Taiwan's economic Growth

-Success to date and new opportunities from an ICT industry's perspective

Hsin Sen Chu, Ph.D.

Executive Vice President
Industrial Technology Research Institute
Hsinchu, Taiwan

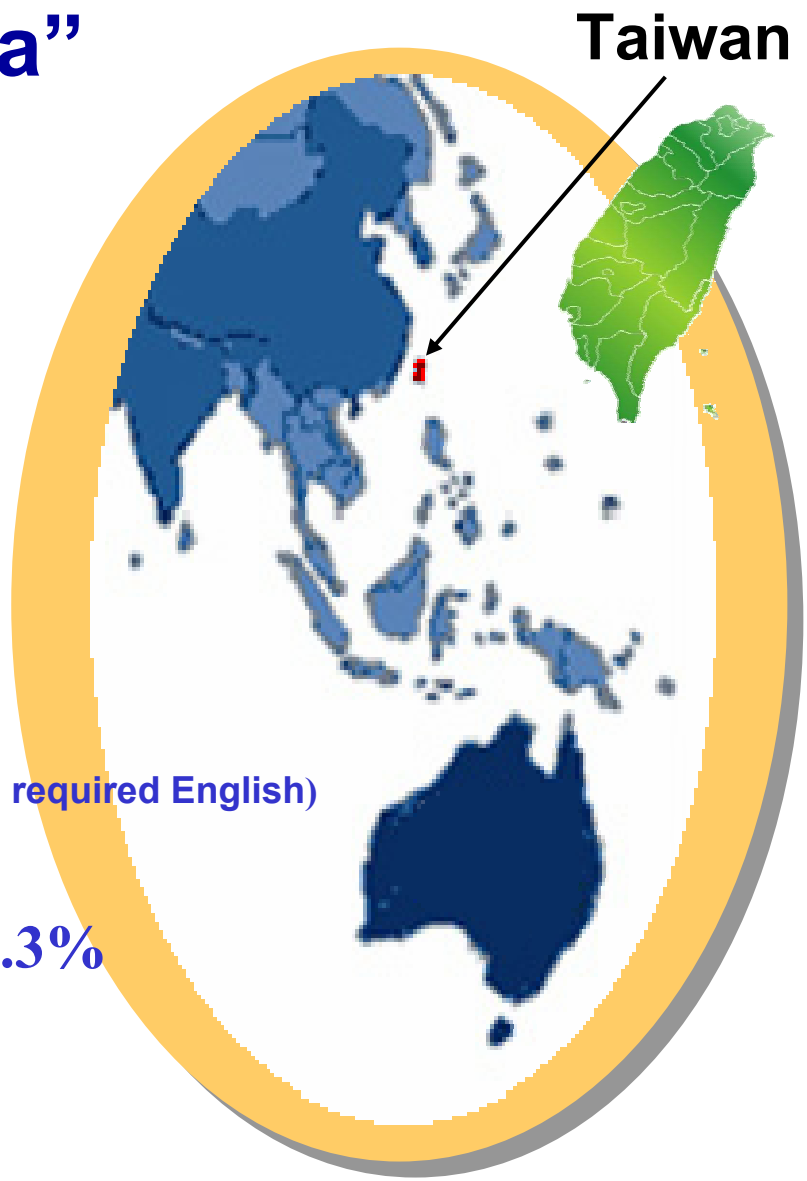
April 25, 2007

Outline

- Overview of Taiwan's Economic Growth
- Industrial Growth through concerted effort
- ICT-centered Challenges & Opportunities
- ITRI
- Conclusion

Overview
of Taiwan's Economic Growth

Taiwan — "Formosa"



Area: 36,179 sq km

Population: 22.83million (Aug. 2006)

GDP: 346.4 billion USD (2005)

per capita: 15,291 USD (2005)

Trade global ranking: 16th

Foreign Exchange Reserves:

253 billion USD, global ranking: 3rd

Language: Chinese (The primary school starts required English)

