Background

Since the 1960s, South Korea has achieved an incredible record of growth and integration into the high-tech modern world economy. Four decades ago, GDP per capita was comparable with levels in the poorer countries of Africa and Asia. In 2004, South Korea joined the trillion dollar club of world economies. Today its GDP per capita is roughly the same as that of Greece and Spain. This success was achieved by a system of close government/business ties including directed credit, import restrictions, sponsorship of specific industries, and a strong labor effort. The government promoted the import of raw materials and technology at the expense of consumer goods and encouraged savings and investment over consumption. The Asian financial crisis of 1997-98 exposed longstanding weaknesses in South Korea's development model including high debt/equity ratios, massive foreign borrowing, and an undisciplined financial sector. GDP plunged by 6.9% in 1998, then recovered by 9.5% in 1999 and 8.5% in 2000. Growth fell back to 3.3% in 2001 because of the slowing global economy, falling exports, and the perception that much-needed corporate and financial reforms had stalled. Led by consumer spending and exports, growth in 2002 was an impressive 7%, despite anemic global growth. Between 2003 and 2007, growth moderated to about 4-5% annually. A downturn in consumer spending was offset by rapid export growth. Moderate inflation, low unemployment, and an export surplus in 2007 characterize this solid economy, but inflation and unemployment are increasing in the face of rising oil prices.

Economy

The new government’s economic policy will focus on growth. As promised in his presidential election campaign, Lee Myung-bak maintains his "747" policy platform, which aims for the country to achieve an economic growth rate of 7% for the next ten years, to reach a per-head income level of US$40,000 and to become one of the world’s seven largest economies. Although the current economic slowdown casts doubt on such a target, he plans to support his growth policy by deregulation and by encouraging construction; one of his proposals is to build a cross-country canal. The GNP government will be more pro-business and pro-growth than either the populist Roh Moo-hyun or the former UDP administration.

The FTA with the US, which was signed in June 2007, is expected to bring many new opportunities, especially for the steel and automotive sectors. South Korea was successful in fending off US demands that it open its rice market. However, the FTA has yet to be ratified by the South Korean and US legislatures, and there are concerns that it could be rejected amid growing US protectionism and anti-US sentiment in South Korea. South Korea’s other FTA negotiations, including those with Japan, the EU, India, Canada and the Gulf Co-operation
Council (a grouping of six Middle Eastern states), are progressing. Additional measures to improve South Korea’s appeal as a destination for investment will include cuts in corporate tax rates. The new president has already announced plans to reduce these rates progressively over the next five years.

**Innovation Clusters**

The government of South Korea has taken great pains to set up clusters as well as regulations to protect the SMEs.

**Main support policies for SMEs**

**General Direction**

The Small and Medium Business Agency (SMBA) targets its policies at improving the structure and international competitiveness of SMEs to stay ahead of the changes and the challenges in the new era in which they are expected to play a leading role.

**Laws Relevant to SMEs**

The Korean Constitution, six general laws (including the Local SME Act), three special acts, and five relevant acts govern SME operations and status:

1. Article 123 of the Constitution provides for the protection and promotion of SMEs, and promotion of self-help organisations by the government.
2. The Framework Act on Small and Medium Enterprises stipulates the subjects and direction for SME promotion policy.
3. The Support for Small and Medium Enterprise Establishment Act, the Act on Special Measures for the Promotion of Venture Businesses govern the support systems for business of start-up of venture companies.
4. The Promotion of Small and Medium Enterprises and Encouragement of Purchase of Their Products Acts and the Act on Special Measures for Supporting the Structural Improvement and Managerial Stabilization of Small and Medium Enterprises establish the systems for promoting the procurement of goods produced by SMEs, expanding the SME market, and improving the structure and management of SMEs.
5. The Act on the Protection of the Business Sphere of Small Medium Enterprises and Promotion of Their Cooperation and the Act on the Subcontract Trade Fairness stipulate necessary systems to prevent large companies from intruding into the SME business sphere and conducting unfair trading, thereby inducing the enhanced mutual cooperation among companies.
6. The Small and Medium Enterprise Cooperative Act lays down the regulations concerning the organisation of cooperatives and the operation of mutual assistance funds.
7. The Act on the Balanced Region Development and Promotion of Regional SMEs and the Act on Special Measures for the Deregulation of Corporate Activities stipulate the systems to facilitate the start-up and management of companies and aims to create balanced development between large cities and provinces by promoting regional SMEs.
In addition, the Industrial Bank of Korea, Korea Credit Guarantee Fund, and Korea Technology Credit Guarantee Fund, established under the Industrial Bank of Korea Act, Korea Credit Guarantee Fund Act, and Act on the Support for New Technology Business Finance, respectively, reduce the fund-raising difficulties of SMEs by providing loans and credit guarantees.

