

Workshop on Technology Innovation and Economic Growth

May 25-26, 2005
Hangzhou, China

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Development of ICT Sector in Korea

Production

Production
(USD)



73B(1998)



CAGR : 21%



173B(2003)

- LCD (2003, Nikkei): LGPhillipsLCD (World MS 16.3%, no.1), Samsung (16.3%)
- DRAM (2003, Gartner): Samsung (World MS 31.0%, no.1), Hynix (13.7%, no.4)
- Mobile Phone (2004. 1Q, Gartner): Samsung (World MS 12%, no.3), LG(5%, no.6)

<Composition of IT industries production in Korea>

(unit: KRW trillion)

구분	'99	2000	2001	2002	2003
IT service	21.6(18.8%)	28.6(19.7%)	33.5(22.8%)	43.0(22.8%)	43.5(21.2%)
IT hardware	86.8(75.5%)	105.6(72.7%)	99.1(67.3%)	127.0(67.5%)	143.6(70.0%)
Telecom equip.	20.2	24.5	25.2	31.8	36.7
Information equip	15.7	18.3	18.7	22.8	22.0
Broadcasting equip	0.9	1.6	2.0	3.9	4.5
Components	50.3	57.8	53.2	68.4	80.4
Software	6.5(5.7%)	10.7(7.4%)	14.7(10.4%)	18.2(9.7%)	18.3(8.9%)
Total	114.9	145.2	147.3	188.2	205.4
Growth rate	30.4%	26.3%	1.4%	27.8%	9.1%

Source: KAIT

Contribution to GDP Growth

Share in GDP



- IT industry has played an important role to overcome the financial crisis.
 - IT industry has contributed 1/3 of GDP growth since the financial crisis.
 - IT industry has kept inflation low, created employment, hosted more FDI and increased export.

	1997	1998	1999	2000	2001	2002	2003
Growth rate of IT industry (%)	30.5	20.7	36.0	35.8	9.1	12.0	8.3
Growth rate of total GDP (%)	5.0	-6.7	10.7	9.3	3.1	6.3	2.3
IT industry share of GDP (%)	7.7	9.9	12.2	15.1	16.0	16.9	17.9
IT's contribution to GDP growth (%)	37.6	-	32.8	46.8	45.2	30.2	60.9

Source: Bank of Korea

Note: 2003. 3/4q

Export

Export
(USD)



30.5B(1998)



CAGR : 10.5%



57.5B(2003)

- Share of main products (DRAM, mobile phones, TFT-LCD, PC, Auxiliary Storage)
 - 51.4%(2001) -> 56.2%(2002) -> 55.7%(2003)
- main export countries (2003)
 - USA(20%), China(16%), HongKong(11%), Japan(8%), Taipei(6%), EU(14.3%)

	1998	1999	2000	2001	2002	2003
IT Export	30.52	39.96	51.20	38.55	46.27	57.47
IT Trade balance	12.29	13.42	15.73	10.64	15.42	21.08
Share of IT export in total export(%)	23.1	27.5	29.7	25.6	28.5	29.7
Total trade balance	39.03	23.93	11.79	9.34	10.34	14.99

Unit: billion USD

Employment

Employment
(persons)



823 thousand(1998)



