

Chapter 2

The Korean innovation system and the Creative Economy Strategy

This chapter provides an overview of the recent evolution of innovation and technology policies in Korea. The main features of the Creative Economy Strategy are described. Relevant legislative developments, the functions of key institutions, and governance arrangements are also examined.

The Korean innovation system is extensive and in many respects highly developed. That system has been one of the underpinnings of Korea's rapid industrialisation. However, long-standing policy emphases on manufacturing and large firms are today in question. Structural problems such as the relatively weak innovation performance of SMEs, a lagging services sector and limited domestic job creation among the industrial conglomerates have led to a shift in policy priorities. This shift is crystallised in the new government's Creative Economy Plan. The shift is not entirely new however. The fostering of creativity in an economic sense involves objectives and measures not greatly different from those espoused by recent previous governments (see, for example, World Bank/OECD, 2000). However, the current administration is instituting a particularly far-reaching and comprehensive set of measures aimed at fostering cutting-edge innovation and consolidating a knowledge-based economy driven to a growing extent by high-value services. This Chapter describes the recent evolution of policies towards innovation, the main features of the Creative Economy Strategy and the functions of the key institutions involved.

2.1. Technology and innovation policy, past and present

Policy from the 1960s to the mid-1990s

Korea is a well-known case of successful economic catch-up achieved through a government-led, manufacturing and export-oriented strategy. Korea is one of the few recent examples of a country that has managed to rapidly transform its agricultural economy, to the extent of becoming a leading industrial power. A major policy instrument in Korea's successful catch-up has been the multi-annual plans. From 1962 to 1992, the Korean government established seven consecutive Five Year Economic Development Plans which supported the creation of domestic capabilities. The Plans set clear targets and orchestrated actions across several fields, including industry and technology, trade, education and infrastructure. Each of the Plans identified key objectives, introduced selective policies and directed resources to achieve them. A major characteristic has been the gradual upgrading of targets in the different planning periods.

During the period 1962 to 1996 the *chaebols* – family-controlled conglomerates such as Samsung, Hyundai and LG – emerged and played a leading role in economic development. The government nationalised the banks so as to channel scarce capital to *chaebols* and encourage them to invest in industries it saw as strategic to achieving national objectives (the banks were privatised in the early 1980s). The government-favoured *chaebols* had special privileges and grew larger, with many SMEs acting as subcontractors to them.

As the main focus of Korean industrial development shifted from light to heavy and high-tech industry, the government supported the modernisation and technological upgrading of domestic industries by fostering learning and by progressively promoting the creation of domestic scientific and technological capabilities. From the mid-1960s, several government research institutes were established, such as the Korea Institute of Science and Technology (KIST). These institutes aimed to carry out R&D in key technological fields, with a view to supporting the industrial upgrading strategy. The Ministry of Science and Technology (MOST) was established shortly after, followed by the drawing up of the Science and Technology Promotion Law. In the 1970s R&D tax credits were introduced. This entire era has been described as one of imitation, with Korea putting in place a science and technology system that would allow it to absorb and adapt foreign technologies in support of industrialisation.

Table 2.1. Five year economic development plans, Korea, 1962-96

Five-year economic development plan	Principal objectives
1st (1962-66)	Building domestic light industry: textiles, etc. Infrastructure development: power plants
2nd (1967-72)	Building key domestic heavy and chemical industries (HCI): steel, machinery, chemicals, shipbuilding, etc. Infrastructure development: Gyeongbu expressway (Seoul-Busan)
3rd (1972-76)	Industrial restructuring: Building heavy and chemical industries (industrial complexes)
4th (1977-81)	Industrial restructuring: Strengthening heavy and chemical industries (building the bases for technological capabilities)
5th (1982-86)	Economic stabilisation: Industrial competitiveness by opening and rationalising the economy
6th (1987-91)	Regulatory reforms Supporting high-tech industries Building high-tech and innovative capabilities
7th (1992-96)	Revitalising the economy Establishing a basis for balanced development of industrial sectors and companies

Source: OECD (2012), “Industrial Policy and Territorial Development: Lessons from Korea”, Development Centre Studies, OECD Publishing, Paris. doi: [10.1787/9789264173897-en](https://doi.org/10.1787/9789264173897-en).