**Specific Government Measures for SMEs**
- Restrictive Entry Barrier against Large Enterprises

According to the SME Framework Law (Article 20), conglomerates are prohibited from entering into specific businesses. Initially in 1979, there were 23 categories of exclusive industries slated for SMEs, the number had increased to 237 categories in 1994, but has since been reduced as the government recognized the side effects of the entry barrier policy in an environment of the global competition. The effectiveness of the entry barriers decreased under the open market, and the restrictive policy deterred the self-reliant competitiveness of SMEs.

**Tax Incentives- for the SMEs**

Tax incentives have played a crucial role in fostering SMEs. To promote technology and human capital development for SMEs, a credit portion of total expenditure has been exempted from taxable income. Some major tax incentives are:

1. the Special Tax Reduction Act, under which 5% of expenditure is tax exempt when obsolete facilities are refurbished for productivity development;
2. tax reductions for development of technology (5% for capital industry, 4% for technology-intensive industry, and 3% for general business) and manpower (5-15%);
3. 50% reduction in corporate tax reduction for five years as an incentive for business restructuring.

**More information - Technology policies that South Korea adopted**

Over the years, the Korean government has adopted an array of policy instruments designed to facilitate technological learning in industry and in turn strengthen the international competitiveness of the economy. The government not only stimulates the demand side of technological learning through industrial policy instruments but also gives rise to the supply side of technological capability through technology policies.

At the outset of economic development, South Korea, had to rely on foreign technology imports. However, Korea’s policies on foreign licenses were quite restrictive in the 1960s. In the case of manufacturing, general guidelines from 1968 gave priority to technology that promoted exports, developed intermediate products for capital goods industries, or brought diffusion effect to other sectors. The restrictive policy on licensing strengthened local licensees’ bargaining power on generally available technologies, leading to lower prices for technologies than would otherwise have been the case (Kim, 1997).

In a bid to attract more sophisticated technologies, a change in national policy was introduced in the 1970s. Restrictions on foreign licensing were eased in 1970 and 1978, resulting in the increase of royalty payments. Most foreign licensing in the early years
was associated with technical assistance needed to train local engineers to run turnkey plants (ibid).

In contrast to the gradual relaxation of government control on foreign licensing, the government policy on foreign direct investment (FDI) saw complete change in the 1960s and 1970s. The FDI policy was rather free in the 1960s, but few foreign investments were made during this decade, primarily due to uncertainties about South Korea’s political and economic outlook. The government reversed its FDI policy in the 1970s, tightening its control. Joint ventures were given priority compared to wholly owned subsidiaries. Three different criteria were introduced:

1) Competition with domestic firms were seldom allowed in both domestic and international markets.

2) Export requirements were forced on FDIs.

3) Foreign participation ratios were basically limited to 50 percent

Thus, South Korea was one of a few countries with restrictions on FDI when technology was not a critical element and necessary mature technologies could be acquired through mechanisms other than FDI, such as reverse-engineering. As a consequence, the size of FDI and its proportion to total external borrowing were significantly lower in South Korea compared with many other newly industrializing countries (Korea Exchange Bank, 1987). These circumstances reflect South Korea’s explicit policy of promoting its independence from multinationals in management control (Kim, 1997). This implies that FDI had a much smaller impact on the Korean economy compared with the FDI effects in other NIEs.