CAGR : 5.7%



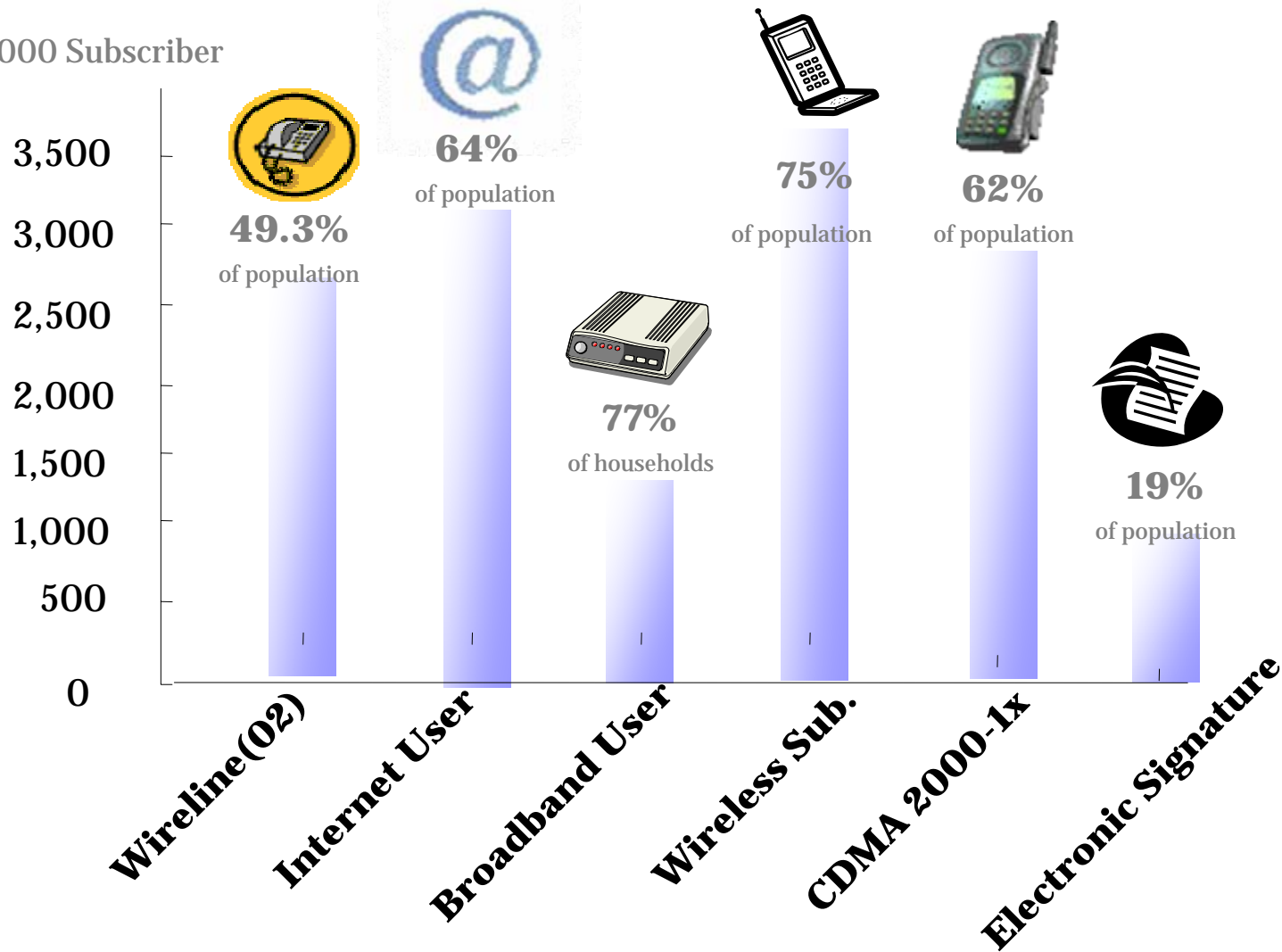
971 thousand(2002)

- Employment in IT hardware accounts for the lion's share in IT industry employment.
 - The growth rate, however, has been highest in software industry
- Employment in IT industry peaked in 2000.
 - The IT recession in 2001 and subsequent slow recovery have depressed the demand for workers in IT industries.

	1998	1999	2000	2001	2002	2003	CAGR (99-02)
Total workers(thousand)	19 994	20 281	21 060	21 362	21 553	-	2.0%
Employment in IT workforce(A+B)	-	823 (4.1%)	983 (4.7%)	954 (4.5%)	971 (4.5%)	-	5.7%
Employment in IT occupation(A)	-	410	462	475	470	-	4.7%
Employment in IT industry(B)	386	413	521	479	501	495	6.7%
IT hardware	241	267	333	266	284	284	2.1%
Software	46	55	90	112	114	114	27.5%
Telecommunication service	99	91	98	101	103	97	4.2%

Korea's ICT Status (June, 2004)

Unit: 10,000 Subscriber





Analysis of the Korean ICT Industry

Industrial Structure

- Manufacturing-biased Structure
 - Share of IT manufacturing in total IT total production in Korea ranked 3rd while that of IT service ranked 21st in OECD countries(2000).
 - Korea's traditional strength in manufacturing: global competitiveness at assembling and mass-production
- Export-oriented Structure
 - 44% of IT manufacturing production is for export
- Large-firms(Chaebol)-biased Structure
 - capital-intensive and R&D-intensive IT industry requires deep pocket
 - Conglomerates vs SMEs in IT manufacturing
 - employment share of SMEs in IT manufacturing: 41.0% (non-IT: 77.9%)
 - value-added share of SMEs in IT manufacturing: 14.5% (non-IT: 58.3%)