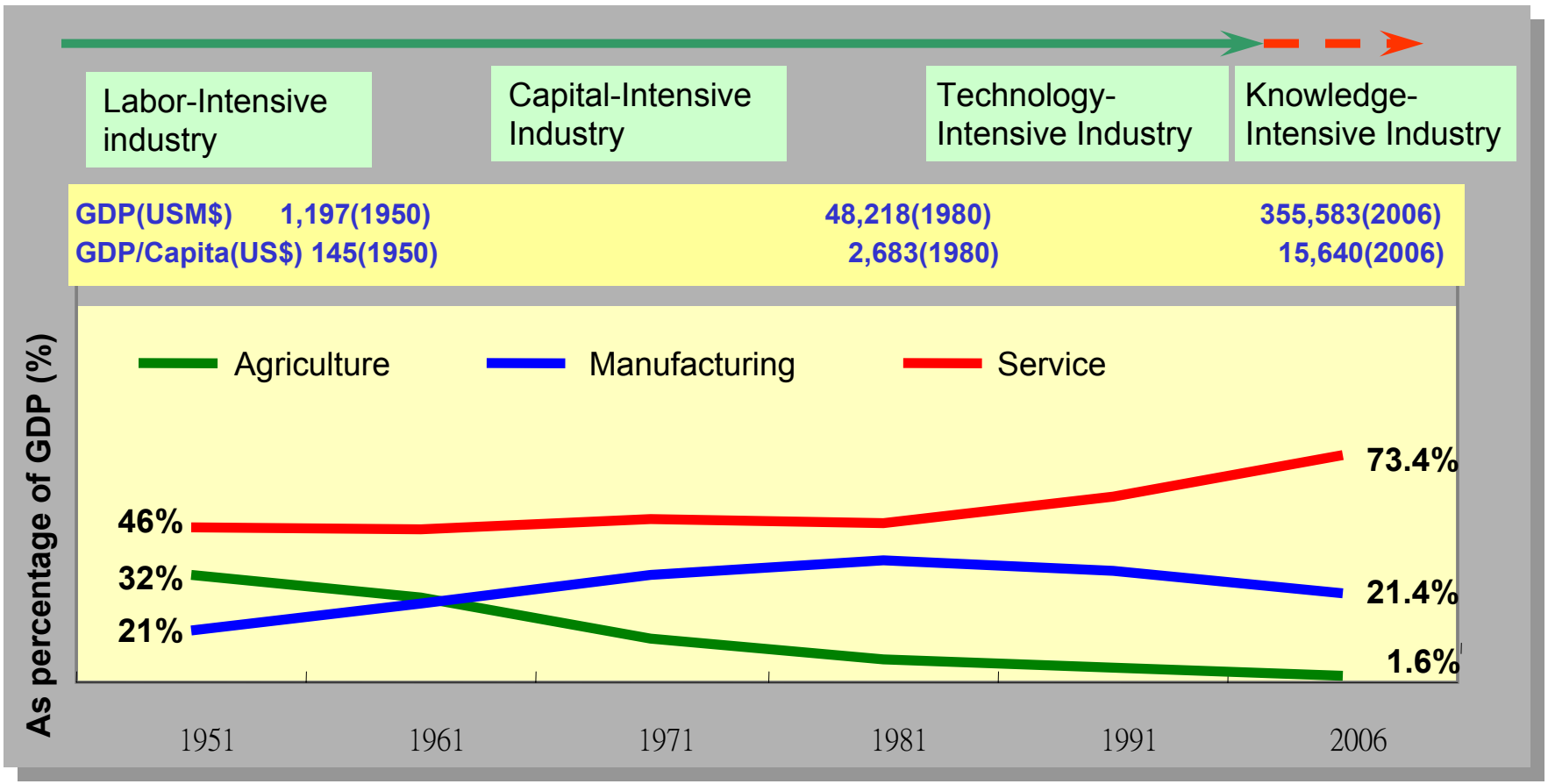
Exchange rate: 1USD:32.4 NTD

PC Penetration (household basis) : 74.3%

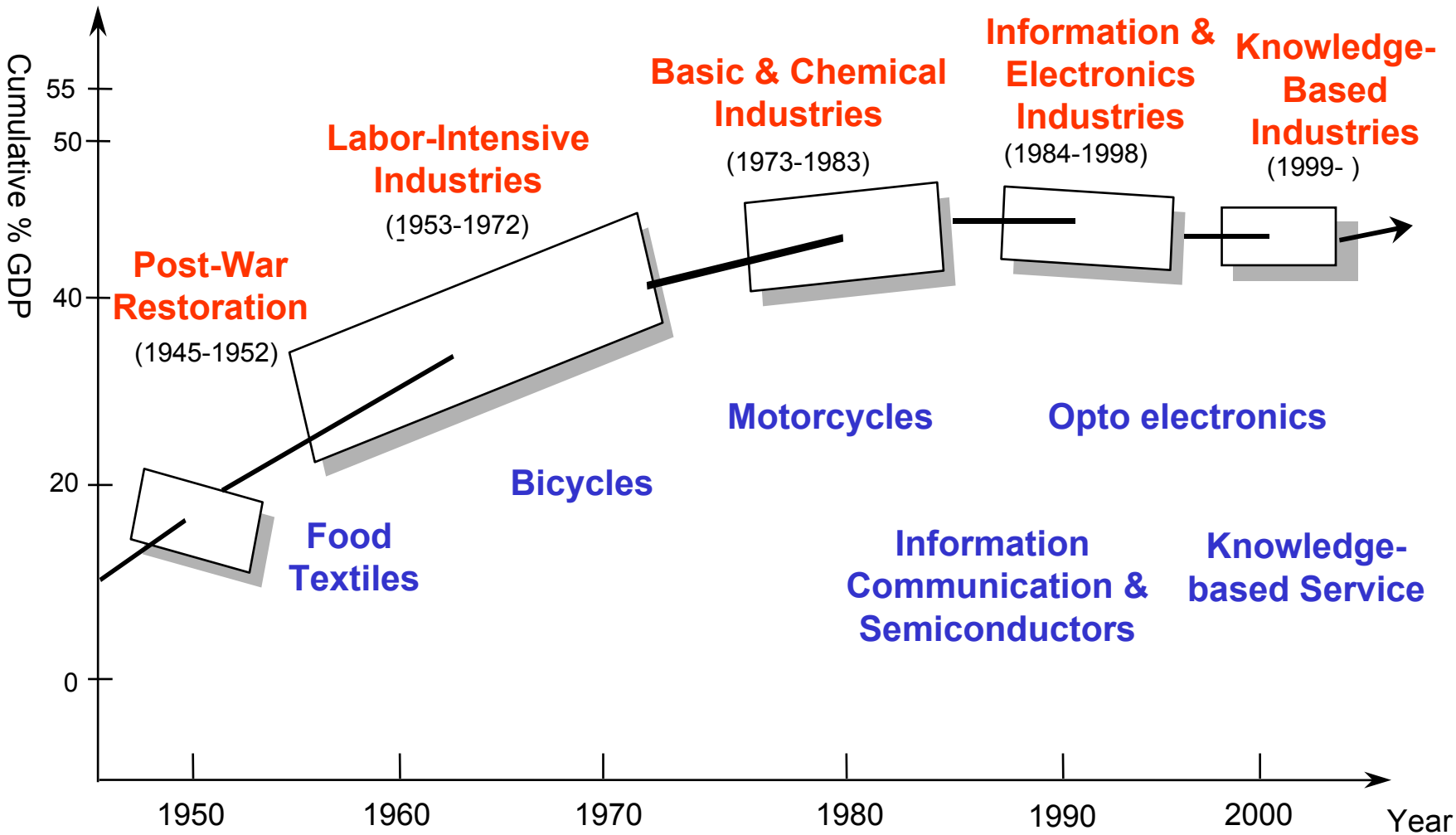
CATV home pass : 84.8%

Mobile phone penetration : 87.3%

Transformation of Taiwan's Economy



Evolution of Taiwan's Industry



Taiwan's Leading Product

Consumer Product-
Materials, Chemicals, Parts, etc.

- ABS resin
- Glass fiber
- PVC
- PU leather
- Textiles
- Chip resistors
- Copper foils
- Hand tools
- Screws-bolts
- Bicycles

Computer & Peripheral Devices

- Notebook PC
- LCD Monitor
- Mother Board
- Digital Camera
- COMBO Drive
- CD/DVD Drives
- CD/DVD Disks
- Small&Medium Size TFT-LCD module
- Large Size TFT-LCD Panel
- TN/STN LCD module
- Plasma Display

IC

- Foundry
- Mask ROM
- IC Packaging
- IC Design
- DRAM

Network Products

- Network Interface Card
- SOHO Router
- Hub
- Wireless LAN
- ADSL/ Cable / Analog Modem
- Lan Switch

INDIA'S MEDIA EXPLOSION | OUR PERSONAL TECH GUIDE

The McGraw-Hill Companies

BusinessWeek

ASIAN EDITION / MAY 16, 2005

www.businessweek.com

WHY TAIWAN MATTERS

The global economy couldn't function without it. That's why peace with China is so crucial.

BY BRUCE EINHORN

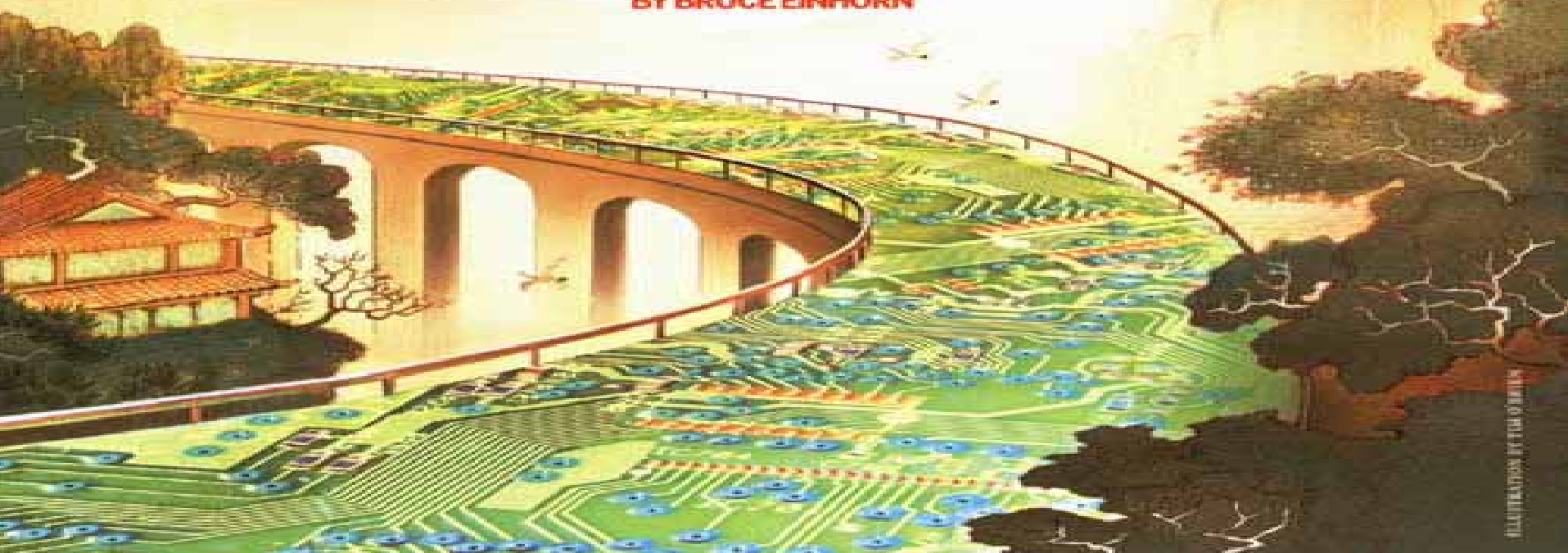


ILLUSTRATION BY TIM O'BRIEN/BW

Taiwan's Tech Clout

Where the Island's Industries RANK Globally

A CAN-DO ATTITUDE

Taiwanese companies, from chip foundry TSMC to laptop maker Quanta, manufacture thousands of items essential to the global digital economy. Most appear under someone else's name—and most are made in mainland China.

#1 Provider of LCD monitors, with **68%** of the market, worth **$14** BILLION

#2 In servers, with **33%** of the market, worth **$1.8** BILLION

#1 Producer of cable modems, with **66%** of the market, worth **$480** MILLION

#2 Producer of digital still cameras, with **34%** of the market, worth **$2** BILLION

#1 Provider of chip foundry services, with **70%** of the market worth **$8.9** BILLION

