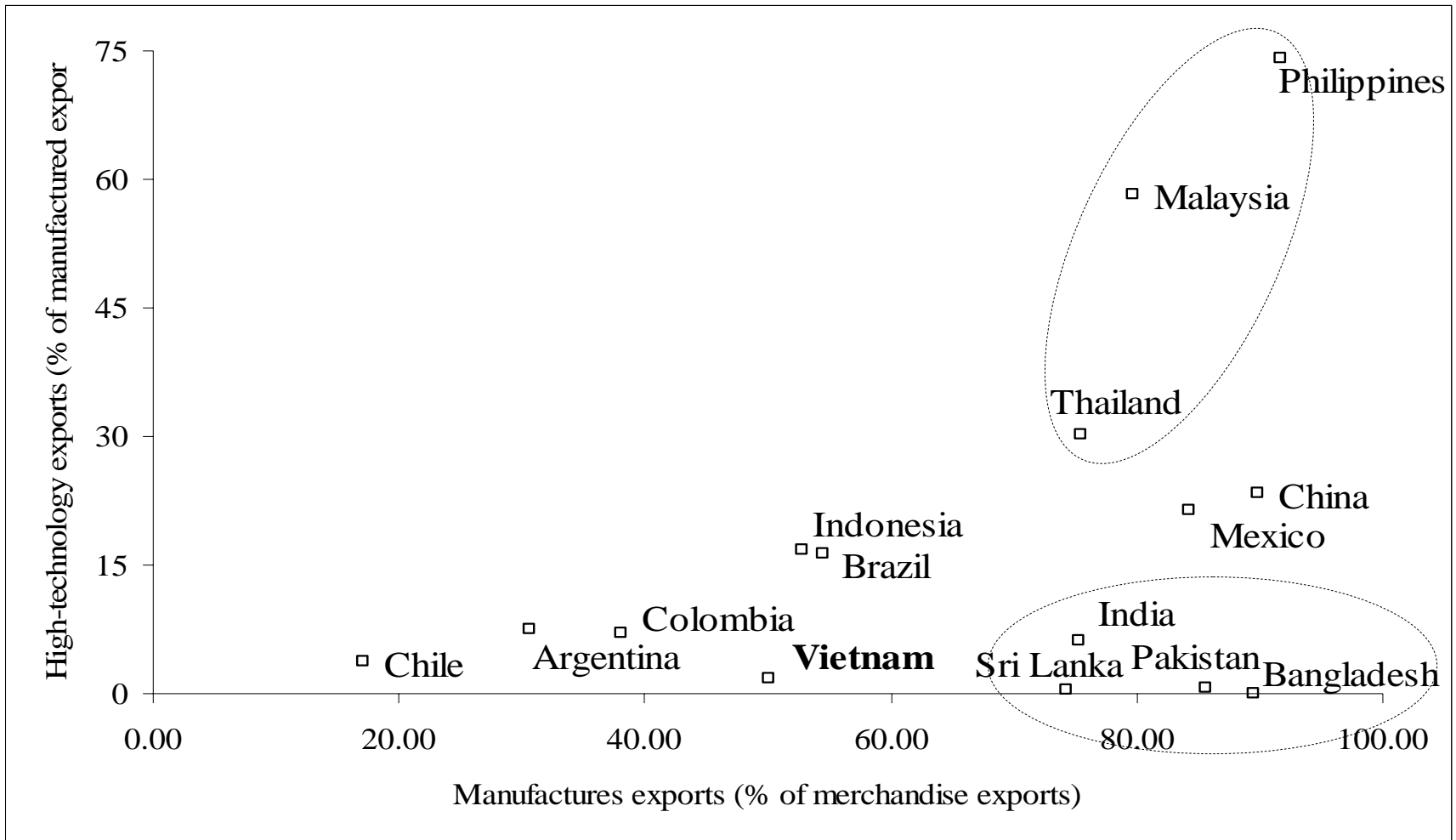


# Education, Science, Technology, and Innovation

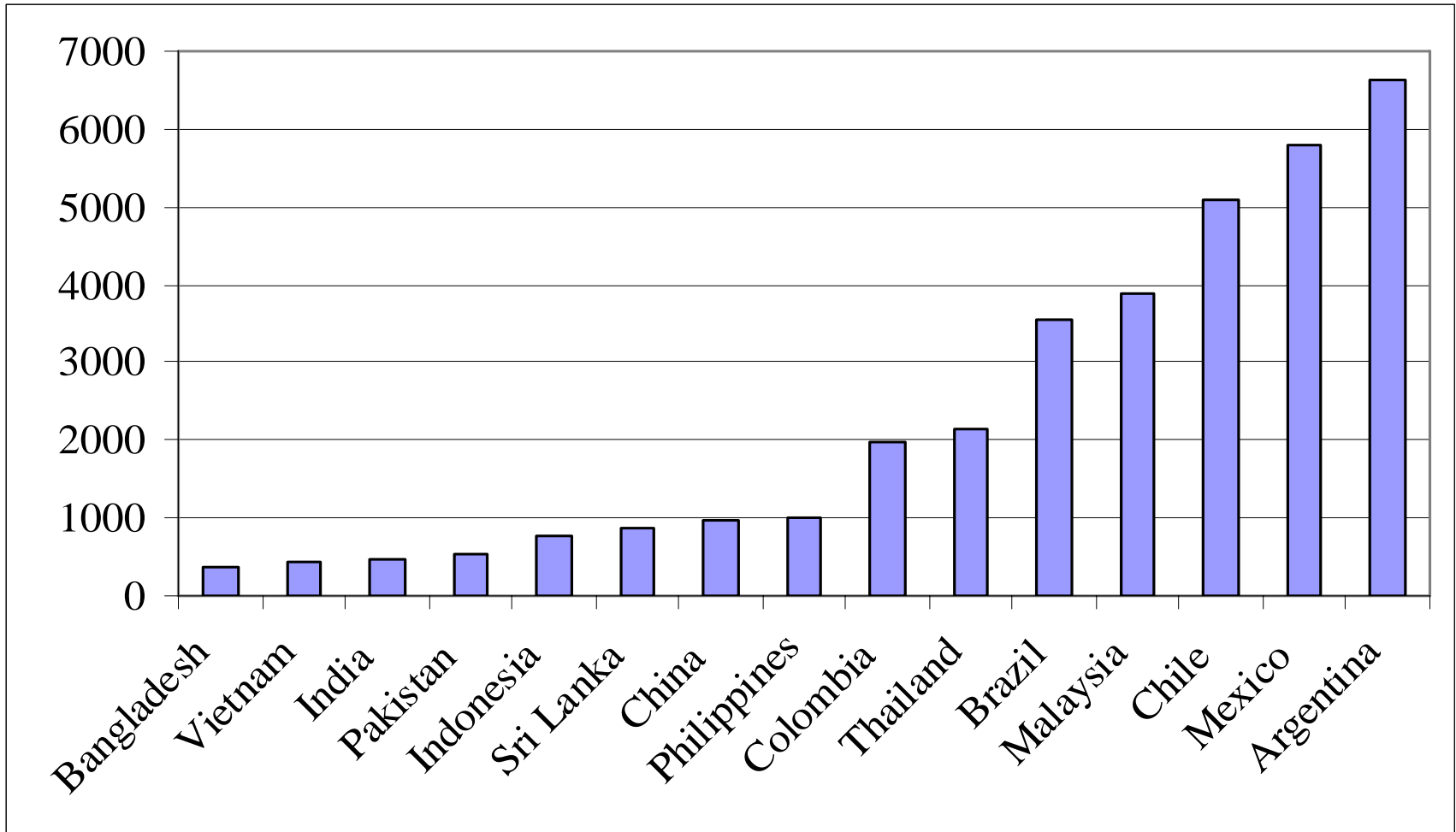
**Alfred Watkins**  
**S&T Program Coordinator**  
**World Bank**

