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South Korea: Structure and Changes

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Since the first century B.C., the Korean Peninsula has been invaded by a series of forces, including those of the Chinese Empire up until the late nineteenth century and the Japanese in 1910. The current Republic of Korea was founded in 1948. During and after World War II, Korea was once again occupied. At the Potsdam Conference, the Peninsula was divided at the 38th parallel into Soviet and U.S. spheres referred to as South and North Korea.

South Korea, or Korea, occupies the southern 29,000 km² of the Peninsula. It has a current population of 44 million people. It is one of the more remarkable growth stories in the Pacific with its current GDP at \$US 240 billion.

Its remarkable economic growth has been translated into progressive policies in telecommunications. Largely open markets have carried the day at the level of intentions and announced goals, and it has called Korea “the fourth country in the world to introduce competition in basic services” (*Telephony*, July 23, 1990, p. 28). However, actual implementation of such policies has moved slowly. By the mid-1980s the government was taking steps toward privatization of public telecom services by allowing the private sector to participate in the market, which previously had been tightly regulated and controlled by the Ministry of Communications (MOC). A key issue was whether the government-controlled common carrier—the Korean Telecommunications Authority (KTA, now Korea Telecom)—should be privatized and deregulated. The major proponents of change have been large corporations eager to have access to advanced information services.

At the same time, South Korean telecommunications have been virtually revolutionized since 1978 by the launching of a national automatic telephone switching network supporting subscriber demands for voice and data communication services. Total subscriber lines exceeded 15 million in 1990, compared with 10 million in 1987 and just 2 million in 1979.

This chapter examines development of South Korea’s telecommunications and information industries and their regulatory structures, with some considera-

tion given the issue of privatization. Sung, in the Chapter 16, analyzes long-term policies.

15.1 Development of Telecommunications

Telegraph service between Seoul and Inchon, its port some 35 km away, was begun in 1885, introducing Korea to modern telecommunications. The royal palace and other governmental bodies in and around Seoul and Inchon were linked by telephone service in 1902. After 1910 the Japanese colonial government extended the telegraph and, later, the telephone to previously remote outposts as a way of facilitating trade, production, security, administrative, and political activities. Most of this infrastructure had been destroyed by the end of the Korean War.

Neither political nor practical conditions during the thirty-five years of colonial rule allowed Koreans much participation in the industry—or even access to its services. After the Korean War, there was no make major investment in telecommunications until 1962, when the first five-year economic development plan was launched.

15.1.1 *The 1960s and 1970s*

Three developments transformed the telecommunications system and industry in the 1960s. The first was construction of basic networks (using imported switches, initially Strowger and then, in 1968, EMD automatic switches). The start of the Korean Broadcasting System (KBS) in 1961 and Mun Wha Broadcasting (MBC) in 1966 was the second. Establishment of the Korean Institute of Science and Technology (KIST) and the Korean Electronics and Telecommunications Research Institute (ETRI) was the third. Along with these developments the government selected telecommunications as one of the strategic sectors for economic development, and subsidized it by providing lower taxes and other financial support.

During the late 1970s, the government began using electronic switches instead of electromagnetic or Strowger switches, and direct distance dialing was introduced in most urban areas.

Beginning in 1969 the ratio of total subscribers to total capacity of switches began to increase, starting at 85.6 percent and reaching 95.3 percent by 1980. The level of unsatisfied demand began increasing during the 1970s as the Korean economy moved into a high growth period. The number of applicants on the official waiting list peaked at 619,000 in 1980. Including potential demand, the number would easily have exceeded 1 million. Not surprisingly, a black market developed. The premium for telephone installation in 1980 was some 1,800,000 won (\$3,000) compared to the official installation charge of 420,000 won (\$700). (Average monthly wages that year were 176,000 won.) People commonly waited a year or more for service, and delayed installation became a serious social issue.

As can be seen in Table 15.1, the number of telephone lines increased at a moderate but steady rate after 1962 (when the first five-year plan was implemented). The growth continued as the second and third economic plans were launched, and in 1982, when the fifth plan began, about 1 million new lines were added—about equal to the total number of lines in service in mid-1975.

15.1.2 The 1980s

The government launched an ambitious telecommunications investment plan in the early 1980s. The primary motive was to solve the persistent backlog of demand for telephone facilities, with secondary goals of supporting development of the electronics industry and of preparing for the anticipated information society. At the end of the 1970s the Korean government was redirecting its industrial policy focus from heavy industry to electronics, with telecommunications as a closely related concern. In 1980 the government supported the launching of color television broadcasting. In 1981 it also allowed and encouraged subscriber purchase of telephone sets from third-party suppliers for both the first telephone and extensions. There was no requirement to lease or buy from the telephone company.