#1 In semiconductor packaging with **36%** share, worth **$3.4** BILLION

#1 Producer of PDAs, with **79%** of the market, worth **$1.8** BILLION

#1 Producer of notebook PCs, with **72%** of the market, worth **$22** BILLION

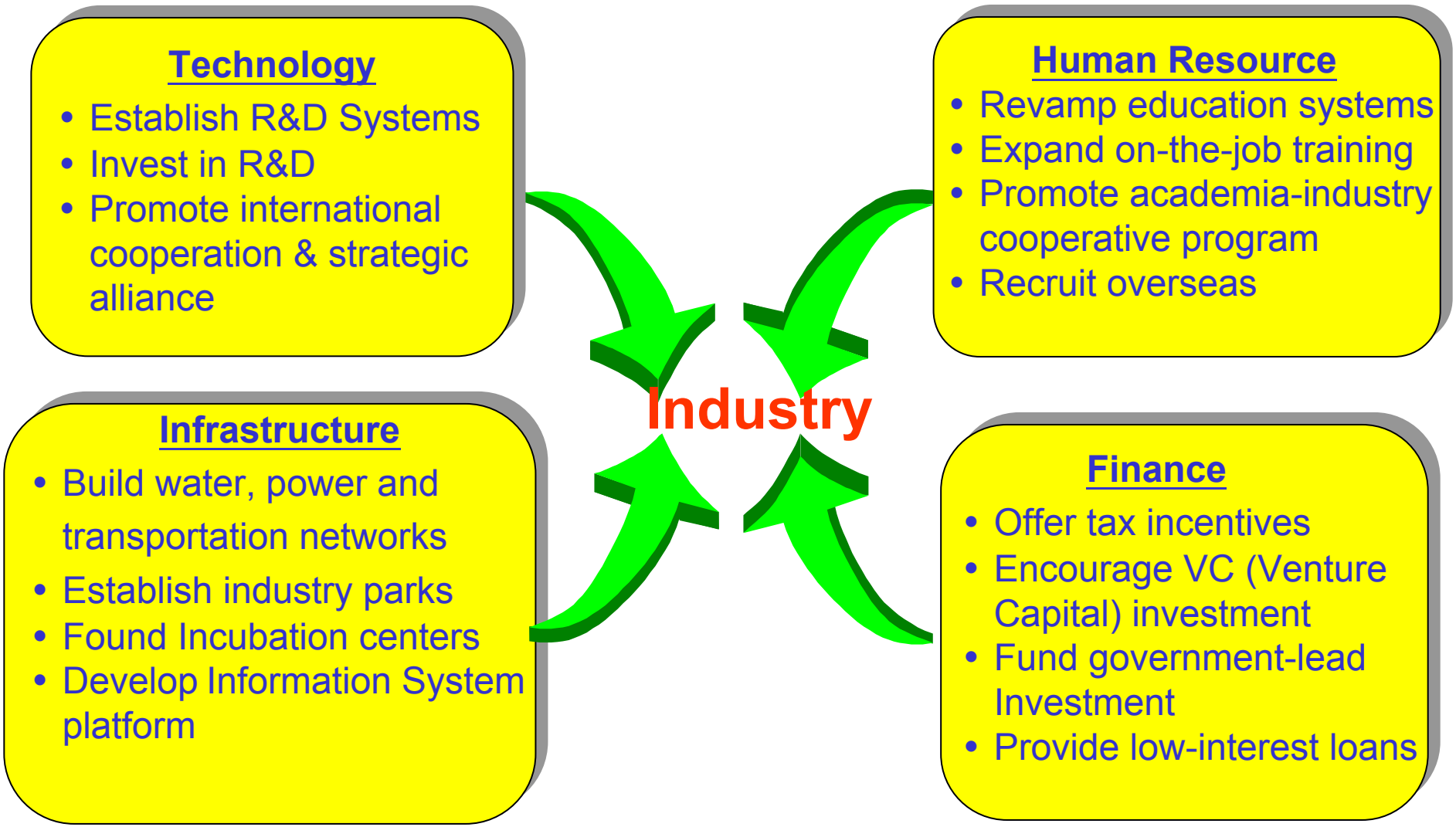
#2 Producer of TFT-LCD panels, with **35%** of the market, worth **$7.6** BILLION

#1 Producer of wireless LAN equipment, with **83%** of the market, worth **$1.3** BILLION

Industrial Growth through Concerted Effort —

by Governments, Academia, and Research Institutions, culminating in world class ICT

Governmental Development Strategies for Industry



Government Policies

Technology Transfer/Foreign Investment

- The First Economic Development Plan
- Regulation for Encouraging Investment

Internal Technology Development

- Established ITRI
- Set up Development Fund of Executive Yuan
- Regulation for Encouraging Investment (R&D)
- Technology Development Program
- Implemented Ten Major Public Construction Projects

- Established Food Industry Research and Development Institute
- Launched Twelve Year Plan of National Science Development
- Established Duty-Free Export Zone

Globalization

- Enacted Fundamental Science and Technology Laws
- Established Incubation Centers
- Set up Southern Taiwan Science Park and Southern Taiwan Innovative Park

- Set up Hsinchu Science Park
- Implemented Ten Emerging Industrial Development Plan
- Set up Leading New Product Development Program
- Foreign Exchange Deregulation
- Initiate NII (National information Infrastructure)

Innovation

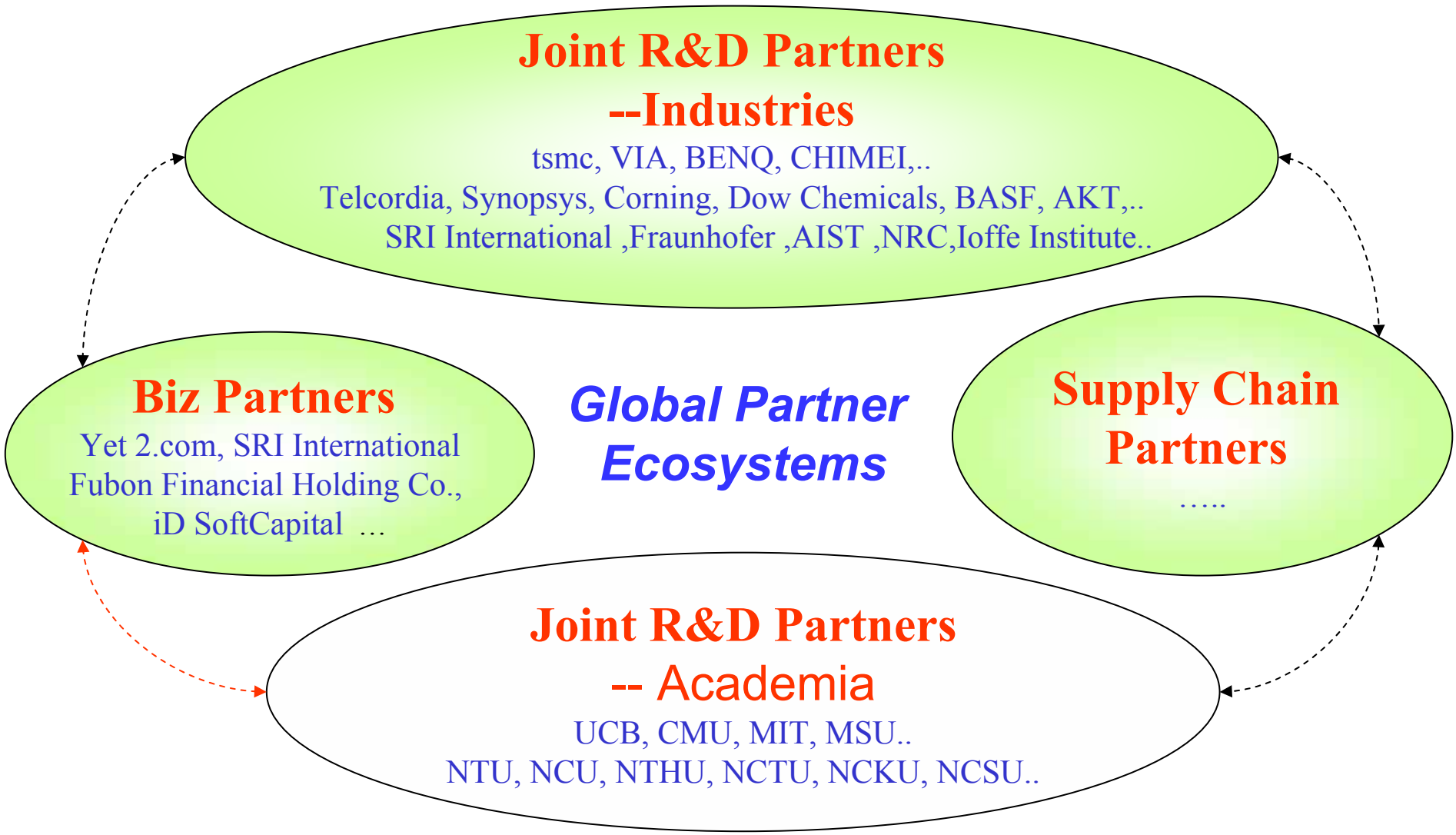
- Industrial Technology Innovation Center Program
- Small Business Innovation Research Promoting Program
- Guidelines & Action Plans for Service Industry Development
- University legal people

1950 1960 1970 1980 1990 2000 Year

Roles of Academia and R&D Organizations

- **Academia**
  - Basic Research
  - Development of high-quality human resource
- **Industrial R&D organizations**
  - Technology innovation, development and implementation
  - Facilitate creation of new industries
    - Industrial Technology Research Institute (ITRI)
    - Information Industry Institute
    - Food Industry Research Institute
    - Textile Industry Research Center
    - Bicycle R&D Center
    - …..

