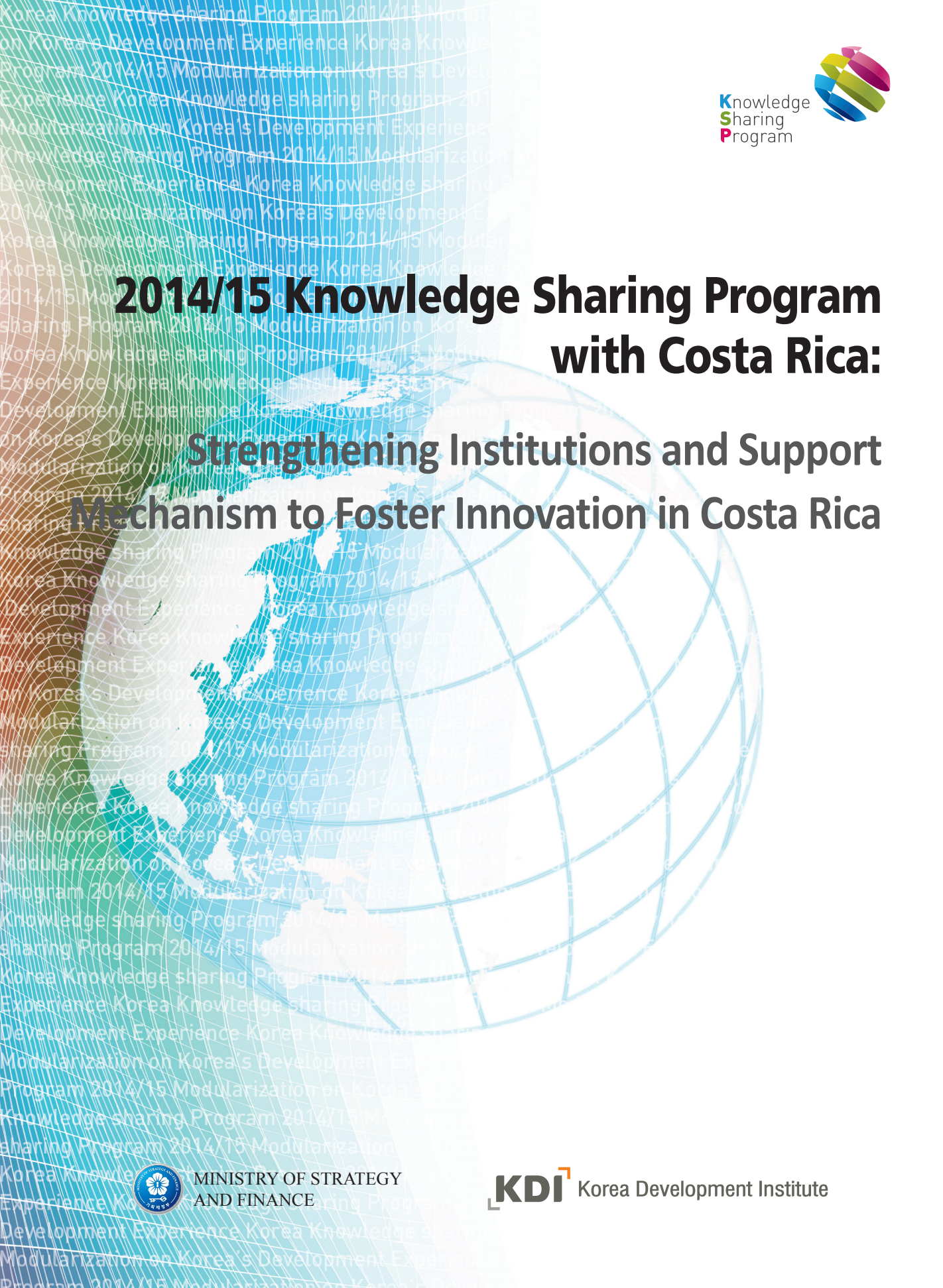
Knowledge Sharing Program

2014/15 Knowledge Sharing Program with Costa Rica:

Strengthening Institutions and Support Mechanism to Foster Innovation in Costa Rica



MINISTRY OF STRATEGY AND FINANCE

KDI Korea Development Institute

2014/15 Knowledge Sharing Program with Costa Rica

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Preface

In the 21st century, knowledge is one of the key determinants of a country's level of socio-economic development. Based on this recognition, Korea's Knowledge Sharing Program (KSP) was launched in 2004 by the Ministry of Strategy and Finance (MOSF) and the Korea Development Institute (KDI).

KSP aims to share Korea's experience and knowledge with the partner countries to achieve mutual prosperity and cooperative partnership. Former high-ranking government officials are directly involved in the policy consultation to share their intimate knowledge of development challenges, and to complement the analytical work of policy experts and specialists who have extensive experience in their fields. The government officials and practitioners effectively pair up with their counterparts in the development partner countries to work jointly on pressing policy challenges and share development knowledge in the process. The program includes policy research, consultation and capacity-building activities, all in all to provide comprehensive and tailor-made assistance to the development partner countries in building a stable foundation and fostering capabilities to pursue self-sustainable growth.

In 2014, policy consultation and capacity building workshop were carried out with 29 partner countries covering over 100 research agendas. As a new partner country, Kyrgyz Republic, El Salvador, Guatemala, Cuba were selected in consideration of the country's policy demand, growth potential, and strategic economic partnership.

The 2014/15 Knowledge Sharing Program with Costa Rica was carried out with the aim of exchanging socio-economic development experience of two countries for improving Costa Rica's policy making capacity and achieving her socio-economic development. Under the MOU signed between the Ministry of Science, Technology and Telecommunications of Costa Rica, the joint research and seminars were conducted in order to achieve its goal of "Strengthening Institutions and Support Mechanism to Foster Innovation in Costa Rica."

I would like to take this opportunity to express my sincere gratitude to Senior Advisor Dr. Kyung Wook Hur, Research Program Manager Prof. Deog-Seong Oh, as well as the project consultants including Prof. Gi-Don An, Prof. Byung Joo Kang, Mr. Ricardo Monge-González, and Mr. David Bullon for their immense efforts in successfully completing the 2014/15 KSP with Costa Rica. I am also grateful to Executive Director Dr. Si Wook Lee, Former Executive Director Dr. Hong Tack Chun, Program Director Dr.

Song Chang Hong, and Program Officer Ms. Jin Ha Yoo, and all members of the Center for International Development, KDI for their hard work and dedication to this program. Lastly, I extend my warmest thanks to the Costa Rican counterparts, the Ministry of Science, Technology and Telecommunications, Competitiveness Promotion Council and other related agencies, program coordinators, and participants for showing active cooperation and great support.

In your hands is the publication of the results of the 2014/15 KSP with Costa Rica. I believe that KSP will serve as a valuable opportunity to further elevate mutual economic cooperation of Costa Rica and Korea to a new level. I sincerely hope the final research results on the selected areas could be fully utilized to support Costa Rica in achieving economic development goal in the near future.

Joon-Kyung Kim
President
Korea Development Institute

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Chapter 2

2014/15 KSP with Costa Rica

Jin Ha Yoo (Program Officer, Korea Development Institute)

Korea Development Institute (KDI), in collaboration with the Ministry of Strategy and Finance (MOSF) of the Republic of Korea, has been implementing the Knowledge Sharing Program (KSP) with numerous partner countries since 2004 with the overarching goal to assist the enhancement of the national competitiveness of its partner countries by sharing Korea's development experience.

Based on the strong will of Costa Rican government, KSP with Costa Rica was initiated in 2013. For the second year, the 2014/15 KSP with Costa Rica was conducted under the theme of "Strengthening the Institutions and Support Mechanism to Foster Innovation in Costa Rica." After careful consideration, two subtopics were chosen under the theme; the following table is a brief overview of the 2014/15 KSP with Costa Rica's topics and selected Korean researchers.

〈Table 1〉 2014/15 KSP Topics and Researchers

Strengthening Institutions and Support Mechanism to Foster Innovation in Costa Rica	
Senior Advisor: Kyung Wook Hur (KDIS, Former Ambassador of Republic of Korea to the OECD) Program Director: Song Chang Hong (KDI) Research Program Manager: Deog-Seong Oh (Chungnam University)	
Research Topics	**Researchers**
Institutional Reform to Promote Innovation	Deog-Seong Oh (Chungnam University) Byung Joo Kang (Hannam University)
Support Mechanisms for Small and Medium Enterprise (SME)	Deog-Seong Oh (Chungnam University) Gi-Don An (Chungnam University)

For the first stage of the 2014/15 KSP, the High Level Demand Survey and Pilot Study visit was conducted from November 29th to December 7th to identify research themes regarding the proposed topics, and to discuss about the implementation cycle and procedures for the 2014/15 KSP with Costa Rica. At the series of meetings, the Korean delegation collected necessary information and data and took advice from experts at relevant organizations. The Additional Pilot Study and Local Reporting Workshop visit was conducted from February 3rd to 12th in order to review the current research direction and findings. During the visit, the Korean delegation gathered more in-depth information and received feedback from the Costa Rican experts.