These policies had their difficulties, however. Typical of many developing countries, Korea had financial problems. Foreign currency, which was desperately needed to purchase foreign switching and transmission facilities, was in short supply. In 1980 Korea experienced poor harvests and, following the second oil crisis, shrinking worldwide demand for its exports, as well as an unstable domestic political climate. Under these circumstances, the government relied on foreign resources to continue its investment in economic restructuring, accumulating external debt at a very rapid pace. It is worth noting that the government maintained its commitment to expand telecommunications facilities, unlike most developing countries, where public telecommunications was a low priority (Saunders, Warford, and Wellenius 1988, pp. 12–18).

Korea also experienced problems with internal financing. To fund construc-

Table 15.1. Number of Subscribers and Unfilled Orders

Year	Lines (thousands)	Percent Utilized ^a	Year	Lines (thousands)	Percent Utilized ^a	Unfilled Orders
1956	64	59.9	1976	1389	91.5	144
1961	123	—	1981	3491	93.4	498
1966	313	87.8	1986	8905	84.5	160
1971	624	89.0	1989	13,354	86.3	0.7
			1990	15,293	—	—

Source: KTA *Statistical Yearbook of Telecommunications* and MOC 1985, vol. 2.

The number of unfilled orders peaked at well over 600,000 in 1979, and was still above that level at the end of 1980.

^aSubscriber lines as a percentage of switch capacity.

— Not available.

tion and equipment procurement internally, the government had to consider increasing prices or some other form of raising capital, such as 1980, and increasing telephone rates would certainly contribute to an even greater increase in the consumer price index. Nonetheless, the government felt that rates were artificially low and decided users should pay for network expansion, so the rates were raised.

Beginning in January 1980 free calling was abolished, local call prices went from 8 to 20 won, and users were required to purchase a 200,000 won KTA bond at the time of installation. The bond matured in five years and could not be sold for the first three years. (The requirement was dropped in 1990.) A 25-percent "special luxury consumption tax" was added to total telephone charges; revenue went directly to the Ministry of Finance and was not necessarily used for telecommunications. In normal situations this kind of rapid price increase would have met strong resistance from users. Such was not the case—perhaps because people recognized the need to finance new services or were simply willing to take service at any price, without complaint.

During the fifth five-year plan, 1982–1986, telephone service made significant progress. Telecommunications' share of gross fixed capital formation increased from less than 3 percent during the 1970s to 7.5 percent during the plan period. This investment resulted in the implementation of essentially universal service, inauguration of a national automatic switching network, and establishment of networks capable of meeting future sophisticated requirements. The number of telephone lines increased to about 8.8 million in 1986, triple the 1980 number; household penetration went from 68 to 90%. The number of public coin telephones increased from 58,000 in 1980 to 138,000 in 1986. This is 3.3 per 1,000 population. Subscriber penetration rates are shown in Table 15.2.

15.2 Telecommunications Equipment

In the early 1970s telecommunications entered a period of accelerating expansion, particularly the equipment industry, largely as a result of developments in the industry's technology. By the end of the 1970s, KIST had produced a PABX and was experimenting with 44 Mbps optical fiber that could be slipped into existing coaxial cable ducts for low infrastructure costs. Two earth stations for satellite communications were built in 1977, and they resulted in lower transmission costs than those with a marine cable.

Production of wireline and radio telecom equipment grew at an annual rate

Table 15.2. Telephone Density*

1980	7.2	1984	13.5	1988	24.6
1982	10.4	1986	18.1	1990	31.0

Source: KTA *Statistical Yearbook of Telecommunications*, 1991 edition.

*Subscribers per 100 people.

of almost 33 percent over the period 1970–1975, as total output increased from \$14.8 million in 1970 to \$60.8 million in 1975. Growth then accelerated to almost 35 percent a year despite the larger base, with production reaching \$363 million in 1981. Since 1981 the growth rate has declined noticeably due to the limitations of labor-intensive production; production was \$1,831 million in 1988. Wireline equipment, such as telephone instruments and switching systems, is the major component. From \$14.1 million in 1970 the industry had grown to \$1,351 million in 1988 (Data are from the *Korean Electronics Yearbook*). Using a broader definition, production of telecom equipment in about one-third exported (*Far Eastern Economic Review*, Mar. 7, 1991, p. 43).