Domestic and Foreign Partners



IC Manufacturing

Revenue: US$ 42.8 billion (2006)
—IC Foundry: Revenue US$13.5 billion

- TSMC: 1st12” Wafer Fab in Taiwan, 2002
- VIS:ITRI spin-off, 1994
  1st 8” Wafer Fab in Taiwan
- TMC: ITRI spin-off, 1988
  1st Mask Company in Taiwan
- TSMC: ITRI spin-off, 1987
  1st 6” Wafer Fab in Taiwan
- UMC: ITRI spin-off, 1979
  1st 4” Wafer Fab in Taiwan

12” Wafer

8” Wafer

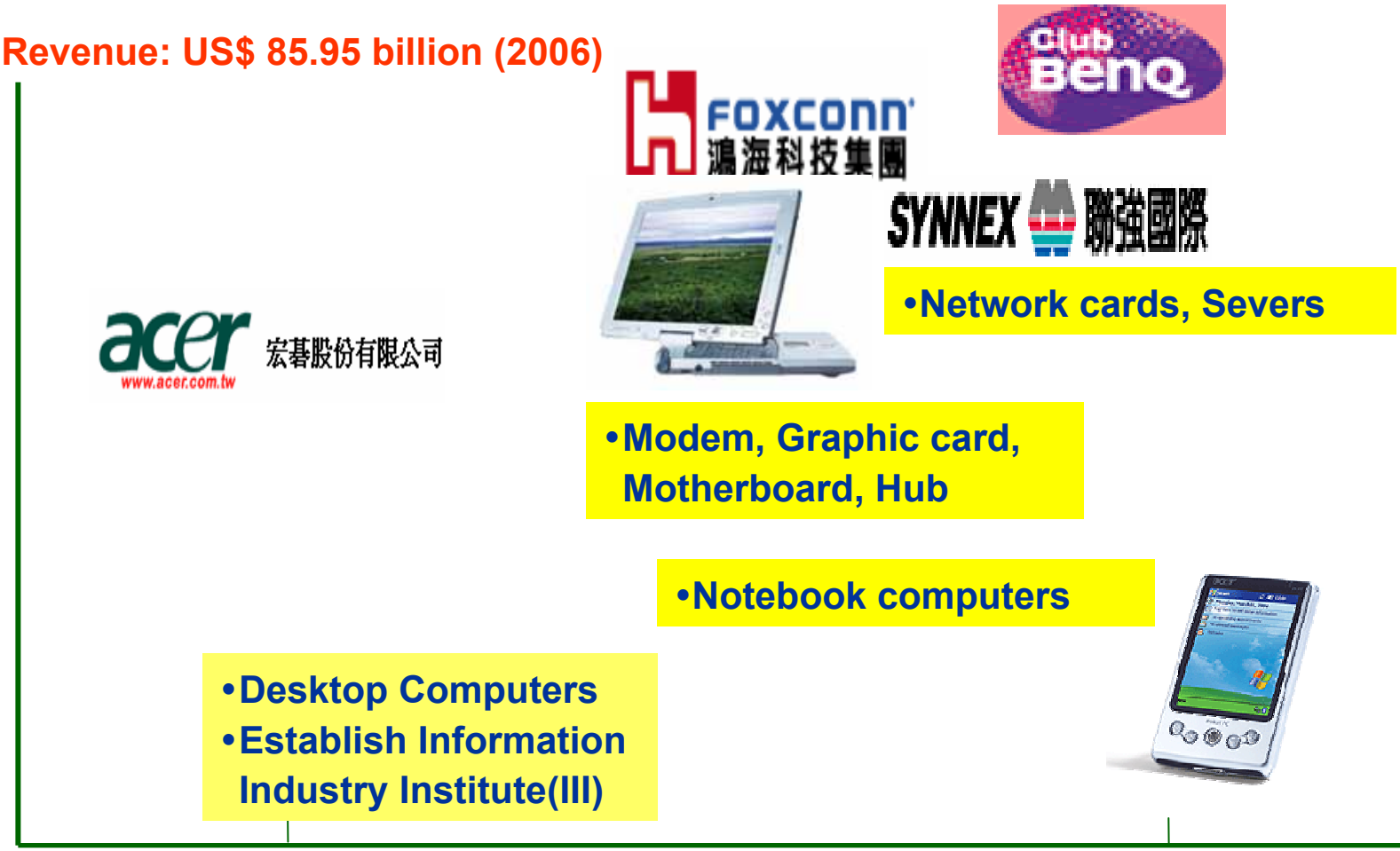
- RCA technology transferred (1976)

linewidth → 7 μm 1.5 μm 0.35 μm 0.18 μm 0.13 μm 0.09 μm

1975 2000 Year

Information Industry

Revenue: US$ 85.95 billion (2006)



Communication Industry

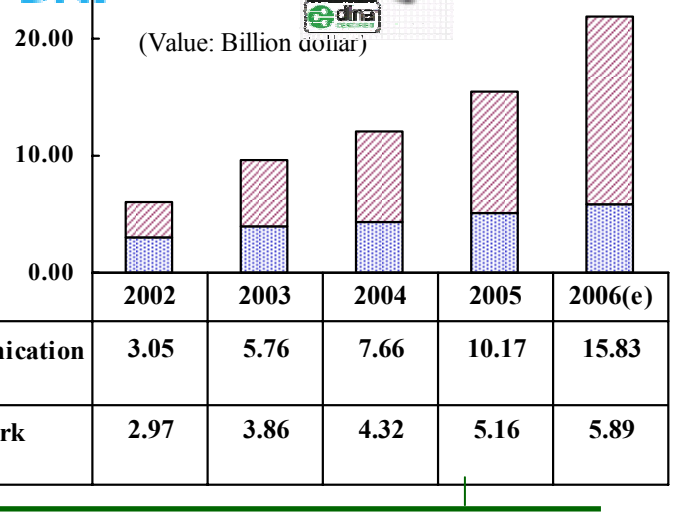
Revenue: US$ 26.1 billion (2006)

OEM:ODM:OBM=12.0%:60.6%:27.4%







	2002	2003	2004	2005	2006(e)
wireless communication equipment	3.05	5.76	7.66	10.17	15.83
broadband network equipment	2.97	3.86	4.32	5.16	5.89

1950 2006

Opto-electronics Industry

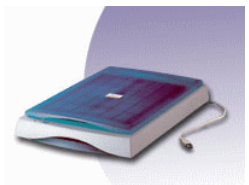
Traditional Optical Industry → **Opto-electronics**

Value ↑

- Contract-manufacturing (camera, Lens,…)

- Eye glasses, camera
- Assembly of movie cameras
- Cathode ray tubes

- Governmental sponsored R&D of opto-electronic materials and components
- ITRI-OESL established
- Laser printer, image scanner, optical storage devices



- Digital camera
- CD/DVD drives and drivers
- Displays (LED, LCD, FED)
- Optical fiber components and devices

Multi-function machines

Pick-up head

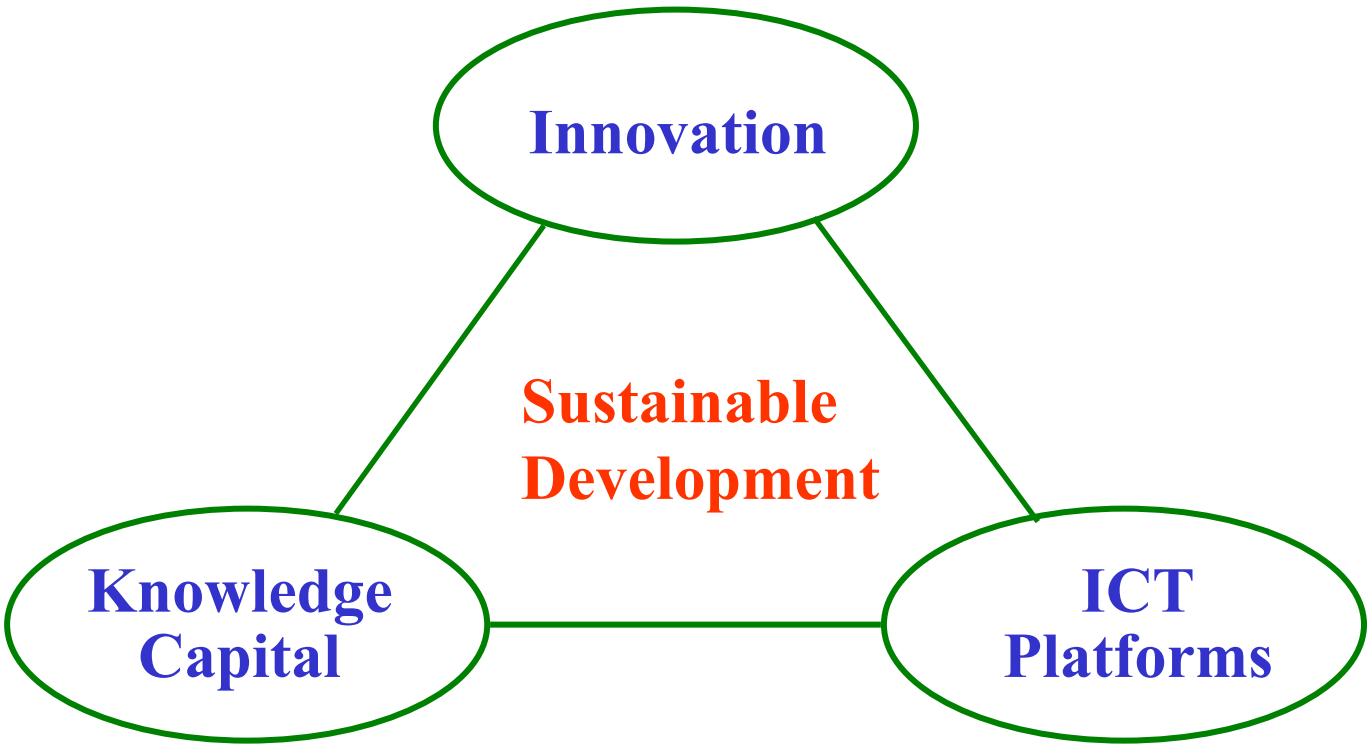
Year 1960 2000

ICT-centered Challenges & Opportunities

Challenges Faced By Taiwan's ICT Industry

- **Manufacturing Base Shifting**
- **Shortened Product Life**
- **Global Market Competition**

