Daedeok Innopolis (KOREA) as an Innovation Cluster

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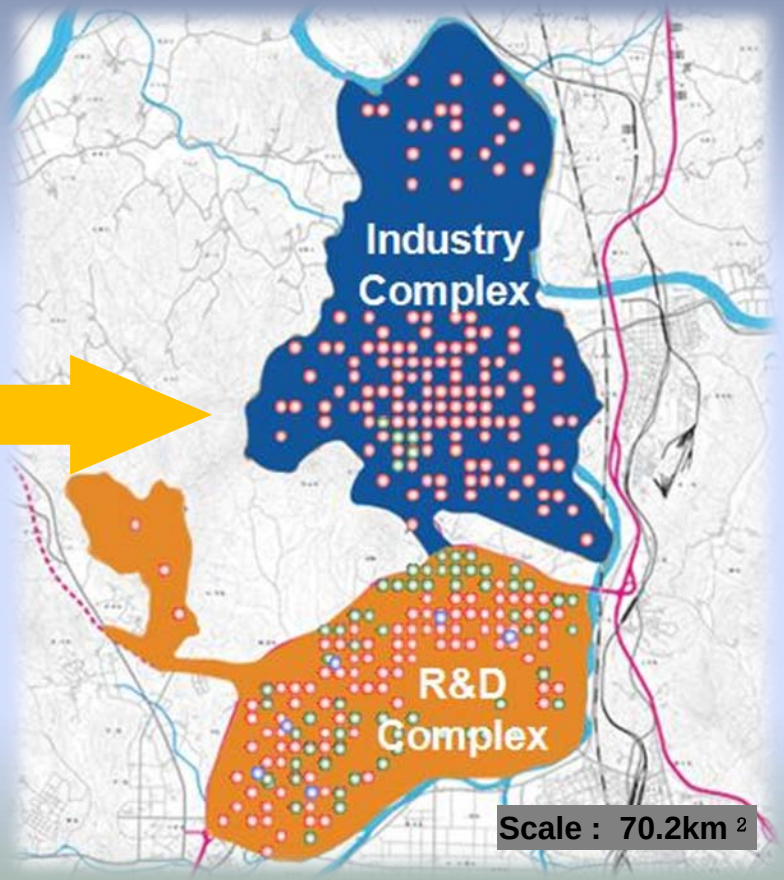
Overview of Daedeok Innopolis (DDI)

- Location of Daedeok Innopolis
- Potential of Daedeok Innopolis
- Vision of Daedeok Innopolis
- Comparison of other clusters

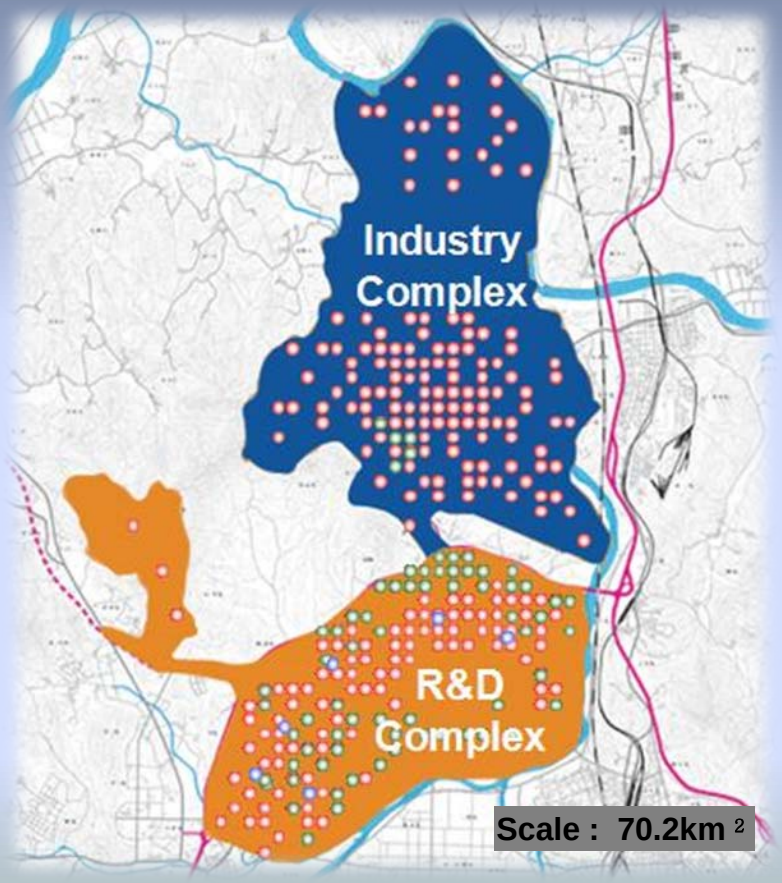
Location of Daedeok Innopolis

- **DAEDEOK INNOPOLIS located in the center of Korea**
  - **Within 1hr from major cities (Seoul, Daegu, Gwangju)**



Potential of Daedeok Innopolis

● DAEDEOK INNOPOLIS integrates industries, academia & R&D institutes



▶ Overview of R&D Institutes

- 20 government sponsored research institutes
- 10 government invested institutes
- 33 private R&D labs