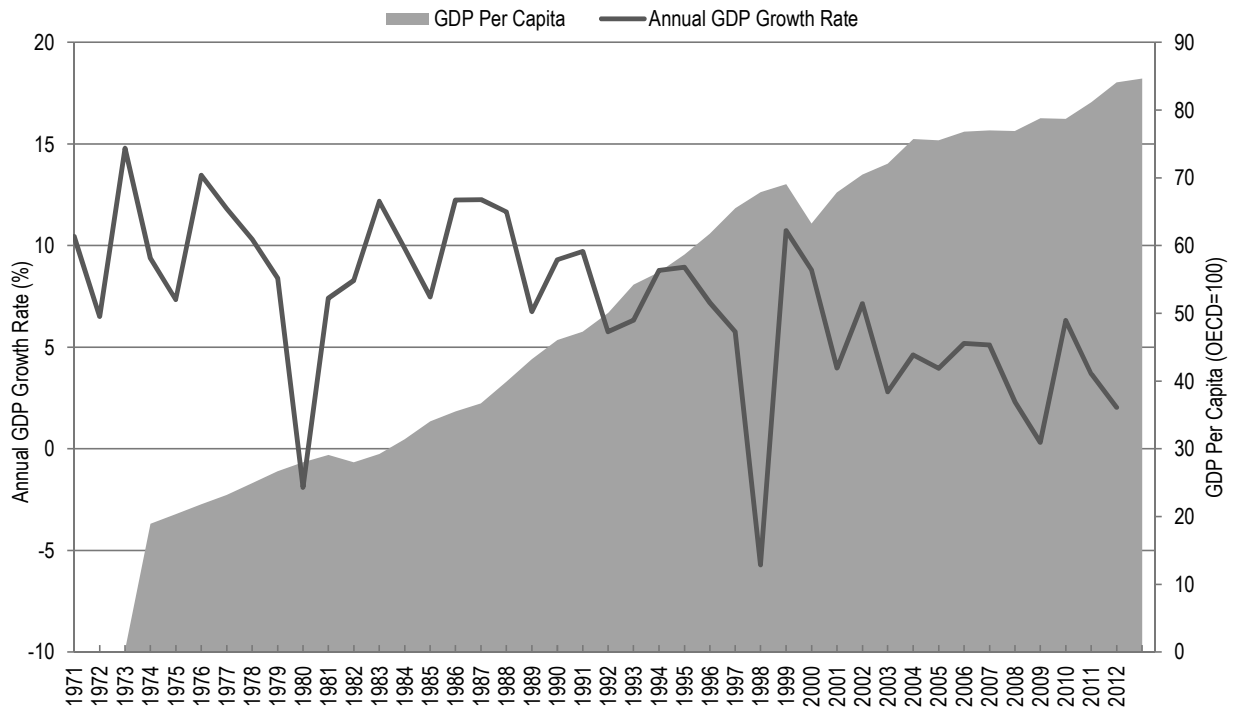
In the 1980s, the government looked to target core technologies that would actively lead Korean national economic growth rather than passively supporting industry’s technological demands. The first national R&D programme initiated by MOST was introduced in 1982. Shortly afterwards, similar R&D programmes were set up in various ministries. In particular, a separate directorate to support industrial R&D was set up in the Industry Ministry.

In addition to public funding of R&D, the private sector was encouraged to engage actively in absorbing and improving technologies from countries operating at the technological frontier, such as the United States and Japan. Learning has been supported in several ways, from selective human resource mobility programmes to controlled capital imports and targeted support for technology transfer. During this phase, however, productivity increased mainly as a result of the extensive use of low-waged labour and processes of reverse engineering, rather than technological innovation.

Policy from the mid-1990s to 2012

Since the second half of the 1990s the Korean government has been pressured to change its catch-up oriented industrial development policy, based on extensive labour and capital input, and to seek new growth engines. Economic growth, which averaged more than 8% a year from 1960 to 1997, slowed from the mid-1990s to a yearly average of 5%. The Asian financial crisis in 1998 caused negative GDP growth (-5.7%) and mass unemployment. There has been growing concern that the legacies of past successes are obstructing further advances for Korea in the broader context of the information and knowledge economy. These legacies include the nature of the catch-up strategy, the dominant role and sometimes alleged unfair business practices of the *chaebol* (which are believed to weaken the innovation capacity of SMEs), and a lagging services sector compared to manufacturing.

Figure 2.1. GDP growth and income per capita, Korea, 1971-2011



Source: OECD (2013), “National Accounts at a Glance 2013”, *OECD National Accounts Statistics* (database). doi: [10.1787/data-00652-en](https://doi.org/10.1787/data-00652-en).

In 1998, when President Kim took office, the country launched drastic reforms in the areas of government, labour, business and finance. In addition, Korea searched for new sources of growth appropriate to the knowledge economy. The government extensively supported ICT and creative venture companies.¹

In 2003, the Roh government initiated an extensive innovation-oriented drive in all sectors of the economy, and looked to the subnational regions – which are underdeveloped relative to the capital area – as a new source of growth. As part of this effort, the Five Year Balanced National Development plan (2004-2008) was introduced and implemented, and included the transfer of most ministries and public agencies to provinces outside of Seoul from 2012. Ten industries – such as digital TV and displays – were designated to develop as Korea’s Next Generation Growth Engines. The government also launched a so-called ‘win-win’ strategy between SMEs and large companies.

Since 2008, the Lee government sought to strengthen potential output growth and create employment by developing a more favourable business environment, and making the economy more knowledge-based. The Ministry of Commerce, Industry and Energy became the Ministry of Knowledge Economy. The government searched for new sources of growth, such as “green growth” and a selection of 17 technologies and sectors.² President Lee continued the ‘win-win’ strategy (the name of the policy was changed to ‘shared growth’) through key reforms such as designating SME-suitable business areas, and introducing a profit sharing system.

These efforts to transform Korea into an innovation-driven economy produced a variety of technology and innovation measures, co-ordinated by the promulgation of national laws and national plans. At the highest level is Vision 2025, formulated in 1999. This proposed the following fundamental shifts in technology policy: i) moving from a government-led and development-oriented innovation system to a private industry-led and diffusion-oriented innovation system; ii) moving from a closed R&D system to a globally networked R&D system; iii) moving from a supply-dominated investment enhancement strategy to an efficient utilisation and investment-distribution strategy; iv) moving from a short-term technology-development strategy to a long-term market-creating innovation strategy; and v) moving towards a science and technology-led national innovation system. Based on Vision 2025, the Science and Technology Framework Law was created to promote science and technology more systematically. The Framework Law is the legal basis for five-year Basic Plans of Science and Technology (2003-07 and 2008-12). The Basic Plans are Korea's overarching guide for the conduct of science and technology policy. In addition to the Basic Plans, in 2008 the Lee government announced the "577 Initiative". This included several ambitious targets: to reach an R&D intensity of 5% by 2012; to focus upon seven key areas of R&D and seven support systems (world-class human resources, basic and fundamental research, SME innovation, science and technology globalisation, regional innovation, science and technology infrastructure, and science and technology culture); and to become one of the seven major science and technology powers in the world.