The Costa Rican delegation, headed by Minister of Science, Technology and Telecommunications Gisella Kopper, visited Korea from March 22nd to 28th to participate in the Interim Reporting and Policy Practitioners' Workshop. At the Interim Reporting session, both Korean delegation, and Costa Rican delegation shared their interim research outcomes and had rigorous discussion to enhance the quality of policy recommendation for the given topics. Furthermore, the Costa Rican delegation visited various institutions such as the Science and Technology Policy Institute (STEPI), University of Science and Technology (UST), LINK at Chungnam University, and others where they first-handedly experienced Korea's economic development.

As the final stage of 2014/15 KSP with Costa Rica, the Korean delegation headed by Former Ambassador of Republic of Korea to the OECD, Mr. Kyung Wook Hur visited San Jose from July 4th to 9th for the Senior Policy Dialogue and Final Reporting Workshop to share final research outcome and policy recommendations for each topic. During the mission, the delegation presented the findings to approximately 100 stakeholders, experts and high-level officials including Vice President Ana Helena Chacón and Minister Marcelo Jenkins of Science, Technology and Telecommunications.

Executive Summary

Deog-Seong Oh (Chungnam National University)

With the increasing importance of knowledge-based industry and high-tech industry throughout the world, there is also a growing emphasis on importance of securing original technology and fostering startups and technology-focused SMEs.

Science and technology are now recognized as an important part of the infrastructure in a number of country which reached successful economic development on commercial sector with assistance from science, technology and engineering. Many developing countries have recognized the necessity to adopt a long-term economic strategy that shifts part of its focus to developing knowledge-based economy. To achieve this, planning at a national level is required. It is to create the right environment that integrate the supply of knowledge production from the investment of national resources in science, technology and education, with the demand by stimulating business to utilize the achievement and to drive it up the commercial value chain.

Costa Rica has made a great economic achievement through the attraction of FDI and extension of export for the last 30 years. Currently, Costa Rica belongs in middle-income countries due to the continuous economic growth for the last 10 years, and per capita income of 2013 was around 10 thousand US dollars. However, despite of the success, Costa Rica has yet to fully taken the advantage of FDI attraction because of weak resource mobilization capacity and technological capability of domestic industries. To reinforce industrial competitiveness of Costa Rica, enhancement of technology absorptive capacity in private industries is a priority task to be taken, and

to solve this problem, strengthening of technological innovation capacity is necessary.

Since the creation of the Ministry of Science and Technology in 1990, Costa Rican government has placed capacity building in science, technology and innovation on the top of its agenda. However, it was not improved as it intended because of many reasons. Main organization that deals with innovation in central government is MICITT, but several other ministries are also involved in managing innovation. However, organizations that manage and implement innovation are too autonomous and decision-making is processed in isolation, so coordination between different organizations is very weak. There are two plans and six policies and programs for innovation in Costa Rica. However, some problems were identified from the analysis, such as no innovation policies or programs exist for FDI-local company linkage, no basic plan for innovation, and no connection between innovation policies and programs, etc. MICITT needs to develop a basic plan for innovation that controls contents of policies and programs of innovation in Costa Rica. Governance structure of innovation is weak because there is a governing body at the top and management and implementation agencies beneath the governing body. There is no organization for innovation at local and middle level.

On this report, the Korean researchers recommend to build the innovation governance composed of 3 layers, such as Innovation Council at the top, MICITT with other ministries in the middle and CONICIT and other implementing agencies at the bottom. If we consider that innovation is generated more easily from private firms and local governments rather than central government, it is better for local governments and regional platform to be included in the implementing organization of innovation policies. However, since local governments and private organizations are currently not ready for building innovation system, innovation system of Costa Rica could be led by the central government organizations at the initial stage, and allowing local governments to be included later any time necessary, but building at least one regional innovation platform, such as techno-park and board of planning for strategic industries, seems necessary.

In particular, the support mechanism to facilitate the growth of SME's is one of the most important tasks to be driven in the context of regional innovation system. The main issues of Costa Rican support mechanism for SMEs are classified into three kinds of agenda: i) institutional agenda, ii) GVC, and iii) innovation capabilities of SMEs.

The institutional agenda has four main issues: serious regulations, inefficient finance system, insufficient implementation level of governance system to support SMEs, and low collaboration between academia and industry.

The main issues of Costa Rican SMEs participating in GVC are two problems: weak linkage between MNCs and SMEs, and poor participation of local firms in GVC.

The main issues of improving innovation capabilities of SMEs are categorized into three agenda: low level of technology innovation capabilities, weak structure of education system for HRD, and low entrepreneurship and innovation culture.

In order to strengthen the linkage between MNCs and SMEs and to enhance the marketing skills of SMEs, the Costa Rican government needs to revise the policies to improve the innovation capabilities of SMEs. In order to improve the innovation capabilities of SMEs, the Costa Rican government needs to establish the Regional Innovation System (RIS). In order to provide the high-quality human capital, the Costa Rican government needs to innovate the education system by creating the academia-industry cooperation and increasing the entrepreneurship programs for accelerating startups.

In addition, we suggest several action programs for improving innovation capability: financial support, incentives for academia-industry collaboration, laws deregulation, and intellectual property. The initial projects that we recommend are to employ IADB-Funded Innovation Platform and a Pilot Technopark.

In terms of the policies to solve the lack of human capital like technicians, engineers, and researchers, we suggest several action programs for HRD: establishing ICT, Medical devices Technical high school, increasing the number of engineering majors, students, graduate students, professors, developing the short special programs of National Learning Institute.

It is also important to set up several strategies to implement a series of actions in order to strengthen linkages of SMEs to GVC: Selection and Concentration on potentially capable SMEs, Developing Special Programs to create linkage between SMEs and MNCs, Expanding the export programs of PROCOMER, Developing PROCOMER as an Internalization Platform, Developing Special Programs to improve marketing skills of SMEs. For enhancing innovation capabilities of SMEs, overcoming various weaknesses, and developing RISs, the establishment of Pilot Technopark as Regional Innovation Platform (RIP) is necessary.

In conclusion, we suggest the implementation strategy of RIS and possible action program of SME's support mechanism in Costa Rica. In terms of RIS, suggestions for short-term and mid-term tasks were provided to promote innovation capacity building in Costa Rica. Working with current governance structure was recommended as a short-term policy suggestion to maximize utilization of resources. Preparing a basic plan for innovation in Costa Rica was also recommended as a short-term task

to promote innovation capability in Costa Rica. Three suggestions, such as creation of National Agency for Productivity and Innovation, redefinition of laws that map the innovation ecosystem, and inter-ministerial effort to create innovation policy for development, were recommended as mid-term tasks to be taken.

As for SME's support mechanism, stimulating the entrepreneurship and innovation culture should be the top priority for the Costa Rican policy of accelerating start-ups in the context of academia-industry collaboration. The universities need to establish a large number of entrepreneurship classes and operate special programs to develop entrepreneurship, such as startup Clubs, startup contest, etc. In order to technically accelerate startups, the Costa Rican government needs to expand the programs of CONICIT based on startup stages and to expand the business incubators or accelerators, which will be established in the context of regional innovation platform.

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Foster Innovation in Costa Rica

Chapter 1

Institutional Reform to Promote Innovation

Institutional Reform to Promote Innovation

Byung-Joo Kang (Hannam University)
Deog-Seong Oh (Chungnam National University)
David Bullon (MICITT, Costa Rica)

Summary

Costa Rica has achieved formidable economic growth for the past 10 years through attraction of FDI and export-oriented policies, placing Costa Rica in the middle income country group with the per capita income of approximately 10,000 USD as of 2013. The full potential of Costa Rica's FDI attraction, however, is yet to be attained; improvement of resource mobilization capabilities and technological capacity of domestic industries are the most conspicuous agendas in strengthening the industrial competitiveness of Costa Rica. To attain this goal, technology absorptive capacity of private industries must be greatly reinforced through enhancement of innovation capacities.

The 2013 KSP report emphasized the importance of a national innovation drive that includes institutional bodies and support policies. The 2014/15 KSP with Costa Rica was conducted as a follow-up project of the previous year under the title of "Strengthening institutions and support mechanism to foster innovation in Costa Rica," and this executive summary covers the first part of the research – "Institutional reform to promote innovation."

This research is composed of introduction, analysis and assessment of institutions for innovation in Costa Rica, analysis of institutions for innovation in Korea, institutional reform for promoting innovation capacity in Costa Rica, and conclusion and policy implications.

The research framework comprised of the aims, scope and methodology of the study was set in the introduction. Since the major task of this research was providing suggestions for institutional reform to promote innovation in Costa Rica, institution for innovation was defined as an institutional environment under which innovation could be easily generated. Institution for innovation was defined with three basic components: organizations, policies and programs, and governance structure for innovation.

A survey on the international trend of strategies for innovation capacity building sought to identify common principles applicable to Costa Rica. The criteria in the selection of case studies of advanced economies were policies and organizations for innovation serving as the major components of institution. The conclusion of this case study was that a strategic approach for raising innovation capacity varies from country to country according to innovation environment. So Costa Rica is highly advised to reform its institution for innovation to fit its economic and social contexts.