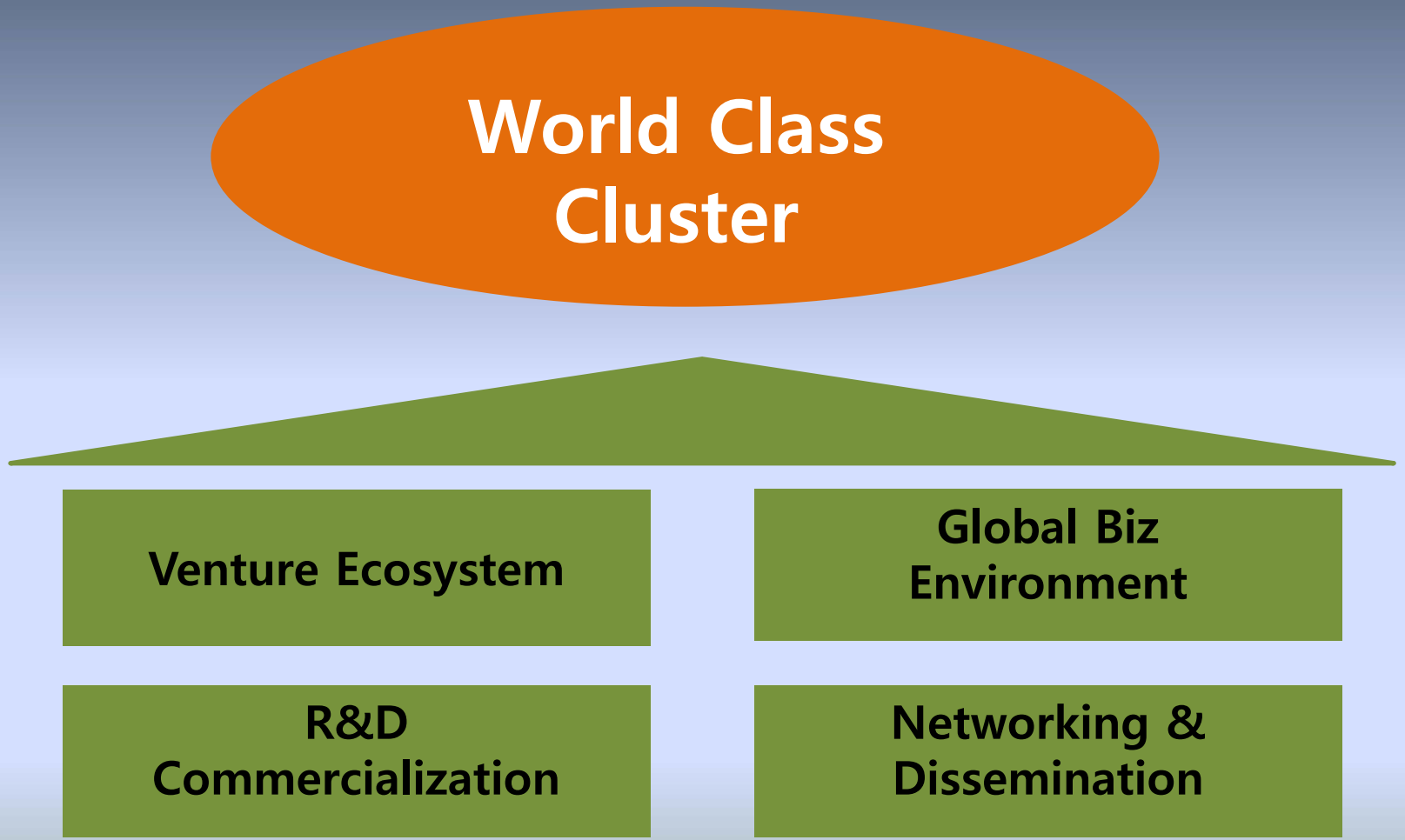
▶ Overview of Academia

- KAIST & 6 other universities
- 5,806 PhDs / 6,625 M.S.

▶ Overview of Industries

- 824 integrated high-tech companies
  (19 registered in KOSDAQ)

Vision of Daedeok Innopolis



Comparison to Other clusters

	DAEDEOK INNOPOLIS (Korea)	Silicon Valley (America)	Shinchu (Taiwan)	Tsukuba (Japan)	KISTA (Sweden)	Sophia Antipolis (France)
Starting Date	1973 (2005)	1950	Early 70's	1970	1976	1970
Area (km^2)	70.2	3885	6.3	26.9	2	44
Establish	Gov,t **(R&D based)**	Univ. (Stanford) **(Market Based)**	Gov,t **(Market Based)**	Gov,t **(R&D based)**	Gov,t **(Market Based)**	Gov,t **(Market Based)**
Driving force	**Led by Gov,t** **R&D focused**	**Led by Univ. & Global Firms** **Private Capital**	**Selection & Concentration (Computer)** **Friendly condition for FDI**	**Led by Gov,t** **R&D focused**	**Specialized Mobile.** **Led by Private Firm (Ericson)** **Private Capital**	**Strongly supported by Gov,`t (for 8 years)** **International MKT for FDI**

R&D Status of Korea

- R&D Status of Korea & DDI
- Why need “Innovation System”
- Why Daedeok Innopolis ?
- R&D Infra of Daedeok Innopolis

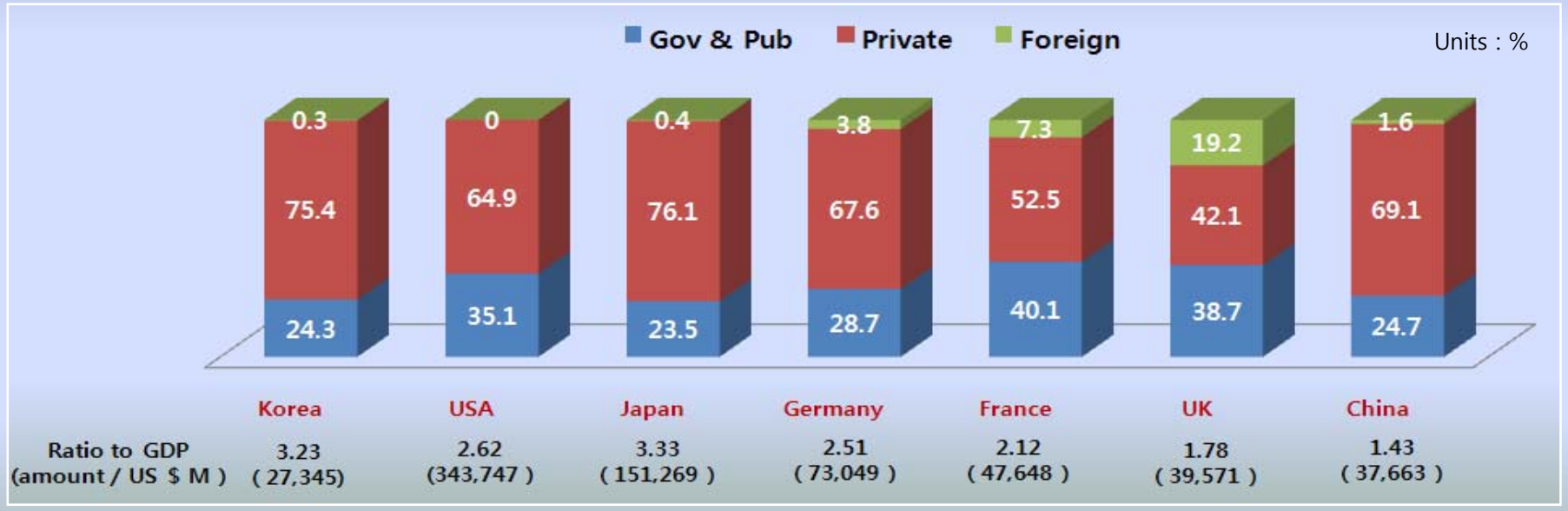
※ More Inform. page : A-1, A-2, A-3, A-4

R&D Status of Korea

▶ **Total R&D budget $27.3 billion (2006)**
- **Public sector (24.3%); Private sector (75.4%); Foreign (0.3%)**
- **R&D expenditure : 3.23% of GDP**

Spending: Private sector (77.3%); Public Research Inst (12.8%); Univ (10.0%)
Stage: Basic (15%); Development (65%); Applied (20%)

R&D expenditure by **source of funds** in major countries



source : OECD, Main Science and Technology Indicators, 2007/02

R&D Status of Korea and Daejeon (DDI)

▶ **Distribution of private R&D institute and Total R&D expenditure by region (`06)**