Workshop on  
Technology Innovation, Private Sector Development, and  
Economic Growth  
May 25-27, 2005  
Hangzhou, China

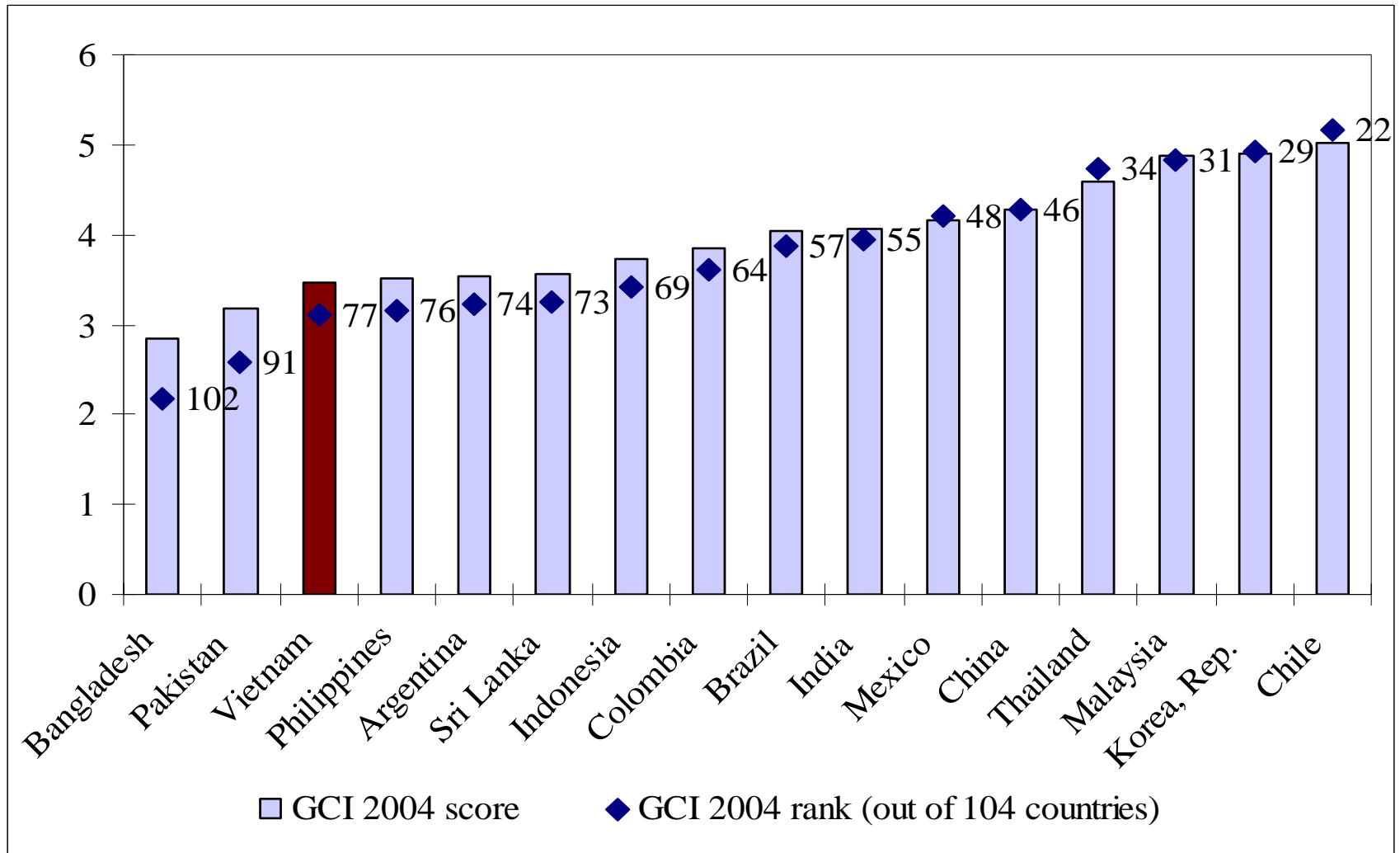
# High Tech Does Not Always Equal Prosperity or Competitiveness