For the analysis and assessment of Costa Rica's innovation institutions, three aspects were taken into account: organization, policy, and governance. The main organizations in charge of innovation within the central government are PCCI, MICITT and CONICIT, but other ministries and agencies such as Ministry of Foreign Trade, Ministry of Agriculture, Ministry of Economy, Industry and Commerce are also involved in the drive for innovation. Organizations managing and implementing innovation, however, are too autonomous and decision making is processed in isolation. Thus, coordination between organizations is considerably difficult. There are two national plans, six programs for innovation in Costa Rica. The institutional analysis identified the most exigent task as the establishment of a basic plan for innovation that controls and coordinates policies. A coordinating body would greatly improve not only the connection between innovation policies and implemented programs, but also strengthening the linkage between FDI and local companies. The governance structure of innovation is weak because governing body at the top and management and implementation agencies are placed below the governing body. It is difficult, however, to find organizations that implement and coordinate innovation policies and programs at the provincial and public-private partnership levels.

Korean institutions for innovation were analyzed considering the same three aspects of analysis: organization, policy, and governance structure. In the case of Korea, two committees, three ministries and two agencies are in charge of innovation within the central government structure. A total of 18 techno-parks and planning boards for strategic industries are in charge of innovation in the public-private partnership dimension. Seven innovation policies of the past 20 years were analyzed, five of which include financial and legal support schemes. Innovation policies of Korea are composed of three levels - central government, local

government, and public-private partnerships. The Korean case shows that institution for innovation is more effective when policies are adequately planned with strong legal and financial support.

For Costa Rica, three layers of governance structure are recommended. The top layer would be composed of three categories of organizations. As for the top layer, the Presidential Council for Innovation would be at the lead, serving as the think tank managing the innovation policies of Costa Rica, and MICITT, with other ministries for policy making, and CONICIT, with other enforcement bodies, will act as executors of innovation policies. The middle layer has one agency, an innovation platform (techno park and planning board for strategic industries or collaboration between academia and industry), as coordinator of innovation policy. Only one organization is at the bottom layer, an office for policy implementation, as executor of innovation policy. PCCI, MICITT and CONICIT are key organizations for innovation in Costa Rica; however, as innovation is more easily generated by private companies and at the lower government level, provincial governments, private companies and regional platforms should be included in implementing organizations. Provincial governments and private organizations, however, are not included in institution for innovation, so Costa Rica could start with central government organizations only in the beginning stage and provincial governments and private agencies could be included later. Also needed is the building of at least one regional innovation platform like a demo techno park, board of planning for strategic industries or collaboration between academia and industry.

Short term and mid-term recommendations are provided in the research to promote innovation capacity building in Costa Rica. The current governance structure should be maintained while empowering the presidential council for innovation for stronger policy coordination. Preparing a basic innovation plan with Costa Rica's vision and mission was suggested as a short-term task to promote innovation capability in the country. The creation of the National Agency for Productivity and Innovation, revision of laws that map institution for innovation and inter-ministerial efforts to create innovation policy for development were three suggestions for mid-term tasks.

Three policy recommendations were suggested at the conclusion. The first was reinforcement of organizations for innovation. Creation of a task force within the PCCI was recommended. MICITT is the key organization for innovation but needs more budget, staff and influence to enhance its capacity as well as getting legal support. The second recommendation was formulation of innovation policies. A basic innovation plan for Costa Rica could come from two options. The first is re-planning of the blueprint National Science, Technology and Innovation 2011-15 or creating a new plan for innovation. The second seems better in having the task

force in charge of establishing a new plan. The third recommendation is building the governance structure. Establishing three layers of innovation governance structure is recommended. A fundamental issue in institution for innovation is the few private stakeholders who are included in governance structure. Including many private companies, universities and think tanks in governance structure is strongly recommended for effective institution for innovation.

1. Introduction

1.1. Background & Global Trends in Innovation Capacity Building

1.1.1. Aims & Scope

The 2013 KSP with Costa Rica found that the country needed an innovation system that could strengthen institutions and support the mechanism of domestic SMEs to enhance their competitiveness. The most urgent tasks were identified as reinforcement of technological absorptive capacity and priority task agenda, such as institutional reform of the FDI attraction system, extension of technological staff supply through the reform and enforcement of the education system, and promotion of investment in technological innovation by private companies, including expansion of national R&D investment.

Also included in the innovation policy agenda was reduced dependency on foreign technologies through higher efficiency in the sci-tech system and expansion of R&D investment, establishment of an independent technology development base and building a national think tank like STEPI in Korea. The 2013 KSP also noted that for a sustainable growth system, Costa Rica needs an innovation system to acquire world-class science and technology capacity in specific areas. What is urgent is a technological innovation-centered economic structure through investment in human resource development and more investment in R&D and technological innovation.

Under these circumstances, the following objectives were requested by the 2014/15 KSP with Costa Rica study:

- Assess the role and capabilities of the main institutions of the innovation system
- Establish a proposal for the organizational and functional structure for national innovation
- Implement solutions over the short (one year) and medium term (three years) to raise the efficacy of the institutional system responsible for running the innovation system.

The following four sub-topics also had solutions proposed:

- Assess the consistency and efficacy of the Costa Rican governance structure to achieve innovation.
- Analyze and compare the governance structure for innovation in institutional models and other successful institutional systems of innovation in other countries, including major public-private alliances
- Propose improvement in the institutional system of innovation governance
- Implement solutions to improve the institutional system for innovation in Costa Rica, including major public-private alliance practices.

With the aforementioned three objectives and four sub-topics, the 2014/15 KSP study sought to develop an appropriate model for institutional reform to promote an innovation system in Costa Rica under the title "Institutional Reform to Promote Innovation."

The aims and scope of this project are the evaluation of roles and capacities of institutions that govern the innovation ecosystem and proposing suggestions for reforms over the short and medium term to strengthen the effectiveness of the organizational governance structure in Costa Rica. Since the key to this project is institutional reform, institution in innovation should be defined in advance. An institution could be defined in many ways according to historical, traditional and social contexts. In this study, institution for innovation comprises three components: an institute and organization that manage and implement innovation policies and programs, a policy and program used as strategies in the innovation process, and innovation governance that facilitates implementation of innovation policies and programs through an organizational structure. All the analyses, assessments and institutions for innovation in Costa Rica and Korea were conducted under the three aspects of organization, policy and governance; policy recommendations for Costa Rica were also suggested under the same research framework.

1.1.2. Global Trends of Policies & Organizations for Innovation Capacity Building

Though national competitiveness is composed of many factors in the era of globalization, innovation capacity such as exporting high quality products and services is a core factor in national competitiveness. Openness and a win-win strategy for society have grown important in the era of knowledge and information. And, establishing a value chain network among the components of the innovation ecosystem is required not only for corporate management but also national governance. Nearly all countries try to connect internal innovation from innovation actors and external innovation from a variety of partners and organizations abroad as open innovation is stressed. As one noted, development is impossible without a

lively innovation ecosystem in a globally competitive society.

Science and technology have come to dominate the era of global competition as the knowledge economy has progressed. Technological innovation is considered more important than before, being a new growth engine to break the limits of economic growth based on factor inputs such as labor investment and capital accumulation, by making raising industrial efficiency.

Recently, major advanced economies have announced strategies for promoting creativity and innovation. Their criteria are innovation capacity building through economic development by fostering science and technology. Innovation policies and organizations were surveyed in this case study analysis, and comprise major components of institution for innovation.

- The U.S. stresses creativity as an innovation policy for economic growth and higher innovation capacity. Investment in creativity for next-generation industries and job creation and the government's role as an accelerator of innovation are emphasized. Organizations for fostering innovation in the U.S. include science parks like Silicon Valley, a global icon of implementing innovation strategies.

- Japan emphasizes solving problems within its societal structure, with economic growth based on demand and R&D that connect value-added technologies. The Cool Japan strategy is an innovation policy to foster the culture and content industry as a new growth engine. Organizations of innovation in Japan include technopolies and techno-parks, which are innovation platforms for public-private partnerships.

- In the U.K., service-based creative industries and finance are crucial to innovation policy, as well as government innovation. Organizations that implement innovation in Britain are called Regional Development Agencies (RDA).

Since a strategic approach for raising innovation capacity building varies from country to country according to innovation environment and capacity, each country should build its own institution for innovation based on its own historical and social contexts.

〈Table 1-1〉 Policies and Organizations for Innovation Capacity Building in Advanced Economies

U.S. Policy for American Innovation (2011)	Japan 2020 New Policies for Growth (2010~13)	U.K. Creative Britain: New Talents for the New Economy (2008)
- Innovation policy seeks to create jobs and industries based on individual creativity and imagination. - The private sector is the engine of innovation, and the government is just an accelerator. - The bases of innovation are education, basic research and an IT ecosystem. - Organizations for Innovations are science parks.	- Innovation policy aims for economic growth based on demand generated in the process of solving social structural problems. - Selection and concentration strategy for seven projects such promotion of domestic SMEs and tech-oriented R&D. - Organizations for innovation are technopolises and techno parks.	- Innovation policy seeks to turn creative and financial industries into national growth engines to restore the stagnant manufacturing sector. - Government innovation in eight fields such as IPR protection, support for creative clusters and building global creation hub. - Organizations for innovation are RDAs

Source: DCMS (2008), Ministry of Inner Affairs (2010), NEC *et al.* (2011).