Exports of equipment and services have increased steadily since 1981, except for 1984, and imports have declined since 1983. The export drop in 1984 can be explained by changes in the U.S. market, including changes in technical standards and exclusion of equipment from the preferential tariff list. There has been a positive trade balance since 1984.

Government encouragement of domestic production of equipment and R&D activities to develop digital switches and optical fiber transmission equipment was, by the mid-1980s, significantly reducing the burden of foreign borrowing (which had provided over 20 percent of investment funds in the early 1980s). By 1987 direct import of switches financed by foreign loans had disappeared.

The government intends to provide producers of facsimile equipment with 14.3 billion won in subsidies during 1989–1994 in a bid to increase local content. The domestic makers are generally allied with a Japanese technology source: Samsung–Toshiba, Goldstar–NEC–Matsushita, Hyundai–Fujitsu, Daewoo–Sanyo, and so on.

15.2.1 *The TDX Switch*

Switches are a particularly important component of the equipment industry for two reasons. First, they account for a very large part of value added. Second, switching technology has been a major barrier to entry; it involves understanding large-scale network behavior, as well as the production and installation of international networks and operations in other countries.

Switching technology began to change rapidly in the mid-1960s as stored program control (SPC) computers replaced wired circuits and relays. SPC permitted vast increases in flexibility. In the early 1970s digital time-division switching replaced analog electromechanical switches. Korea had to import the switches.

To attain self-reliance in network development, standardize the national network, and prepare for ISDN, Korea considered it crucial to develop a switch that could be used domestically by the public authority and enable the country to compete in the world market.

In collaboration with private businesses, ETRI successfully developed the first exchange, dubbed the TDX-1 (for Time Division eXchange), in 1983. In April 1984 a 2,400-line experimental model was installed as the main central exchange system in the West Taejon office and a 480-line unit went into the

Yusung office as a remote branch exchange system. After the success of these field tests, four TDX-1 6,000-line switches were installed at Kapyung, Jungok, Koryong, and Muju in 1985.

TDXs have been installed primarily in rural areas where large-capacity switches are not needed. Installations include TDX 1As, which have 10,000-line capacity, and TDX 1Bs, with 23,000-line capacity. Korea's domestically developed digital switches, though limited in capacity, enabled the country to become less dependent on foreign technology, and as a result foreign suppliers cut prices for their large-capacity switches. By early 1990 1.4 million TDX lines were in operation.

Given the magnitude of R&D involved, TDX-1 manufacturers Samsung Electronics, Goldstar Semiconductor, Daewoo Telecom and Oriental Telecom (Otelco) have, as intended, sought to enter international markets. While established suppliers based in OECD countries dominate the world market, Korean exchange equipment firms are trying to penetrate Asian and African markets with small exchanges. Sales have also been made to Poland and Hungary. To keep the four producers from undercutting each other, KTA formed KTA International (KTAI) to coordinate marketing and provide system consulting.

The government has provided subsidized financing through Economic Development Cooperation Fund (EDCF) projects. For example, MOC asked that \$1 billion be made available for telecommunication loans to LDCs in 1992 at 3.5 percent.

15.3 Telecommunications Regulation and Its Institutional Structure

The Telecommunications Act of 1961 was the basic law governing the industry until the early 1980s. It rested on a tradition of heavy government regulation of equipment, service offerings, rates, and conditions. Policy has since moved under the control of the MOC. A regulatory framework of minimum competition and public monopoly was adopted and implemented by MOC.

In 1983 the Basic Telecommunications Act and the Public Telecommunications Business Act brought about dramatic changes in this regulatory structure. The purpose of these acts was twofold: to separate the functions of policy formulation and business operation and to take a step toward privatization. In addition, these measures were supposed to support:

1. Integrated and efficient control and regulation of the network as a national infrastructure.
2. Consistent policy formulation, industrial development, and technological advancement.
3. A greater degree of competition between manufacturers in the private market.
4. Entry by competitors into telecom services provision.
5. The direction and financing of research and development.

KTA historically had exclusive authority to permit construction of new and additional facilities by Korean carriers, as well as licensing and standard-setting power over other entities seeking to provide basic telecom services over existing or new facilities.

When the Business Act was promulgated in 1983 KTA was restructured as a public corporation with all the stock owned by the government. The Act authorized the creation of a private specialized carrier, Dacom (Data Communications Corporation of Korea). Dacom's main task was to construct a public switched data network (PSDN) that interfaces with the public switched telephone network (PSTN). Dacom had established twenty-one access nodes by 1983 and begun an international service called Dacom-net.