Technology and innovation policy today

The current Park government took office in 2013 and is continuing the efforts of the previous governments to turn Korea into an innovation front-runner rather than an effective innovation follower and to seek new means of ensuring continued economic growth. In this context, President Park, elected in 2012, has launched plans to develop a 'creative economy' and accomplish 'economic democratisation'.

President Park has set up a new ministry – the Ministry of Science, ICT and Future Planning (MSIP) – which is in charge of driving the creative economy strategy. In June 2013 the MSIP drew up the guiding plan for the creative economy, the "Creative Economy Plan". With respect to the possibly ambiguous concept of 'creative economy' the Plan stated that "Korean creativity and imagination will be combined with science, technology and ICT to create new industries and markets, and to make existing industries stronger and thus create decent jobs". The Plan also affirmed that 'the Korean economy has reached the limits of the catch-up strategy which had driven economic growth for the last 40 years, and the government is now working to switch the Korean economic paradigm to that of the leading type of growth founded on creativity.'

The Creative Economy Plan establishes a vision for "realising a new era of happiness for the Korean people through a creative economy", setting three goals, six strategies, and 24 tasks. The three goals are:

- Create new jobs and markets through creativity and innovation;
- Strengthen Korea's global leadership through a creative economy;
- Creating a society where creativity is respected and manifested.

The six strategies are to:³

- Properly compensate for creativity and create an eco-system that promotes the creation of start-ups;

- Strengthen the role of venture firms and small and medium-sized enterprises (SMEs) in the creative economy and improve their ability to enter global markets;
- Create growth engines to pioneer new markets and new industries;
- Foster global creative talent that has the spirit to rise to challenges and pursue dreams;
- Strengthen innovation capacities in science, technology and ICT, which form the foundation of the creative economy;
- Promote a creative economic culture together with the Korean people.

Within each of these six strategies there are typically 3-5 tasks to be accomplished (see Box 2.1). Relevant ministries and agencies will develop and implement appropriate tasks from among this list, which will be co-ordinated by the newly formed MSIP. The government also plans to set up a public-private partnership which is expected to help effective implementation of the Creative Economy Plan through constantly receiving the views of private sector actors and reflecting these in policies.

Even though ‘creativity’ is clearly emphasised in the Creative Economy Plan, the objectives and measures of the Plan are not greatly different from those announced by recent previous governments. However, the current government gives new emphasis to the role of venture firms and start-ups and has drawn up a wide range of measures to reinvigorate them. The government regards venture firms and start-ups as key to the creation of new markets and jobs (a view which accords with international evidence that new and small firms act as sources of radical innovation and carriers of structural change).

However, some SMEs and innovative start-ups may find it hard to thrive if in some sectors the *chaebol* rely primarily on their in-house networks of suppliers, and as long as getting a job at LG, Samsung or Hyundai remains a principal goal for college graduates. Therefore, President Park promised ‘economic democratisation’ during her presidential campaign and has committed to addressing Korea’s chronic challenge of a widening productivity gap between SMEs and large companies, as well as any anti-competitive practices of the *chaebol* with respect to SMEs.

In 2013, Korea’s National Assembly approved several revisions to laws aimed at curbing conglomerates’ unfair business practices and creating a level playing field for companies of all sizes. Among these changes are provisions that: subsidiaries of a *chaebol* will face constraints in awarding supply orders and contracts to sister companies without competitive bidding; unreasonable determination and reduction of subcontracting prices will be liable for punitive damages of up to three times the damage caused; the maximum share of a bank that a *chaebol* can own will be reduced to 4% – from 9% – to prevent manufacturers from owning too large a part of financial firms (which addresses concerns that conglomerates might seek to bend banking rules to secure loans for their units); and the rights of franchise owners under franchise deals with big companies will be protected through several measures, such as not allowing another store of the same type to open in the area.

Based on the creative economy strategy, the new five-year Basic Plan for Science and Technology (2013-17) has been launched. The Basic Plan’s vision is one of “pioneering a hopeful new generation guided by creative science and technology” which is an acknowledgement of the broader creative economy initiative. Compared to the previous Basic Plans, this Plan is characterised by a strengthening of R&D’s ties to economic growth, technology commercialisation and job creation (NSTC, 2013).

Box 2.1. The six strategies of Korea's creative economy plan

1. Properly compensate creativity and develop an ecosystem that promotes start-ups

For start-ups:

- Support for start-up funding is to change from the previous loan-based structure to an investment-based one.
- Tax benefits to boost angel investment: Capital gains taxes can be deferred. If cash from the stock sales of existing ventures are reinvested in another venture, the capital gain tax on the sales (10%) will be deferred until the new shares are cashed out. To foster angel investment, the deduction rate of income tax will increase from 30% to 50% for up to 50 million Korean Won (KRW) of investment, while the rate for the amount for over KRW 50 million will remain at 30%. The deduction limit on total annual income will be raised from 40% to 50%.
- A crowd-funding system will be introduced to provide an on-line funding platform for small-scale investments in start-ups. And a KRW 500 billion 'Future Creation Fund' will be created (KRW 200 billion for start-ups and KRW 300 billion for mergers and acquisitions [M&A]). This fund will give private investors priority in profit distribution.
- A door will be opened for venture capital firms of overseas Koreans to receive investments from the Fund of Funds (FOF) under equal conditions to domestic venture capital firms. For top-tier venture capital firms from foreign countries the FOF will also provide active collaboration if they want to invest in Korean start-ups. Overseas Koreans will also be eligible for support from the Angel Investment Matching Fund. The government will form the 'Start-up Supporters for Young People' with successful venture businessmen at home and abroad. It will also actively invite overseas Koreans to mentor and invest in Korean start-ups.
- The government will also introduce the 'Start-up-Friendliness Index' to the evaluation of government-funded research institutions.