# GDP per capita in 2002 (constant 2000 US\$)



# The Global Competitiveness Indexes and Ranking



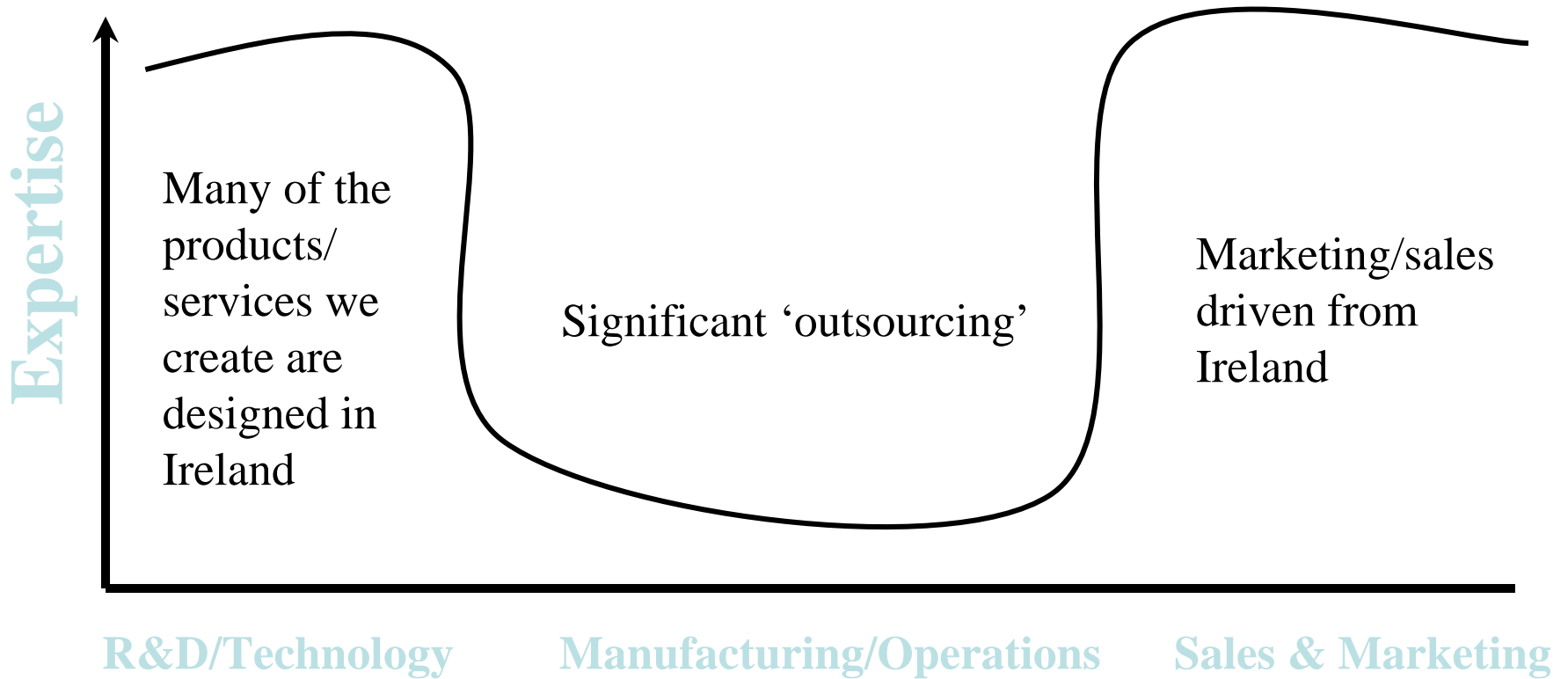
# The world is moving fast... ...with or without you!

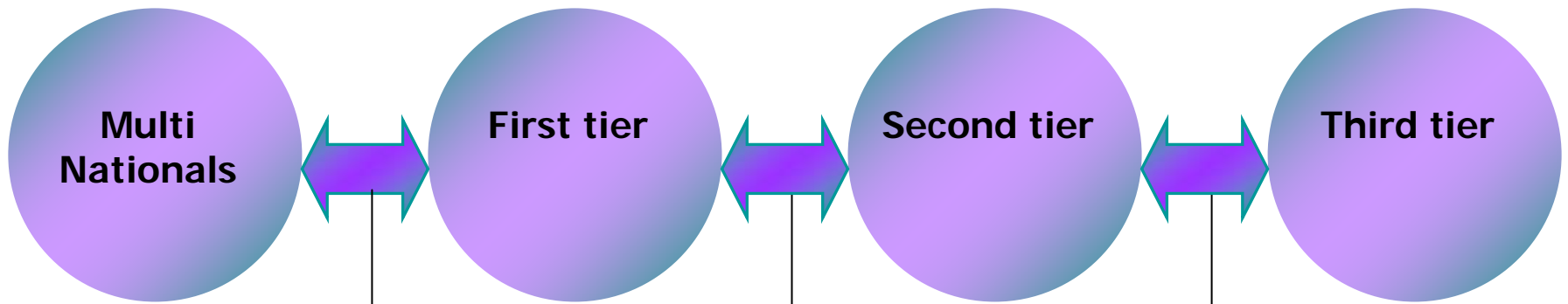
- **Increasing globalization:** reduction of transportation & communication costs, increasing global information, increasingly mobile FDI.
- **Rapid pace of technological change and innovation:** Half life of technology is getting shorter. Choice: Keep up or fall behind.
- **Increasing competition,** driven by trade liberalization and increasingly larger players (e.g., China, Korea, India)
- **Networking and disintegration of production.**

The world is moving fast...  
...with or without you!