Imitation to Innovation: The Korean firms' strategy in DRAM Industry (1)

- Trend of market catch-up
 - The Korean share in DRAM world export increased from nil in 1983 to almost 30% in the mid-90's.
- Semiconductor industry in Korea in 60's and 70's
 - The Korean semiconductor industry began in the 1960's when several MNCs (Signetics, Fairchild, Motorola, Control Data, AMI and Toshiba) began assembling devices in Korea
 - The government established government research institute (KIET) to conduct R&D on VLSI circuit process in 1975
 - KIET was not successful in developing commercially viable product due to lack of flexibility and dynamics.
 - In 1984 the government sold the facility to LG which was virtually obsolete at that time.
 - Contribution of KIET: Trained many engineers who moved to private firms and played important role

Imitation to Innovation: The Korean firms' strategy in DRAM Industry (2)

- Korean firms' catch-up strategy
 - skip 1-16 kbit DRAM and enter directly 64 kbit DRAM based on design and process technologies acquired from financially troubled small US semiconductor makers
 - Samsung - Microelectronic Technology & Zytex (design), Sharp (manufacturing)
 - Hyundai – Vitelic (design), Texas Instrument (manufacturing)
 - LG – Advanced Micron Devices & Zilog (design), joint venture with AT&T's Western Electric, license 1Mbit DRAM technology from Hitachi
 - Develop their own circuit design technology
 - Korean firms were consistently rejected from leading US and Japanese firms to license technology.
 - The role of overseas R&D outpost in Silicon Valley and returning brains was critical.
 - Narrow the technology gap and Samsung developed the world's first 256 Mbit DRAM

Imitation to Innovation: The Korean firms' strategy in DRAM Industry (3)

- Less important government role
 - The government initially opposed to Chaebols' decision to enter DRAM business and compete directly with US and Japanese leaders
 - Government set a national R&D consortium with the goal of developing and mass producing 4Mbit DRAM and avoiding duplication in R&D
 - Samsung, Hyundai, LG and 6 universities are involved and coordinated by GRI (ETRI)
 - the government contributed 57% of the total expenditure (USD 110 million)
 - Consortium never got off the ground due to unwillingness to share knowledge : Chaebols have different technology approaches and developed independently
- Close fit between demand of DRAM Industry and the structure of Korean Chaebol
 - Less uncertainty in technological trajectory, high frequency of innovation, transferability of knowledge between generations is not strong, reducing unit cost matters within the same generation
 - Hard work, technological resourcefulness, manufacturing prowess and heavy investment
 - Large pools of internal capital : Chaebols had cash-cow subsidiary to keep DRAM business → Hyundai lost money for a decade before making big profit
 - Management style of Chaebol : The president had full authority over the company and can start a risky business without worrying about stock price or consensus among management team.

Strength & weakness of the Korean IT Industry

strength

World's Best Broadband
Infrastructure

Large Domestic
IT Consumer Base

Ideal Test-bed for
Technology Innovation

weakness

high dependence on
a few products

High dependence on
core technology & parts

Lack of IT experts
with creativity



IT Policy in Korea

Informatization Promotion

■ The Master Plans for Informatization Promotion

Title	Basic Informatization Promotion Plan	Cyber Korea 21	e-Korea vision 2007
Period	1996~2000	1999~2002	2002~2007
Vision	Attain world-class informatization levels by 2010	Build a leading knowledge-based society	Build e-Korea as the global leader

- Recently enact “Broadband IT Korea Vision 2007” (2003. 12) to set the blueprint for the future Korea
 - E-Government to enhance efficiency and transparency of public service
 - E-transformation to increase global competitiveness
 - Build BcN network and find new engine of growth
 - Realize digital welfare state
 - Increase global IT cooperation