The technology transfer promotion through procurement of turnkey plants and capital goods led to massive imports of foreign capital goods at the cost of retarding the development of the local capital goods industry. The massive imports of foreign capital goods became a major source of learning through reverse-engineering by Korean firms (Kim & Kim, 1985). Among NIEs, the proportion of capital goods imports to technology transfer was higher in South Korea than in countries such as Argentina, Brazil, India and Mexico (Westphal, Kim & Dahlman, 1985). Other instruments also played a role in lubricating the inflow of foreign capital goods to South Korea: the slight overvaluation of the local currency, tariff exemptions on imported capital goods, and the financing of purchases by suppliers’ credits, which carried low interest rates relative to those on the domestic market, all worked to increase the attractiveness of capital goods imports.

After two decades of restrictive policy toward foreign direct investment and foreign licensing, South Korea liberalized its technology transfer policies in the 1980s and 1990s. Progressively more sophisticated foreign technologies were needed to sustain its international competitiveness in high value-added industries. In the early 1990s there was a steady decline in new FDI into manufacturing, while there was an increase in FDI in service sectors. In the 1960s and 1970s foreign companies invested mainly due to low
labour costs, at a time they were not so willing to collaborate with Korean companies in relatively more technology-intensive areas (Kim, 1997). South Korea has been heavily dependent on both Japan and the U.S. for technology imports. These two countries accounted for more than 80 per cent of FDI and more than 70 percent of foreign licensing and capital goods imports during the 1960s and 1970s (ibid).

The government’s plan to develop the capital goods industries was initiated in 1968 but not seriously implemented until the mid-1970s. The development of local consulting engineering firms was promoted by the Engineering Service Promotion Law of 1973, which stipulated that most engineering projects should be given to local firms as major contractors with foreign partners as minor participants. From a technology diffusion perspective South Korea had no efficient mechanism for diffusion of technical information until the 1980s. In the 1960s the government established a scientific and technological information centre as a linking mechanism for disseminating technical information and a public research institute as a diffusion agent. These diffusion agents were not successful because Korean researchers lacked the manufacturing know-how that was important in the first decades of development. More important as diffusers were the government enterprises established in the 1950s and 1960s. Many engineers from these firms, mainly fertilizer and machinery industry, later went to private firms’ engineering and production departments (ibid).

In the 1980s the government established an extensive network of government, public, and private technical support systems to promote technology diffusion within the economy. The Industrial Advancement Administration, a government agency, coordinates the functions of different technical support agencies for both large and small firms. The National Industrial Technology Institute and more than ten regional industrial institutes, together with the Small and Medium Industry Promotion Corporation, constitute a national network of technical services. Korea Academy of Industrial Technology, together with other government R&D institutes and industry-specific R&D institutes under trade associations, comprise a core of an R&D network for technology diffusion.

The Korea Standard Association’s national network and Korea Productivity Centre promote technology diffusion among firms mainly through their educational and training programs on quality control, value engineering, physical distribution, and factory automation. To this should be added a number of private, non-profit, technical support systems mainly focusing on technology diffusion among SMEs.

In the early part of the 1960s a very limited range of technology resources was available to South Korean companies, due to lack of inadequate research infrastructure and lack of skilled manpower. But in the late 1960s and early 1970s relevant technology was available in machine-embodied form and learning by doing was relatively easy. Stimulating policies aiming at the country’s own R&D were not effective. As the years passed and South Korea’s industries became more technology-intensive, the government focused more attention on indigenous R&D activities, primarily through two major mechanisms: direct R&D investment and indirect incentive packages.
The direct investments aimed at developing the science and technology infrastructure and promoting R&D at universities and government research institutes (GRIs). In the late 1960s, the Korean Institute of Science and Technology (KIST) was established as an integrated technical centre to support the industry’s technological learning. The ongoing sophistication in the industrial development hiked demand for development of government research institutes in shipbuilding, marine resources, electronics, telecommunications, energy, machinery, and chemicals. Another important creation was the establishment of Korea Advanced Institute of Science, which is the country’s most important institution with regard to examination of PhDs in science and engineering.