As Table 15.3 shows, various public entities are involved in the development of telecommunication networks before the 1989 reforms, with partial penetration by the private sector.

In addition to these organizations, the Network Coordination Committee in MOC is in charge of computer network projects. The Korean Computerization Agency has also been established for supervising and validating the National Administrative Information System Network, which is in partial use. The Korean Computer and Communications Promotion Association (KCCPA), a private entity, was founded in 1987 to enhance information exchanges between industries and to make recommendations to the government.

In summary, regulatory policy has operated under the principle that common carriers provide public telecommunication services. KTA, as a public corporation, was in charge of basic network services. Dacom was responsible for enhanced network services. Information services such as data processing and information retrieval became more widely open to the private sector.

The 1983 Business Act provided a statutory basis for market liberalization, outlining the activities, obligations, and regulatory structures. Even though KTA was made a corporation and some private companies like Lucky Goldstar, Samsung, and Daewoo began to participate in new services such as VANs, there was no decided principle of competition. Still, the government planned to develop competitive markets.

15.3.1 The 1989–1991 Restructuring

The telecommunications laws were revised again in July 1989 and July 1991. The first primarily involved VANs (discussed later). The second was part of a broader process formalized in March 1989 when the Korea Information Society Development Institute (KISDI), an MOC affiliate, assembled an advisory group from the government, industry, academia, and research institutes to look at the information and telecommunications industries. It reported six months later. Competition, but not all at once in any specific area and not immediately in every area, was the consensus. The areas producing trade friction with the United States—in particular, enhanced services—were recommended for opening first. KTA would have no restraints on its business activities, although it had to practice “fair competition.”

Table 15.3. Major Korean Telecommunications Organizations*Supervising Government Body*

Ministry of Communications (MOC). Formulates and implements telecommunications policies. Direct and coordinates common carriers. Promotes and supports R&D activities.

General Service Providers^a

Korea Telecommunications Authority (KTA). Provides telecommunications services. Constructs, operates, and maintains public telecommunications facilities. Renamed Korea Telecom in 1991. 100 percent government. Jan. 1982.

Data Communications Corporation of Korea (Dacom). Originally established to construct and operate public data communications networks as a monopoly. Subsequently designated to compete with Korea Telecom in international calling. 34 percent Korea Telecom, 66 percent owned by twenty-three private companies. 1984 Sep.

Specific Service Providers^a

Korea Mobile Telecommunication Co. (KMTC). Provides cellular and paging services. 68 percent Korea Telecom, 32 percent private (trades on Korean Stock Exchange). Apr. 1988.

Korea Port Telephone Co (KTP). Provides communication services in harbor areas. 49 percent Korea Telecom; 51 percent private. Jan. 1988.

R&D Institutes

Electronics and Telecommunications Research Institute (ETRI). Carries out R&D in the field of telecommunications, semiconductors, and computers. Promotes the astronomical and aerospace sciences.

Korean Information Society Development Institute (KISDI). Undertakes long-term research for telecommunications development. Work outs progress indicators for the information society.

National Computerization Agency (NCA) Standardizes technologies relating to computer networks. Undertakes feasibility studies and supervises computerization projects run by government or public organizations.

Engineering Services

Korea Telecommunication Authority International (KTAI). Provides telecommunications engineering services. Manages overseas telecommunications projects.

Korea Information Telesis Incorporate (KITI). Maintains and repair telex facilities and equipments.

Public Relations and Education

Information Culture Center (ICC). Publicizes the information society to the public.

Unless noted, the organizations are government-related.

^aThese were common carriers prior to the 1991 restructuring. The date given is when MOC designated the entity a common carrier under the previous regulatory structure. There was a fifth common carrier (designated Feb. 1988): Korea Travel Information Service Company Ltd. (KOTIS), which is now classified as a Value-Added Specific Provider. It provides air travel and tourist information and is owned by Dacom and private interests.

MOC accepted the recommendations, and set out to prepare specific implementing policies. In putting together proposed legislation and regulations, public hearings were held—the last, in June 1990, attracted 300 people, mostly from entities directly affected, as distinguished from the general public. The decisions in the July 1990 Structural Reform Plan included directives that the liberalization of VANS was to accelerate, and that there was to be a duopoly in international and mobile calling and in data. However, domestic long dis-

tance remains a KTA monopoly until the mid-1990s. Telecommunications is divided into three categories, as shown in Table 15.4.