Informatization - Korea Information Infrastructure

- 1990s : Begin building the Korea information infrastructure
 - Launching the Korea Information Infrastructure Initiative: 1995.3
 - Korean Information Infrastructure - Government(KII-G) : funded by public investment, testbed for an early completion of the high-speed network
 - Korean Information Infrastructure - Public(KII-P) : by private funds raised by the telecommunications service providers
- Government's Role
 - Initial funding to trigger siphoning the private investment
 - 620 mil. USD from 1995 to 2003 : 3.6% of the total investment in KII
 - Win-win strategy "First Invest, Settle Later"
 - Investment in KII-G ↔ discounted network price for public agencies

Informatization - E-Government Projects

- 2002: Special Committee for e-Government
 - completing the infrastructure for an electronic government
 - e-Government project : (2001~2002) 186 million USD invested

- Major e-Government initiatives

Type	11 Main Areas
<p style="text-align: center;">Innovation in Government Services (G4C, G2B)</p>	<ul style="list-style-type: none"> • Government for Citizen(G4C) System for government-wide service • Social Insurance Information Sharing System (health,pension,unemployment, industrial accidents) • Home Tax Service System • Government e-Procurement System(G2B) • National Financial Information System
<p style="text-align: center;">Enhance Government Productivity (G2G)</p>	<ul style="list-style-type: none"> • Local Government Information Network System Project (21 areas) • National Education Information System for record management • Personnel Policy Support System for management of civil servants • Expansion of e-Approval and e-Document
<p style="text-align: center;">E-Government Infra (Infra)</p>	<ul style="list-style-type: none"> • Expanding the use of e-Signature and e-Seal System • Government-wide Integrated Computer Network

Informatization - Informatization Promotion Fund(1)

- The promotion of informatization requires large scale investment, calls for cooperation of various organizations, and last for several years. So, it is difficult to carry out the projects with the general budget.
- The Informatization Promotion Fund was established as a special vehicle to overcome the budgetary restrictions in order to promote the informatization project. The fund is managed by MIC.
- The Fund, based on government budgetary and private sector contribution, created the system for letting the profits from ICT fields be reallocated into ICT sector.

Informatization - Informatization Promotion Fund(2)

Goal

- Promotion of e-Government
- Broadband Network Roll-out
- Support R&D and Standardization
- Educating human resources in ICT

Management

- MIC(overall management), IITA(specific project management)
- Fund Management Council (Evaluation)
 - Chair : Vice Minister of MIC
 - Members : Director Generals of related Ministries

Status of Fund Investment

- Funding: Total of 7.78 billion USD ('93~'02)
 - Government : USD 3.06B (39.3%)
 - Private Sector : USD 3.59B (46.2%)
 - Miscellaneous profits and interests:
USD 1.13B (14.5%)
- Investment: Total of 5.33 billion USD ('94~'03)
 - Broadband infrastructure and promotion:
USD 800M (15.1%)
 - Informatization promotion: USD 1.07B (20%)
 - Infra for IT industry: USD 375M (7%)
 - IT R&D : USD 2B (37.5%)
 - ICT Human Resource: USD 950M (17.8%)
 - Standardization: USD 135M (2.6%)

- expand internet, broadband connection
- connecting schools
- teacher training

Building ICT Infrastructure

- Model schools for IT
- IT Research Centers
- National IT scholarship

Quality ICT Workforce from Educational Institutions

Institutional measures

- forecasting IT labor markets
- National Certification
- Evaluation of HRD Program

Bridging Digital Divide

- Basic ICT training-13.8 million benefited from 2000 to 2002
- Free ICT facilities in rural areas

Retraining

- MIC IT Academy
- Foster Hot Skills
- Conversion Training

R&D in ICT

- The average annual growth rate of R&D expenditure in ICT was 33.3 percent.
 - In 2001, R&D investment in ICT accounted for more than half of total R&D spending in Korea.
- The Korean government has contributed about 10-15 % to total R&D investment in ICT each year.
 - Informatization Promotion Fund have played an important role as a source of public R&D investment: Ensuring stable funding for the long-term R&D projects and Enabling policy makers to flexibly respond to rapid changes in ICT
- Although the share of public R&D is relatively small, the public R&D in ICT has focused on technologies which led significant impact on the ICT industry and living standards, such as TDX and CDMA.