Until the early 1990s university research has been relatively underdeveloped. According to the Ministry of Science and Technology (1994) university research accounted 7.7 percent of the nation’s R&D spending in 1994, and 33 percent of the nation’s R&D manpower, and as much as 73.7 percent of its Ph.D.-level personnel. Of South Korea’s total R&D expenditures, in 1994, basic research accounted for 14.4 percent, applied research for 23.8 percent and development for 61.8 percent. The statistics also show that the private sector accounted for 45.1 percent of the nation’s basic research and 64.5 percent of applied research, while universities accounted for only 29.1 percent and 6.3 percent, respectively.

According to Kim (1997) there are reasons for questioning the figures concerning basic and applied research, particularly the share commanded by the private sector, because only lately have the leading chaebols begun rather limited investments in applied research in their largest technology businesses. In basic research the investment have been more limited than in applied ones.

**Innovation system perspectives**

In general the inadequacy of university research, including lack of well-trained scientists, has been a bottleneck in the South Korean innovation system. To deal with this weakness the government enacted the Basic Research Promotion Law in 1989, targeting basic research as one of the nation’s technological priorities. Main focus has been to introduce a scheme to organize science research centres (SRCs) and engineering research centres (ERCs) in South Korea’s universities.

The most ambitious government vision is the Highly Advanced National R&D Project, also known as the G-7 Project, which is aimed at lifting the nation’s technological capability to the level of G-7 countries by 2020. This project consists of two parts: product technology development projects and fundamental technology development projects.

The former include new drugs and chemicals, broadband technology, next-generation vehicle technology, and high-definition television (HDTV). The latter consist of ultra-large-scale integrated circuit, advanced manufacturing systems, electronics and new
material technology in information technologies, energy and environmental technologies, biomaterials and next-generation nuclear reactor.

To support R&D within the industry, the government has used various incentives. In the 1960s and 1970s various tax incentives and preferential financing for R&D activities were offered. The mechanisms were largely ignored by industry owing to the absence of a clearly felt need to invest in R&D and the relatively easy means of acquiring and assimilation of foreign technologies the available from many sources. In the early 1980s preferential loans became the most important means for financing private R&D activities.

Public financing, mostly in the form of preferential loans, accounted for 64 percent of the nation’s total R&D expenditures in manufacturing in 1987. The impact of this source of financing may be overstated due to rates of preferential loans ranging from 6.5 to 15 percent, thus conferred little advantage over financing terms available in markets outside South Korea (KITA, 1994). Another source for corporate R&D is tax incentives, which can be classified into five objectives: incentives aimed at promoting corporate R&D investment, reduced tariffs on import of R&D equipment and supplies, deduction of annual non-capital R&D expenditures and human resource development costs from taxable income, exemption from real estate tax on R&D related properties and a tax reduction scheme, and finally Technology Development Reserve Fund, whereby a company can set aside up to 3 percent (4 percent for “high-tech” companies) of sales in any year to be used for its R&D work in the following three years.

There are also some indirect support programs for specific industrial R&D activities, such as the World Class Korean Products program, introduced in the late 1980s. It is a government scheme to make products world class. Twenty-seven products were selected by the government, involving fifty-nine producers in existing industries, offering various kinds of support. Among the products chosen were sport shoes, fishing rods, pianos, tires, bicycles, CDs, ultrasonic scanners, VCRs and videotapes (KOTRA). In 1993 the government introduced the New Technology Commercialization Program, in which it offers preferential financing activities related to R&D and commercialization of new technologies developed locally.

A characteristics of the 1970s to the mid-1990s is the rapid growth of indigenous industrial R&D activities, especially within the private sector (MOST, 1994, Kim 1997). The total R&D investment in South Korea increased from W 10.5 billion in 1970 ($28 million) to W. 7.89 trillion ($10.25 billion) in 1994. That corresponds to an increase from 0.32 percent to 2.61 percent of the GNP during the same period.