Parable of the Lion and the Gazelle

# Typical Value Chain



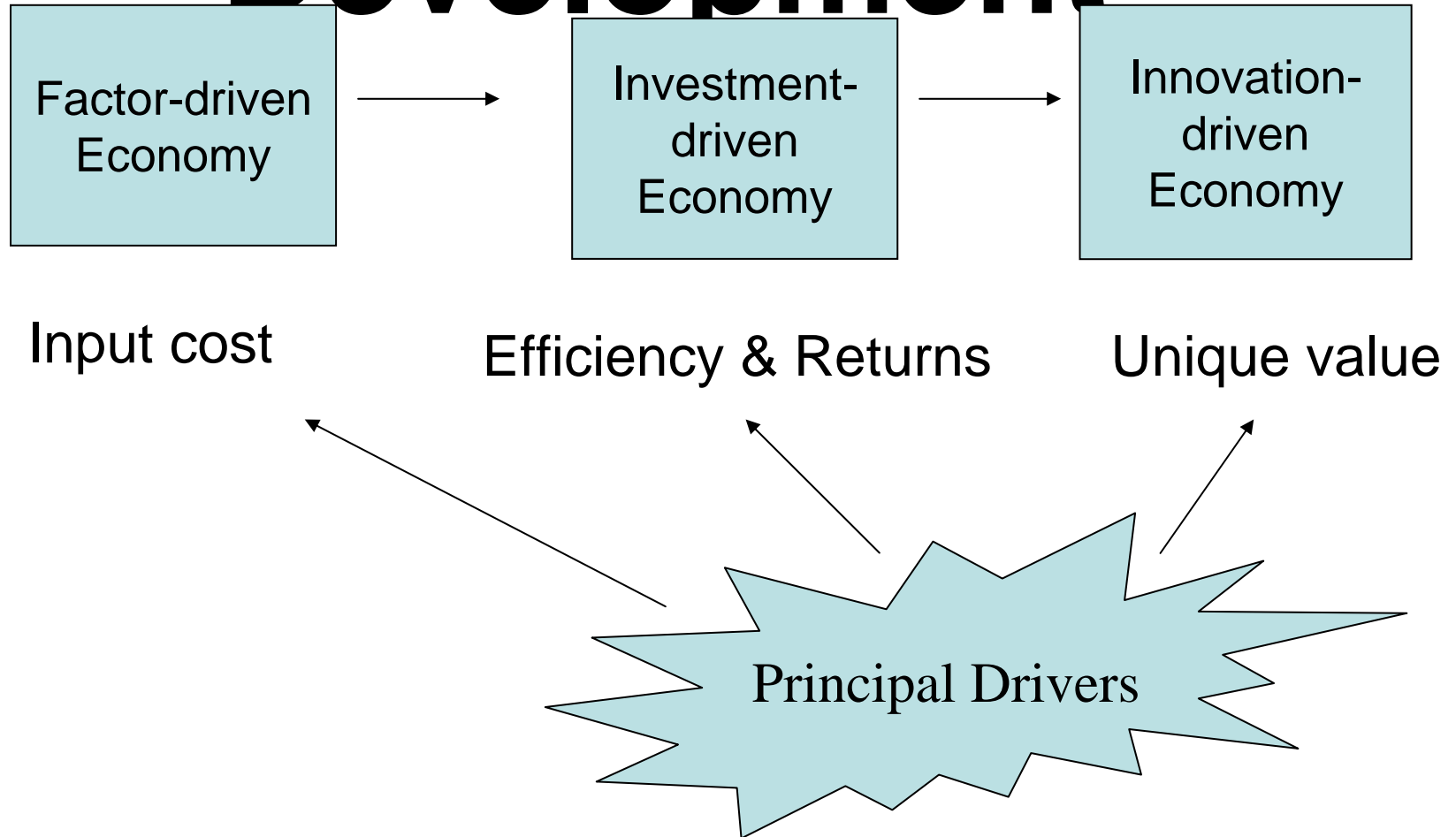


| Nature of relationship |
|------------------------|
| Close family           |
| Partner                |
| Inter dependency       |
| High trust             |
| Relationship based     |

| Nature of relationship |
|------------------------|
| Cousin                 |
| Provider               |
| Dependency             |
| Medium trust           |
| Specification based    |

| Nature of relationship |
|------------------------|
| No ties                |
| Servant dominated      |
| No trust               |
| Price based            |

# Stages of Economic Development



# In What Stage is China?

- Factor Driven, Investment Driven or Innovation?
  - Huge country with largest supply of very low wage labor
  - One of the largest recipients of FDI
  - Second largest absolute level of F&D expenditures – second only to US

# What do we mean by Education, Science, Technology and Innovation Capacity?

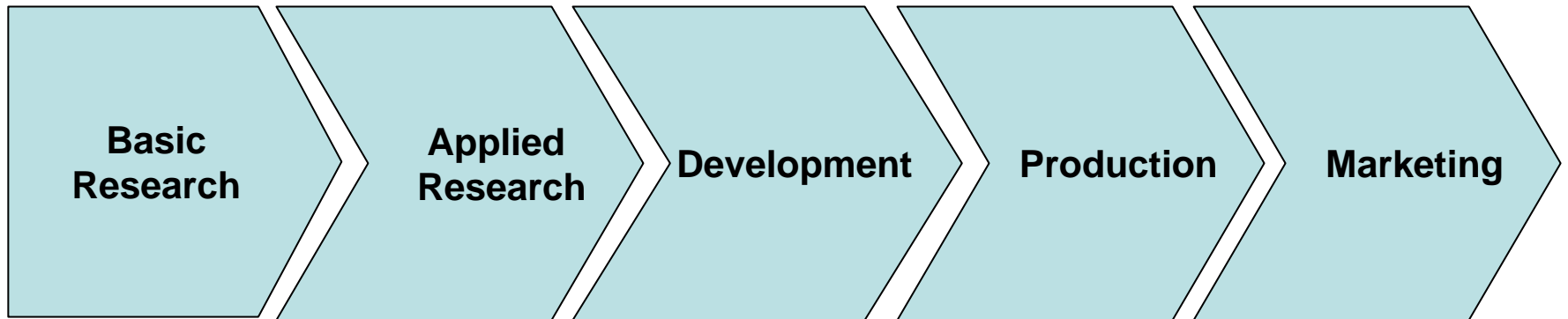
## Four Critical Dimensions

- Improving R&D systems – ability to produce new, economically relevant knowledge
- Enhancing capacity to import, adapt, adopt, and use existing technology
- Improving Education for the KE
- Enhancing national S&T policy-making