Region \ Type		Big Comp.	Mid-size comp.	Venture Comp.	Total	Ratio (%)	Total R&D expenditure (%)	Researcher (%)
National-Capital-Region	**Seoul**	217	2,250	2,281	**4,748**	**32.8**	**18.3**	**26.5**
	In-cheon	43	378	288	**709**	**4.9**	**4.0**	**3.4**
	Gyeonggi	298	2,234	2,063	**4,595**	**31.7**	**41.1**	**34.0**
Mid-Region	**Daejeon**	**62**	**177**	**357**	**596**	**4.1**	**11.2 ($ 3 billion)**	**7.7**
	Choong-nam	46	265	205	516	3.6	4.3	4.4
	Choong-buk	32	241	139	412	2.8	1.6	1.9
	Kangwon	8	73	52	133	0.9	0.7	1.9
Yung-Nam-Region	Pusan	19	285	207	511	3.5	2.2	3.0
	Ulsan	34	99	30	163	1.1	2.0	1.4
	Kyoung-nam	58	415	205	678	4.7	4.4	4.4
	Daegu	10	209	187	406	2.8	1.1	1.9
	Kyoung-buk	49	218	192	459	3.2	5.7	4.9
Ho-Nam-Region	Gwangju	12	93	104	209	1.4	1.4	1.7
	Jun-nam	14	55	38	107	0.7	0.8	0.9
	Jun-buk	20	100	72	192	1.3	1.0	1.8
etc.	Jeju	0	9	16	25	0.2	0.2	0.2
	Oversea	10	2	3	15	0.1	**100.0** ($ 27.3 billion)	**100.0**
Total		932	7,103	6,439	**14,474**	**100.0**		

source : White Paper on Industrial Technology in Korea (2007), Korea Industrial Technology Association(KOITA)

Why need “Innovation System”

※ More detail page : A-4

▶ Too much concentrated on “National-Capital-Region”

- almost 60% of total resource of R&D

▶ Needs to create “balanced national development” through RIS

- **Regional R&D Investment : (36.2% of total public R&D)**
- **Activities for RIS/NIS : TP(Techno-Park), RIC(Regional Innovation Center), Innovation Cluster, etc.**

- **TP (Techno-Park)** : 18 TPs

- **RIC (Regional Innovation Center)** : 32 Regional Centers

- **Innovation Cluster : 3 categories**
  1) **Daedeok Innopolis**
  2) **Regional Strategic Industry**
  3) **Industrial Complex Innovation Cluster**

Why Daedeok Innopolis ?

● R&D infra of Daedeok Innopolis

▶ Korea & DDI R&D Infra (`06)

	R&D budget (Public + Private)	Gov`t sponsored R&D Institute	Research equipment infrastructure (Unit: Kind)	Researcher	corporate annexed research laboratory
KOREA	$ 27.3 billion	40	116,890	256,598	14,474
Deajeon (DDI)	**$ 3.1 billion (11.2%)**	**28 (70%)**	**26,813 (22.9%)**	**19,827 (7.7%)**	**596 (4.1)**

source : National Science & Technology Information Service, DDI PR report (`08), OECD, Main Science and Technology Indicators (1981~2007)

R&D infra of Daejeon (DDI)

ST
- **KARI (Korea Aerospace Research Institute)**

IT
- **ETRI (Electronics and Telecommunications Research Institute)**

BT
- **KRIBB (Korea Research Institute of Bioscience and Biotechnology)**

CT
- **Graduate School of Culture Technology at KAIST**

NT
- **NNFC (NANO FAB Center)**

Univ.
- **KAIST (Korea Advanced Institute of Science and Technology)**

OTHERS

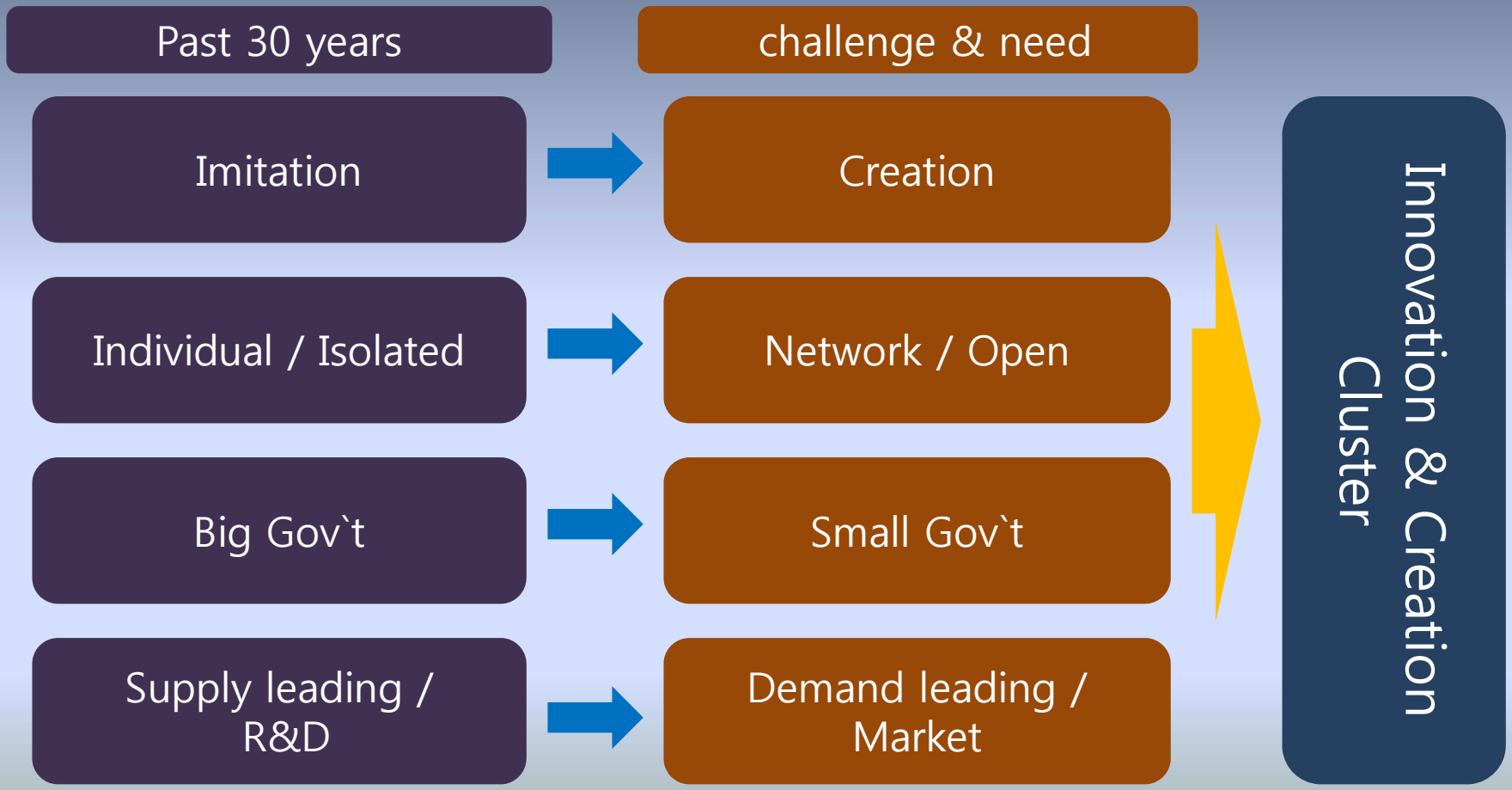
- KRICT (Korea Research Institute of Chemical Technology),
- ADD (Agency of Defense Development)
- NFRI (National Fusion Research Institute)
- KIMM (Korea Institute of Machinery and Materials)
- KRISS (Korea Research Institute of Standards and Science)
- KIGAM (Korea Institute of Geoscience and Mineral Resources)
- KBSI (Korea Basic Science Institute)
- etc.