R&D - Korea's Public R&D Programs

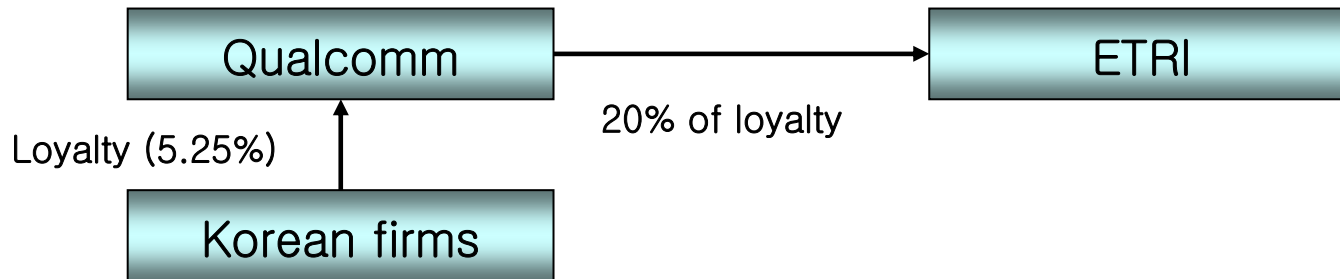
- The Leading Technology Development Program
 - Support strategic R&D activities which requires long-term R&D efforts performed mainly by public research institutes
- The Industrial Competitiveness Development Program
 - Support technology development with a higher potential for commercialization in the short-term performed by private ICT companies
- The New Technology Development Program
 - Support R&D in SMEs which are less than 3 years old
 - Provide management assistance as well as seek investors for the commercialization
- Other R&D programs
 - Promoting Standardization Activities
 - Investment in Research Personnel

History of CDMA Development (1)

- R&D & Standard policy
 - Korean government designed the CDMA system development R&D project in 1989
 - Induce co-operative R&D effort among government, government research institute (ETRI) and private firms
 - Declare CDMA which is a new wireless technology as a standard in 1993
 - great uncertainty over CDMA technology and strong reservation from private firms
 - The government think the gap between the Korean firms and the forerunners would be never reduced if TDMA(GSM) is chosen.
 - The first test of the CDMA system conducted in 1995
 - High risk can be shared by government-led R&D consortium and knowledge alliance with Qualcomm
- License policy
 - Induce lower price, diverse service, better service quality and more investment for network through competition
 - KMT(SKTEL), Shinsegi Telecom(1994), KTF, LG Telecom, Hansol PCS (1997)
 - Since the deployment of CDMA service in 1996, it grabbed 10 million in 2 years, June, 1998. Only after a year or so, it reaches 20 million subscribers. As of June 2004, it reaches 36 million.

History of CDMA Development (2)

- Increase in manufacturers' competitiveness
 - 4 companies (Samsung, LG, Hyundai and Maxon) in 1996 → 14 companies in 2002
 - emerged as a new export industry since CDMA development
 - USD 2.3 million in 1996 → USD 3.7 billion in 2002
 - ETRI developed MSM chip in 1997, Samsung produced most of core chips in 1999.
- Advantage of pioneering country in CDMA
 - Qualcomm acknowledges ETRI's IPR and pays 20% of its royalty received from Korean firms to ETRI
 - ETRI expects USD 2 billion from Qualcomm from 1996 to 2008



- Competitiveness of CDMA is spilt over to GSM sector
 - Based on design development and production ability in CDMA, Korean firms export USD 7.5 billion GSM handset in 2002

IT Venture - Entrepreneurial Activities

- The major area for startups is IT
 - Korean government (Small and Medium Business Administration; SMBA) has certified promising startups as “ventures”
 - Although the number of certified ventures has decreased drastically since 2001, IT-based ventures still takes a large share (above 40%)
- Government is an important player in fund raising
 - Since 2001 when private investors became pessimistic, government’s involvements got greater
 - In the short run, it helps stabilize the fundraising for VC industry which shows severe fluctuation of fundraising
 - In the long run, government may displace private efforts
- Venture capital puts the most importance on IT industry
 - During IT boom (1999-2000), VC’s investments in IT-based firms reached up to 70% out of total VC’s investments