KTA was privatized effective January 1, 1990. Renamed Korea Telecom, part of the stock was to be sold to the public, but this was postponed—although apparently more because of a generally weak stock market than anything else. Korea Telecom was not happy, calling the Korean telecom services market too small to support competition.

Under this liberalized regime, Korea Telecom will face Dacom, which is 34 percent owned by Korea Telecom (the rest is owned by major corporations) and had 1990 revenues equal to just 5 percent of Korea Telecom's. Dacom loses its monopoly on data transmission but does compete with Korea Telecom

Table 15.4. Classification of Service Providers

Type of Service Provider	Network		
	General	Specific	Value-Added
Scope	Telephone Telegraph Telex Data Leased and dedicated circuits Various voice, nonvoice, and mixed transmission service Extension service for telephone network	Paging Mobile phones Wireless phones and data Trunked radio service Port communications Aeronautical communications	(examples) Data base Data processing Data accumulation, processing and transmission E-mail EDI MHS CRS Video conferencing
Entry requirement	designated by MOC	approval by MOC	registration with MOC
Ownership limits	Less than 10% by one individual ^a	Less than one third by one individual ^a	No limitations
Foreign investment	Not allowed	Allowed if does not exceed one third	In stages: 50% in 1991, 100% by 1994
Duties	Establish an efficient national communication system Supply regular and universal service	Appropriate to the type of enterprise	No duties imposed

Source: Adapted from MOC *Annual Report on Telecommunications 1990*, English edition, p. 35.

^aOr by one corporation or related group.

in international calling (from December 1991). Dacom initially competed just in the Japan, Hong Kong, and U.S. calling markets—but these are 70 percent of outbound traffic. In anticipation of the competition, Korea Telecom reduced international rates, but Dacom priced calls 5 percent under Korea Telecom. It is that expected Dacom will be allowed into domestic long-distance later.

Dacom has been barely profitable since it was created, and this is considered a factor in its selection as the second major carrier. Another reason is a government reluctance (which mirrors popular sentiment) to give the major *chaebol* (business groups) a big piece of any more pies. Dacom has indicated that once it is allowed into the domestic long-distance business it will first concentrate on building an all-digital network for major business customers, and consider a 10-percent market share a reasonable goal (*Telephony*, July 23, 1990, p. 32). In the past, Dacom's network facilities have been leased primarily from Korea Telecom.

15.4 Telecommunication Facilities and Services

In 1983 a fiberoptic system with 45 Mbps shortwave, multimode transmission was installed between Seoul and Incheon (35 km); this system was designed and manufactured under the supervision of ETRI. A similar system was constructed between the ETRI office building and the Taejon Toll Office, a distance of 17.3 km, without a repeater. Based on these experiments, a 90 Mbps system has been established for commercial use. It is capable of simultaneously transmitting 1,300 voice signals. Preparation for the Seoul Olympics was a major motivation for developing this capacity. The long-distance switching system has been fully digital since 1984. In 1990 AT&T was retained by Korea Telecom to help digitize and otherwise upgrade the international service.

Semiconductor development is important in electronic switching systems and other telecom equipment. In 1985 KTA contributed the necessary funds for ETRI laboratory facilities. ETRI subsequently successfully developed custom VLSI chips used by the TDX-1 switching system and other applications.

There is an increasing demand for data communication between computers and between remote terminals and their processors. Though this demand can be met through shipment of tapes or disks, data transfer through telecommunications is much faster and allows interaction between the sender and the receiver. The number of leased data circuits at the end of 1988 was 126,496 channels, a 23 percent increase over 1987. High-speed digital channels were made available for public lease in Seoul, Pusan, and Taegu in 1985, and digital service was extended to eleven cities for use of inter- and intracity data transport. Domestic leased line service has grown rapidly. According to a 1986 survey by the Korean Information Industry Association (KIIA) users were banks and financial institutions (53 percent), general business establishments (31 percent), and administrative and public agencies (15 percent).

15.4.1 Value Added Networks

Several major corporations have their own VANs. An example is Daewoo Motor, which started in 1984 with computer links between five sales offices and its headquarters that by 1989 had developed and expanded the system into a full-fledged VAN that included thirty suppliers. The company has expressed interest in cooperating with other automakers on standards for an industry VAN.