For growth and exit stages:

- M&A is not a common exit route for venture companies in Korea. To promote M&A for the purpose of new technology acquisition the government will provide new tax benefits. 10% of the value of technology in an M&A deal will be deductible from the buyer's corporate tax. To allow large firms to actively acquire venture companies, when it acquires a venture company or an SME with a minimum of a 5% R&D investment ratio the large company will be able to postpone the affiliation of the acquired company for three years.
- A Growth Ladder Fund (public KRW 0.6 trillion, private funds KRW 0.4 trillion) will consist of stocks, mezzanines, asset-backed securities and loans for growth and exit stages, including the protection of intellectual property rights, support for M&A, IPO and restart-up.
- The government will expand participation from accounting firms and overseas consulting firms in the operation of the 'M&A Information Network'. To promote M&A it will introduce a certification system for brokerage institutions and will increase their incentives by giving them priority in the M&A Matching Fund.
- The Korea New Exchange (KONEX) will be established to boost the growth of innovative start-ups. KONEX's listing requirements and items subject to public notice will be minimised. In the case of M&A activity between a company listed on the KONEX and a company that is not, some regulations for listed companies will be excluded. Restrictions on venture investment partnerships will not be applied to KONEX-listed companies.

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Box 2.1. The six strategies of Korea’s creative economy plan (*continued*)

- The KOSDAQ market will undergo significant reform. The government will separate the KOSDAQ Market Committee from the Board of Directors at the Korea Exchange and will strengthen the organisation and function of the Committee to the level of an independent organisation. The government will also seek to improve the operation of the Listing Committee by staffing it mainly with experts in technology and by relaxing listing requirements.
- The government will operate a KRW 100 billion ‘Restart Support Fund’. Restarting companies will also receive preference in the Angel Investment Matching Fund.

2. Strengthen the role of venture companies and SMEs in the creative economy and support entry in global markets

- Attracting a technical workforce to venture and start-up companies. The government will expand the current availability of stock options in a venture company. A Start-up Visa will be introduced to remove obstacles for foreigners with good technologies wishing to start a business in Korea.
- Corporations with promising future products will be given opportunities to enter public procurement markets through the Excellent Product System and can also be publicised in the government-sponsored online shopping malls.
- The protection of technology and prevention of piracy will be strengthened. KRW 100 billion will be added to the Intellectual Property Right Fund, which can buy patents from SMEs and lease the right back to the SMEs so as to protect the patents and technology of companies. Stronger sanctions will also be introduced against unauthorised use of technology. The government will expand its ‘Technology Deposition Safe’ system, which proves the ownership of technology by keeping technologically valuable items such as design drawings in public institutions. Support will also be increased for companies to apply for patents in the United States and other foreign countries after acquiring domestic patents. Abuse of trade secrets will be monitored closely.

3. Growth engines to pioneer new markets and new industries

- Efforts will be made to combine science, technology and ICT in existing industries. Under the ‘Vitamin Project’, industries which were traditionally strong but are now lagging will improve their productivity by expanding management systems based on IT. Steps will also be taken to rationalise regulations that affect market creation and industry convergence.
- Unlike the previous one-time (even if sometimes long-term) loan guarantees, the government will provide SMEs pursuing technological and industrial convergence with loan guarantees tailored to each stage of the process (such as technology transfer or commercialisation).
- Creating new industries based on software and the Internet. More than 5 000 people will be trained as software security professionals by 2017. The Korea Digital Contents Fund (KRW 400 billion) will aim to promote content production and business creation in industries such as music, film, games, animation and music. To foster new Internet industries, the Cloud Computing Development Act will be enacted and a Big Data Analysis and Utilisation Centre will be established.
- Investment in new future-oriented industries will be promoted. Promising future sectors such as biomedical, nano and environment technology and large-scale national strategic industries such as satellites and nuclear power will be given more support.

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Box 2.1. The six strategies of Korea’s creative economy plan (*continued*)

4. Fostering global creative human resources

- The development of creative talent will be strengthened. Support will be given, for instance, to develop new didactic material for elementary and middle school students, convergence classes and departments for university students. A technology start-up camp will be operated and a new mentoring programme developed. Overseas jobs will also be announced to the public through K-Move Portal and the Global Internship Programme.

5. Strengthening the innovation capacity of science, technology and ICT

- Government investment in basic research will be increased by up to 40% by 2017. To provide opportunities for creative young researchers, Future Challenge Adventure Research Projects will be conducted. The evaluation process for basic research will be simplified.
- Promising future technologies such as 5G mobile communication and realistic media will be developed and next-generation networking industries fostered.

6. Building a creative economy culture

- A Creative Economy Expo will be held for the public, giving publicity to success stories. Infinite Imagination Rooms which provide mentoring programmes to the public will be established. An on-line portal for the creative economy – Creative Korea – is available. Government-owned data useful to create new business models will be opened to the public, with enactment of the Public Information Supply and Use Stimulation Act. Channels for communication between the public and private sectors will be strengthened.