1.2. Theoretical Framework for Innovation Capacity Building & Institution for Innovation

This section reviews innovation capacity building and institution for innovation with other terms such as organization for innovation, innovation policies and programs, and innovation governance.

1.2.1. Innovation Capacity Building

Researchers and policymakers increasingly identify the usefulness of the innovation ecosystem concept for explaining cooperative innovative activities. The fundamental aim behind such an ecosystem is to expand the capability of one actor beyond its own boundaries and transform knowledge into innovation in collaboration with others (Adner, 2012). National competitiveness is not only influenced by internal innovation capacity but also a variety of factors within the innovation ecosystem. Since an ecosystem is composed of various factors, each country has a governance structure markedly different from traditional ones that coordinate vertical value chains.

Sci-tech innovations are widely recognized as the engine driving the economic transformation of developing countries. This recognition, however, is only

beginning to be featured as part of national development policies. Increasingly, the main innovation obstacle is not the provision of new knowledge, but elements surrounding processes such as institution for innovation. Innovation will grow more advanced and diverse with significant influence over economies and the way people live. To harness innovation and enhance the contribution of science and technology to the growth and competitiveness of developing countries, a pertinent need is to improve institution for innovation. To sustain innovation, all countries need to continuously modify their own versions of institution for innovation.

To foster innovation, a suitable innovation ecosystem must meet a variety of conditions that entail structural, organizational and cultural factors. Innovation capacity is a necessary element in establishing a successful innovation ecosystem and innovation capacity building is crucial for both central and lower-level governments. The goals and implementing tools are different for each party. The goal of innovation capacity building for a central government is finding new growth potential and engines. Implementation tools used in innovation capacity building include coordination of policies from diverse ministries for innovation and establishment of an organization to conduct innovation projects from ministries through compromise and combination.

The goal of innovation capacity building for lower-level governments is setting up an environment that accelerates technological innovation by domestic companies. Implementation tools of innovation capacity building come through h the establishment and operation of a regional platform that plans and coordinates policies for regional industrial development and leads regional industrial development.

〈Table 1-2〉 Viewpoints of Innovation Capacity Building

Category	Role and function
Central government viewpoint	- Innovation capacity building requires finding new growth potential and engines. - Implementing tools of innovation capacity building include coordination of policies from diverse ministries for innovation and establishment of an organization to conduct innovation projects from ministries through compromise and combination.
Lower-level government viewpoint	- Innovation capacity building for a lower-level government entails setting up an environment that accelerates technological innovation by domestic companies. - Implementing tools of innovation capacity building is realized through the establishment and operation of a regional platform that plans and coordinates policies toward and leads regional industrial development.

Division of roles and networking among innovation actors such as universities, think tanks and companies are crucial to an innovation system because they produce, transfer and apply knowledge (OECD, 1997). Environmental factors that lead to innovation by individuals and organizations based on creativity and let them connect are more important than individual capacity and talent in an innovation system.

An innovation system looks different based on a country's innovation environment and capacity. Such a system is composed of systems for national and regional innovation, and their functions and viewpoints are also different.

A national innovation system (NIS) provides mutual networking between various sectors of science, technology and industry to acquire new growth engines and potential. New and effective generation of knowledge from universities, public think tanks and industry and receipt of knowledge from the outside are important in NIS. Meanwhile, a regional innovation system (RIS) provides venues for companies to do business. A combination of the industrial production systems of a provincial area and science and technology with a support system is important and industry is the key factor behind RIS.

Well-functioning innovation systems depend on how well governments can bring together and coordinate the activities of various actors and stakeholders for advancing science, technology and innovation (STI) in the economy.

1.2.2. Institution for Innovation

Institution for innovation is composed of three components: organization for the management and implementation of innovation policies, innovation policy and program comprising the strategy to be used in the innovation process, and innovation governance to facilitate implementation of innovation policies and programs.

Firstly, three types of organizations manage and implement innovation policies. The central and provincial governments play the most important role in pushing innovation policies. The central government intervenes in the formation of a regional innovation system through the implementation of innovation policies such as setting up support and related organizations, assisting regional strategic industries and providing investment to R&D institutes. The role of the central government is important in the beginning stage of building an innovation ecosystem. A provincial government requires system works and coordination of innovation projects from related organizations.

Since the success of an innovation ecosystem depends on promotion of private

companies over the long run, PPP's role should be increased as time passes and the division of roles and good relations between the central and smaller governments are important.

〈Table 1-3〉 Roles and Functions of Innovation Organizations

Organization	Role	Major functions and affairs
Central government	Manager & supporter	- Gather opinions of universities, companies and public research centers & support corporate innovation - Give technical support to universities and techno parks, managerial support to BIs and financial organizations, & physical support such as building industrial parks and warehouses
Provincial government	Executor & coordinator	- Coordinate demands from provincial innovation actors and put coordinated demands in innovation plan - Operate plan and coordinating organization that handles relations & functions of innovation projects
Public-private partnership	Connecter for private & public sector	- Network industries, public research centers & universities through stronger links between internal innovation actors to enhance national innovation capacity.

Two types of organizations implement innovation policies at the level of a regional innovation platform. The first is an RDA, which is used as a regional innovation platform in the U.K. The second is a techno park (TP) with a planning board for strategic industries used in Korea. RDA launched to implement regional development policies in wide economic zones, and techno parks were tasked with boosting cooperation among industry, academia and research institutes. Both organizations now implement innovation policies all over the world.

Secondly, innovation policy requires a public action that influences technical change and other innovations. Innovation policies and programs are primarily responsible for the promotion of innovation or creation of suitable basic conditions to that end. Innovation policies seek to achieve goals and objectives based on the major features of the innovation environment, such as the strengths and weaknesses of a nation's innovation system. Innovation policies are categorized into several groups depending on the goals of the innovation system in each country. Every society should find out ways to innovate to meet its needs based on its capability. An innovation environment is largely determined by a country's overall macroeconomic, business and governance conditions. Innovation policies with good design and implementation are extremely relevant.

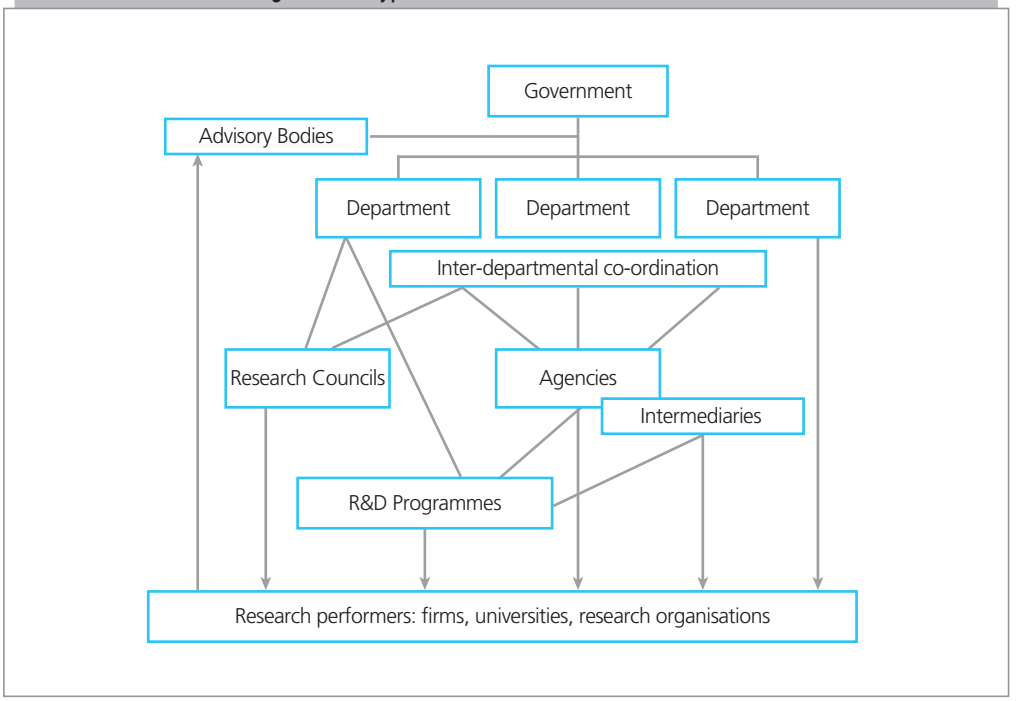
〈Table 1-4〉 Organizations for Implementation of Innovation Policies

Classification	Role and function
Regional development agency	- An RDA was originally established to implement regional development policies. - Planning and managing regional industrial development through concentrating regional innovation actors and coordinating interests of each regional platform & related programs.
Techno park	- A techno park was established to conduct cooperation projects among industry, academia and research centers. - Providing infrastructure to domestic startups and companies located within park, as well as technological and administrative support to those looking to expand offshore.
Planning board for strategic industries (PBSI)	- PBSI prepares long- and mid-term development plans for regional strategic industries and manages R&D projects through control and coordination of related plans established by innovation organizations.

