDHI
INSTITUTE OF SCIENCE AND TECHNOLOGY

# Frontier Research Center (FRC)



**Research is inspired by:**

Quest for fundamental understanding?

Yes

No

Pure basic research (Bohr)

Use-inspired basic research (Pasteur)

Pure applied research (Edison)

Relevant for the advancement of knowledge

Relevance for immediate applications

No        Yes

**Consideration of Use ?**

**VISTEC - Frontier Research**

Quest for fundamental understanding?

Yes

No

Pure basic research (Bohr)

Use-inspired Frontier research (VISTEC)

Pure applied research (Edison)
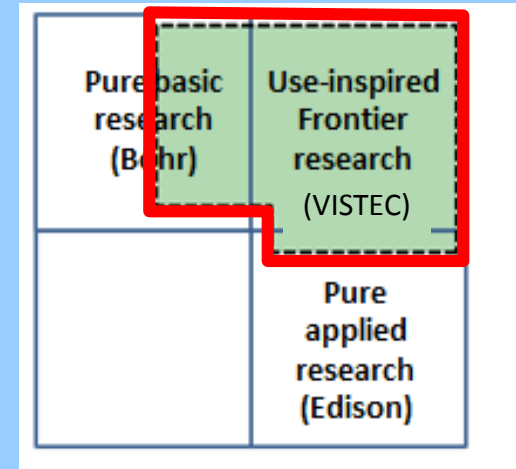
No        Yes

**Consideration of Use ?**

# Frontier Research Center (FRC)

Establish of Scientific Research and technology foremost To mobilize researchers Collaborate with leading academic institutions and the business sectors. Research and create added value for the national economy.



Industry

Institutions
- National
- International

VISTEC
Vidyasirimedhi Institute of Science and Technology

Energy Science& Engineering ✓

Molecular Science & Engineering ✓

Biomolecular Science& Engineering ✓

Information Science & Technology ✓

Management Science & Technology

Frontier Research Center

VISTEC RESEARCH CENTERS

VISTEC

MIT

OXFORD

TOKYO

National and International Institutions

Investors    Endowment    NSTDA, TRF, NRCT

# Curriculum Design



**Institute of Energy Science and Engineering**
Division of Chemical and Biomolecular Engineering

**Institute of Molecular Science and Engineering**
Division of Materials Science and Engineering

## Major Courses

- Chemical and Statistical Thermodynamics
- Chemical Kinetics and Reaction Engineering
- Transport Phenomena in Chemical and Biological Engineering
- Molecular Modeling and Process Simulation

## Major Courses

- Thermodynamics and Kinetic Processes in Material
- Molecular Design and Synthesis of Materials
- Structure and Properties of Materials
- Characterization of Materials

## Elective Courses

Group A: Frontiers in Energy and Materials Technology
Group B: Petro-based Engineering and Advanced Materials
Group C: Bio-resource Engineering
Group D: Molecular Design and Functional Polymers
Group E: Green Process Engineering, Process Control and Others

## Elective Courses

Group A: Advanced Materials Science and Engineering Courses
Group B: Specialized Courses on Molecular Design and Synthesis Processes
Group C: Advanced Courses on Cutting-edge Analysis and Characterization
Group D: Novel Materials, New Processes and Applications
Group E: Frontiers in Materials Science and Technology

| Major Courses | Elective Courses | Seminar | Leadership Training Courses | Thesis |
| --- | --- | --- | --- | --- |

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# Core Data Science & Engineering Research



**Domain-Specific Applications**

Data-Driven Experimental Design for Energy, Advance Meterial, Biotech Research

Visual Analytics

Simulation Control

Big Data Analytics for Business Intelligence

Algorithmic Trading

Speech Recognition

Electroencephalography (EEG) Data Analysis

Sentiment Analysis

Text Mining

Social Network Mining

**Artificial & Machine Learning** · **Statistics** · **Data Mining** · **Data Management**

**Core Data Science & Engineering Research**

Internet of Things: In-situ Query Processing

**Data Systems Research**

Internet of Things: Data Acquisition

Analytical Processing: Data Lake & Data Warehouse

Cloud Computing: Wide-area Analytical Processing

HPC: Scalable Storage

Information Security: Query Processing on Encrypted Data

Cloud Computing: Elastic Resource Management

HPC: Near Data Processing

# NATURE INDEX: Asia Pacific

## 1 April 2017 - 31 March 2018
## Subject/journal group: All

nature INDEX

| | Country | Article Count (AC) | Fractional Count (FC) |
|---|---|---|---|
| 1 | China | 12801 | 9303.28 |
| 2 | Japan | 4670 | 3025.08 |
| 3 | South Korea | 2032 | 1248.59 |
| 4 | Australia | 2311 | 1047.38 |
| 5 | India | 1410 | 938.17 |
| 6 | Singapore | 1102 | 586.09 |
| 7 | Taiwan | 898 | 408 |
| 8 | New Zealand | 356 | 122.34 |
| 9 | Thailand | 192 | 33.61 |
| 10 | Vietnam | 76 | 11.55 |