Source: MSIP (2013), “Korea’s Creative Economy Plan”, Press release, June 2013, Korea, and MOSF (2013), “Plan for Venture and Start-up Ecosystem”, May 2013, Korea.

The Basic Plan for Science and Technology has three policy goals with five strategies and 18 tasks. The three goals are: to contribute 40% of economic growth through R&D; to create 640 000 jobs; to raise Korea’s innovation capability to the level of the top seven globally.

The five strategies are:

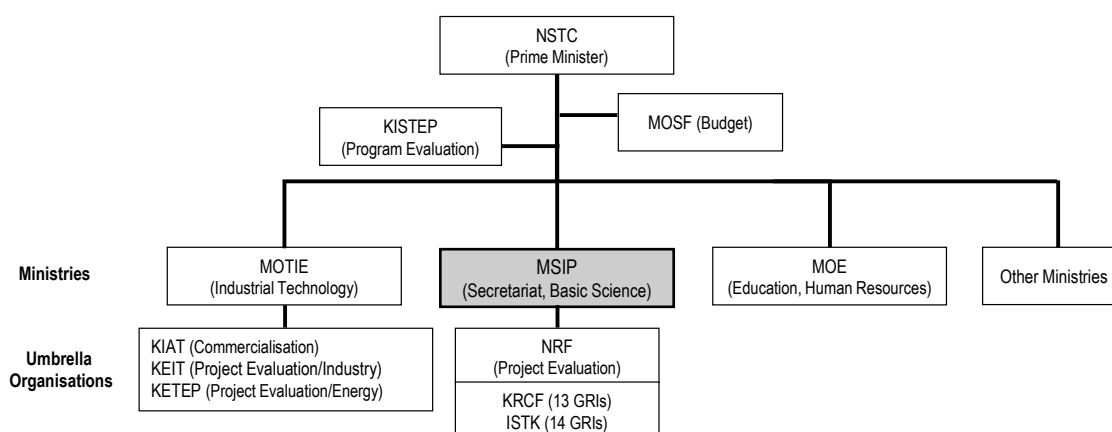
- Enhancement of R&D investment and maximising efficiency, including raising R&D support from KRW 68.0 trillion to KRW 92.4 trillion between 2013 and 2017, up 35% from the previous government;
- The strategic development of technologies: 30 priority and 120 strategic technologies have been identified, covering energy, environment, ICT and healthcare fields; more specifically, priorities include smart grids, carbon capture and storage, big-data applications and personalised pharmaceuticals;
- Building mid to long-term creative capability through greater funding for basic sciences and international exchange;
- Greater support for SMEs and venture companies in new industries, and the stimulation of intellectual property generation and commercialisation; and,
- Creating new science related jobs, in part through new measures to boost start-ups.

The MSIP is responsible for the Basic Plan and emphasises that the Plan will be implemented effectively through linking to the process of R&D budgeting, co-ordination and evaluation. MSIP also plans to draw up a strategic roadmap for the 30 priority technologies, together with other ministries.

2.2. Technology and innovation policy system

In most OECD countries, the governance of technology and innovation is organised around a multi-layered matrix of ministerial bodies, advisory structures and a range of other actors, all concerned with the making and steering of policy and its implementation. This situation is similar in Korea, which has a rich organisational landscape of ministries, public agencies and co-ordination bodies engaged in formulating, implementing and evaluating technology and innovation policy (Figure 2.2). This section briefly describes the main ministries, public agencies and co-ordination arrangements in the area.

Figure 2.2. The technology and innovation system in Korea, 2013

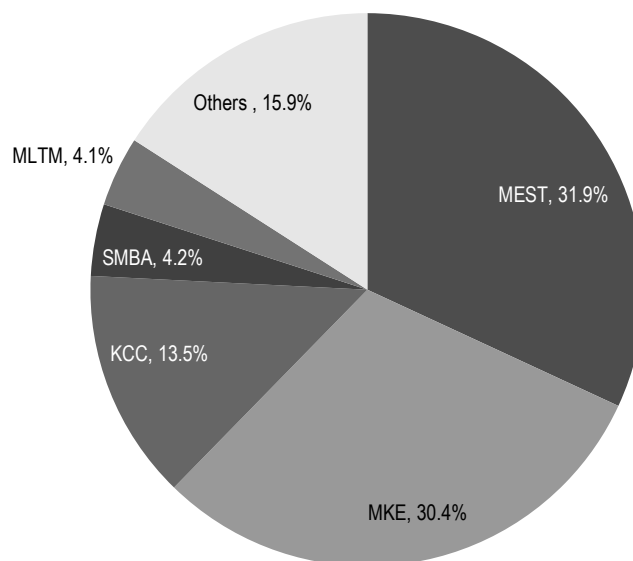


NSTC: National Science & Technology Council; MOSF: Ministry of Strategy and Finance; MOTIE: Ministry of Trade, Industry and Energy; MSIP: Ministry of Science, ICT, and Future Planning; MOE: Ministry of Education; KISTEP: Korea Institute of S&T Evaluation and Planning; KIAT: Korea Institute for Advancement of Technology; KEIT: Korea Evaluation Institute of Industrial Technology; KETEP: Korea Institute of Energy Technology Evaluation and Planning; NRF: National Research Foundation; KRCF: Korea Research Council of Fundamental Science and Technology; ISTK: Korea Research Council of Industrial Science and Technology.