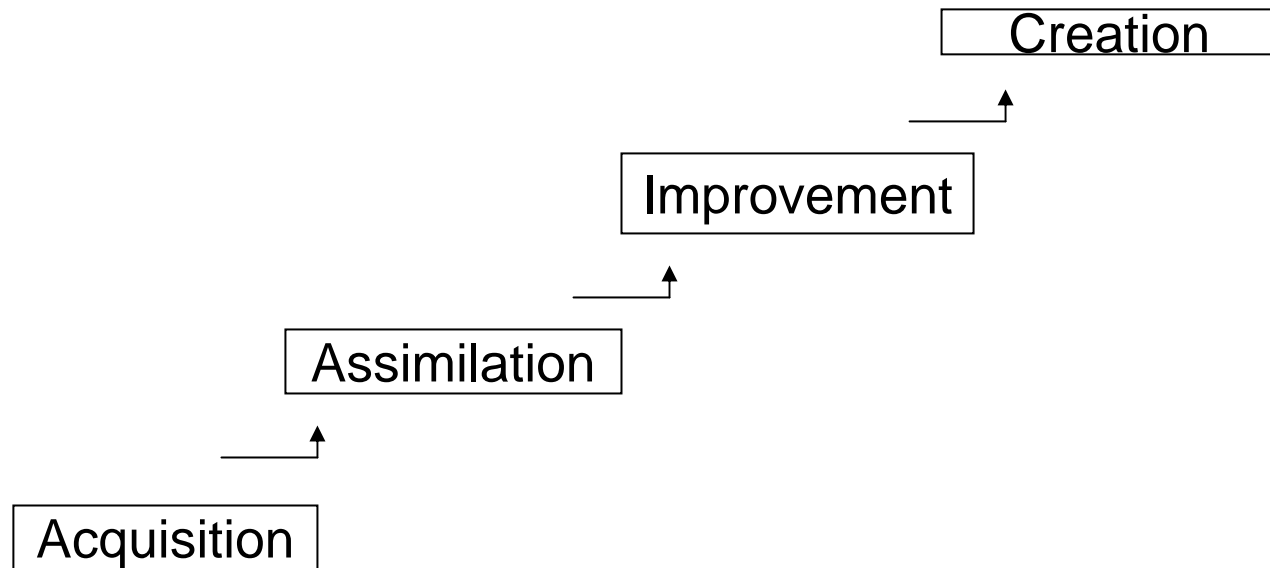
# Improving R&D – Critical Issues

- Quality of research
- Relevance to industry and agriculture
- Linking teaching and research
- Links to global and domestic technology markets – technology commercialization processes, rules, procedures and expertise
  - Lesson from Russia: Not simple to convert knowledge into wealth

# Linear S&T Capacity Building Model Dominates Capacity Building Approach



# East Asia Capacity Building Model: A Different Approach



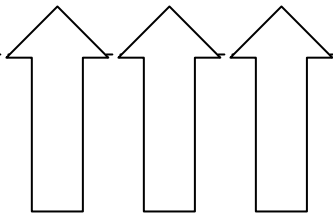
---

|                    |                    |                               |                   |
|--------------------|--------------------|-------------------------------|-------------------|
| S&T & R&D Stages   | <i>Imitation</i>   | <i>internalization</i>        | <i>generating</i> |
| Development Stages | Developing Country | Newly-Industrializing Country | Advanced Country  |

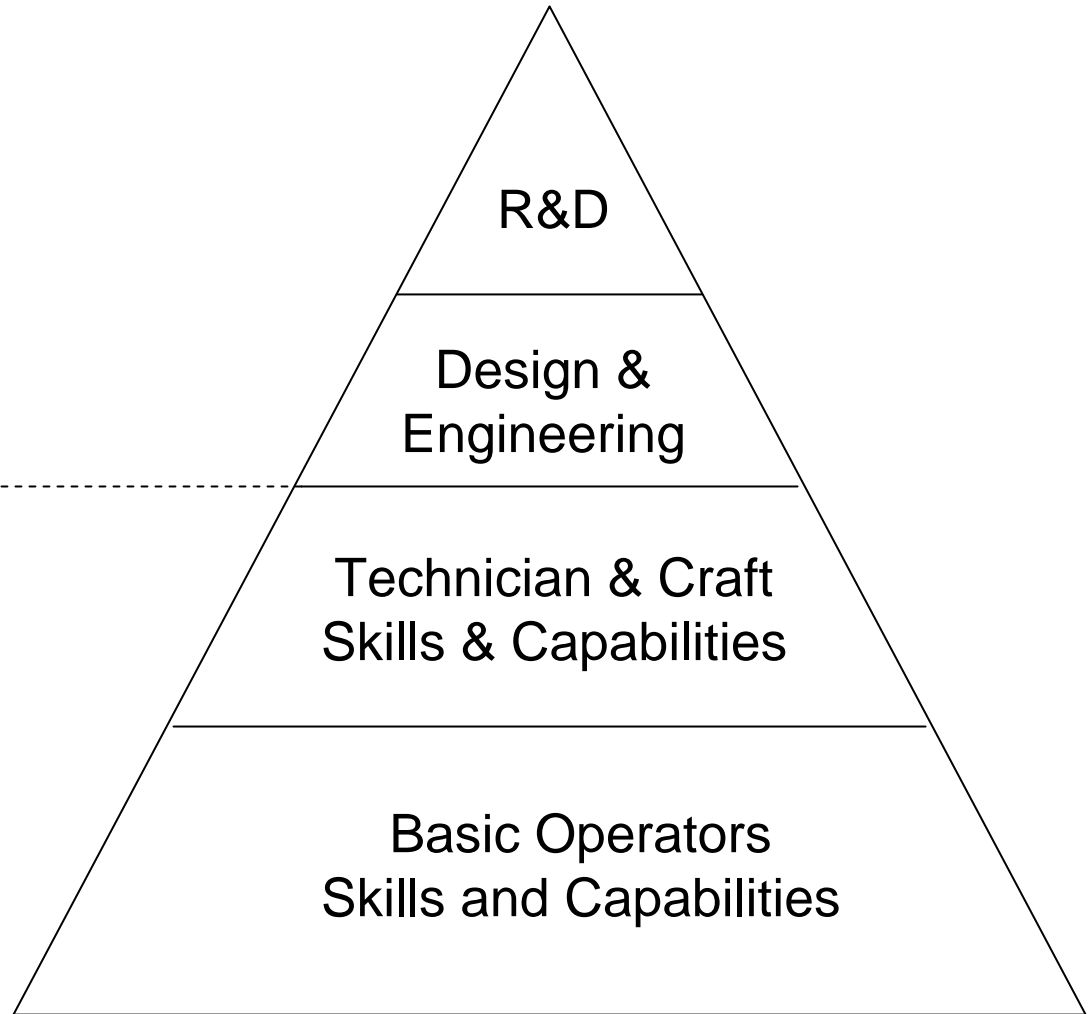
# Capacity to Import, Adapt and Adopt Existing Technology

- China has abundant FDI
- But spillovers are not automatic
- Firms need capacity to take advantage of potential opportunities
  - Maintain balance and harmony between hardware and software aspect of technology adoption