Note: Sort by FC

Source: https://www.natureindex.com/country-outputs/Thailand

# NATURE INDEX: Singapore vs. Thailand vs. Malaysia
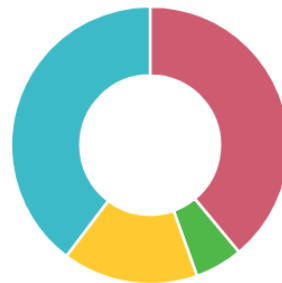


| | Singapore | | Thailand | | Malaysia | |
|---|---|---|---|---|---|---|
| | AC | FC | AC | FC | AC | FC |
| | 1102 | 586.09 | 192 | 33.61 | 142 | 8.77 |

Outputs by subject (FC) · Outputs by subject (FC) · Outputs by subject (FC)

Published between 1 April 2017 - 31 March 2018 which are tracked by the Nature Index.

Subject/journal group: All

| Country | Singapore | | Thailand | | Malaysia | |
|---|---|---|---|---|---|---|
| All Subject | AC | FC | AC | FC | AC | FC |
| Life Sciences | 269 | 110.27 | 41 | 6.43 | 21 | 2,62 |
| Chemistry | 451 | 272.99 | 34 | 13.42 | 10 | 2.67 |
| Physical Sciences | 504 | 278.24 | 116 | 12.79 | 100 | 1.21 |
| Earth & Environment Sciences | 78 | 38.88 | 9 | 3.01 | 17 | 2.99 |

Note: AC = Article Count | FC = Fractional Count

Source: https://www.natureindex.com/country-outputs/Thailand
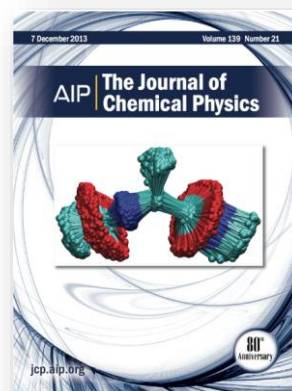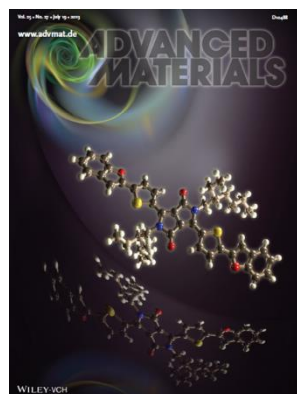
# Academic Excellence (1):

## VISTEC EXCELLENCE Nature Index 's Publication:
*A global indicator of high-quality research*

Note: Sort by FC

| Academic Sector : Rank of THAILAND – CHEMISTRY As of 1 April 2017 - 31 March 2018 | Article Count (AC) | Fractional Count (FC) |
|---|---|---|
| 1. VISTEC | 10 | 5.09 |
| 2. Mahidol University (MU) | 6 | 1.95 |
| 3. Chulalongkorn University (CU) | 7 | 1.87 |
| 4. Suranaree University of Technology (SUT) | 4 | 1.12 |
| 5. Walailak University | 3 | 0.83 |
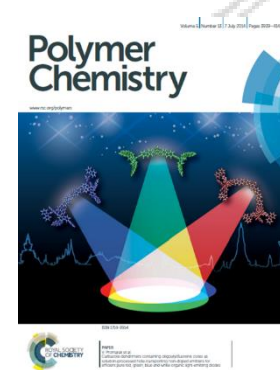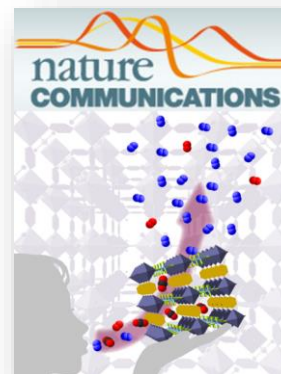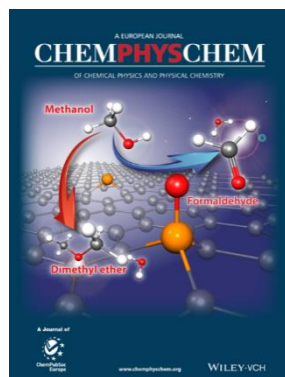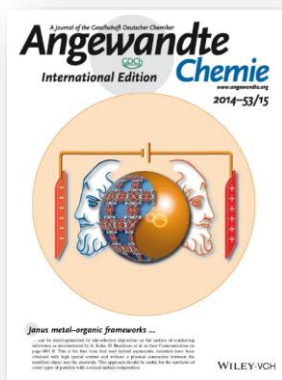
Source: https://www.natureindex.com/country-outputs/Thailand