Background of Daedeok Innopolis

- Before Daedeok Innopolis & Challenge
- Revolution of Daedeok Innopolis
- Purpose of Daedeok Innopolis
- Steps of Daedeok Innopolis by 2015

Before Daedeok Innopolis & Challenge

● **KOREA faced many challenges in improving innovation systems**



source: 황혜란, 새로운 한국 혁신 체제의 구축, 2004, 한국은행

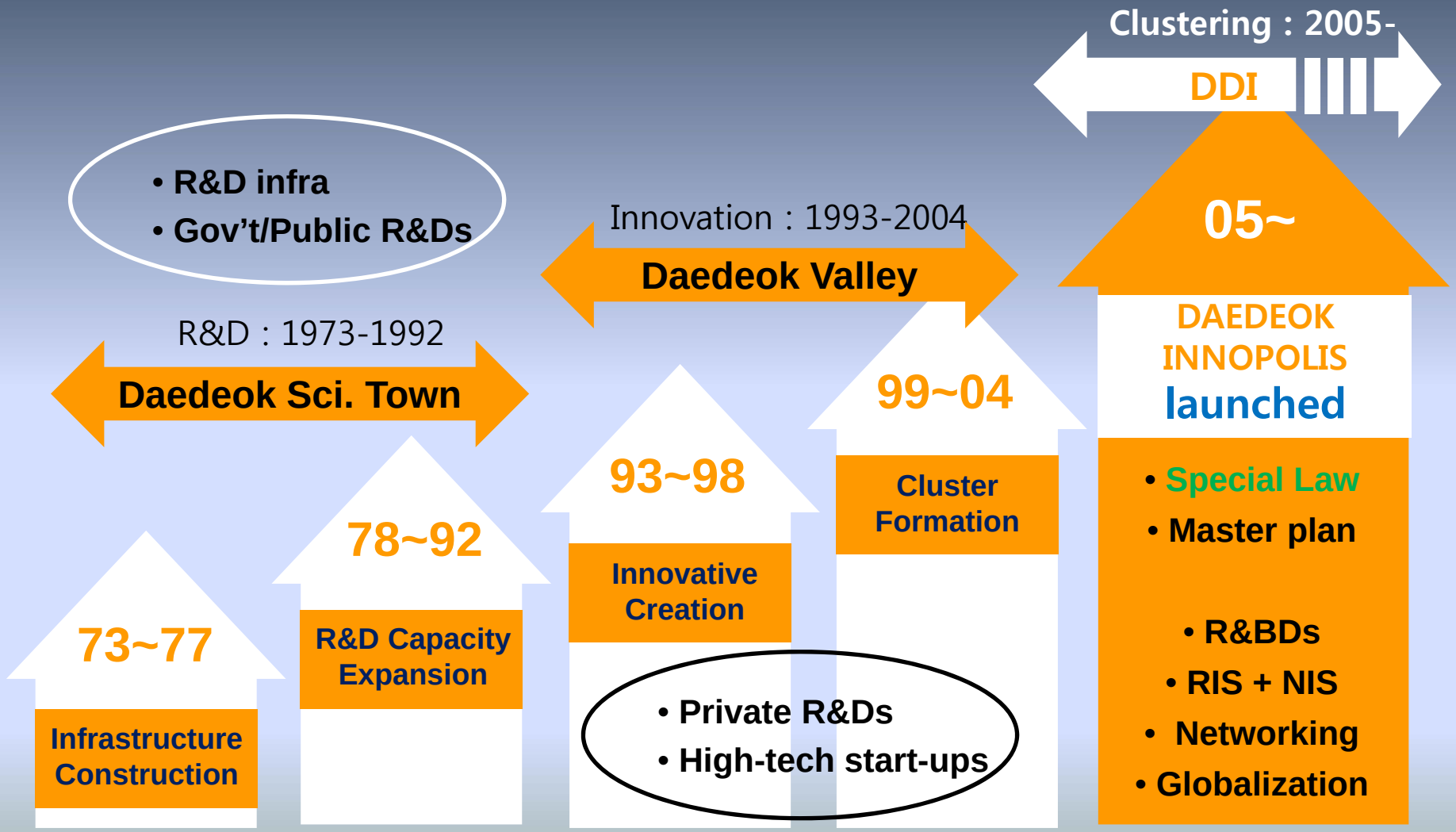
Before Daedeok Innopolis & Challenge

● R&D environment for past 30 years before DDI

a. Each R&D project as well as each researcher is under the control of Gov`t
b. Few interactions among researchers to share information (individual & isolated R&D)
c. Insufficient R&D infra to fuse complex technologies (NT, IT, BI …)
d. R&D away from commercialization
e. Obscure distribution system of achievements
f. Lack of motivation for startups & Biz resources
g. Chaebol oriented system (few Hi-Tech big/mid size companies)
h. Low entrepreneurship
i. Insufficient infra for globalization.
j. Little or no incentive for FDI / for multinational companies

source: Designing the Daedeok Special R&D Town: Legal Backgrounds and Policies, MOST, Daejeon City, 2004.11 (modified)

Revolution of Daedeok Innopolis



source: Designing the Daedeok Special R&D Town: Legal Backgrounds and Policies, MOST, Daejeon City, 2004.11 (modified)

Purpose of Daedeok Innopolis

Designating Daedeok Sci. Town & its vicinity as Daedeok Innopolis (R&D special zone) in order to develop it as a world-class innovation cluster

a. To foster R&D activities and technology commercialization of R&Ds, Universities & Industries (RUI).

b. To activate clustering & networking amongst RUIs upon forming a market-dynamic ecosystem.

c. To globalize biz environment and networking with advanced oversea clusters as well as enhancing living standards.

d. To share and connect its innovation model & performances with other RISs.

■ **Enacted on July 28, 2005**

- Special Law for R&D special zone

Steps of Daedeok Innopolis by 2015

Growth Period ('11~'15)
Global Innovation Cluster

- Leading biz hub
- Building ubiquitous environment
- Mecca for tech. & science-culture

Jump up Period ('08~'10)
Creating & Using new tech.