Science  
Development  
and Creation

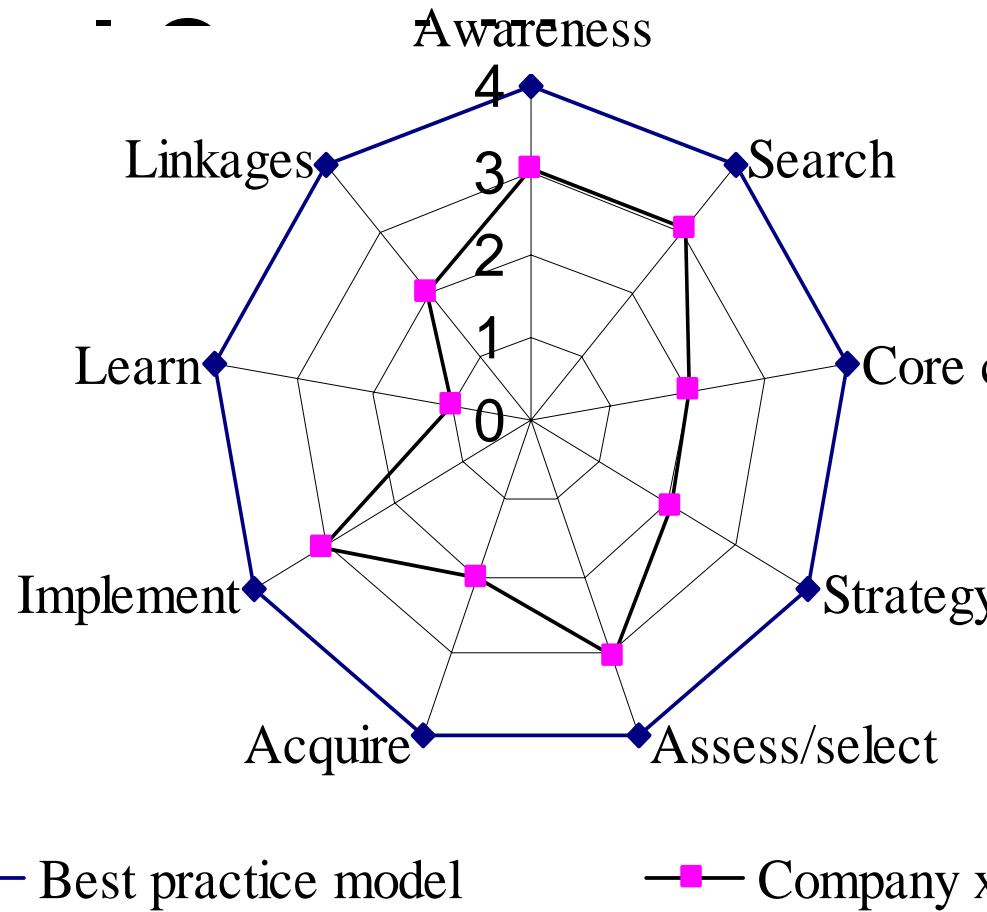


Science  
Use, Operation  
and Maintenance



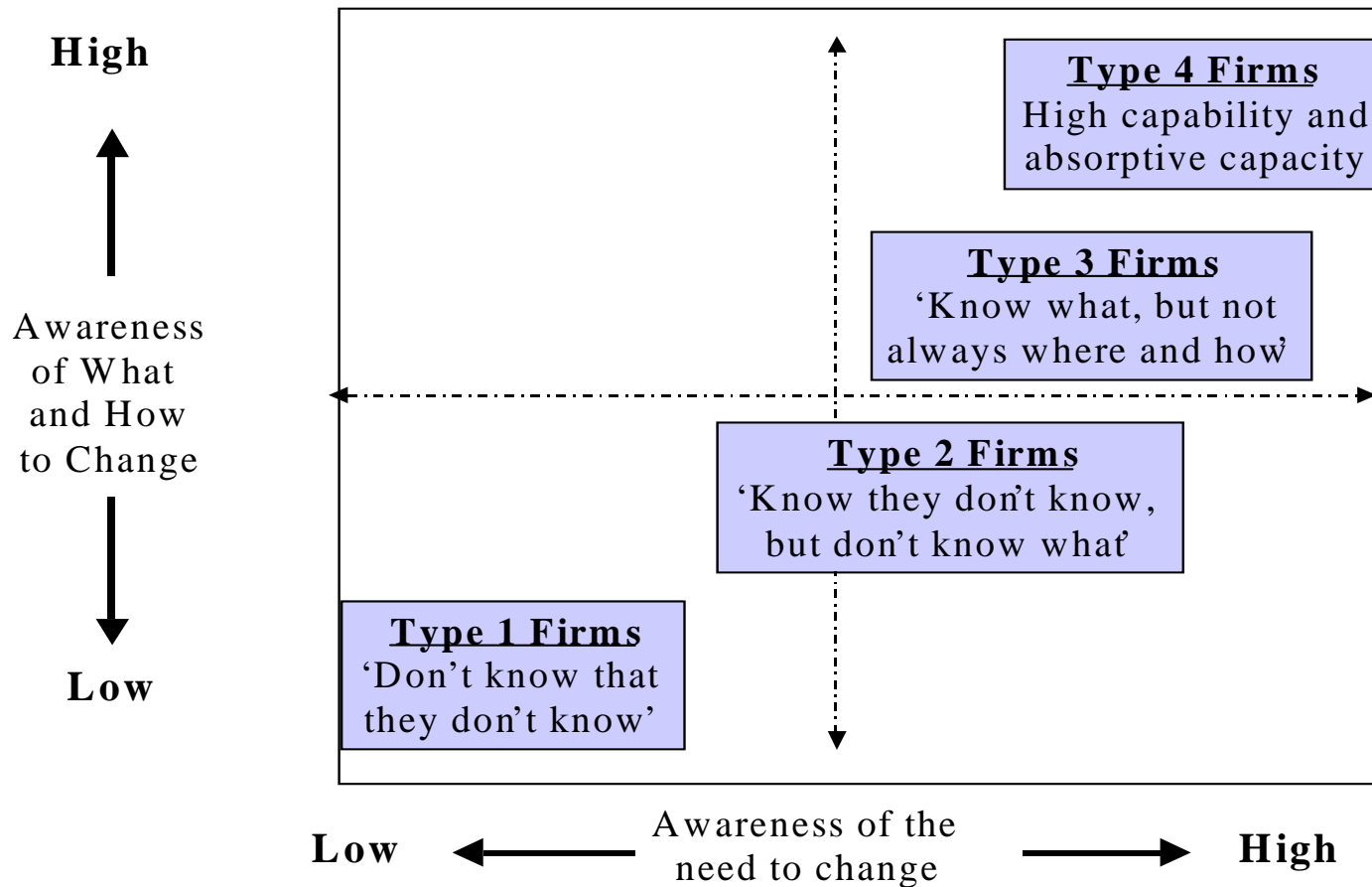
(These all need human capacity.)