By Pailin Chuchottaworn

# Academic Excellence (2):

# VISTEC EXCELLENCE Nature Index 's Publication:

*A global indicator of high-quality research*

Note: Sort by FC

| Academic Sector : Rank of THAILAND – OVERALL As of 1 April 2017 - 31 March 2018 | Article Count (AC) | Fractional Count (FC) |
|---|---|---|
| 1. Chulalongkorn University (CU) | 90 | 7.05 |
| **2. VISTEC** | **13** | **5.60** |
| 3. Mahidol University (MU) | 33 | 4.51 |
| 4. Naresuan University | 12 | 4.15 |
| 5. Suranaree University of Technology (SUT) | 29 | 2.56 |



ChemComm
Chemical Communications
RSC Publishing

ADVANCED MATERIALS
WILEY-VCH

AIP The Journal of Chemical Physics
jcp.aip.org

CHEMPHYSCHEM
OF CHEMICAL PHYSICS AND PHYSICAL CHEMISTRY
Green Ethylene
WILEY-VCH

Source: https://www.natureindex.com/country-outputs/Thailand
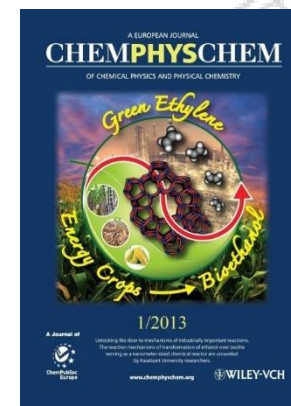
# Academic Excellence (3) :

## Publications in 2017 by the MRS Research Group at VISTEC

# Business Model



TOP50 of the World in 2035

ENDOWMENT (กองทุนฯ)

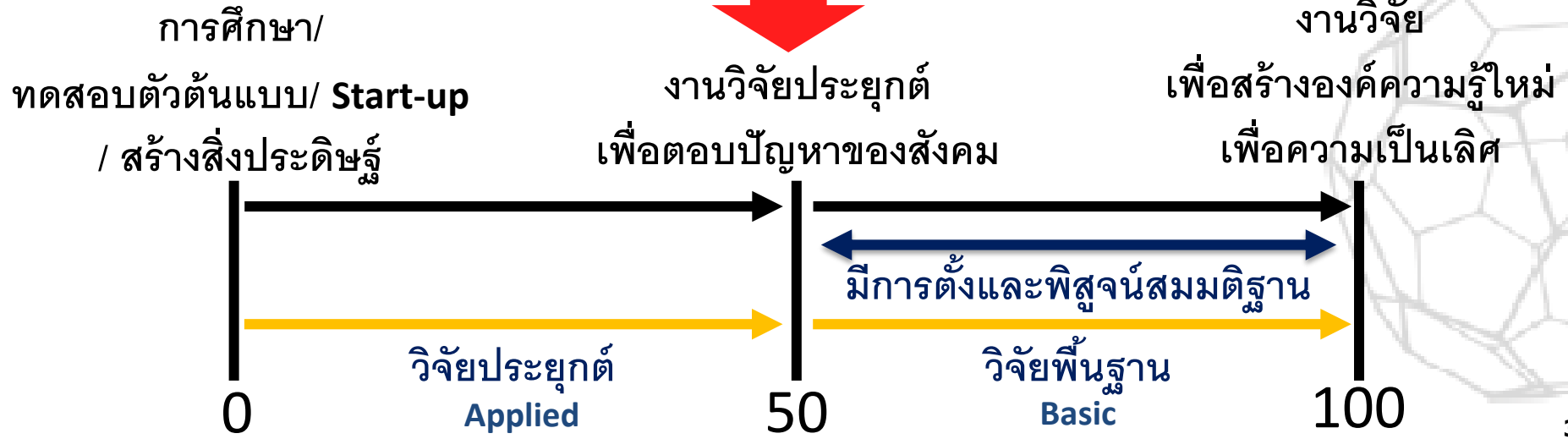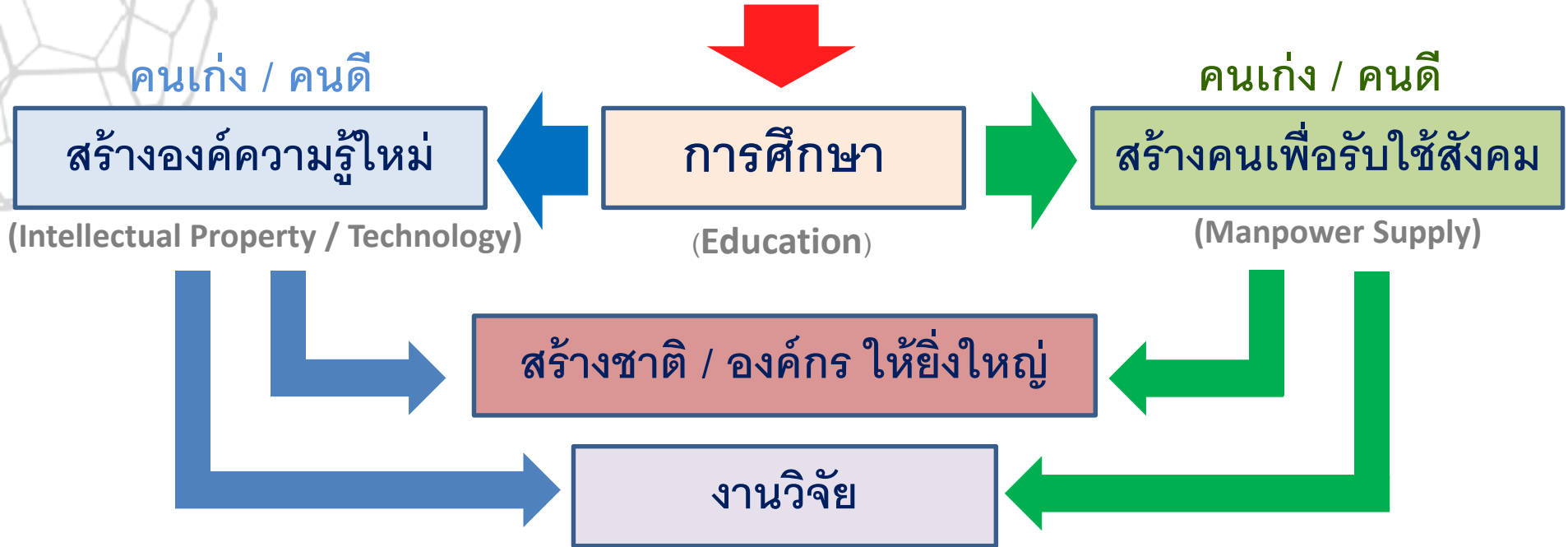RESEARCH FUNDS (ทุนวิจัย)