Thirdly, innovation governance is the handling of complexity and management of dynamic flows of innovation. It is fundamentally about interdependence, links, networks, partnerships, co-evolution and mutual adjustment in the innovation process (John de la Mothe, 2001). Innovation governance shows what roles the actors in the innovation process play, how the rules of the game work, how decisions are made and how changes in the overall innovation system come into being. The focus of innovation governance is mutual relationships among innovation actors rather than the priorities, strategies and outcomes of innovation.

According to Arnold (2003), innovation governance is composed of three layers of organizations. The most important layer for policy design and overall strategy formulation for innovation lie at the level of governments, departments and, to varying degrees, advisory bodies. The degree to which the central government (Cabinet and head of state) are involved in deciding overall coordination and strategy formulation in innovation differs enormously, but nonetheless can have great impact. The composition of these bodies and their links with key decision makers determines their importance.

[Figure 1-1] Typical Innovation Governance Structure



Source: Arnold, *et al*. (2003), p. 28.

Each country has an important "middle level" consisting of research funders (typically research councils, funding institutes and dedicated agencies) that allocate funding to research performers (universities, think tanks and labs, or companies). The level of independence in this middle layer shows large variations in their policy design roles and decisions on fund allocation.

The third level in the governance system consists of actors that perform research and innovation and directly benefit from public R&D funding. This is where country patterns vary the most.

2. Analysis of Institution for Innovation in Costa Rica

2.1. Analysis of Institution for Innovation

Over the past few decades, Costa Rica has been successful in attracting foreign direct investment (FDI) and using it for economic growth by specializing in high-tech, high-growth industries. FDI has produced a structural transformation in the country,

facilitating economic diversification from primary products such as coffee, bananas, textiles and apparel to electronics, software and medical devices. Costa Rica now has South America's largest portion of high-tech exports as a percentage of overall exports. Its economic structure from 1970 to 1990 was centered on resources and FDI attraction was the main focus until the mid-2000s (WEF 2013). Now, however, is the time for the country to move toward an economic structure featuring innovation initiative. The World Economic Forum in 2013 said Costa Rica was in the process of moving from an efficiency-orientated economy to one stressing innovation initiative.

Analysis of institution for innovation in Costa Rica is divided into innovation organizations, policies and programs for innovation, and innovation governance.

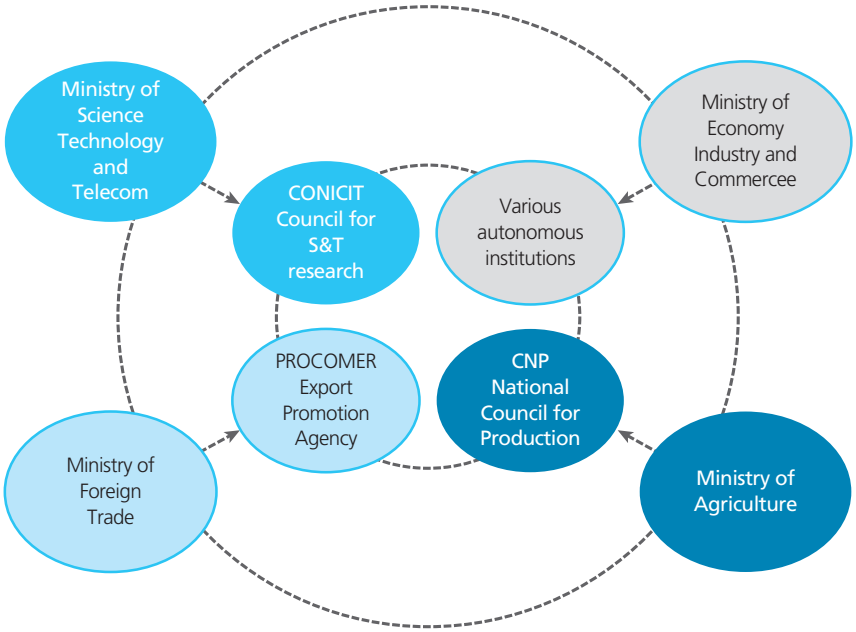
2.1.1. Organizations for Innovation

Costa Rica has eight organizations for the management and implementation of innovation policies. Since the founding of the Ministry of Science and Technology (MICITT) in 1990, the government has placed improvement of the national innovation system at the top of its agenda. Following the 2010 elections, the Presidential Council for Competitiveness and Innovation (PCCI) was formed to enhance the country's human capital and capacity for innovation. Within the main institutions that coordinate and organize science and technology in Costa Rica, MICITT, as a governing body, and CONICIT (National Council for Scientific and Technological Research), as an enforcement body, have played an essential role in promoting the development of science, technology and innovation (STI). Though the major organization handling innovation witihin the central government is MICITT, other ministries such as the Ministry of Foreign Trade (COMEX), Ministry of Agriculture, Ministry of Economy, Industry and Commerce (MEIC), Foreign Trade Promotion Agency (PROCOMER) and the Chamber of Commerce and Industry (CICR) also help manage innovation policies. One non-governmental organization, CPC (Competitiveness Promotion Council), handles promotion of competitiveness. The ministries deal with sci-tech and innovation issues related to the policies within their job classifications, and operate their own agencies for promoting and funding the innovation of organizations under their authority (Refer to Figure 1-2).

One characteristic of organizations for innovation in Costa Rica is that they are too autonomous and decisions are made separately, so coordination between organizations is weak.

Innovation policies are implemented over the organizations in isolation due to lack of link between MICITT and Ministry of Economy. Nearly no R&D investment is seen in the private sector, sci-tech activities are barely visible and links between multinational corporations and Costa Rican SMEs are rare.

[Figure 1-2] Innovation Organizations in Costa Rica



〈Table 1-5〉 Roles and Functions of Organizations for Innovation in Costa Rica

Organization		Role and function
Key organizations	PCCI	- Enhance economic development potential through improving human capital & capacity for innovation
	MICITT	- Sci-tech policy formulation, implementation & coordination of innovation
	CONICIT	- Implementation of innovation policies established by MICITT
Related ministries	Ministry of Agriculture	- Innovation in agricultural production & exploring foreign markets for agricultural products
	Ministry of Foreign Trade	- Responsible for trade & FDI attraction
	MEIC	- Deregulate production & marketing processes & promote domestic SMEs
Other agencies	PROCOMER	- Accelerate exports and attract FDI
	CICR	- Support sustainable development in industry & business

2.1.2. Innovation policies and programs

The two plans for innovation are "Century XXI Strategy," a long-term plan, and "National Science, Technology, Innovation Plan 2015-21," a mid-term plan. The former aims to improve the knowledge and innovation levels of Costa Rica through socioeconomic and human development that would reach the levels of a developed nation by the first half of the 21st century. And education and STI will play key roles in this. The latter plan focuses on the development of five areas: education, water resources and environment, energy, health, and food and agriculture.

Other innovation policies and programs include the SME-strengthening Program of National Food Science and Technology Center (CITA) at the University of Costa Rica, the Innovation Program of Costa Rica's National Chamber of Industries, UNA-Entrepreneurs Program at the National University of Costa Rica, Central America Innovates and AL INVEST of Costa Rica's Chamber of Exporters (CADEXCO).

The government has also launched new programs and incentive packages such as PROPYME and CR Provee to promote private sector innovation, particularly in SMEs. Most SMEs receiving PROPYME support had previously engaged in innovation activities and have continued investing in technological improvements after receiving

〈Table 1-6〉 Plans and Policies for Innovation in Costa Rica

Plans & policies		Contents & innovation policies
Plans for innovation	Century XXI Strategy	- Improve knowledge & innovation levels of Costa Rica
	National Technology and Innovation Plan 2015-21	- Enhance innovation capacity in five fields: education, water resources and environment, energy, health, and food and agriculture
Policies & programs for innovation	SMEs strengthening program	- Implement food security system through training & consulting program
	UNA-Entrepreneurs program	- Increase entrepreneurial capacities of students & Costa Rican society to foster creation of SMEs
	Central America Innovates	- Regional project based in San Jose to support business by introducing management, diagnostics, training & consulting in innovation process
	AL INVEST	- Regional project in collaboration with European Union to support SME consolidation and globalization
	PROPYME	- Promote private sector innovation, particularly in SMEs
	CR Provee	- Increase ties between Costa Rican SMEs & multinationals operating in Costa Rica

such assistance. PROPYME provides grants to SMEs to develop sci-tech projects related to innovation. The grants finance R&D projects and human resource training in SMEs, covering up to 80 percent of a project's cost.