# Nine dimensions of Techn

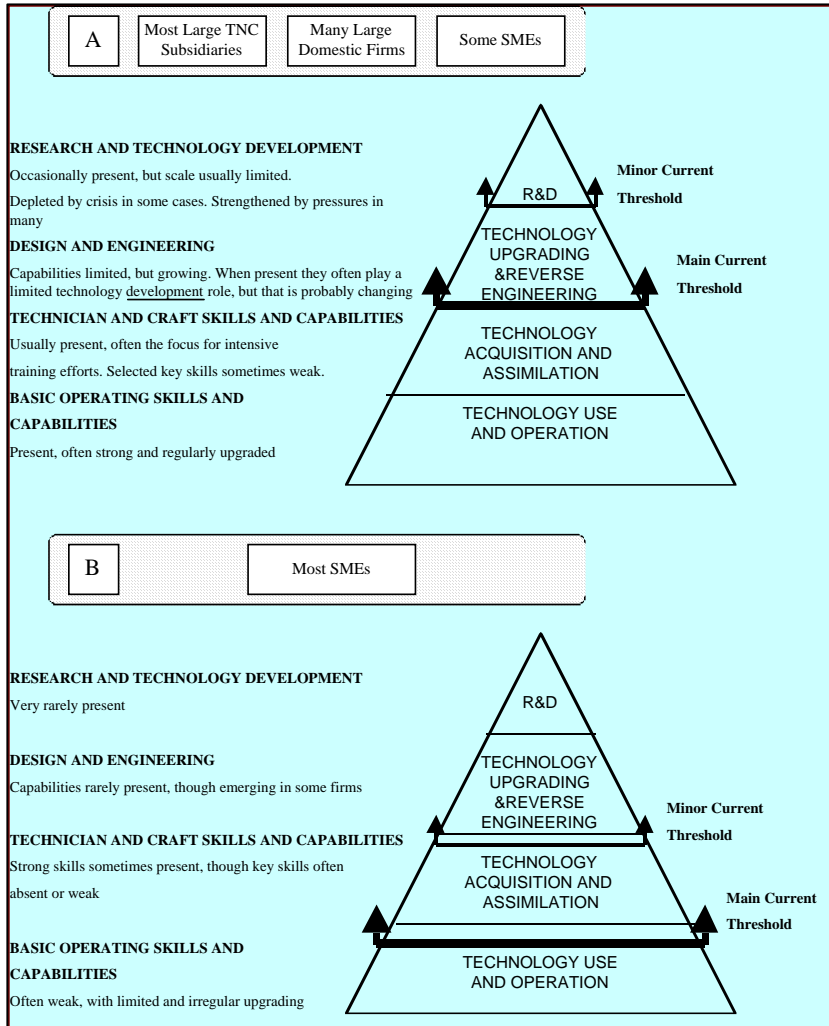


Source: Korea: How Firms Use Knowledge, Part A – Firm Level Innovation in the Korean Economy, World Bank processed, 2002