*Public*

*Government, Private*

# PTT Group's intention to create KVIS/VISTEC

- ✓ **To create new type of tertiary education**
- ✓ **To create learning opportunity for the gifted**
- ✓ **To create scientist/researcher carrier path**
- ✓ **To create bond with industry**
- ✓ **To create new high tech industrial area**
- ✓ *To make Thailand a great country thru Science & Technology …..*

# That is RESEARCH . . . . .(1)

The more we know, the more we discover new things we don't know.
Then, as someone else put it, there are the known unknowns,
and the unknown unknowns.

[ME TOO RESEARCH]
There are known knowns; there are things we know we know.

[GOOD IDEA RESEARCH]
We also know there are known unknowns; that is to say,
we know there some things we do not know.

[GROUND BREAKING RESEARCH]
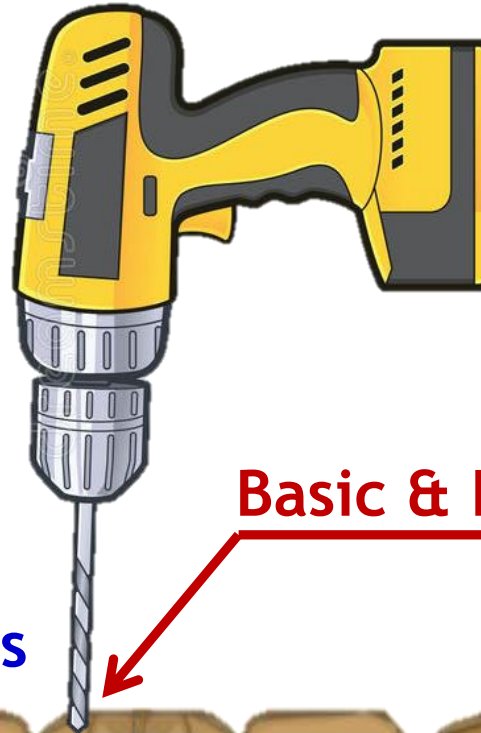But there are also unknown unknowns;
the ones we don't know we don't know'.

# That is RESEARCH . . . . . (2)

The Know Knowns

Basic & Frontier Research

The Know Unknowns

The Unknow Unknowns

> ❝
> # We should aim for the frontiers of science and technology, strengthen basic research, and make major breakthroughs in pioneering basic research and groundbreaking and original innovations.
> ❞
>
> ## By Xi Jinping

*2017 was a momentous year for China in the field of science and technology. From outer space to deep sea, China broke physical barriers, smashed scientific boundaries and pushed the limits of innovation.*

*It shattered records and set new ones, introduced the world to a handful of firsts and blazed many new trails in numerous fields.*

Thank you