- Startups, R&D-spin offs
- Raising expert for tech. commercialization
- Biz environment & venture ecosystem

Infra Construction Period ('06~'07)
Infra for R&D & Biz

- Finding, analysis & evaluation of tech.
- Construction for facilities and infra
- Networking

source : www.ddinnopolis.or.kr

Facts & Figures of Daedeok Innopolis(DDI)

- R&D Outputs from DDI
- Residing institutions
- KOSDAQ Registered Companies

※ More Inform. page : A-5, A-6, A-7

R&D Outputs from Daedeok Innopolis

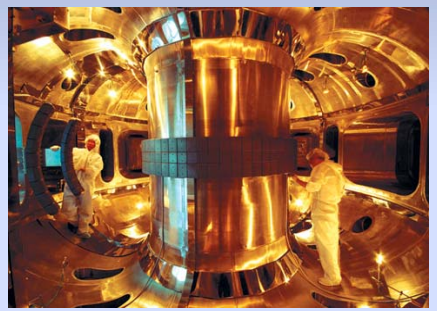
※ **More detail page : A-5**

▶ ETRI (Electronics and Telecommunications Research Institute)

- CDMA, Ground wave DMB, WiBro, "NoLA"

▶ LG Life Science (Private Sector)

- Factive : Global New Drug (FDA 2003)



▶ NFRI (National Fusion Research Institute)

- KSTAR (Korea Superconducting Tokamak Advanced Research)
-KSTAR is one of the first research tokamaks in the world to feature fully superconducting magnets
- first plasma occurred (2008)

▶ KAIST (Korea Advanced Institute of Science & Technology)
▶ KARI (Korea Aerospace Research Institute)

- First Korean Astronaut

R&D Outputs from Daedeok Innopolis

▶ KAIST (Korea Advanced Institute of Science & Technology)

- Students ranked top 0.1% in Korea
- Produce the most distinguished Ph.Ds & Masters in Korea
- World class University (No. 1 in Korea)
- Leading Korea's Science & Technology
- No. 1 (IT : system, S/W) in the World (`08. 2 JSS Journal)

▶ KAERI (Korea Atomic Energy Research Institute)

- nuclear reactor ("HaNaRo")

▶ KARI (Korea Aerospace Research Institute)

– Space projectile

▶ KARI (Korea Aerospace Research Institute)

- Artificial satellite (ARIRANG2)

▶ KIMM (Korea Institute of Machinery and Materials)

- Maglev train

Facts & Figures of Daedeok Innopolis

※ More Inform. page : A-6, A-7

▶ Residing institutions

Type of	Gov`t sponsored institution	annexed to company	investing institution	educational institution	state/public institution	Other non-profit institution	companies	total
'07. 12	28	44	7	6	15	23	898	882
'06. 12	21	45	9	6	13	8	786	843
'05. 12	21	39	10	6	12	6	687	742

* Institutions that cover multiple districts are marked as one institution

▶ KOSDAQ Registered Companies within Daedeok Innopolis

Classification	2004. 12	2005. 12	2006. 12	2007.12
Number of companies	7	11	14	19

source : www.ddinnopolis.or.kr

What Daedeok Innopolis has done

- Major tasks of Daedeok Innopolis
- Main activities of Daedeok Innopolis

※ More Inform. page : A-8, A-9, A-10, A-11

Major tasks of Daedeok Innopolis

▶ Enforcing R&BD competency and innovation infra

Identifying	• Promising R&D results • Strategic R&BD projects
Enabling	• One-stop incubating & mgt. support system • High-tech investment fund
Networking	• Connections among R&Ds, Univ.s, Biz.s • Global/Local networks and Living standards
Founding	• Training program for R&BD and Corporate mgt • Information system for tech. commercialization

source : www.ddinnopolis.or.kr

Main activities of Daedeok Innopolis

A. R&D Commercialization

※ More detail page : A-8, A-9

1. R&BD Spin-offs

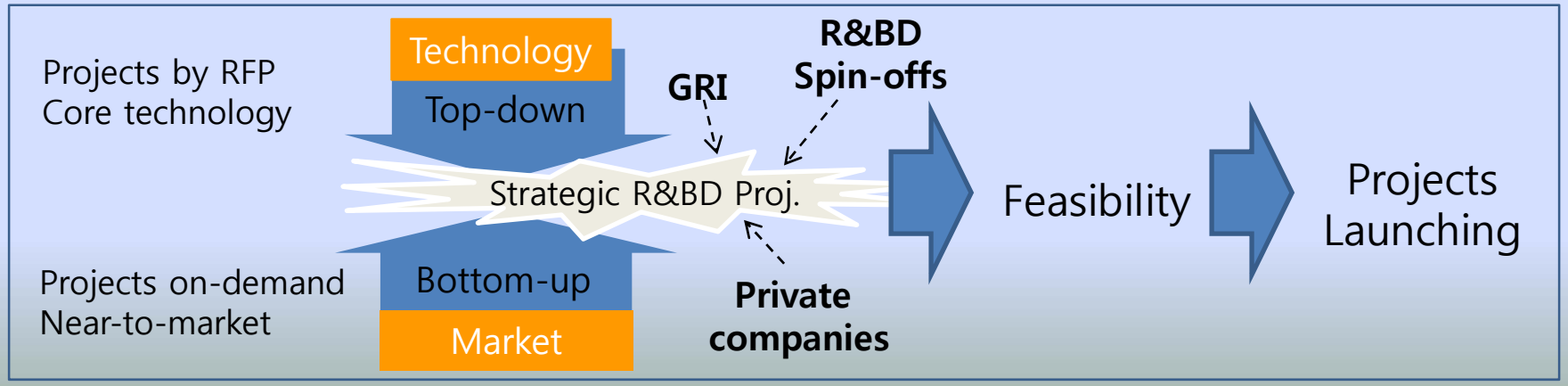
- Startups incorporated by Gov't-sponsored R&D institution(GRI)

(2008.8) 7 new entries from KRIBB, KRISS, KAERI, KAIST and ETRI etc.

2. Strategic R&BD Projects

- Market-oriented R&D activities

(2008.8) 2 strategic R&BD Projects (BT, NT) Launched in 2007.
3 more projects are ready to launch in 2008.



source : www.ddinnopolis.or.kr

Main activities of Daedeok Innopolis

B. Supporting Enterprise Growth

※ More detail page : A-10, A-11

1. Hi-tech Investment Fund : INNOPOLIS Partners LLC. U$80 million

➡ (2008.3) Hi-tech Investment Fund invested $ 27.1 million to 15 companies.

2. R&BD Community / networking

➡ (2008.8) about over 30 forums and communities in DDI
(ex, KAIST BP Forum, Energy Forum and Biz Strategy Forum,..., etc.)