Ministries and public agencies

Technology and innovation policy in Korea is organised around many ministries engaged in policy formulation, implementation and evaluation. The key ministries, however, are MSIP and MOTIE (Ministry of Trade, Industry and Energy), both of which account for more than 60% of total public R&D expenditures in 2013 (MSIP accounted for 31.9% of total public R&D, and MOTIE 30.4%). Other ministries with significant research responsibilities include: the Defence Acquisition Programme Administration (DAPA); the Small and Medium Business Agency (SMBA); and the Ministry of Land, Infrastructure and Transportation (MOLIT).

The Ministry of Strategy and Finance (MOSF) is also involved in technology and innovation policy in terms of budget allocation. MOSF allocates the total R&D budget to ministries on the basis of their technology and innovation programmes, including the R&D they perform, and to government research institutes in the form of block funds, after approval by the National Assembly each December.

Figure 2.3. Share of public R&D investments by ministry, 2012

MEST: Ministry of Education, Science, and Technology; MKE: Ministry of Knowledge and Economy, former MOTIE; KCC: Korea Communications Commission; SMBA: Small and Medium Business Administration; MLTM: Ministry of Land, Transport and Maritime Affairs.

Source: KISTEP (2012), “Government Research and Development Budget Analysis in the FY 2012”, Korea Institute of Science and Technology Evaluation and Planning, Korea.

As noted earlier, created by President Park, the MSIP (Ministry of Science, ICT and Future Planning) is a super-ministry responsible for driving the creative economy forward through science and ICT. Launched in February 2013, MSIP has incorporated the science and technology functions of the former MEST (Ministry of Education, Science and Technology)⁴, as well as ICT functions which had been dispersed in several ministries, such as the former MKE (Ministry of Knowledge Economy).⁵ The organisational structure of MSIP gives the ministry two “wings”, one dedicated to science and technology and the other to ICT, each headed by a different vice minister. However, there is a concern that the integration of the two will occur, and that science and technology policy, which needs a long-term approach, could be relatively neglected in favour of ICT, which may have more challenges of a short-term nature. MSIP’s major functions are to:

- Formulate and co-ordinate the creative economy strategy;
- Co-ordinate national science and technology policy;
- Formulate, implement and evaluate basic science R&D policy;
- Plan, promote and support the development of core, future-oriented and large-scale technology;
- Support basic and applied research conducted by GRIs, universities and private research institutes;
- Attain technological self-reliance and the safe use of nuclear technology;
- Promote public awareness of S&T; and,
- Promote ICT infrastructure and industry.

MOTIE, formerly MKE, is responsible for the development, transfer and commercialisation of industrial technology and facilitating business innovation. IT-industry promotion activities that formerly were the responsibility of MKE have been transferred to MSIP. Trade negotiation activities of the former MOFAT (Ministry of Foreign Affairs and Trade) were incorporated in MOTIE. The key mandate of MOTIE in terms of technology and innovation includes:

- Formulating, implementing and evaluating industrial R&D policy;
- Fostering the transfer and commercialisation of industrial technologies, and industrial standards;
- Promoting the regional innovation system;
- Enhancing companies' intrinsic ability to innovative;
- Facilitating private investment in R&D;
- Strengthening global co-operation in joint technology development; and
- Formulating demand-side technology policy.

Both MSIP and MOTIE consult with public organisations, funded by the ministries, to formulate, implement and evaluate technology policies. MSIP relies on the Korean Institute of Science and Technology Evaluation and Planning (KISTEP) for planning, co-ordinating and evaluating national R&D programmes. The National Research Foundation (NRF) supports MSIP in funding and performance management of the basic science R&D projects for which MSIP is responsible.

MOTIE relies on the Korean Institute for Advancement of Technology (KIAT) for designing industrial technology policy. KIAT conducts research and analysis on issues relating to industrial technology and innovation, and draws up industrial technology road maps. MOTIE conducts the evaluation of industrial technology R&D projects through support from the Korea Evaluation Institute of Industrial Technology (KEIT), KIAT and the Korea Institute of Energy Technology Evaluation and Planning (KETEP). KEIT is in charge of the manufacturing sector, while KETEP is responsible for energy sectors. KIAT also supports MOTIE in the evaluation of regional R&D projects.

With the exception of KISTEP, these evaluation and management organisations (NRF, KEIT, KETEP and KIAT) publicly propose various R&D projects in the sectors for which they are responsible, garner proposals from researchers, select appropriate researchers for projects, monitor and review the performance of projects, evaluate the final performance of annual and multiannual projects and report the end results to their respective ministries. KISTEP is not involved in the evaluation of individual R&D projects, but is involved in the evaluation of overall national R&D programmes, establishing standards for ministries' evaluation of their own R&D programmes, and monitoring the quality of the evaluations conducted by ministries (which will be discussed in detail later).

The Science and Technology Policy Institute (STEPI) is a think tank for science and technology policy. STEPI conducts research and analysis on issues relating to science and technology, and provides ministries and public organisations with policy ideas and suggestions for the promotion of technology and innovation.

Box 2.2. The main public organisations for technology and innovation

The Korean Institute of Science and Technology Evaluation and Planning (KISTEP) is the main STI planning agency in Korea, and supports MSIP in co-ordinating and evaluating national R&D programmes. Its specific functions are: to formulate, co-ordinate and support major S&T policies, including forecasting S&T development trends; to analyse and evaluate S&T-related programmes implemented by all government ministries while providing support for co-ordinating and distributing R&D budgets; to conduct research into domestic and overseas research planning, evaluation and management systems; and, to disseminate R&D policy information and data.