A few problems were found in the analysis of innovation policies, such as lack of a basic plan for innovation and no policy or program for links between FDI and domestic companies or to enhance national competitiveness. The 2013 KSP with Costa Rica also discovered a serious problem in Costa Rica of weak links between FDI and domestic companies. To solve this problem, innovation policies or programs are needed to facilitate such cooperation. The benefits of innovation are realized through formulating a basic plan for innovation or related policies and programs in many countries, but Costa Rica has not done this.

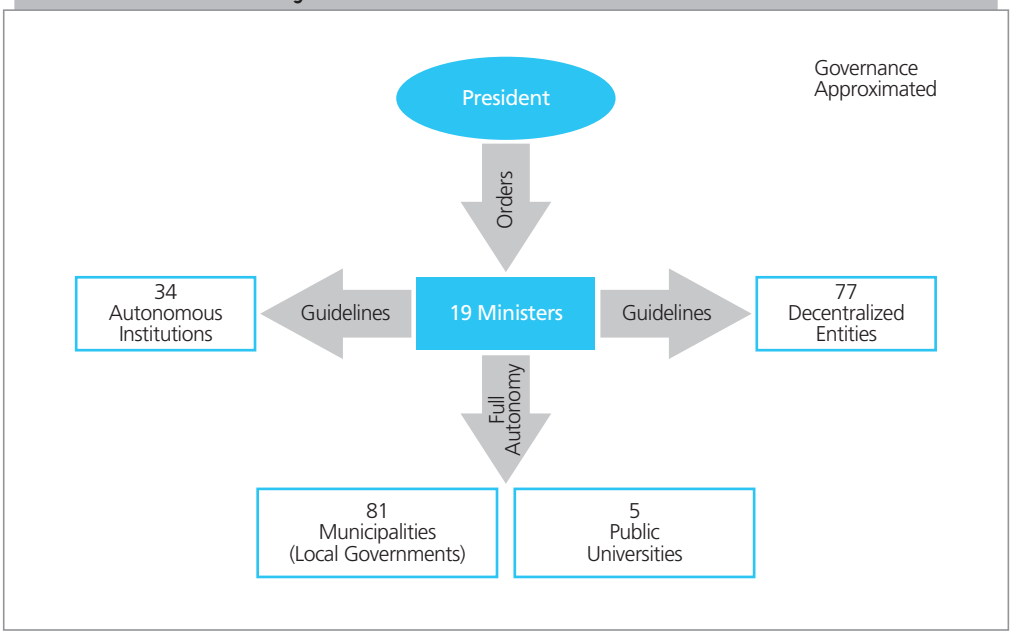
2.1.3. Innovation Governance

The governance structure of innovation in Costa Rica is illustrated in [Figure 1-3]. Both under law and in practice, the country has a well-defined innovation governance but the high level of autonomy within the system makes it impossible for MICITT to influence activities occurring outside of its immediate sphere of influence. As shown at the top of [Figure 1-3], the president has under his supervision 19 ministries, and each ministry can provide guidelines to the country's 34 autonomous institutions and 77 decentralized entities. But such institutions can make decisions on their own with their own budgets. On the other hand, the central government renders full autonomy to 81 municipalities and five public universities, with autonomous budget allocation and decision making. This decentralized system is the product of a long tradition of democracy in Costa Rica.

The traditional system of Costa Rica creates a unique environment for political decision making. When the government pursues an innovation policy for a goal such as economic development, the policy cannot be effectively implemented without consensus from stakeholders. In short, Costa Rica has weak innovation governance that prevents it from pursuing innovative policies and programs.

MICITT is in charge of making science and technology related policies. But according to the National Law of Planning (Law 5525), each ministry has the power to manage all matters related to its area of jurisdiction. This is the reason that other ministries are involved in R&D activities; For example, Ministry of Health is in charge of medical research, and Ministry of Agriculture and Livestock is responsible for managing agricultural research. So though MICITT is the government authority for STI, it lacks influence over the innovation policies adopted by other ministries.

[Figure 1-3] Innovation Governance in Costa Rica



Innovation governance in Costa Rica also faces three problems (Minister Kopper, 2015).

Firstly, key ministries are not designed for optimal policy coordination. Thus, coordination is poor due to separation of STI, business and entrepreneurship, foreign trade and agriculture; the lack of a permanent body also means no long-term vision.

Secondly, ministries are not designed to ensure implementation, so rules do not allow incentives for performance or the flexible and rapid use of funds. The budget is inadequate to implement at scale and efforts to implement detract from those to define policies.

Thirdly, enforcement agencies are ineffective. The governance structure excludes ministers, so alignment of policy priority is poor. The governance structure also leaves out other enforcement agencies, so coordination among them is weak. Rules do not allow incentives for performance or flexible use of funds.

2.2. Assessment of Effectiveness of Innovation Organizations

2.2.1. Assessment of Effectiveness in Policy Cycle

The organizational structure and policy cycle of innovation in Costa Rica were assessed by a Costa Rican consulting team to test the effectiveness of organizational design in managing policy cycle for innovation (This assessment was requested as an objective of the 2014/15 KSP with Costa Rica). Analysis was done on seven areas: mapping needs, definition of policy options, decision making, and design of policy instruments, implementation of solutions, and monitoring and evaluation. The roles and effectiveness of stakeholders were also evaluated.

2.2.1.1. Mapping Needs

The three stakeholders in this area are the Presidential Council for Competitiveness and Innovation (PCCI), State of Nation and ministries. Public, private and academic stakeholders of the council are divided into the Council for Competitiveness and Council for Innovation and Human Talent.

〈Table 1-7〉 Evaluation of Effectiveness in Mapping Needs

Solutions	Performance compared to best practices		Overall evaluation
	Participation of respected experts with long-term views	Participation of influential political stakeholders	
Presidential Council for Competitiveness & Innovation	Option to involve other stakeholders though subject to short-term incentives	Political stakeholders defined by decree. Missing some, confusing division in two areas that affect economy	Could be effective with inclusions & unification
State of the Nation (university-based think tank)	Involvement of experts by choice, though bias means exaggerated view of academia's importance	Some by choice	Effective for technical opinions
Ministries' isolated efforts (surveys, interviews, committee)	Flexibility to include experts on specific topics, but lacking holistic view of innovation & subject to short-term incentives	Track record of effective use to include broad spectrum of political stakeholders, but lacking holistic view Forced to follow separate process with sectors defined by planning ministry	Could be effective if not in isolation

The role of the Council for Competitiveness led by the vice president is to lead the economic council and the Council for Innovation and Human Talent led by the vice president is to lead the social council. State of the Nation is a university-based think tank financed by the Council of Public Universities. Each ministry chooses how to map its needs in isolation through surveys, interviews and committees.

2.2.1.2. Define Policy Options

The three stakeholders in this area are the Presidential Council for Competitiveness and Innovation (PCCI), State of Nation and ministries. The PCCI is mentioned at the Presidential Decree to define policy. State of Nation provides a summary of general recommendations. And each ministry chooses how to balance policy options in isolation.

〈Table 1-8〉 Evaluation of Effectiveness in Policy Options

Solutions	Performance compared to best practices		Overall evaluation
	Clear summarization of all stakeholders' opinions	Determination of policy options balancing technical value & political viability	
State of the Nation	No attempt to include political opinions	No attempt to seek Balance	Ineffective in this role
Presidential Council for Competitiveness & Innovation	- Access to all political stakeholders, but missing many technical points - Severely understaffed	No expertise or personnel with time to perform this activity	Could be effective in coordination with ministries and more staff
Ministries' isolated efforts	Summarizes sometimes without considering other ministries' key views	Little expertise within ministries	Could be effective if with other ministries & training

2.2.1.3. Make Decisions

The four stakeholders in this area are the Cabinet, government councils, the PCCI and ministries.

Decision makers in the Cabinet are the president, vice president and all ministers. Decision makers in government councils are vice presidents and relevant ministers. Stakeholders of the PCCI are from the public sector, academia, and private and civil society. The decision maker of the Council for Competitiveness is the vice president of the economic council, and the decision maker of the Council for Innovation is vice president of the social council. Each ministry often makes decisions in isolation.

〈Table 1-9〉 Evaluation of Effectiveness in Decision Making

Solutions	Best practices		Overall evaluation
	Inclusion of all relevant members of executive branch	Decision considered to override all others	
Cabinet	President, vice presidents &all ministers make decisions together	Many policy decisions made in other settings	Effective, when not undermined
Economic & social councils	Vice president & relevant ministers can debate policy options before decisions are made in Cabinet	Subdivisions make sense, but many debates over policy decisions occur in other settings	Effective as extension of Cabinet
Presidential Council for Competitiveness & Innovation	Includes private sector at highest level, which is inappropriate for decision making	Subdivisions lead to overlapping decisions because key executive stakeholders are always missing	Ineffective as decision-making organization
Ministries in isolation	Even if president is included, exclusion is not uncommon if topics are covered by various ministries	Ministries that should work together make decisions separately	Ineffective as decision-making organization

2.2.1.4. Design Policy Instruments

The two stakeholders in this area are ministries and enforcement agencies. Each ministry makes a decision with three alternatives: alone, with chosen experts or with an enforcement agency. Such agencies often make decisions alone or with chosen experts or ministry.