Despite increasing governmental involvement in technology policy, Kim (1997b) observes several weaknesses in South Korea’s innovation system: research at universities is relatively weak; there is a serious lack of interplay between universities and the private sector; there are relatively few technological spin-offs; and there is a dearth of diffusion mechanisms to transfer research results from public research establishments (PREs) to
industry and particularly to SMEs. There are signs that the character of South Korea’s technology policy is moving from a mission-oriented to a diffusion-oriented one. For instance, the central government has increasingly been supporting the innovativeness of SMEs and interfirm networks. According to Hassink (2001), these SME-oriented innovation policies are more strongly developed than one would expect after reading the literature on South Korea’s economic policy. In the literature and journals stress is often placed on the strong connection between the government and the chaebol, also involving large support, and thus neglecting SMEs.

South Korea’s SME-oriented innovation support is judged variously in the literature. OECD (1996) and Park (1998) have negative views, while Kim and Nugent (1994) have a more positive view of the policy. Chung (1999) is of the opinion that different judgements depend on the lack of systematic evaluation.

In 1997, South Korea plunged into a serious economic crisis. According to Crotty and Lee (2002), the neoliberal restructuring of the Korean economy in the years preceding the 1997 crisis was to blame for the serious impact on South Korea. Kim (2001) asserts that unlike previous economic disruptions, which had been evoked by external shocks such as oil, the 1997 and 1998 crisis that affected South Korea stemmed from fundamental structural weaknesses in its institutions that support national innovation.

"The developmental state consolidated sufficient power to pick “winners” and mobilized and allocated resources to them for ambitious development goals, achieving phenomenal industrial growth in the early decades. However this approach eventually led to corruption and collusion between the state and big business, and mismanagement of the financial sector with serious resource misallocation. The chaebol relied heavily on state protection, which resulted in diversification by big businesses beyond their financial and technological capabilities. Lack of transparency and accountability in the economic system was also a serious problem.” (ibid, p.1)

After the Asian crisis the government launched in early 1998 major reforms in four areas: the public sector, the financial sector, chaebols, and the labour market. Prior to the crisis, reform programs had been discussed but never implemented because of inertia and resistance from stake-holders. The crisis, however, provided South Korea with a rare opportunity to carry out reform programs.

According to Kim (2001) the government, prior to the crisis, continued to function as a development state, hindering the growth of a free market economy by authoritative dictates, frequent intervention in the market, and unnecessary regulations. Non-transparent policies and inaccessible administration nurtured dubious collusion between the government and chaebols, leading to political corruption. After the Asian crisis, the administration of Kim Dae Jung set government reform as a high priority, including the establishment of a Government Reform Office (GRO) with the explicit mandate to reform the public sector. Some of the central government functions have been transferred to local governments, outsourced or privatized, or transformed into executive agencies. The Asian crisis also triggered the government to restructure its administrative apparatus for coordinating public science and technology efforts.
The financial sector has long been a tool of collusion between the government and the chaebols, resulting in major resource misallocation, and had for a long time been recognized as a serious problem in the South Korean economy. As a result of the crisis major steps were introduced to reform the financial sector. Two public agencies – the Financial Supervisory Commission (FSC) to review, design and supervise the financial system and Korea Asset Management Corporation (KAMCO) to buy non-performing loans to recapitalize financial institutions, were created to function independent of the government. The FSC has been instrumental in reforming the financial sector, including closing many banks and hundreds of financial institutions. In recent years foreign participation and ownership in the bank sector is expected to introduce more modern market-oriented activities, accountability and transparency in operations.

**More details of the technology and innovation policy formulation**

In Korea, various independent ministries and agencies carry out Science and Technology (S&T) activities, which could include Research and Development activities (R&D). Duplication and conflict between individual policies create inefficiencies within the system. To minimise such inefficiencies, a process of policy co-ordination and budgetary co-ordination is carried out (Chung 2001).