There has been significant resistance to foreign involvement, and the issue has been a major one in Korea–United States trade talks. It is candidly admitted that Korean resistance stems from the feeling U.S. and Japanese technology is so advanced that allowing it in would freeze out most Korean firms (see, e.g., *Korea Business World*, Apr. 1989, p. 46). Joint ventures are actively being sought.

Under July 1989 legislation the registration system for new VANs was theoretically made less stringent. In practice, because the law was silent on what market segments were to be open to competition, not much changed until more than a year later when MOC provided specifics. Data base and data processing were open to international competition in July 1991 and all other areas were to be opened by 1995. Korea Telecom has plans to actively enter the market.

In September 1991, there were more than 130 companies providing value added service (VAS), mostly data base and data processing. This compares to just twenty VAS providers in early 1990, only ten of which were licensed to deal with the general public (the others were intrabusiness-group), even though the KCCPA reported that 143 had licenses.

15.4.2 Data Communication

Improvements in microprocessor technology have increased the capacity and reduced the cost of data communications equipment, including data terminals, modems, and multiplexers. The range of terminals available has expanded to meet the demand of users (e.g., high-speed terminals for high-volume but relatively simple operations; lightweight portable terminals for field communications; and display terminals with graphic capabilities for scientific applications).

The number of facsimile subscribers reached 13,000 in 1986 and 115,000 in 1990. Facsimile uses the same lines as voice service in most cases, thus network charges are the same. Telex subscribers increased from 7,539 in 1983 to 10,304 in 1987. However, the diffusion of telex is stagnating because of incompatible standards in transmission format. It has been predicted that communicating word processors capable of storing, retrieving, and editing text will compete with telex, if not completely replace it.

Videotex as an interactive data communication service enables widespread consumer access and retrieval of computerized information. It is still in the development phase in Korea. Serious experiments are underway using specially adapted television receivers to display information accessed through telecommunication networks. Videotex combines elements of mass and point-to-point communication: The information available from the central data banks is in

many cases identical to that normally distributed through newspapers, magazines, and books. The use of the point-to-point network to access this information, however, allows great selectivity in its retrieval.

ETRI developed a standardized model for Korean-language videotex based on North American Presentation Level Protocol Syntax (NAPLPS) in 1984. ETRI also developed a teletex model and its specifications were transferred to Korean manufacturers in 1986.

In addition to these services, AP Telerate (November 1983) and Reuter Monitor (May 1984) have provided on-line data base services covering interest rates and other financial statistics. These specialized providers of otherwise unavailable data are the only foreigners who have been permitted in Korea's market.

15.4.3 Cellular Service

Carphone service began in 1973 and cellular joined it in May 1984, but the market did not take off until prices were cut July 1988. Initially in Seoul and Pusan, cellular had been extended to seventy metropolitan areas by mid-1991. Korean Mobile Telecommunications Corp. (KMTC), which trades on the Korean stock exchange but is controlled by Korea Telecom, has been the monopoly provider of both paging and cellular service. Korea Telecom has supervised long-term investment and facilities planning, while Mobile Telephone Service Corp. (MTS) has handled installation and maintenance of the cellular system.

Under a July 1990 decision, MOC will select a second carrier by July 1992. To their consternation, equipment producers will be limited to 10 percent ownership of the system; as a group, foreigners can own 33 percent, but may not take part in management. The new entrant will need several years to get a system built and operating, so observers do not see it as much of a threat to KMTC any time soon.

Five local firms produce cellular equipment, including Samsung Electronics, Goldstar Telecom, and Hyundai Electronics. Motorola is also in the market, with an estimated 30-percent share (1989). Service does not come cheap. To make the first call, using the least expensive telephone, cost 1.7 million won (over \$2,500) in early 1989. This included the telephone, a number of permits and other set-up fees, plus twenty-five won for the first message unit of calling.

In May 1991 KMTC reported 113,000 mobile telephones and 591,000 pagers in use. The paging system was expected to be nationwide at yearend 1991; the cellular network is restricted from some areas because of military installations. In January 1992 the Korean National Police ordered mobile equipment from an Ericsson-General Electric joint venture, using EDACS, a system not directly compatible with the general public system.

15.4.4 The Koreasat Project

A Korean communications satellite was considered in the mid-1980s, but it was rejected because of uncertainty over profitability. In 1991 Korea Telecom was soliciting requests for proposals for a satellite, and General Electric was chosen

prime contractor (with Goldstar as its local coordinator) that December. During the bidding process, it was made clear that foreign supplies were expected to joint venture with (and supply technology to) domestic firms. However, the launching will be contracted to a foreign entity because no one with the technology has indicated any interest in sharing it with Korea. Five new ground stations will be built to supplement the four currently in operation. With an estimated total project cost of \$400 million, launching is planned for April 1995 (*Business Korea*, Dec. 1991, p. 38 and Jan. 1992, p. 61).