The National Research Foundation (NRF) manages and evaluates basic science R&D projects, provides subsidies for operating academic research organisations, supports domestic/international academic exchanges, supplies facilities and accommodation for academic activities, provides scholarships or loans for education, conducts surveys, analyses and evaluations, and collects statistics on support and management of research conducted in universities.

The Korean Institute for Advanced Technology (KIAT) supports MOTIE's industrial technology policy (e.g. through research and statistical analysis, trend and competitor analysis, technology road mapping). Main functions also include evaluation and management of regional industry support projects; upgrading innovation capability through international joint R&D and co-operation; and, promoting the transfer and commercialisation of developed technology.

The Korea Evaluation Institute of Industrial Technology (KEIT) is dedicated to supporting MOTIE's industrial R&D project planning, and evaluation and management, and to undertaking technology demand surveys and technology forecasting in manufacturing.

The Korea Institute of Energy Technology Evaluation and Planning (KETEP) supports MOTIE in designing industrial technology policy (e.g. through research and statistical analysis, trend and technology road mapping). KETEP also evaluates and manages national R&D projects in the area of energy.

The Science and Technology Policy Institute (STEPI) conducts research and analysis on issues relating to science, technology and innovation. STEPI also provides government agencies with policy ideas and suggestions for the promotion of innovation, suggests strategic options for technological development by the public and private sectors, and creates and disseminates S&T policy information and data.

Source: Various brochures and websites of the agencies concerned.

Government Research Institutes (GRIs)

Since the 1960s, Korea's Government Research Institutes have played a key role in conducting fundamental research and supporting technology development and adaptation by Korean firms. A description of the GRIs, their functioning and proposals for their reform are contained in Chapter 4.

Governance of technology and innovation policy

A key challenge for Korea has been to co-ordinate its fast-growing list of policy measures (and the activities of institutions devoted to delivering such measures). Perhaps more than most countries, Korea has taken the issue of policy co-ordination seriously. Recent years have seen the introduction of several reforms aimed at avoiding any duplication of policies and programmes between ministries and addressing insufficient inter-ministerial co-operation. Korea's major policy co-ordination effort comprises three mechanisms: the promulgation of laws and national plans; institutionalising horizontal co-ordination; and the evaluation of public R&D programmes. These are briefly described below.

The promulgation of laws and national plans

The Science and Technology Framework Law of 2001 was created to promote science and technology more systematically. It includes provisions for the formulation of mid and long-term policies and implementation plans, and is the legal basis for inter-ministerial co-ordination of science and technology policies and R&D programmes. It also provides the overall framework of support for R&D activities and science and technology agencies, and the legal basis for fostering an innovation-driven culture. Based on the Framework Law, five-year Basic Plans for Science and Technology (2003-07, 2008-12 and 2013-17) have been formulated. Each Basic Plan proposes 5-year goals and a strategy for the nation's science and technology policy, as well as inter-ministerial tasks to achieve the goals. Based on the Basic Plan, each ministry draws up its own technology promotion plan (e.g. MOTIE's 5-year Basic Industrial Technology Plan)

Institutionalising horizontal co-ordination

An important challenge for the Korean government has been to improve co-ordination among the many ministries and agencies with a stake in R&D and, more broadly, innovation. The scale of the co-ordination task has been complicated by Korea's densely populated organisational landscape of ministries and public executive agencies involved in technology and innovation policy and programming. In this regard, it is important to understand the division of labour among the various ministries that support research. Currently, MSIP is focused on funding universities and public research institutes associated with basic and applied research, and supporting R&D activities of the ICT industry. MOTIE, however, emphasises support for SMEs associated with developmental research at the pre-commercial stage. Other ministries support universities, research institutes and industries associated with their own functions. In practice, there had been some overlap between the targets and types of funding available, so that ministries' traditional foci had become somewhat blurred.

To eliminate unnecessary duplication and enhance the coherence of a distributed set of policies and programmes, Korea created the National Science and Technology Commission (NSTC) in 1999. It was composed of 13 ministers with an STI policy remit, plus nine experts from the S&T community. The NSTC, a cross-ministerial body, was expected to play a pivotal role in policy co-ordination among ministries since the president took the chairmanship. Since its creation, and to make it more effective and efficient, the NSTC has experienced a succession of changes in its governance system. In 2011, the previous Lee administration made NSTC a permanent organisation with its own secretariat so as to enhance its independence and accountability (previously, the Ministry of Education, Science and Technology fulfilled the secretariat function). The ministers were excluded from membership. Instead, the president appointed a civilian commissioner, two standing commissioners, and seven non-standing commissioners.

The current Park government also reformed the NSTC's governance. The independent secretariat was abolished and its function taken over by MSIP. The change was aimed at giving MSIP, the Park government's flagship ministry, the authority to co-ordinate national R&D and technology policy. The composition of members also substantially returned to that which existed before 2011 (ministers now participate in the NSTC and the only difference is that the Prime Minister, and not the President, acts as the Commissioner of the NSTC). The mission of the NSTC, however, remains the same as with the previous governments. The Council has the following responsibilities:

- Co-ordination of major policies and a plan for science and technology promotion;
- Establishment of a Basic Science and Technology Plan;
- Distribution and co-ordination of the national R&D budget;
- Investigation, analysis and evaluation of national R&D programmes; and,
- Co-ordination of policy for science and technology human resources development.