For policy co-ordination, the Ministry of Science and Technology (MOST) is legally the central point of S&T policy. Eventually long term technological forecasting was added to MOST’s role. Every five years, MOST uses the Delphi method and feeds the results back into R&D policies and directions (Chung 2001).

Largely ineffective due to the lack of political power and financial resources, MOST actually functions as the secretariat for the National Science and Technology Council (NSTC) instead. NSTC was created under the Special Law for Scientific and Technological Innovation in 1997 and chaired by the President of Korea. NSTC decides policy agenda, policy directions, priorities for R&D allocation and evaluation of national R&D programmes. The Ministry of Planning and Budget (MPB) performs the budgetary coordination, which includes producing the annual budget guidelines and allocation of the budgets. Previously, the MPB had the most power in the S&T policies; however, it is likely that the balance of power will shift towards NSTC in the future (Chung 2001).

**Statistics of R&D in South Korea**

In the past two decades, the Korean government has shifted its stance from having a leading hand in R&D activities from the 1960s and 1970s to the encouragement of private firms to perform R&D. In 1980, 62% of R&D was performed by public institutes, along with 9.2% by Universities and only 28.8% by private firms. By 1990, this had dramatically shifted to 74% of research performed by private firms (an increase of
45.2%) whilst the public sector only performed 18.5% (drop of 43.5%) (Chung 2001).

**Steps for technological Diffusion**

The Korean NIS does not have any “explicit policy instruments” (Kim and Dahlman 1991) on technology diffusion. Indirect instruments such as consulting engineering firms and capital goods producers allowed the government to target these agencies to help technology diffusion. In addition, two main instruments were used in link supply and demand of technology diffusion. For SMEs, six public agencies provide various technical services which ranges from training and automation to assisting firms with product quality. Secondly, scientific and technical information are disseminated through scientific papers within technical information centers (Kim 1993).

**The Hubs, places in Seoul**

Tom Collins’s enthusiasm cannot hide his exhaustion. Tom is one of 300 staff working at the offices of the Incheon Free Economic Zone (IFEZ) just outside Seoul, created to attract foreign high-tech investment to the self-styled knowledge hub of northeast Asia. Tom, an American, is the only non-Korean on the staff. It is his job, almost single-handedly, to make the zone attractive to foreign investors. After our whistle-stop tour he is due to meet an international education company considering setting up a school in the zone.

Forty miles from Seoul, on the way to Incheon airport, past drab, brown high-rise apartment blocks, there are few signs of what is planned: at the zone’s heart will be Songdo, a city with ubiquitous broadband infrastructure due to come to life in 2010. Incheon is self-consciously positioning itself as ‘The Manhattan of northeast Asia’, an open and cosmopolitan place, more connected to the global economy than to the rest of Korea. A 12.3km latter day Brooklyn Bridge will carry cars to the nearby international airport in just 15 minutes. An area of 209 square kilometres, much of it reclaimed from the sea, will support a population of half a million people, mainly employed in high-tech jobs.

IFEZ stands for the future Korea wants to project to the world: knowledge-based businesses in a cosmopolitan setting, with everyone connected through ubiquitous communications. How IFEZ develops, not just in terms of infrastructure, but also its culture, will determine what kinds of innovation it may produce. IFEZ will be a test bed for how traditional Korean recipes for economic development may combine or clash with its ambitions to become a hub for global innovation.

The US government played little direct role in the growth of Silicon Valley. By contrast, IFEZ is a deliberate creation of central government in part because local government in Korea is so weak. South Korea’s dictatorship allowed for no local government. The first time that mayors were publicly elected was 1995. Perhaps it is no surprise that regional development is lagging.
The Ministry of Communications is investing $400 million in Songdo’s ubiquitous wireless infrastructure to realise a vision of ‘U-life’, where everything someone needs, from their house key to their health details, will be on one smart card.