Fiberoptic marine cable capacity is also being expanded. Under a February 1992 contract among AT&T, KDD, Dacom, and Korea Telecom, Korea will get its first direct link to Guam, where the new cable will link with the TPC-5 network on to Hawaii and the U.S. mainland. This leg will have 7,560 circuits. In addition, there will be a 15,120-circuit cable between Korea and Japan. Both are to be in operation by 1995.

15.4.5 Related Measures

MOC's policies extended beyond traditional telecommunications to related areas, including electronics and computers. For example, MOC—together with KTA, Dacom, and ETRI—actively participated in 4M DRAM and superminicomputer development projects. Computer technologies obtained during research for digital switches were used in the development of computer networks for the Asian Games in 1986 and the Summer Olympics in 1988.

Some liberalization measures have been instituted. For example, many types of customer premises equipment—including telephone sets, modems, and facsimile machines—can be freely sold and attached to the network without restrictions, subject only to technical-standards approval. In addition, networks for television, telephone, telex, and military and public security have been integrated wherever possible to improve efficiency.

15.5 Cable and Broadcast Television

These areas have been very contentious. In 1990 when the government announced it would license a new over-the-air television broadcaster and CATV operators, it received scores of applications. Seoul Broadcasting System (SBS), the entrant of a medium-size construction company, got the nod to become the third broadcaster (and fifth station). Two of the stations are part of KBS, the third is operated by MBC, and the fourth is educational; all are government owned.

Regarding cable, Korea Telecom awarded a contract in October 1990 to Korea Communications Engineers (KCE) to build pilot projects in two Seoul apartment projects. It began operation in July 1991 by offering seven channels (including four broadcast ones) to 8,400 households. None of the channels operate twenty-four hours a day.

More extensive CATV and broadcast service is set for 1995 when a Korean

satellite is launched. Between 1993 and 1995 the government, through MOC and the Ministry of Information, plans to install interactive twenty-five-channel cable systems in fifty cities. Korea Telecom will oversee building them. The interaction feature initially involves connection to police boxes and fire stations.

Although the government will tightly control the system, there will be competition to supply hardware and programming. Seoul Telecom has been among the more aggressive of the cable firms—signing contracts with CNN and ESPN (a sports network) in 1990, more than a year before service could even begin.

15.6 The Information Industry

In Korea the term *information industry* is used to collectively cover telecom services and equipment manufacturing, data processing, and sometimes even the electronics industry generally. Before 1989 there were no systematic statistics for the information industry. Here the term covers producers of the physical equipment and the systems that drive it (software and firmware) rather than the actual information content, so print media and broadcasting are excluded—although of course much of the equipment they buy is covered. KTA began classifying data for the industry in 1989, specifically breaking out telecommunications and electronics as subgroups.

Korea's electronics industry was inaugurated in March 1959 when Goldstar brought out vacuum tube radio receivers. For the next decade the level of investment and technical development were limited to assembly of imported parts—screwdriver factories. In the mid-1960s, the government launched a policy to attract foreign investment and technology transfer. Foreign investors sought the advantages of low-wage labor in Korea, with American Signetics and Fairchild building manufacturing plants for black and white television sets, and Motorola locally manufacturing transistors and integrated circuits. As a result, total domestic production of electronics increased from 125 billion won (\$522 million) in 1962 to 1,640 billion won (\$5,115 million) in 1969.

The government's initiation of an eight-year development plan for the electronics industry (1969–1976) was a turning point. Five goals were established by MOC: expansion of export sales, maximum use of domestically produced equipment, rationalization of production and distribution systems, construction of electronics plants, and opening the domestic market to foreign investment. In 1976, as part of the third basic development plan, several special laws were enacted establishing national investment funds, reducing trade and sales tax, and reorganizing small electronic companies by specializing their product lines.

At the start of 1977 the structure of manufacturing industries was reorganized by the fourth basic development plan (1977–1981). The principal objective was to balance overall imports and exports. Whereas production of industrial equipment was intended to supply the domestic market (displacing imports or at least reducing their increase), home electronic items were designated for export.