The NSTC has authority to make decisions over 70% of all public R&D-related funding. Major R&D programmes must be reviewed by the NSTC, and the MOSF should respect the NSTC’s review in making budget allocations. On behalf of the NSTC, KISTEP evaluates the performance and effectiveness of every programme and its assessments are reflected in the following year’s R&D budget.

The recent changes in the NSTC structure, however, have raised some concerns. These concerns centre on the independence and accountability of the NSTC. As MSIP, one of the ministries responsible for its own R&D programmes, takes over the secretariat function of the NSTC, MSIP acts as both “player” and “referee”. This is a main reason why the previous government set up an independent secretariat under the NSTC.⁶

Table 2.2. Organisational history of the NSTC

	1999-2003	2004-07	2008-10	2011-12	2013-
Organisational composition	Chair: President Governmental members (14) private sector members (3)	Chair: President Governmental members (13), private sector members (8)	Chair: President Governmental members (10), private sector members (13)	Chair: appointed by the President Standing Commissioners (2), private sector members (7)	Chair: Prime Minister Governmental members (10), private sector members (9)
Secretariat	Ministry of Science and Technology	Office of Science and Technology Innovation (under MOST)	Ministry of Education, Science and Technology	Internal Secretariat	Ministry of Science, ICT and future Planning

Evaluation of public R&D programmes and budget allocation

The evaluation of R&D programmes, as part of the R&D budget allocation process, also plays a role in co-ordinating Korea’s technology and innovation policies. The Korean system of evaluation for public R&D support is considered in Chapter 3.

R&D investment and support

Despite budget constraints caused by the global financial crisis, the Korean government has invested significantly in R&D. The Previous Lee government targeted total R&D investment of up to 5% of GDP by 2012. As a result, government R&D investment in 2012 was 1.5 times as high as in 2008. According to the new five-year Basic Plan of Science and Technology (2013-17), the increase in R&D investment is expected to continue. The current government plans to achieve annual average R&D investment of KRW 18.5 trillion between 2013 and 2017 (an increase of 35% from the previous government). Moreover, the Basic Plan for Science and Technology specifies that the government will raise the proportion of fundamental research to 40% of total R&D expenditure (in 2011 this was 30.7%). The R&D investment will focus on developing a total of 120 technologies,

especially 30 priority technologies in five sectors (social safety; health care; the environment; future growth engines; and ICT combined with other industries).

Table 2.3. Public R&D investment, Korea, 2009-12

KRW trillion					
	2009	2010	2011	2012	Average growth rate
Total government expenditure	284.5	292.8	309.1	325.4	4.6%
Total government R&D	12.3	13.7	14.9	16.0	9.2%
(Number of projects)	(39 471)	(39 179)	(41 619)	(-)	

Source: Office of Prime Minister (2012), “Review and Future Direction of the New Growth Engines”, Korea.

The Korean government has been providing diverse tax incentives to promote the private sector’s R&D investment and innovation activities. Korea’s R&D tax credit is provided on either the volume of R&D expenditure or incremental R&D expenditure (see Chapter 5).

Technology transfer and commercialisation

Like other OECD countries, Korea has actively engaged in promoting technology transfer and commercialisation. The institutions and policy measures adopted to meet this challenge are examined in Chapter 4.

International technology co-operation

Weak international research collaboration and the relatively small number of foreign researchers working in Korea all suggest that the Korean innovation system is only loosely linked to international knowledge networks. Against this background, the Korean government has been enacting policy initiatives to increase the internationalisation of its research base. In the new Basic Plan for Science and Technology, devised in 2013, Korea has announced a push for the globalisation of its science and technology. In this connection the government has identified several targeted tasks. Among them are: expanding international joint research on global challenges such as climate change and energy; establishing Korea as a hub of global science and technology; increasing overseas development assistance in science and technology; and building infrastructure for international co-operation.

In Korea, several ministries have started their own international programmes. The two biggest are MSIP’s Internationalisation Programme of science and technology in the area of fundamental science and technology and MOTIE’s International Joint Research and Development Programme, which focuses on industrial technology. Both programmes are conducted by their umbrella agencies. The Korea Foundation for International Co-operation of Science and Technology (KICOS) used to support MSIP for international co-operation, but with the abolishment of KICOS NRF now performs that task. On the other hand, KIAT, on behalf of MOTIE, has operated several programmes to facilitate international technology co-operation.

Notes

1. A legal definition of ‘venture company’ exists in Korea. The Korean government enacted the ‘Special Measures on the Promotion of Venture Companies’ in 1997 to promote venture start-ups. According to that law, a venture company is defined as a small and medium business in which: 1) a venture capital company has invested; 2) research and development expenses are large in relation to its revenue; or 3) the main business activity is technology related.
2. The 17 sectors representing new growth engines are: Green Technology (new and renewable energy, low-carbon energy, advanced water processing, LEDs, green transportation systems, and high-tech green cities); High-tech Convergence (broadcasting and communications, IT convergence, intelligent robots, nanotechnology, biopharmaceuticals and medical devices, food industry); Value-added services (health care, education, green financing, content and software, and conventions and tourism).
3. In May 2013 the details of the first and second strategies were released in advance in ‘Measures to Develop a Virtuous Cycle in the Venture Start-up Capital Ecosystem’.
4. Responsibility for the education function has been given to MOE (Ministry of Education).
5. The former MKE has now become MOTIE.
6. MSIP and KISTEP have emphasised that since the ministers participate and discuss in the NSTC, presided by the Prime Minister, co-ordination works properly. However, considering that the NSTC’s Commissioner used to be the President, before the NSTC became permanent during 2011 - 2012, its co-ordination authority must be weakened to some extent.

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