Key Factors in Knowledge-Based Economy



Mega-Trends

- Aging population
- Resource limitation
- Digitalization permeating all aspects of life
- Ever-rising service industries

Taiwan's Future Opportunities

1.Novel Applications and Products

2.High-Value Advanced Manufacturing

3.Knowledge-based Services

⇨Integration and Innovation will be Essential

Changing Mindset and Approaches

- **Technology R&D**
  - From optimization to exploration
  - From components to systems & solutions
  - From technology creation to value creation
  - From single to multi-discipline integration
  - From in-house to collaboration & partnership
- **Business / Services**
  - From local to regional / global market
  - From technical services to knowledge-based services

Taiwan's National Infrastructure

Northern Taiwan
- 38 Incubators
- IC, ICT Industries

Taiwan High Speed Rail

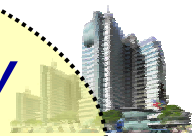
Taipei Wi-Fi City

Hsinchu Science Park

Taipei

Hsinchu

Ubiquitous Network Society



Central Taiwan
- 15 Incubators
- Precision Machinery Industries

Taichung Software Park

U-Taiwan

Taichung

Eastern area
- 5 Incubators
- Tourist Industries

Central Taiwan Science Park

Kaohsung Cyber city

M-Taiwan

Taiana

Kaohsung

e-Taiwan

Southern Taiwan
- 23 Incubators
- Biotech, Opto-electronics

Southern Taiwan Science Park

Southern Software Park

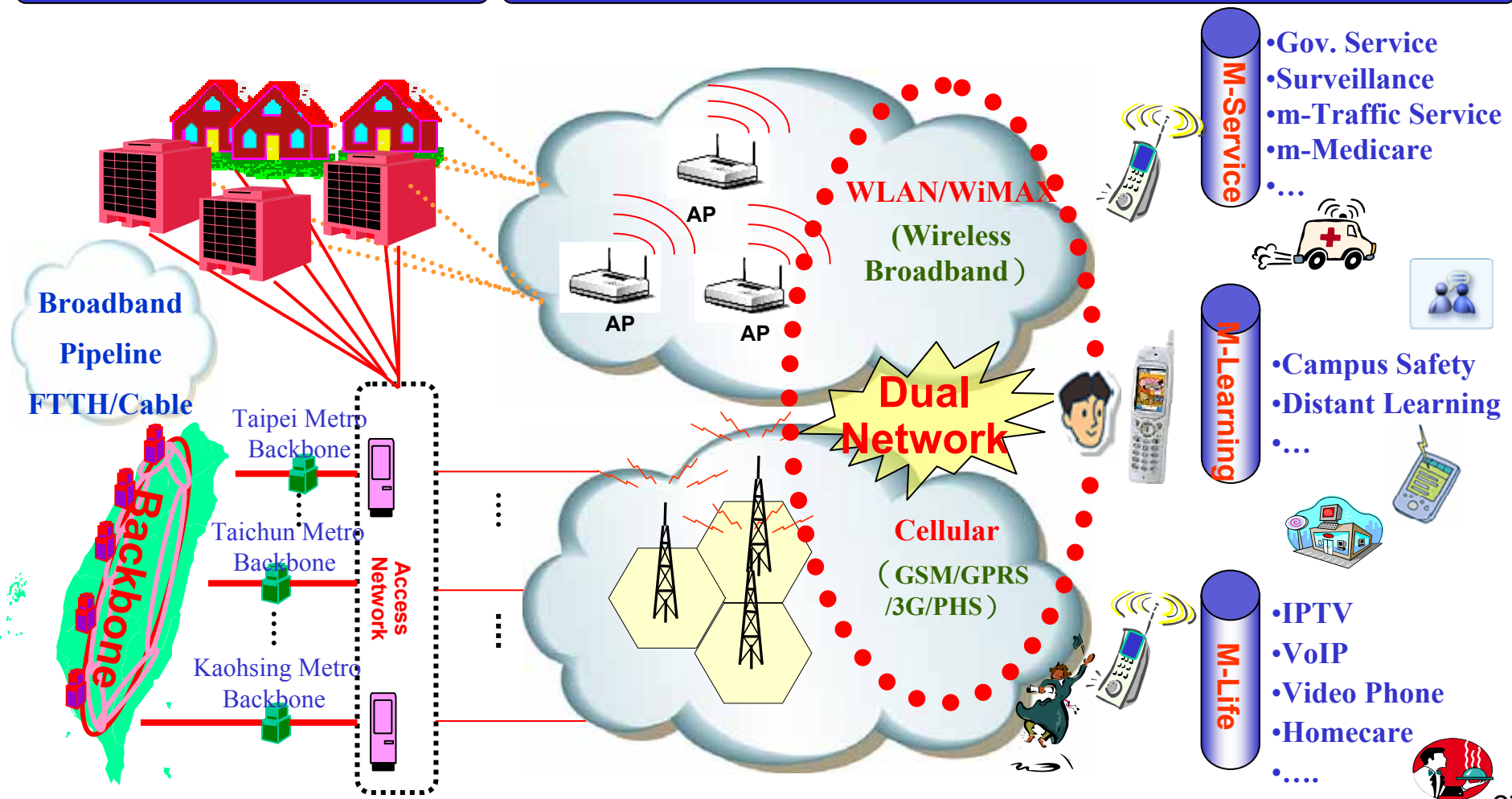
ICT-Related National Drives

- **R&D**
  - Telecom (2004-2008, 2nd phase): US$ 381 M
  - SoC (2006-2010, 2nd phase): US$ 450M
  - Nanotech (2003-2008): US$ 659M
  - Digital-Learning (2003-2007): US$125M
  - Nation Digital Archives (2002-2006, US$77.56M)
- **Implementation**
  - E-Taiwan (2002-2007, US$12.8 B)
  - M-Taiwan (2005-2009, US$1.16B)

M-Taiwan

A National Program to Realize Taiwan WiMAX Blueprint

Broadband Pipeline | **Mobile Applications and WiMAX/WLAN-Cellular Dual Network**



Service-Linked Technology R&D

- Intelligent Delivery & Warehousing
- Distributed Diagnostic and Homecare
- Digital Recreation & Entertainment
- Green Building & Community
- Intelligent Transportation System

Healthcare

- Healthcare Centers
- Physical Examination Centers
- Fitness Centers

Medical Service Providers

Service Center

- ICT industry
- Insurance Co.
- Financial/Banks
- Realstate

Telecomm.
-Phone/Modem
-3G
-WiFi/WiMax

Physiological Monitoring
-NIBP -SPO2
-HRV -Pulse
-BR -Temp.
-ECG -RFID
-Video/Motion