# Groups of Firms According to Technological Capability

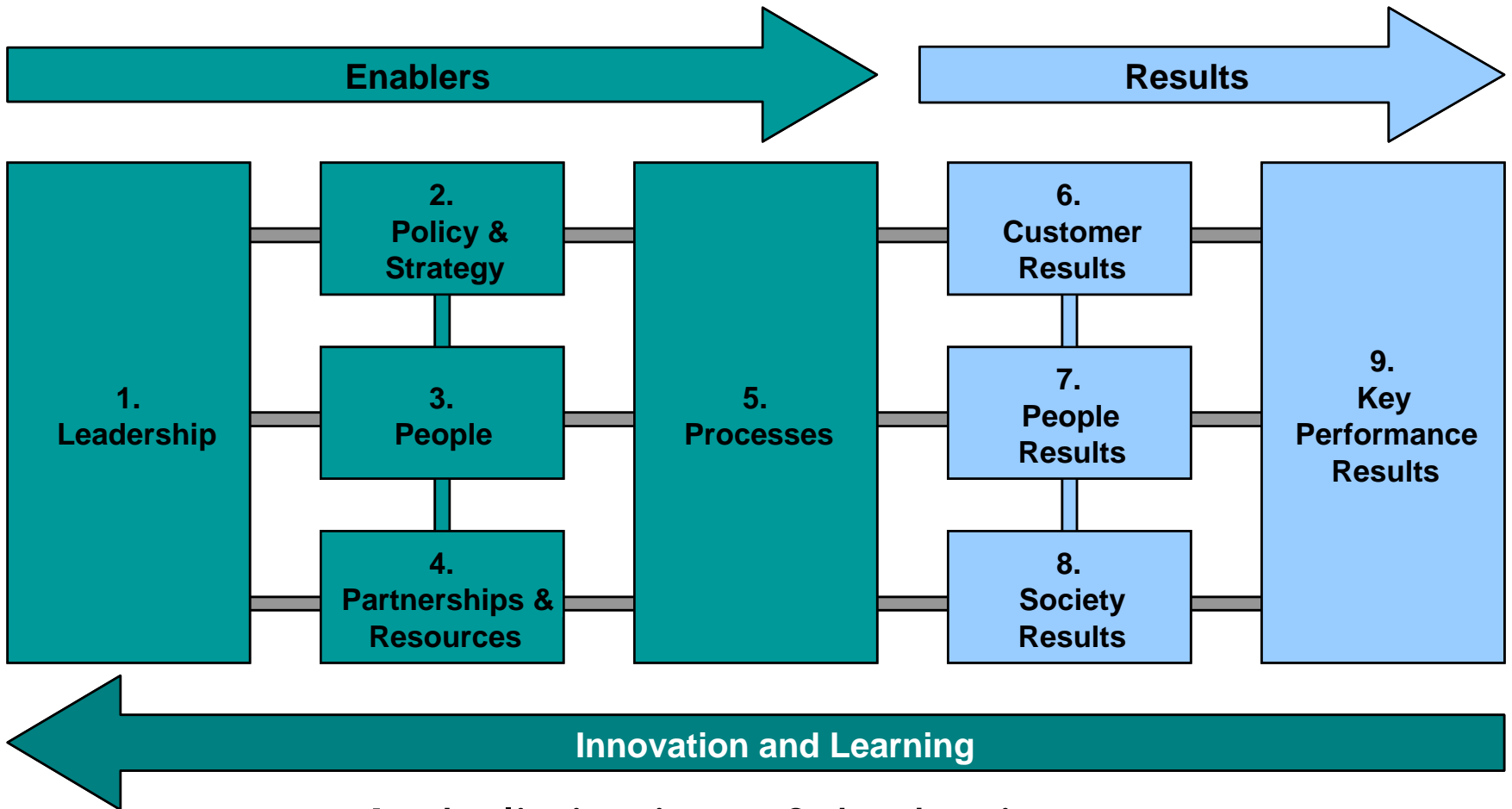


# Firm-level Capacity Building Thresholds



- The key thresholds of technological capability are concerned with design and engineering, not R&D
- **Critical need:** Target incentive schemes on assisting firms to cross thresholds

# The EFQM Business Excellence Model



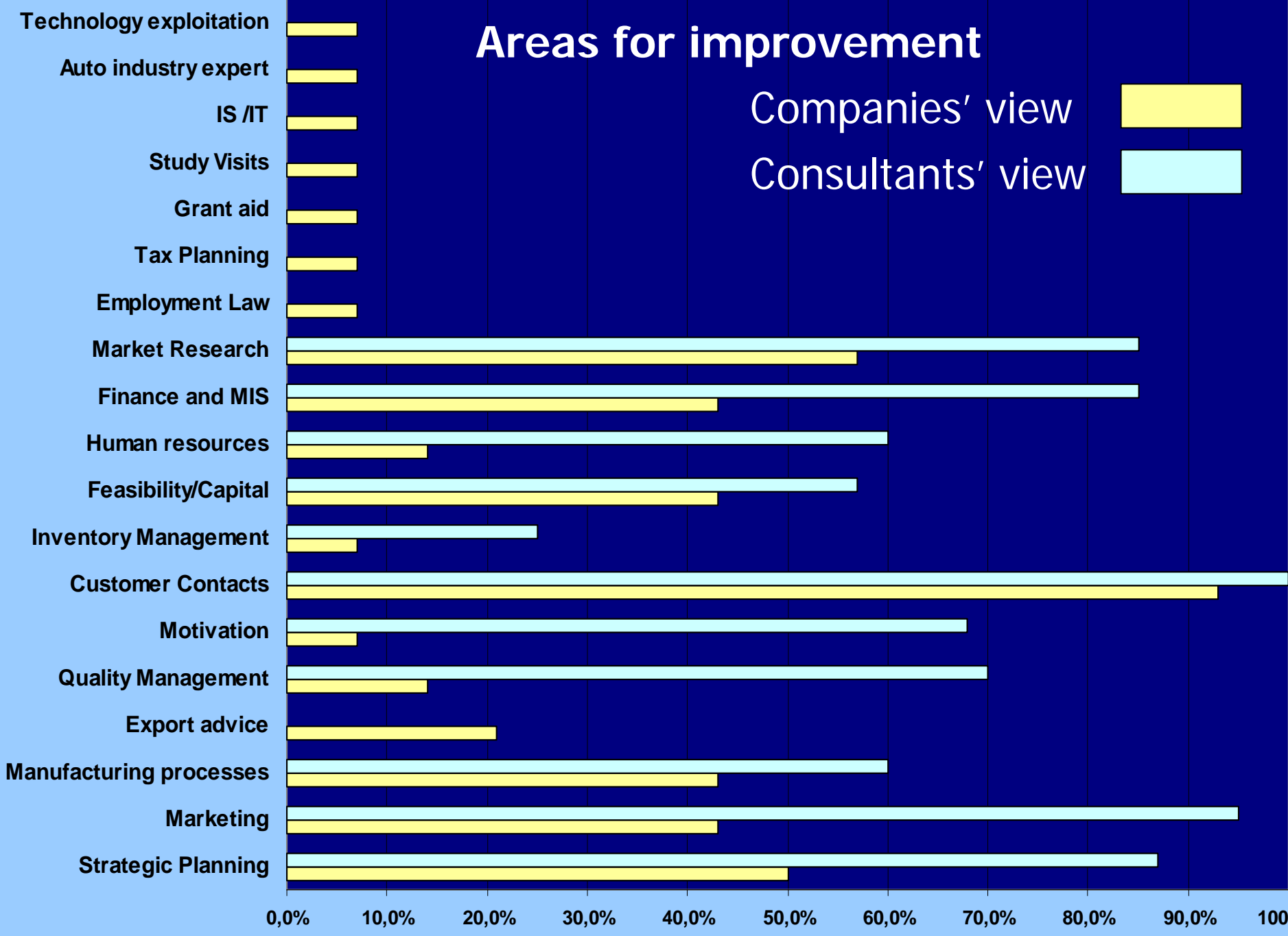
An holistic view of the business

# Areas for improvement

Companies' view



Consultants' view



# Conclusions

- Ability to produce new knowledge (R&D) is important, but ability to absorb and utilize existing knowledge may be more important at early stages of development – National Systems of Economic Learning and Technology Diffusion
- Goal of universal education should be complemented by expanded access to vocational, secondary and tertiary education
- A critical challenge for S&T policy is increasing effective demand for S&T by developing enterprise capacity to innovate and utilize existing knowledge

# THANK YOU

Alfred Watkins

Science and Technology Program  
Coordinator

The World Bank

[Awatkins@worldbank.org](mailto:Awatkins@worldbank.org)

1-202-473-7277