The Ministry of Maritime Affairs and Fisheries is building the port infrastructure. Everywhere ministries are heavily involved in the details of what is being planned. The brochures say IFEZ will be cosmopolitan, a place where foreigners and Koreans can mix as equals. Yet there is real doubt about how many foreign companies it will attract. By early 2006 about 45 Korean companies had applied for space in a hundred-acre bio complex. Foreign investors have been harder to find. Tom and his team are scouring the world to attract star researchers with carefully targeted incentives. Yet still culture stands in the way. ‘London is international and people feel comfortable there,’ Tom explained. ‘In the US, there is a sense that “our ethnicity is the world’s ethnicity”. By contrast, Korea, once dubbed the ‘hermit kingdom’, is ‘very developed technologically, but also very provincial to international visitors’. It is not just culture that’s a problem but money as well. Tom explained: ‘Korea is a very cash-rich economy at the moment. They don’t need the FDI, so how aggressive does the government really want to be in attracting it?’

**Clusters**

1. **Seoul**
   
   Seoul is the centre of gravity of economic, political and cultural activity – the main magnet for talent and research. Seoul Metropolitan Area comprises 11.8 per cent of the nation’s territory but its population has increased from 20.8 per cent of the national total in 1960 to 47.9 per cent in 2004 and is forecast to reach 50 per cent by 2011. About 70 per cent of students who ranked in the top 4 per cent in the Scholastic Aptitude Test for entrance to universities in Seoul. Out of 327,740 admissions places in universities in Korea, 114,908 are in Seoul and nearby areas. Seoul is home to the Korea Institute of Science and Technology, the oldest and most outward-looking government research institute, and the most prestigious university, SNU. Crucially perhaps, Seoul is also home to the new wave of Korean entrepreneurs in digital media and culture. It is Korea at its most cosmopolitan.

   Venture capital firms and the stars of the gaming industry congregate in the city’s Kangnam district, just south of the river, which teems with young people visiting shops, restaurants and PC bangs, the internet cafés where they congregate to play ‘massive multiplayer online role-playing games’ (MMORPGs).

   Seoul will remain the main magnet for talent and the main source of innovation in Korea. Seoul’s dominance, however, has prompted a string of attempts to create alternative centres for growth and innovation. Since 1995, MOST has created two or three regional research centres in each provincial area to encourage cooperation between universities and small businesses. Science and engineering research centres located in universities are meant to connect research interests to local businesses. The Industrial Research Cluster Support Program, launched in 2002, encourages SMEs to work closely together to find synergies and cooperate in the development of new technologies. The government also supports nine industrial research clusters.

2. **Daedeok science town**
By far the most impressive initiative is the Daedeok ‘Innopolis’. Daedeok Valley is an integrated industrial belt, which includes a clutch of towns such as Daejeon, and industrial parks in Chungbuk-do Jeollabuk-do. At its heart is Daedeok Innopolis, a mass of publicly funded research complexes covering 6849.5 acres close to Daejeon, more than four times the size of IFEZ.

Built in 1973, Daedeok Innopolis has 56 research institutes, more than 6000 PhD researchers and accounts for 10 per cent of the aggregate research power in Korea. KAIST was relocated to Daedeok in 1989, and Daejeon is also home to the National Central Science Museum, Chungnam University and the newly reopened Expo Science Park.

Daedeok’s concentration of scientists and researchers seems very impressive. Yet in other respects the idea of innovation emerging from a state-planned science city cut off from the rest of the economy seems old fashioned. The number of spinoff ventures created in Daedeok grew from 40 in 1995 to 2000 in 2005, with 45 per cent of those in the IT sector and 15 per cent in biotech. But it is far from clear that Daedeok will become a Silicon Valley style centre for innovation or even match the Hsinchu Park in Taiwan that has spawned thousands of semi-conductor companies, many of them now very large. Several other places, each deploying a different approach to cluster development, could play a role in future Korean innovation.

3. Pohang

Pohang, located in Gyeongsanbuk province on Korea’s east coast, is not a first choice tourist destination, perhaps because it is home to the Pohang Iron and Steel Company (POSCO), founded in 1968 and now the world’s second-largest steel producer, producing 28 million tons of steel products each year.