3. Training program at the Stages

➡ "High Up Program (ex, UCSD Connect Program, USA)" trained 80 startups, 12 new entries, $ 11.3 million invested for 8 companies. ('06~'07)

Learnings / Observations (‘05~’07)

- **Learnings #1 ~ # 6**

Learnings / Observations (‘05~’07)

- *1. Market*
- *2. Finance*
- *3. Networking*

Learnings / Observations (‘05~’07)

- *4. RIS & NIS*
- *5. Experts*
- *6. Others*

What Daedeok Innopolis should do.

Learning period (‘05~’07)

KEY WORD : Infra

- Big Gov`t
- R&D focused
- Diversified items
- Built infra structures
- weak basis of tech-comm.

(not enough expert, etc)

- Focused on RIS

(only in DDI)

Jump-up period (‘08~)

KEY WORD : Commercialization

- Small Gov`t
- Market focused
- Selection & Concentration
- Create model for tech-comm.
- Raising expert & motivating
- Focused on RIS + NIS

(connect to other regions)

Thank You

#. Attachment

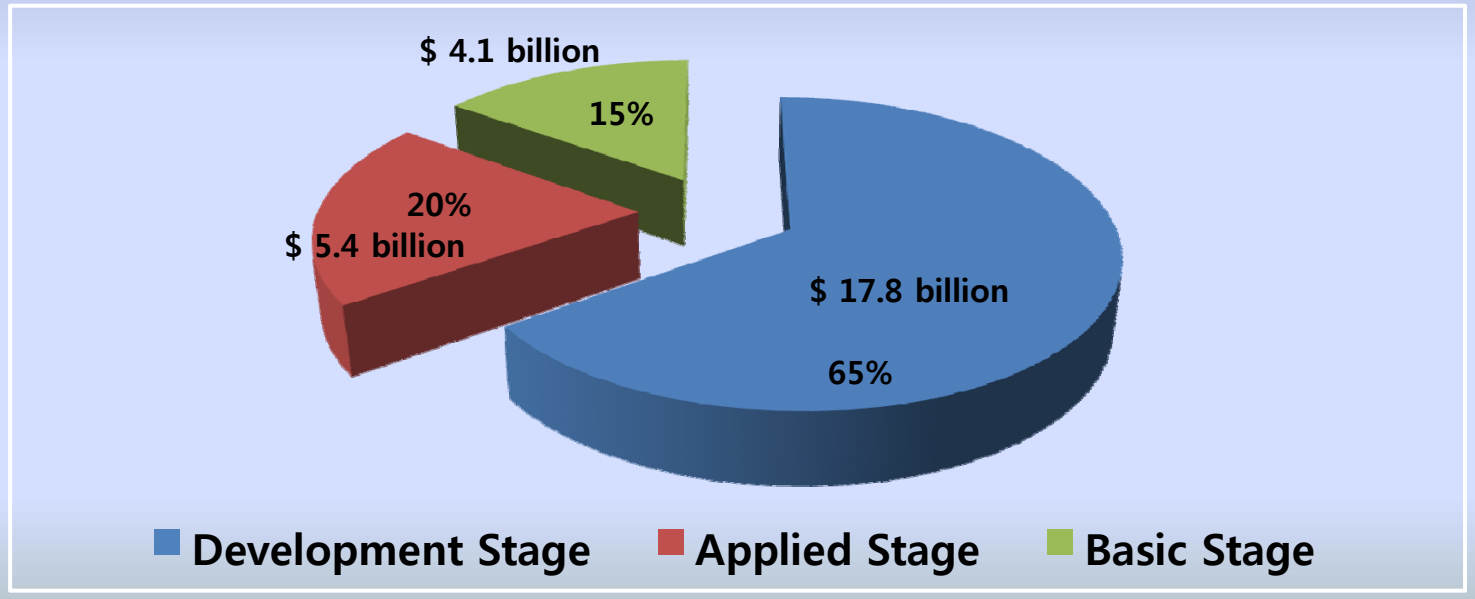
FACTS & DATA

R&D Status of Korea

R&D expenditure by Research Stage

To classify the total R&D expenditure of year 2006 according to research stage, 15.2% of the total ($4.1 billion) was invested in basic researches, 19.9% ($5.4 billion) in applied researches, and 65.0% ($17.8 billion) in development researches

Trend of R&D expenditure by research stage (2006)



source : OECD, Main Science and Technology Indicators, 2007/02

According to Korea's Standardized Classification of Science and Technology of the Year 2006, electric and electronics (25.3%), machinery (13.2%), and telecommunications (9.4%) took up 47.9%, while the R&D investment in basic sciences such as earth science and mathematics was small.

R&D Expenditure by Technology Type

units : %

	Mathematics	Physics	Chemistry	Life Science	Earth Science	machinery	Material
Pub. Research Institutes	0.1	0.2	0.9	4.4	0.6	6.0	3.7
Univ.	1.4	3.9	4.7	8.8	1.0	7.3	5.2
Companies	0.2	0.6	5.4	1.2	0.0	15.1	9.0
Sub-total	**0.3**	**0.9**	**4.7**	**2.4**	**0.2**	**13.2**	**7.9**

	Chemical Process	Electric & Electronics	Information	Telecommunication	Agriculture & Fishery	Public health & Medicine	Environment
Pub. Research Institutes	1.1	7.7	6.7	6.3	9.7	3.0	4.7
Univ.	3.6	11.4	5.9	4.2	4.4	15.9	4.9
Companies	4.0	30.0	6.5	10.6	0.8	1.8	3.4
Sub-total	**3.6**	**25.3**	**6.5**	**9.4**	**2.3**	**3.4**	**3.7**

	Energy & Resource	Nuclear Power	Construction & Transportation	Space, Aeronautics, Astrology, & Maritime	Tech Innovation & Sci-tech Policy	others	Total
Pub. Research Institutes	4.3	6.5	4.2	12.4	2.2	15.3	100.0
Univ.	1.4	1.0	5.4	2.0	0.8	6.8	100.0
Companies	4.6	0.2	5.3	0.5	0.3	0.4	100.0
Sub-total	**4.2**	**1.1**	**5.2**	**2.2**	**0.6**	**2.9**	**100.0**

source : OECD, Main Science and Technology Indicators, 2007/02

R&D Status of Korea and Daejeon (DDI)

The association rate of Korea's R&D expenditure in 2006 to promising future technologies, also known as 6T (BT, IT, NT, CT, NT, ET) showed information technology ranked first with 35.6% followed by Nano technology with 13.4%.