Customers/Contents Needs

Care/Wellness

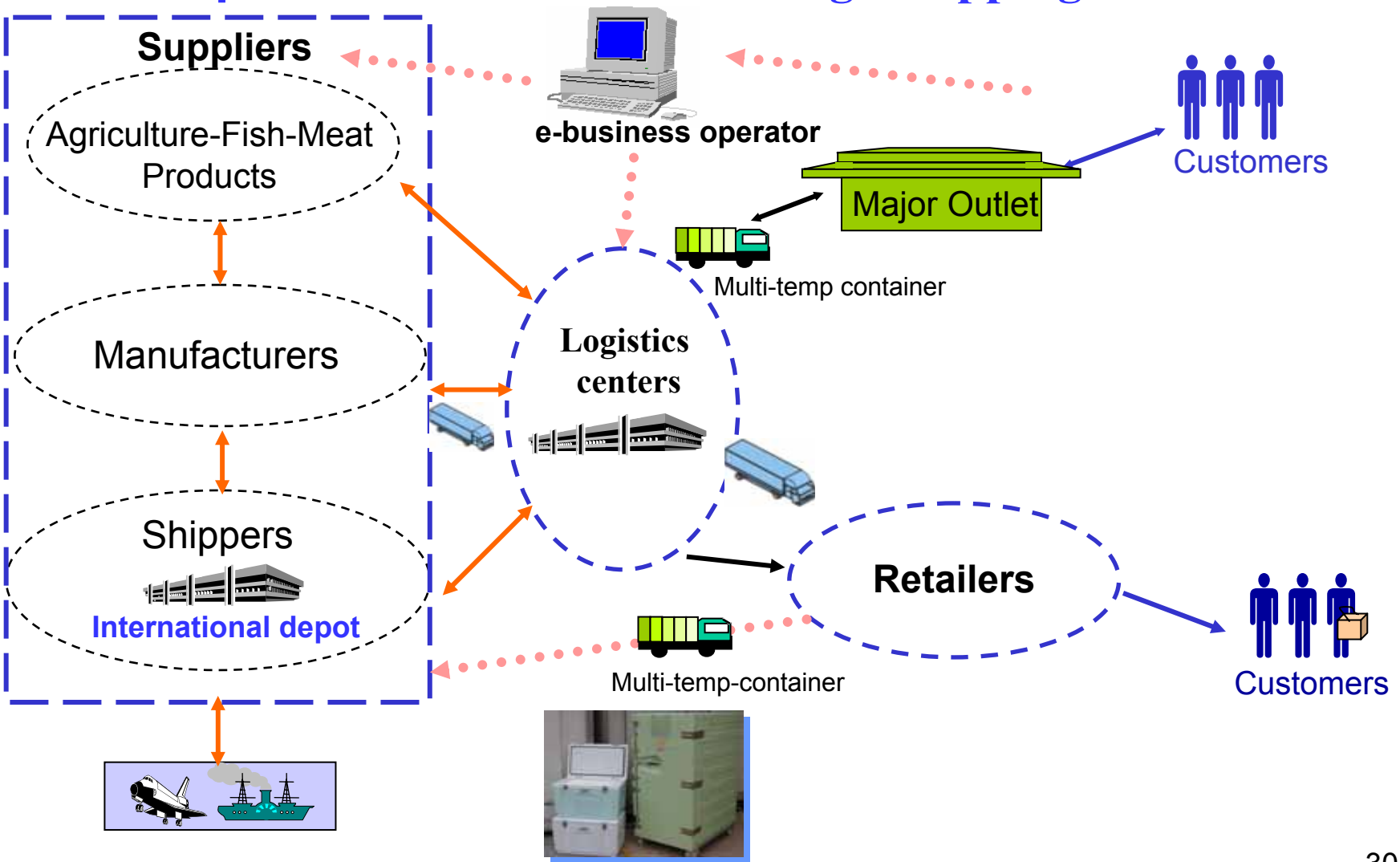
Infant & pregnancy Healthcare

Senior/High risk group Healthcare

Diseases Management

Logistic Service

All-temperature Ever-Fresh storage-shipping service



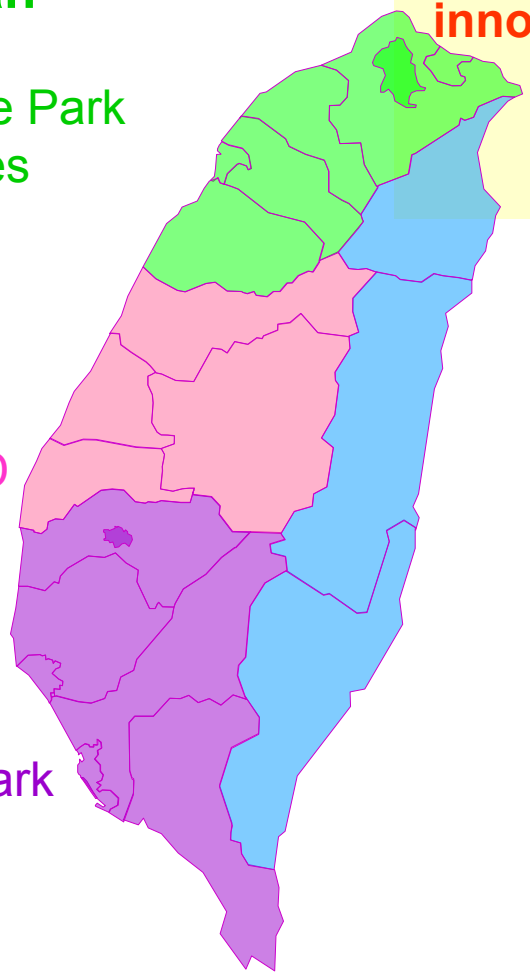
Industrial Infrastructure

Northern Taiwan
- 38 Incubators
- Hsinchu Science Park
- IC, ICT Industries

From manufacture clusters to innovation clusters

Since 1996 incubated over 1600 companies
attracted US$0.8b Investments

Central Taiwan
- 15 Incubators
- Central Taiwan Science Park
- Precision Machinery, TFT-LCD

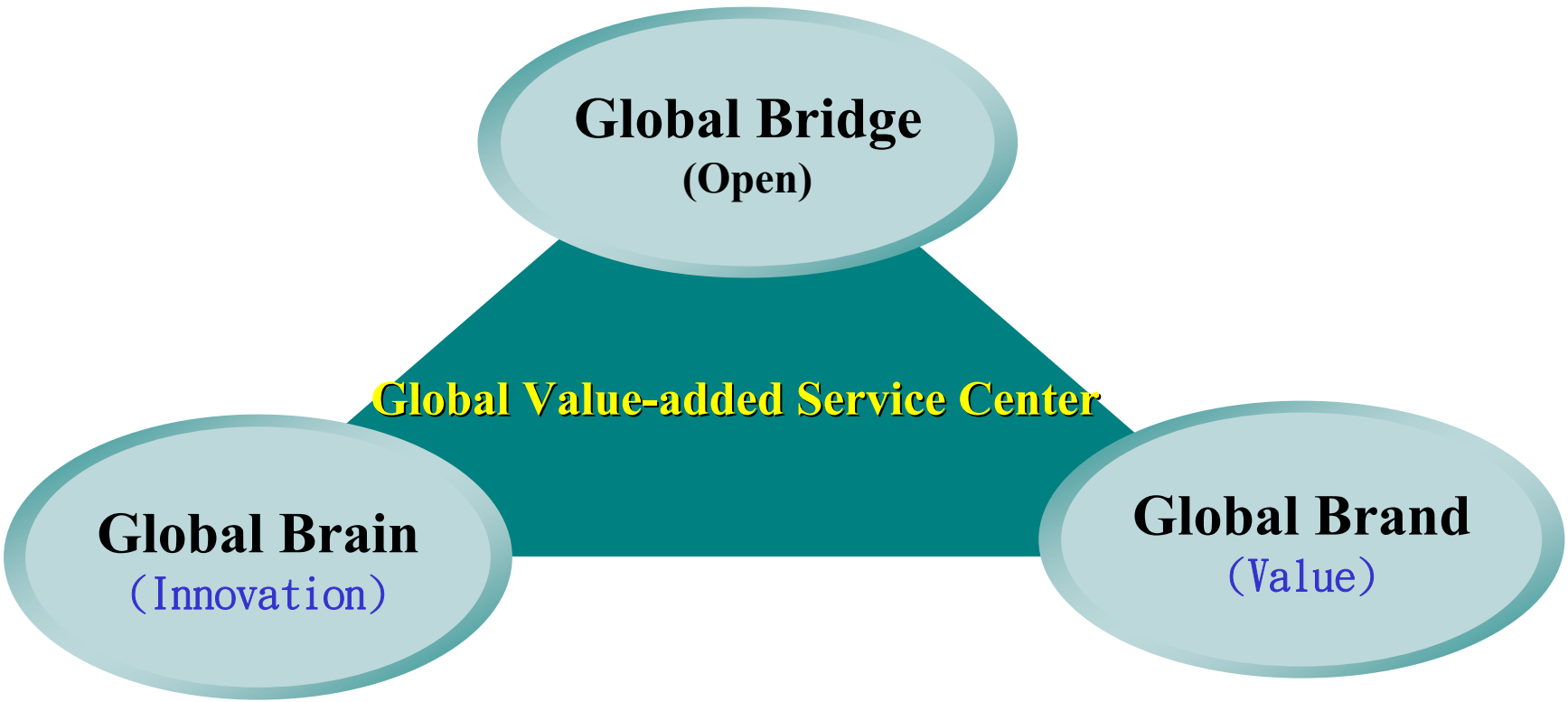


Eastern area
- 5 Incubators
- Tourist Industries

Southern Taiwan
- 23 Incubators
- Southern Taiwan Science Park
- Biotech, Opto-electronics

Create Taiwan's New Era

- Nation: strengthen ICT infrastructures and services
- Society: create wireless broadband access environment
- Industry: build up global business opportunities for Industries



Industrial Technology Research Institute (ITRI)

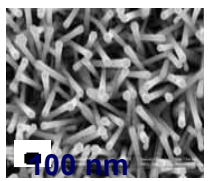
Industrial Technology Research Institute

A not-for-profit R&D institution founded in 1973

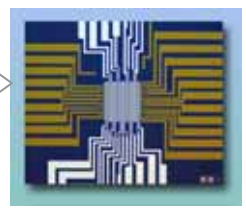
- To create economic value through innovated technology and R&D
- To spearhead the development of high-value industry
- To enhance the competitiveness of industries in the global market

Information and Communications

Energy and Environment



Electronics and Optoelectronics



Biomedical Technology

Nanotechnology, Materials and Chemicals

Advanced Manufacturing and Systems

Industrial Technology Research Institute





Research Laboratories, Incubation Center, Library, Classrooms, Dining Service, Housing, Exercise, and Medical Facilities