POSCO helped to found POSTECH, Asia’s number two science and technology university, which in 1994 received an endowment from POSCO ensuring its future. The alliance between the steel company and the university could yet produce significant innovation.

A case in point is PAL, Pohang Accelerator Laboratory, a national user facility which houses an electron linear accelerator and synchrotron radiation light source. In Soo Ko, director of the physics department at PAL, explains it got off the ground only by trading with Chinese and Japanese to get the technology required. ‘We learned a lot from the Chinese,’ he said. Local researchers and companies use the lab. Ko proudly relates that the experiment behind the first Nature cover story on Korean research was done at PAL: work in 2003 on Viagra and Alzheimer’s by Crystal Genomics and KAIST. Next door, completed in 2006, is one of Korea’s five nanotechnology support facilities, the National Center for Nanomaterials Technology (NCNT). The combination of the accelerator and the latest nanotechnology instruments aims to keep them at the cutting edge of materials research.

POSCO is looking for new growth areas, and POSTECH, while maintaining its physics and chemistry strengths, is moving into biotechnology. POSTECH Biotech Center was established in 2000, funded partly by POSCO (40 per cent) and by pharmaceutical companies (60 per cent). Major R&D areas include molecular medicine, biochips and biochemical engineering, plant systems biology, DNA and adenovirus-based preventative vaccines and diabetes treatment research.
4. Busan
Further south down the coast, Busan, in neighbouring Gyeongsangnam province, is the second-largest city in the country and one of the world’s top three ports.

The Busan port, which first opened in 1876, is now being expanded to include 30 new shipping berths by 2011. This will also allow the current port to be redeveloped by 2015 into a multipurpose logistics and commerce centre, incorporating an exhibition and cultural centre, leisure park and international passenger terminal.

Busan-Jinhae Free Economic Zone will compete with IFEZ for foreign investment in high-tech manufacturing.

5. Gwangju
Gwangju Technopark in Gwangju, Korea’s sixth largest city, is a prime example of attempts to create a stronger regional innovation system. Founded in 1998, it is one of 13 regional technoparks. Founder James Moon acknowledges that policies ‘legislated and implemented from the top are no longer relevant in the era of globalisation’ and have ‘deepened regional tensions and endangered national cohesion’. Gwangju Technopark houses 18 venture companies and specializes particularly in optical communications, photonics and LED/LD technologies. It is actively seeking to increase its international links.

Regional innovation
Regional innovation committees, to bring together universities, government and business, operate in 116 cities and counties. In addition, at least three complexes run by private companies are home to some of Korea’s best R&D. One of these is a semi-conductor cluster in Suwon, a key stop on the railway from Seoul to Busan and home to large parts of Samsung Electronics. An LCD cluster in Paju and the new materials cluster in Pohang are also privately owned.

An example - Wireless clusters and ubiquitous innovation
Cutting across all these attempts to create geographic clusters, however, is Korea’s heavy investment in broadband infrastructure, which may prove to be the distinctive ingredient in the Korean approach to innovation. Ubiquitous innovation is central to the branding of Songdo in IFEZ. ‘There are really no comparable comprehensive frameworks for ubiquitous computing,’ said Anthony Townsend, a research director at the Institute for the Future in Palo Alto, California, and a former Fulbright scholar in Seoul. ‘U-city is a uniquely Korean idea.’ If all goes well, Songdo’s ubiquitous wireless infrastructure should be a world first, piloting new technologies, lifestyles and services.

We will find out in Korea whether broadband networks can provide new non-physical spaces for innovation. By 2008, everywhere in Korea will have mobile access to the internet, even while traveling at speeds of up to 120km/hour thanks to the WiBro service being rolled out by South Korean internet service provider KT and mobile phone operator SK Telecom.

This could also reinvigorate innovation in rural areas. The Information Network Village project run by the Ministry of Government Administration and Home Affairs has invested more than $105 million since 2001 to bring broadband connectivity to 305 villages. Mexico plans to implement its own version soon. Delegations from 65 countries have visited Korea to investigate what is seen as a successful example of bridging the digital divide.
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