Proclaiming 1983 as inaugurating “the period of the development of the

information industry," the government selected three strategic fields: computers, integrated circuits (ICs), and telecom equipment. Until the mid-1980s expansion in export markets was led by microcomputers, electronic systems, ICs, and color television sets. Due to competition and increasing pressure from importing countries, several Korean companies such as Lucky Goldstar and Samsung built factories in the United States and Portugal.

15.6.1 The Rise of the Information Industry

The Korean information industry has focused on international markets because of the limited domestic market. Most imported information equipment has been for assembly manufacturers who are oriented toward the international market (i.e., it was re-exported). There was a positive trade balance by 1981. Investment by foreign firms was a key factor in this. Japanese and U.S. multinationals have been the principal sources.

In 1983 the government initiated a policy to promote the flow of foreign capital and investment into the country, changing to a positive list system from a negative list one. (While the former explicitly lists the sectors foreign companies are able to invest in, the latter allows foreign capital in any sector not explicitly listed as off limits). With this measure, investment by foreign information companies started to grow rapidly. For example, IBM became one of the top twenty companies in terms of sales in 1986.

Technology transfer has been regarded as a crucial factor for indigenous development because it influences both the sociocultural characteristics of the importing country as well as domestic production factors and national scientific and technological potentials. During the period 1982–1989 some \$3,315 million was paid in royalties for technology transfer such as patents, technical information, and services—a third of it by the electrical machinery, electronics, and telecommunications industries. Technology originating from the United States and Japan has accounted for more than 90 percent of the total since 1977.

15.7 Public Policy for Industrial Development

Five types of broad measures taken by the government are generally considered significant in bringing about the rapid expansion of the information industry since the early 1970s. These include:

1. Encouraging investment in new information technologies,
2. Local manufacturing of products and parts,
3. Establishing research and development sectors and a system for technological innovation,
4. Encouraging new techniques and products,
5. Fostering cooperation of universities and industries.

To encourage investment in information industries, the government decided in 1982 to establish a development fund for electronics with 240 billion won

(\$300 million at the time). The fund was used for technical innovation and automation of production lines, as well as long-term, low-interest loans. In addition, the government encouraged new businesses, including investment of venture capital, to contribute to innovation in information technologies and services.

The Ministry of Commerce determined a list of electronics products and parts that were desired for indigenization to increase Korea's competitive power in the international market. With this measure, relationships between electronics businesses were streamlined to avoid overlapping investment and overcompetition.

To promote R&D and technological advancement, engineering centers were established abroad that were funded by the government, research institutions, and private enterprises. These centers played an important role in collecting information about recent technological development, training engineers, and recruiting foreign scientists and engineers.

In early 1990 Korea Telecom announced it would invest 3 trillion won (\$4.5 billion) in R&D by 2001, starting with 133 billion won in 1991 (about 3 percent of expected revenue), moving up to 6 percent of revenue in 2001. This is to include funding of four research institutes, placement of 28,000 personal computers in 1,230 schools, and distribution of 10,000 monitors to individuals for experimental videotex services.

A committee on technological innovation provided universities and businesses with research projects to develop new products and knowledge. The committee also organized an annual electronics exhibition to display new innovations. To strengthen education and training of engineers and workers, the Ministry of Science and Technology began a program of inviting Korean scientists working abroad and foreign retired engineers to teach and train in Korea. Training centers for electronics engineering also provided a variety of courses to engineers from small factories.

The United States has made an issue of access to the Korean telecom services and equipment market. To avoid retaliation under U.S. trade laws, in February 1992 an agreement was reached to make the market more open. Among other things, registration in value added services is being streamlined and restrictions on investment are being phased out by 1994. Tariffs have been cut, and U.S. firms are given more access to the standards-setting process and government markets.

15.8 Conclusion

After the Korean government launched "the period of development of the information industry" in 1983, telecom equipment makers, computer manufacturers, and other electronics-related firms have enjoyed tremendous growth in revenues and value added services. With stringent, although now falling, barriers to import, and the government as a major buyer of domestic production, the trade balance has improved. Still, research must pay attention to the intri-

cate formal and informal procedures that pervade the decision-making process in South Korea within and between formal telecommunications institutions.

During the 1980s the monopoly structure of KTA and the lack of competition in most aspects of telecommunications were the subjects of debate among administrators, industry, users, and other interested parties. It was pointed out that the bureaucratic administrative structure of KTA hindered provision of services. As a result of these debates, KTA's control over such areas as specification of technical standards for services and equipment has been reduced and the government has confirmed a willingness to liberalize the sector by moving toward duopoly in long distance and relatively open markets in VAN and VAS.

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