R&D Staff：5,859　　Total Patents：7,789

Ph.D.：　966　　Spin - Offs　：　142





ITRI Facilities in Taiwan

Kung-fu Campus
founded in 1936

Nankang SoC Design Park
since 2004

Taipei

Taiwan Taoyuan Airport

Hsinchu Chung Hsing Campus
since 1975

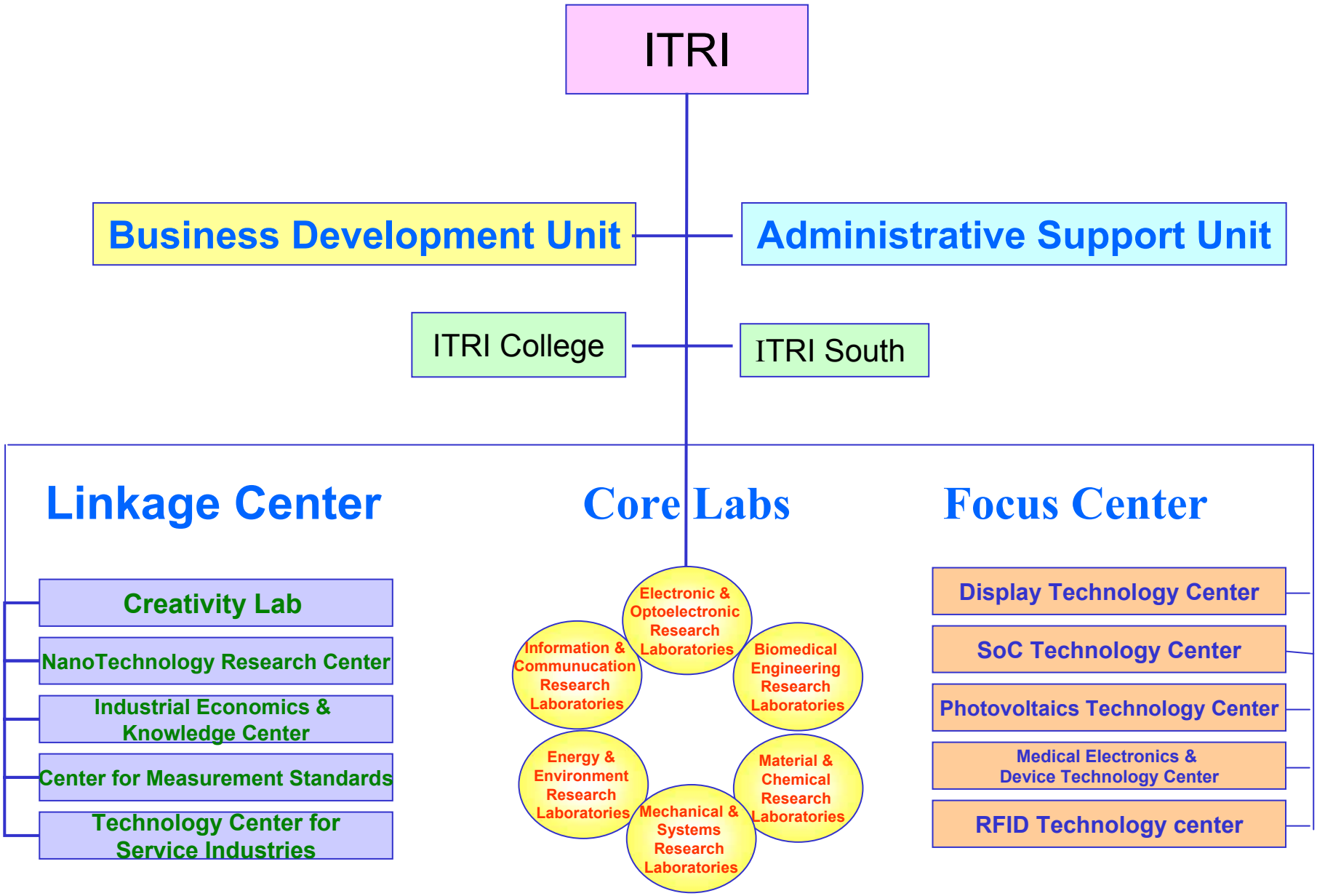
Tainan Science Park Campus
since 2002

Tainan

Kaohsiung

Southern Innovation Park
since 2004

Lioujia Campus
(open 2005)


ITRI
Business Development Unit
Administrative Support Unit
ITRI College
ITRI South
Linkage Center
Core Labs
Focus Center
Creativity Lab
NanoTechnology Research Center
Industrial Economics & Knowledge Center
Center for Measurement Standards
Technology Center for Service Industries
Electronic & Optoelectronic Research Laboratories
Information & Communucation Research Laboratories
Biomedical Engineering Research Laboratories
Energy & Environment Research Laboratories
Mechanical & Systems Research Laboratories
Material & Chemical Research Laboratories
Display Technology Center
SoC Technology Center
Photovoltaics Technology Center
Medical Electronics & Device Technology Center
RFID Technology center

ITRI's Creativity Lab

- Discover the power within
- Linking technology to life style
- Application Concept R&D
- Focus on client-end applications
- "NEXT" Consortium with MIT Media Lab

Industrial Partnership & Alliance

– **Resource Deployment** – **Patents Pool** – **Multi-disciplinary Integration**
– **Standardization** – **Market Development** – **Coordinated Development**

- Taiwan TFT-LCD Association
- Next Generation Lighting Alliance
- New Nylon & Polyester Textile R&D Alliance
- Fresh Food Logistic Service Industrial Alliance
- RFID System
- Digital TV / Digital Home
- Advanced Optical Storage Research Alliance
- Environmental Friendly Alliance

ITRI Open Lab

A conducive environment for Taiwan industries to access the R&D resources of ITRI

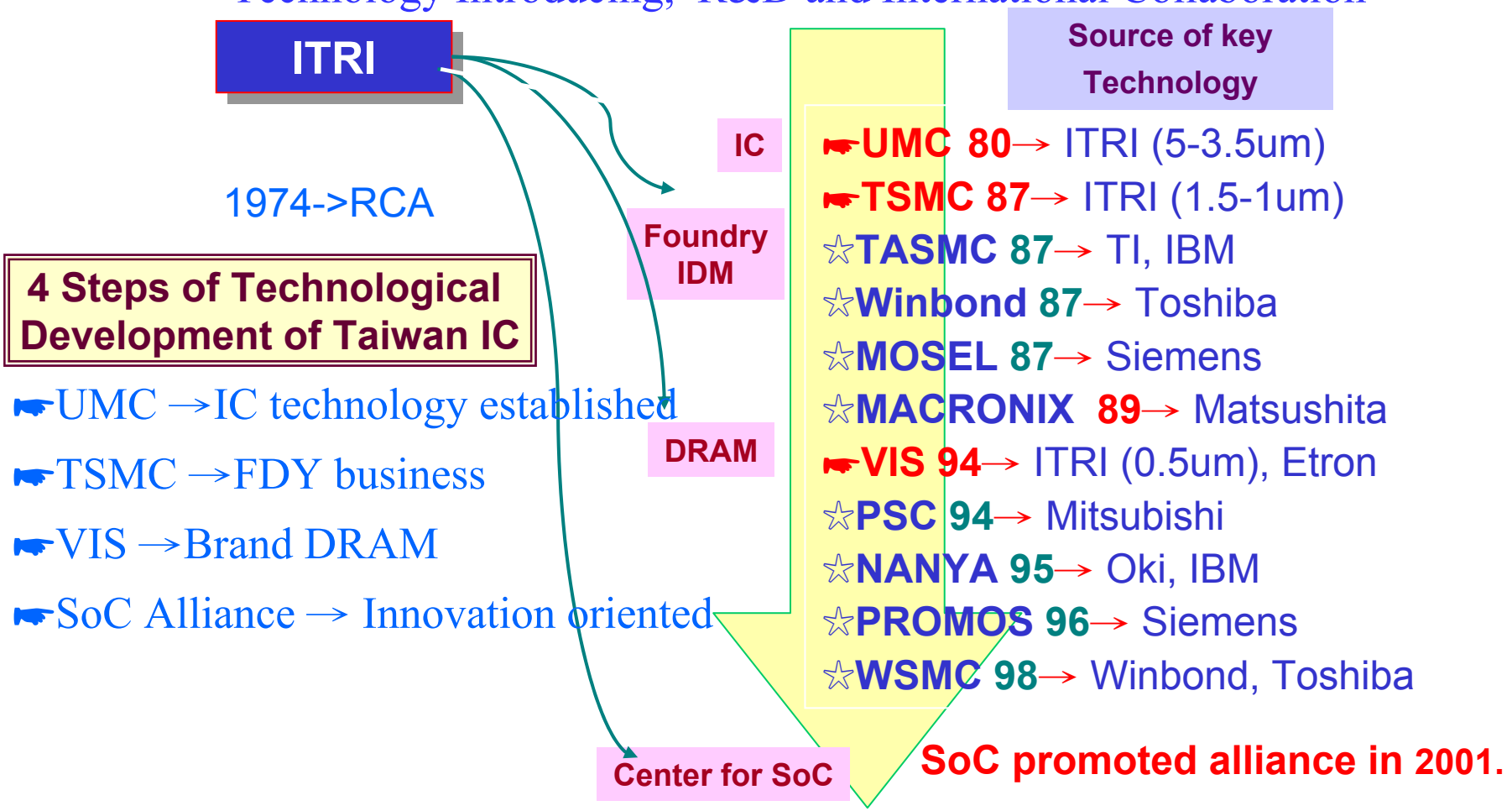
Joint R&D Collaboration Programs for existing companies

Incubation of High-Tech Startups

As of Dec. 2006, 231 projects completed, 142 new companies formed with total capitalization of US$1.45 billion