IT Venture - Policy Agenda

- Evaluation of the current venture promotion policy

Success	<ul style="list-style-type: none">■ proliferating ventures■ stabilizing venture capital fundraising■ improving financial market transparency■ opening KOSDAQ
Challenges	<ul style="list-style-type: none">■ heavy dependence on government for fundraising■ one dimensional policy for ventures without consideration of industries' own characteristics and of firms' stages by growth<ul style="list-style-type: none">➡ polarization of business performances by industries■ financial support for the firms in which VC can play■ creation only without programs for exit or restructuring<ul style="list-style-type: none">➡ high exit barrier➡ inefficiency

Competition Policy - Achievement and Evaluation

- ❖ Korea is among the World Leaders in Telecom Services
 - Broadband Internet Access (11.6 mil. 77% of household)
 - Mobile Penetration (36.0 mil. 75% of pop.)
 - CDMA 1x, EV-DO (29.9 mil. 62% of pop.)
 - PSTN Penetration (22.8 mil. 47% of pop.)

Textbook Approach
by the global standard in
competition, liberalization
and privatization

Facility-Based Competition
provides proper incentive
for network build-out

Consumer Welfare ensured
by competitive market and
government regulation

Virtuous Cycle developed
among network operators,
contents providers,
and equipment vendors

Competition Policy - Introducing Competition (1)

1981	Establishment of Korea Telecom Authority
1990	Competition introduced in value-added services Dacom enters international market
1992	Competition introduced in paging services (10 new operators)
1994	Second cellular license issued (Shinsegi Telecom)
1995	Competition introduced in long-distance market (Dacom)
1996	27 new licenses granted : 3 PCS, 6 TRS, 11 CT-2, 2 dedicated line, 1 paging, 3rd international operator (Onse), and 3 wireless data transmission
1997	10 new licenses granted: 1 local operator (Hanaro), 1 long-distance (Onse), 6 TRS, 1 paging
1997	Resale based competition introduced
2002	Privatized KT

Competition policy

- Induce price reduction, investment in network and service quality improvement through deregulation and liberalization since 1990
 - More than 2 operators in every market
 - since WTO Basic Telecommunication Agreement in 1997, Korea has opened the telecommunication market to foreign investment
 - increase in subscribers, providers and sales
- Current telecommunication market status
 - KT market share in wired market (2003, sales) : 95.4% in local telephony, 77.0% in long-distance, 53.8% in broadband internet service market
 - SKT market share in wireless market (sales) : 56.4%('01) → 57.6%('02) → 59.6%('03)
- Major competition policy
 - Number portability in local telephony and mobile service market
 - Discriminating the spectrum usage fee, interconnection rate, universal service fee in favor of late entrants
 - Sharing the essential facility and local loop unbundling

History of Broadband Internet Service Development (1)

Free Competition

- FSPs, free of regulation, concurrently entered the market, setting flat retail charges at a low enough level to induce churning of long-hour dial-up users
- Facilities-based competition, intensified moving up to 'last-one-mile' deploying and upgrading access networks

Urban Geography

- Nearly 48 percent of total households live apartment complexes
 - economies of scale work sufficiently for FSPs' market operation
 - Hanaro Telecom targets Apt. Complexes in the form of fiber
 - more than 90 percent of households, located around the wire centers of Korea Telecom

History of Broadband Internet Service Development (2)

Gov't as a promoter

- Early commitment and promotion by the government has given momentum for creating the recognition on the importance of Informatization.
- Funding at the prime rate for the investment into access networks by FSPs in 1999 and 2000
- promote the penetration of broadband network the government coined a very unique certificate, Cyber Building Certificate System in 1999