〈Table 1-10〉 Evaluation of Effectiveness in Designing Policy Instruments

Solutions	Performance compared to best practices		Overall evaluation
	Inclusion of end user, technical experts & implementers	Implementation that allows learning through iteration & pivoting	
Ministries	Does not always include all stakeholders	Rarely designed for learning	Effective if together with others
Enforcement agencies	Does not always include all stakeholders	Rarely designed for learning	Effective if together with others

2.2.1.5. Implement Solutions

The three stakeholders in this area are the Presidential Council for Competitiveness and Innovation's working group, ministries and enforcement agencies. The role of four ministries is management and that of six agencies is implementation of innovation policies. The Ministry of Foreign Trade makes decisions with the Export Promotion Agency and Investment Promotion Agency. The Ministry of Science, Technology and Telecom makes decisions with the Council for Science and Technology Research. The Ministry of Agriculture makes decisions with the National Production Council. The Ministry of Economy, Industry and Trade makes decisions with Popular Bank and National Learning Institute (SME branch). Decision making, however, is often conducted in isolation.

〈Table 1-11〉 Evaluation of Effectiveness in Implementation Solutions

Solutions	Best practices		Overall evaluation
	Alignment with policy priorities	Efficiency & flexibility for programs	
Presidential councils (innovation & competitiveness)			Ineffective
Ministries	Governance structure excludes ministers, other agencies or private sector	Budget inadequate to implement at scale – subdivided	Ineffective
Sector-based enforcement agencies	Governance structure excludes ministers, other agencies or private sector	Restrictive rules	Ineffective

2.2.1.6. Monitor and Evaluate

The three stakeholders in this area are the Ministry of Planning, Ministry of Finance and the controller's office. The Ministry of Planning monitors and evaluates goals and metrics (on paper). The Ministry of Finance monitors and evaluates the timeliness of fund use. And the controller's office monitors and evaluates the legality of fund use.

〈Table 1-12〉 Evaluation of Effectiveness in Monitoring and Evaluation

Solutions	Best practices			Overall evaluation
	Monitoring of fund use	Evaluation of impact of fund use	Allocation of funds based on performance	
Ministry of Planning	Metrics not associated with funds	Asks for indicators rarely related to impact	Does not allocate funds	Ineffective
Ministry of Finance	Ministries report progress in fund use every six months	Asks for indicators rarely related to impact. Little control in case of enforcement agencies	Allocation of funds to ministries only loosely tied to impact. Allocation to enforcement agencies not tied to impact.	Ineffective
Controller's office	Way funds used must be approved	No role in evaluation of impact	Does not allocate funds.	Ineffective

2.2.1.7. Policy Intermediation

The two stakeholders in this area are the PCCI's working group and four ministries. The ministries often make decisions in isolation.

〈Table 1-13〉 Evaluation of Effectiveness in Policy Intermediation

Solutions	Performance compared to best practices		Overall evaluation
	Coordination of inseparable topics	Leadership of intermediaries in contact with needs, decisions & implementation	
Presidential Council for Competitiveness & Innovation	Two councils separate topics that should go together	Seeks to play this role via technical secretariat but has little experience	Could be effective if merged via dynamic lead of ministries
Ministries' isolated efforts	Ministries often do not take time to cooperate	Ministries have a comparative advantage in intermediation	Could be effective if not in isolation

Four implications were drawn from the evaluation:

- Existing mechanisms exclude important technical stakeholders and lead to overlapping in discussions on mapping needs.
- Insufficient centralization in political decision making and risk of political capture by private sector in decision making
- Inadequate mechanisms to efficiently implement in alignment with policy priorities in implementation.
- Lack of unified approach through which key ministries can work together with presidential office to guarantee results in policy intermediation.

2.3. Need for Innovation in Costa Rica

Costa Rica is a stable country with no army and a commitment to human rights. Though its political system has made Costa Rican society stable, it has also rendered social reform or innovation difficult, as identified by a government resource allocation policy focused on meeting the short-term needs of society over long-term planning for R&D and innovation.

Since the mid-1990s, Costa Rica has attracted much FDI from multinational companies such as Intel, Abbott Laboratories, Procter & Gamble (P&G) and HP in high-tech industries, especially in the manufacturing of electronics and semiconductors and, more recently, the provision of medical devices. When domestic and foreign companies are separated by a wide technology gap, however, the potential for FDI links for development grows smaller. Foreign companies have upgraded their activities and this presents new opportunities for developing knowledge-intensive links, but these can materialize only if domestic companies and think tanks raise their technological capabilities to match MNC quality requirements. This is why Costa Rica needs innovation.

Despite enjoying enormous success in economic growth as shown in the increase in per capita income, Costa Rica has not taken full advantage of FDI attraction. The benefits of FDI attraction can come in the form of technology and knowledge spillovers that enhance the host country's production capacity and competitiveness. Costa Rica, however, has failed to take advantage of such opportunities because of weak capacity for resource mobilization and the poor technological capability of domestic companies.

Since a serious problem in Costa Rica at the moment is weak links between FDI and domestic companies, encouraging and facilitating such cooperation through domestic supply of production inputs, technology transfer, technical training and joint R&D are crucial tasks. Without interaction and collaboration, technology transfer and learning cannot take place by simply having FDI companies within the

territory of the host country.

In many cases, the benefits of innovation are realized through a basic innovation plan. Costa Rican politicians seem to put higher value on stability than dynamism, and government attention goes mainly to the immediate demands of citizens. Thus little attention gravitates to the need for preparing for the future, such as R&D and innovation. For innovation to take root, consensus on the need for innovation among members of society is required (Sungchul Chung, 2013 KSP with Costa Rica Report).

Costa Rica is a middle-income country thanks to continuous economic growth over the last 30 years, with per capita income in 2013 reaching 10,000 U.S. dollars. One of the problems middle-income countries have is that economic growth is no longer possible only through low wages and cheap resources, giving rise to the so-called middle income trap. To avoid this and make another leap onto the next stage of development, Costa Rica has to complement FDI and its export-based development strategy with an effective innovation system to develop a base for indigenous technologies.

The World Economic Forum of 2013 stressed that Costa Rica needs to transform from a resource-oriented economy to a knowledge-driven economy to enter the global value chain. The country's economic structure from 1970 to 1990 was based on resources, and foreign investment attraction was the main focus until 2000. Now, however, is the time to move toward an economic structure based on innovation initiative. Costa Rica is considered to be in the process of moving from an efficiency-orientated economy to one orientated toward innovation initiative (World Economic Forum, 2013). To reinforce the country's industrial competitiveness, enhancement of the technology absorptive capacity of private domestic industries is a priority. To solve this problem, strengthening of technological innovation capacity is necessary. Government intervention in the market is also needed to change the industrial structure into one based on innovation initiative.

3. Analysis of Institution for Innovation in Korea

3.1. Innovation Organizations

Organizations for the management and implementation of innovation policies are classified into three levels: central, provincial and public-private partnership.

3.1.1. Organizations for Policy Formulation

A. Committee

The lone presidential committee is the Regional Development Committee, and the Advisory Council on Science and Technology belongs to the Ministry of Science, ICT and Future Planning. Members of these committees are experts from related fields and provide consulting and opinions on innovation.

B. Ministry

Four central government organizations – the Ministry of Science, ICT and Future Planning, Ministry of Education, Ministry of Trade, Industry and Energy, and the Small and Medium Business Administration – are in charge of managing innovation. Their functions are to set up principles of innovation management and form guidelines for enforcement agencies.

C. Agency

The Small and Medium Business Administration (SMBA) and the Korea Institute for the Advancement of Technology (KIAT) are in charge of operating innovation programs. Their function is operation of innovation programs from corresponding ministries.

3.1.2. Organizations for Implementation

An innovation-related office and the Center for Regulatory Reform oversee the implementation of innovation policies at the provincial government level.

3.1.3. Organizations for Coordination

The techno park and the Center for Creative Economy and Innovation implement innovation policies at the public-private partnership level.

〈Table 1-14〉 Roles and Functions of Organizations for Innovation in Korea

Classification of organizations			Main functions
Policy formulation	Committee	Advisory Council on Science & Technology	- Advise organizations on sci-tech innovation policy
		Regional Development Committee	- Advise organizations on balanced development policy
	Ministry	Ministry of Science, ICT and Future Planning	- Form startup ecosystem & innovation center for creative economy to enhance national innovation capacity
		Ministry of Education	- Run four leading innovation programs such as NURI, LINK or BK21
		Ministry of Trade & Education	- Develop business model by supporting creative ideas and locating core technologies for business
		Small & Medium Business Administration	- Operate Inno-Biz & conduct related projects
		KIAT	- Run programs for innovation from Ministry of Trade, Industry & Energy
Policy implementation	Innovation-related office		- Implement innovation policies for central gov't ministries
	Center for Regulatory Reform		- Implement policies on regulatory reform
Coordination	Techno park		- Support new technology-based startups, R&D, pilot production & supplementary education for technology innovation
	Center for Creative Economy & Innovation		- Connect & synthesize related programs for SMEs in regionally specialized strategic industries

3.2. Innovation Policies

Seven types of innovation policies are divided into three categories to improve national competitiveness and build regional innovation capacity and that of others.