R&D Expenditure's association Rate to 6T (2006)

Units : %

	Pub. Research institutes	University	Companies	Total
IT (Information Tech)	19.4	25.7	39.5	35.6
BT (Biology Tech)	12.7	24.2	3.3	6.6
NT (Nano Tech)	4.8	9.7	15.3	13.4
ST (Space Tech)	9.2	2.0	0.6	1.8
ET (Environment Tech)	13.1	8.6	5.0	6.4
CT (Culture Tech)	1.1	2.7	1.2	1.2
Others	40.8	27.2	35.1	35.0
Total	100.0	100.0	100.0	100.0

source : OECD, Main Science and Technology Indicators, 2007/02

Why need “Innovation System”

▶ **Too much concentrated on “National-Capital-Region”**
- almost 60% of total resource of R&D

▶ **Needs to create “balanced national development” through RIS**

- **Regional R&D Investment : $2.6 billion (36.2% of total public R&D)**
- **Activities for RIS/NIS : TP(Techno-Park), RIC(Regional Innovation Center), Innovation Cluster, etc.**

- **TP (Techno-Park)** - $28 million (`07) : 18 TPs ; R&D facilities, education, venture incubation facilities, testing Lab. etc.
- **RIC (Regional Innovation Center)** - $45.9million (`07) : 32 Regional Centers ; developing specialized technologies based on regional characteristic ; academic-industrial cooperation
- **Innovation Cluster : 3 categories**
  1) **Daedeok Innopolis - $50 million (`07) : focusing on R&BD with high-tech of Gov`t sponsored Institutes, and creating high technologies**
  2) **Regional Strategic Industry - $152 million (`07)** : Foster Specialized Industry through 13 cities (Textile industry, optical electronics industry, footwear industry, machine industry + Infra structures)
  3) **Industrial Complex Innovation Cluster - $61.2 million (`07)** : Add “research function” to existing cluster (low tech industry) : 7 Innovation Clusters (ready to join 5 clusters in 2008)

source : White Paper on Industrial Technology in Korea (2007), Korea Industrial Technology Association(KOITA)

R&D Outputs from Daedeok Innopolis

ETRI (Electronics and Telecommunications Research Institute)

CDMA — **CDMA System successfully commercialized ($ 100.0 billion) for the first time in the world. Salient contribution to the domestic industry and economy (1996)**

DMB WiBRO

- **Super-speed portable Internet developed for the first time in the world (2004)**
- **Ground wave DMB developed for the first time in the world (2004)**
- **WiBro and ground wave DMB acquired international standard (2007)**

NoLA — **3.6Gbps, 4th-generation radio transmission system ("NoLA") developed for the first time in the world (2007)**

- (`03~`07) **ETRI spent approximately $2.1 billion on R&D** and implemented 1,424 projects.
- a total of **2,747 patent** applications have been submitted (2007). ※ **ETRI accounts for 48% of all patent applications submitted by public institutions.** (Intellectual Property White Book, 2007, Korea Intellectual Property Office)
- (`03~`07)ETRI earned approximately **$ 218.7 million in technology royalties**. A total of 1,683 cases of technology transfer were also recorded. ※ **ETRI accounts for 76% of the total income earned from royalties by public research institutions.** (White Book on Technology Transfer/Commercialization, 2006)
- a total of **1,308 ETRI papers** have been published in the SCI Journal
- **the ETRI Venture Association** has **posted $ 5.3 billion in production value** and **created 40,860 jobs** through the commercialization of newly developed technologies. (total number of startups 280, Companies registered in KOSDAQ (14 companies)
- ETRI established **4 laboratory enterprises since August 2007**

source: ETRI website (www.etri.re.kr)

Facts & Figures of Daedeok Innopolis

▶ Resources

(Unit: case)

Classification	Number of domestic patents (cumulative)		number of foreign patents (cumulative),		number of technology transfers	Technology transfer fees (in millions of US $)
	applications	registered	applications	registered		
2007. 12	46,355	29,193	17,893	5,978	518	77.79
2006. 12	46,392	27,197	17,710	6,586	716	59.52
2005. 12	41,368	22,625	15,872	5,935	577	50.75
2004	36,636	21,019	14,257	5,743	-	-

▶ Personnel

(Unit: person)

Classification	Researchers and technical experts				Number of employees
	doctor	master	under bachelor	Total	
2007. 12	6,800	7,699	4,327	21,542	40,338
2006. 12	6,495	9,145	2,892	18,532	37,224
2005. 12	6,236	7,561	2,962	16,759	23,558
2004. 12	5,806	6,593	2,828	15,227	22,395

source : www.ddinnopolis.or.kr

Facts & Figures of Daedeok Innopolis

▶ Companies designated as having "up-to-date technology"

Classification	Under 1 million US $	1~5 million US $	5~10 million US $	10~50 million US $	Total
Number of companies	10 companies	22 companies	8 companies	8 company	48 companies were designated

▶ R&BD spin-offs (established research companies) (‘08.8)

- **7 research companies from 6 institutes**(ETRI, KAIST, Korea Atomic Energy Research Institute, etc.)

▶ Overseas R&D centers within Daedeok Innopolis (‘08.8)

- **6 R&D centers : Cavendish (Cambridge), Hutchinson Center, Promega Research Center, Cambridge, Texas Instrument, ISIS(American pharmaceutical company)**

▶ Resident companies by incubating institution (‘08.6)

- **314 companies form 18 incubating Institutions (KAIST, ETRI, etc.)**

source : www.ddinnopolis.or.kr

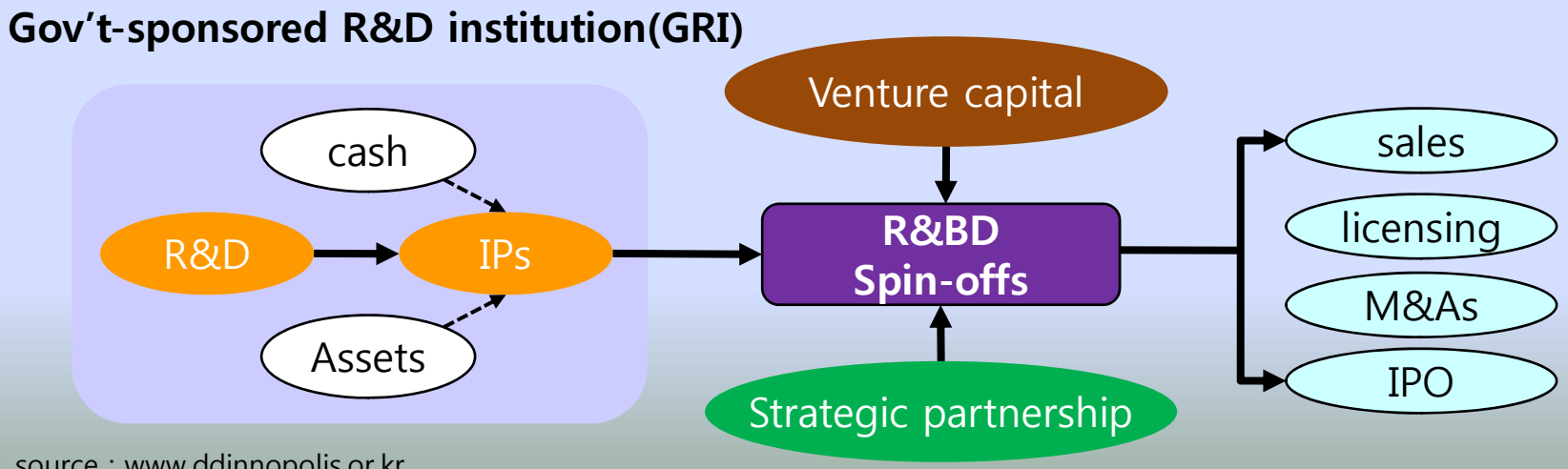
Main activities of Daedeok Innopolis

A. R&D Commercialization

1. R&BD Spin-offs

- Startups incorporated by Gov't-sponsored R&D institution(GRI), in order to directly commercialize its IPs in Daedeok Innopolis.
- At least 20% of total share be owned by GRI, consisting of IPs, intangible/tangible assets as well as cash. (cf. researcher's start-up)