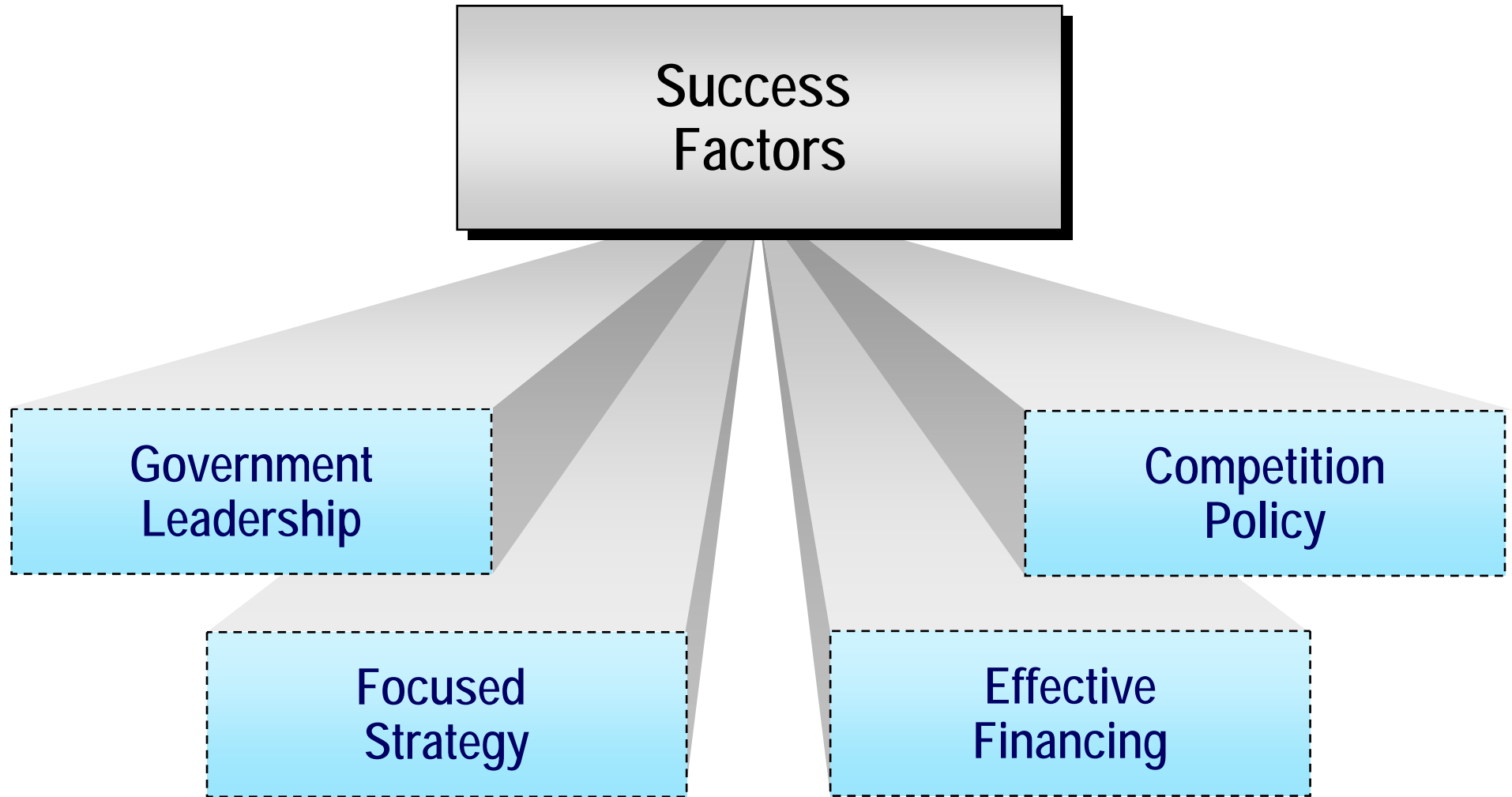
Demand for broadband service

- a high level of educational attainment which has helped the population understand and use ICT.
- on-line game and free VoIP service as a killer applications
 - PCs have always superseded consoles as the main gaming platform in Korea.
- the flat-rate pricing structure
 - The Korean regulator MIC introduced LLU and line sharing at the end of 2001 with relatively low prices



Success factors by government

Success Factors



Success Factors

Government Leadership

- Adoption of a government led model
- Application of effective policy vehicles including planning, laws and regulations, funds and organization

Focused Strategies

- Investments focused in the future demand of ICT
- Building the infra and implementing e-Government and e-commerce for knowledge-based economy
- R&D efforts in human resources and CDMA technology

Success Factors

Effective Financing

- Informatization Promotion Fund enabled focused investment in ICT.
- Developed effective investment criteria such as settlement after investment
- Attracted private investments with government's seed money.

Competition Policy

- Liberalization and open competition in local telephony and broadband created the mass market that formed virtuous cycle by reducing the cost.
- Unique habitat (60% of population lives in high rise apartment)
- Rapid increase of internet users with the rise in computer usage and real time information exchange
- Online game, "PC Bang" as well as Internet Café



Thank You!



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