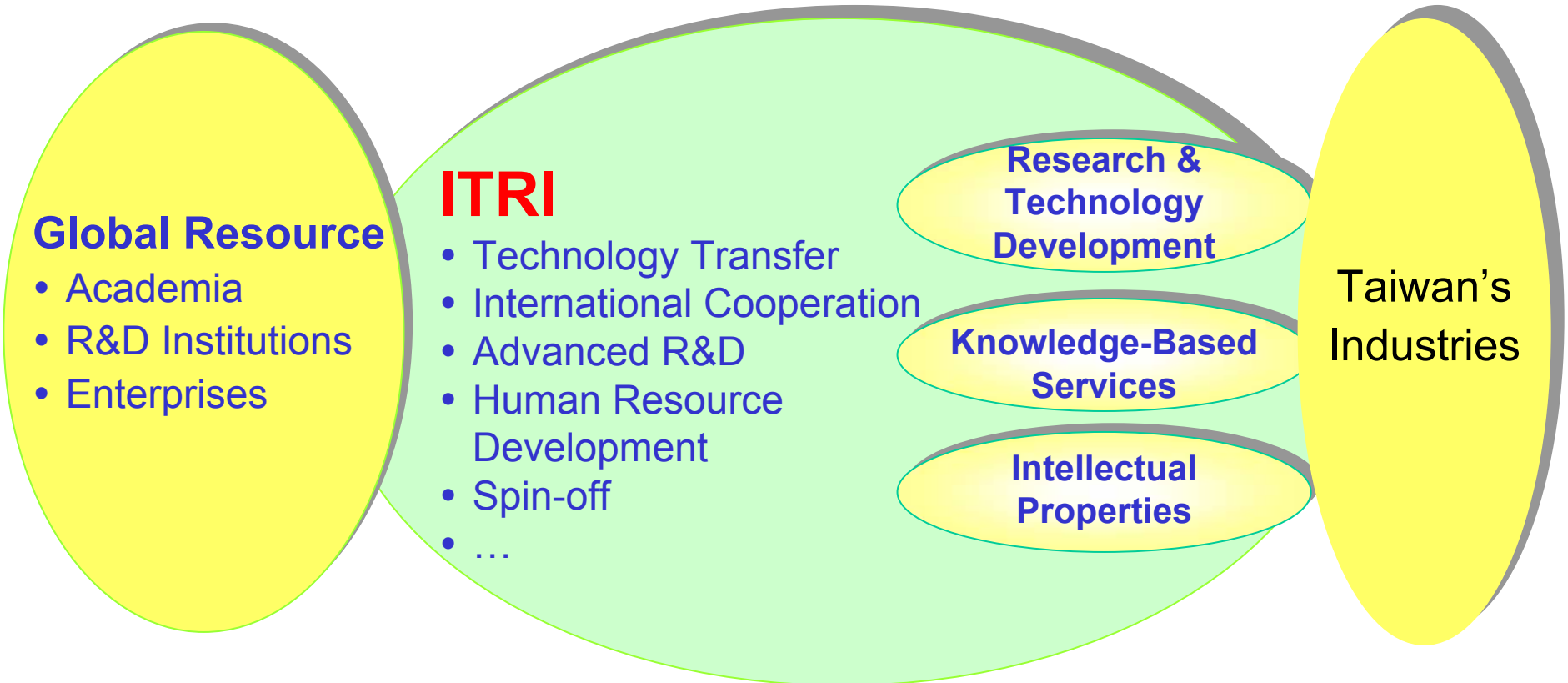
ITRI Spin-Offs in Action
(Taiwan IC Industry)

Technology Introducing, R&D and International Collaboration-



Source: IEK (Oct. 2006)

ITRI and Taiwan's Industries



ITRI's International Cooperation

ITRI International

USA
Agilent
Boeing
BTG
Carnegie Mellon
DuPont
Honeywell
Improv
Lucent
MIT
MITRE
Motorola
SRI
Stanford U.
Sun Microsystems
Telcordia
Texas Instrument
U. California
U. Southern California

HP
IBM
Croning
Dow
Microsoft
U. Texas
U. Washington

Canada
NRC
CBDN
CGDN

Western Europe Office

EC Government
MUFFINS

Germany
Aixtron
BASF
Covion
Fraunhofer
TUV
TUI

UK
ARM

Sweden
Acreo AB

France
ETSI

Netherland
Avantium, TNO

MATIMOP

Moscow Office

Russia
RAS (IOFFE, ICPC, PTI…)
MAI

Tokyo Office

Japan
AIST
Fanuc
Matsushita
Mitsubishi

Hong Kong
HKUST

Malaysia
SIRIM

India
Hughes Software

Korea
KSBC
KETI

Austrlia
CRC
CSIRO
QMI

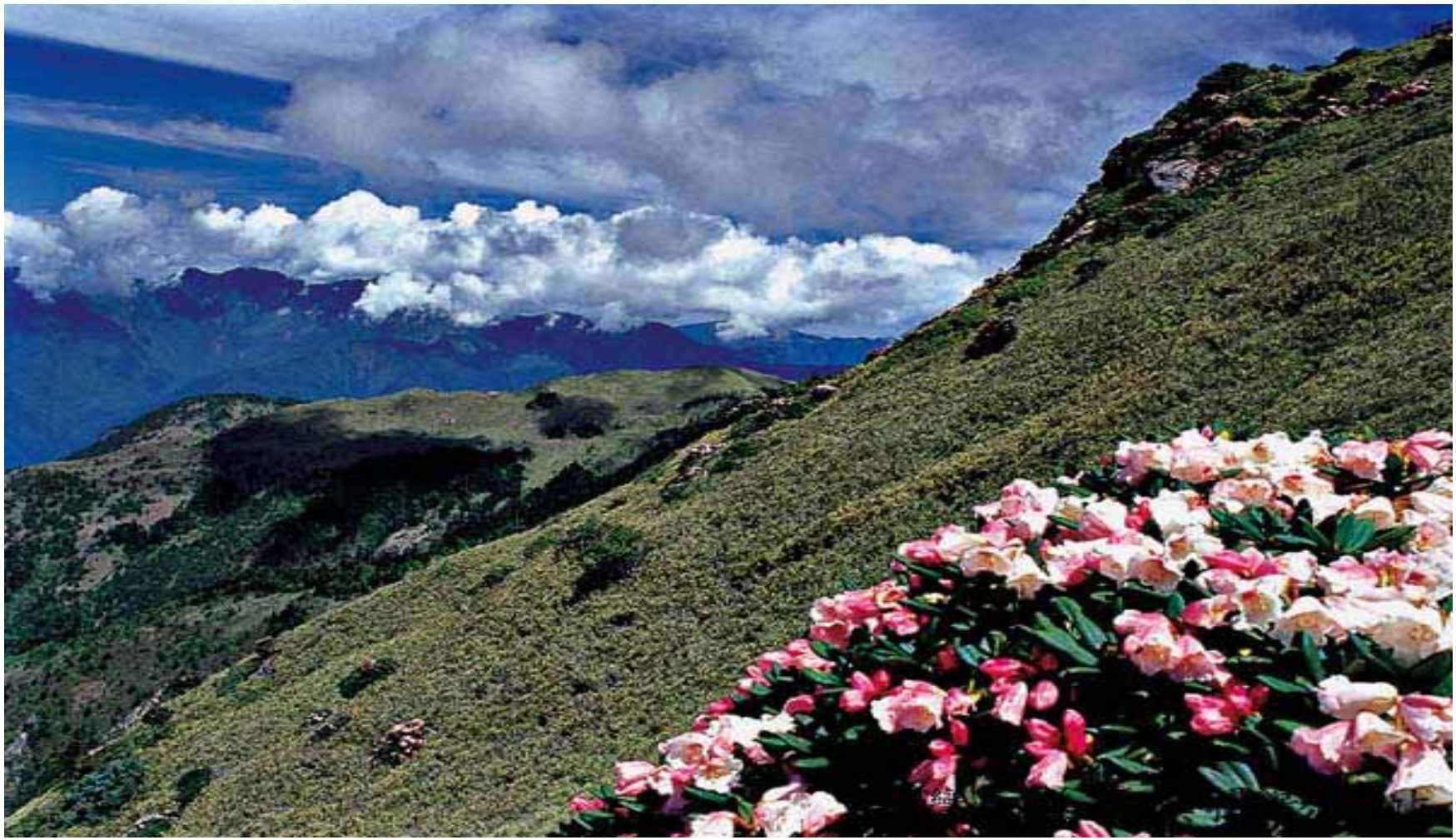
South Africa
CSIR

Conclusion

Conclusion

- Concerted efforts by public and private sectors led to Taiwan's remarkable economic growth, ICT industry being the highlight.
- In response to changing social and technological trends, Taiwan's ICT industry is striving to develop new ideas and to build a platform for broad-based growth. International partnership will feature prominently in the process.
- Integration, innovation and flexibility will be the key success factors.

Jade Mountain



At 3,952 meters, Jade Mountain is the highest peak in Southeast Asia.

Kenting National Park

Taroko National Park

"Taipei 101" The Tallest Building in the World

National Palace Museum

工業技術研究院
Industrial Technology
Research Institute

Thank You!

http://www.itri.org.tw/eng/index.jsp