(2008.8) 7 new entries from KRIBB, KRISS, KAERI, KAIST and ETRI etc.



source : www.ddinnopolis.or.kr

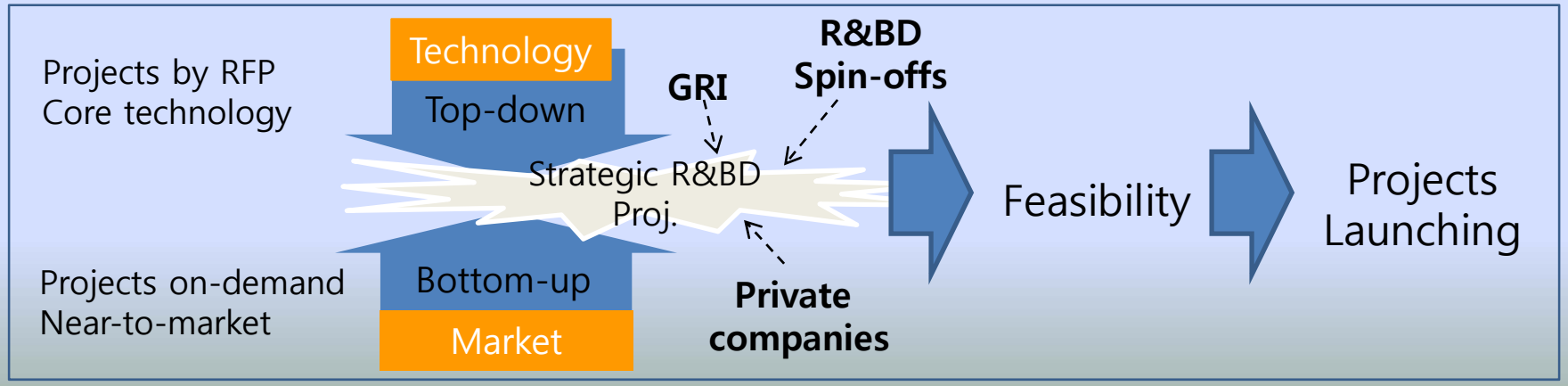
Main activities of Daedeok Innopolis

A. R&D Commercialization

2. Strategic R&BD Projects

- More market-oriented R&D activities and results
  - Consortiumed by Researchers, CEOs, and Experts
- Purpose:
  - **Strengthening R&D in fusing complex technologies**
  - **Next growth-engine such as "CDMA", "WiBro" etc**

(2008.8) 2 strategic R&BD Projects (BT, NT) Launched in 2007.
3 more projects are ready to launch in 2008.



source : www.ddinnopolis.or.kr

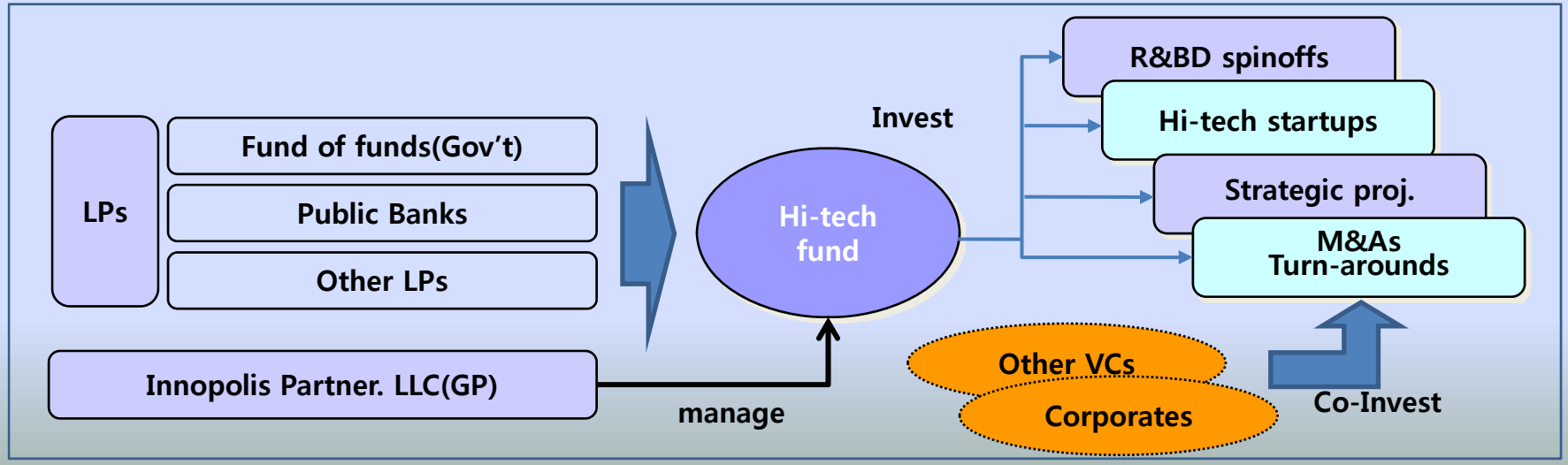
Main activities of Daedeok Innopolis

B. Supporting Enterprise Growth

1. Hi-tech Investment Fund

- General partner: Innopolis Partners LLC.
- Amount: $ 80 million
- Duration: June 2006 ~ June 2013 (7yrs)
- Investment target: IT, BT, NT, fusion etc
  - Hi-tech startups with global competency
  - M&As, Turnarounds etc.

(2008.3) Hi-tech Investment Fund invested $ 27.1 million to 15 companies.



source : www.ddinnopolis.or.kr

Main activities of Daedeok Innopolis

B. Supporting Enterprise Growth

2. R&BD Community / networking

- To boost connections & networking among technology provider, tech users, capital providers, and service providers etc.
- The community committee decide which connective programs, as "Friends & family", are entitled to sponsor.

➡ **(2008.8) about over 30 forums and communities in DDI**
(ex, KAIST BP Forum, Energy Forum and Biz Strategy Forum,…, etc.)

3. Training program at the Stages

- To foster R&BD, and corporate management, technology commercialization of R&Ds
- To raise CEO, CFO, CMO and CTO having entrepreneurship.

➡ **"High Up Program (ex, UCSD Connect Program, USA)" trained 80 startups, 12 new entries, $ 11.3 million invested for 8 companies. ('06~'07)**

source : www.ddinnopolis.or.kr