3.2.1. Policies for Raising National Competitiveness

Policies for raising national competitiveness seek the acquisition of new growth engines and promotion of sci-tech competitiveness.

3.2.2. Policies for Enhancing Regional Innovation Capacity

The two policies for enhancing regional innovation capacity are one for balanced regional development and the other for fostering locally specialized industry.

3.2.3. Policies for Other Innovation Capacity Building

The two policies for building innovation capacity in other areas are human resource training and regulatory reform.

〈Table 1-15〉 Objectives and Contents of Innovation Policies

Category	Policy	Objectives and contents
Enhancement of national competitiveness	New growth engine	- Search for new technologies, products and services expected to generate jobs and become leading industries in next generation
	Building sci-tech capacity	- Build huge facilities such as IBS and Isol Separator as a leading facility for International Science & Business Belt - Policy for enhancing technology competitiveness by setup of KISTEP and designation of four R&D special zones
Regional innovation capacity building	Balanced regional development	- Strengthen national & regional competitiveness through balanced development
	Fostering locally specialized industry	- Creation of added value through development of specialized products by using regionally located resources or distinguished regional brands
Other innovation capacity building	Training human resources	- LINK Project of Ministry of Education & BK21 project (Korea Brain 21)
	Regulatory reform	- Regulatory reform for environment, market failure & safety

3.3. Innovation Governance

Innovation policies in Korea are implemented at the levels of central government, provincial government and public-private partnership agency.

3.3.1. Governance Structure at Central Government Level

The National Science and Technology Committee and National Technology Innovation Special Committee coordinate and negotiate projects of national

influence such as "Next-generation Growth Engine R&D Support Project" based on efficiency, but project implementation is in the hands of related department offices. The steering committee, which is composed of the National Technology Innovation Special Committee and Regional Development Committee, sets guidelines for innovation based on the criteria of competition and coordination, and related departments propose project lists for their administrative zones. The Ministry of Science, ICT and Future Planning manages techno parks to enhance sci-tech capacity.

3.3.2. Governance Structure at Provincial Government Level

No specific department or office implements innovation policies at this level but provincial governments have different office types according to their situations when carrying out innovation policies set by the central government.

3.3.3. Governance Structure at Public-private Partnership Level

Eighteen techno parks connecting the central and provincial governments and planning organizations for implementing innovation policies serve as platforms for the implementation of innovation policies.

Korea's innovation system has a complex governance structure. Government policies toward science, technology and innovation (STI) have long roots, and the government has had a pronounced role overall. A key challenge is for Korea to govern its rapidly growing portfolio of policy measures, and Seoul is responding with efforts to improve policy coherence through horizontal coordination between advisory councils and ministries and vertical coordination between ministries and state-run think tanks.

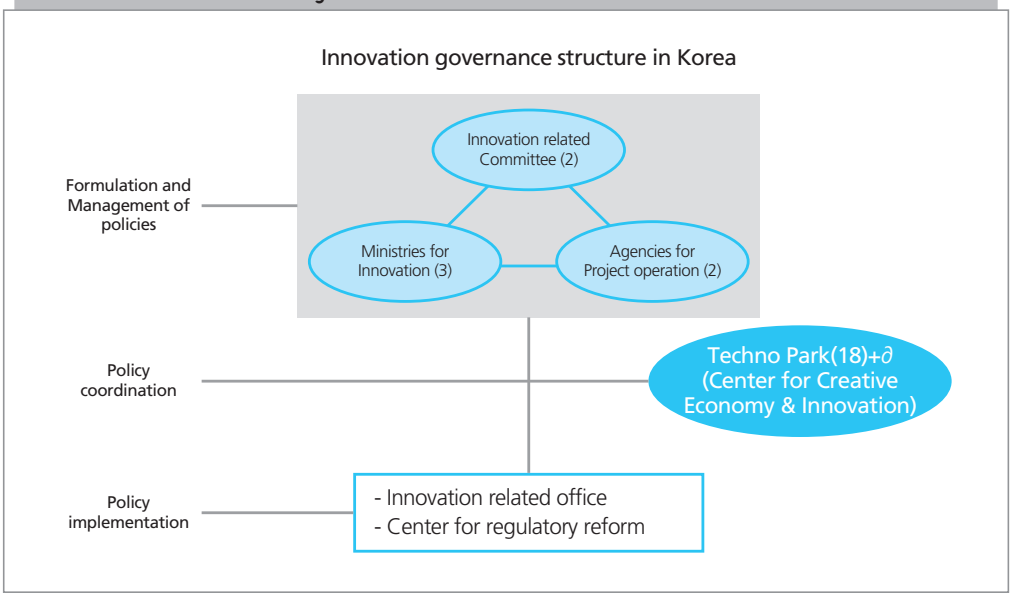
3.4. Four Elements Behind Korea's Effective Institution for Innovation

The four elements that make implementation of innovation policies more effective in Korea are below:

3.4.1. Exclusive Innovation Committee (Regional Development Committee)

Overlapping and duplication often plagued innovation projects of central government departments due to excessive competition. One high-level organization for the negotiation and coordination of carrying out regional innovation projects was necessary, and the Regional Development Committee was established for that purpose.

[Figure 1-4] Innovation Governance in Korea



As one innovation project within the central government expanded, it turned into many projects at the provincial government level, and management of innovation projects grew complicated for both the central and provincial governments. As a result, separated management of innovation projects was needed. The Ministry of Industry and Resource managed innovation policies by excavating regional strategic industries and saw the need for an authority that plans and manages each region's innovation projects. The Regional Planning Board for Strategic Industries was launched by the ministry as an organization for planning and evaluating innovation projects in each region. A planning board for strategic industries and a techno park are located in one place.

3.4.2. Special Law on Supporting Innovation (Special Law for Regional Balanced Development)

The purpose of the Special Law for Regional Balanced Development is alleviating unbalanced regional development and strengthening regional development capacity through connection and coordination among regions based on each area's potential and characteristics. The law seeks to support innovation projects such as promoting regional development capacity, enhancing social facilities, fostering provincial industries, creating jobs and stimulating the regional economy.

3.4.3. Special Account for Supporting Innovation (Special Account for National Balanced Development)

The aims of the Special Account for National Balanced Development are synthesizing and combining accounts for the implementation of innovation policies over the departments, and promoting efficiency and economy at scale by using funds for innovation policy implementation.

3.4.4. Mid- & Long-term Plans for Innovation (Five-year Plan for National Balanced Development)

This plan seeks to introduce the "innovation-oriented regional development model" for regional prosperity and higher quality of life for residents of the Seoul metropolitan area. Another aim is to build a network based on a national innovation system to maximize the development potential of each region and balanced development.

〈Table 1-16〉 Special Institutions that Make Innovation Effective in Korea

Institution	Contents and aims
Exclusive innovation committee	- Highest-ranking committee dealing with negotiation & coordination for innovation policies among related organizations (ex: Regional Development Committee).
Special law on supporting innovation	- Strengthen regional development capacity, foster provincial industries, generate jobs &stimulate regional economy (ex: Special Law for Regional Balanced Development).
Special account for supporting innovation	- Synthesize & combine accounts for implementation of innovation policies & promote efficient fund use in implementation of innovation policies from 2005 (ex: Special Account for National Balanced Development).
Mid- and long-term plans for innovation	- Introduce "innovation-oriented regional development model" for regional prosperity & quality-oriented convergence model for capital region's prosperity (ex: Five-year Plan for National Balanced Development).

3.5. Summary and Implications

Innovation capacity building at the national level began in the 1960s through the approach of imitative technology innovation in the process of Korea's industrialization, and innovation was done by the individual innovation actor base. Innovation capacity building at the provincial level started in the mid-1990s with

innovation governance such as the Balanced Regional Development Committee, Five-year Innovative Regional Development Plan, Special Law for Balanced Regional Development and Special Account for Balanced Regional Development. The effectiveness of innovation policies was thanks to consistent policy implementation by the central and provincial governments.

The Korean innovation ecosystem works in harmony as a synthesized tool. Its well-designed innovation governance was successful due to various factors including proper selection of innovation targets, coordination among the central and provincial governments and public-private partnership organizations, and strong support mechanisms like law and finance. Seven new innovation policies sought to enhance innovation capacity and have been in effect over the last 20 years. Five of the policies are major projects that receive legal backup and financial support.

〈Table 1-17〉 Innovation Policies & Institutions for Innovation in Korea

Innovation policy	Innovation organization & governance			Support mechanism	
	Central gov't	Provincial gov't	Public-private partnership	Legal backup	Financial support
New growth engine	O	O	O	O	O
Balanced regional development	O	O	O	O	O
Training human resources	O	O	O	O	O
Building up locally specialized industry	O	O	O	O	O
Sci-tech capacity building	O	O	O	O	O
Green growth	O	O	O		O
Regulatory reform	O	O	O		

The Korean experience shows that the institution for innovation is effective when innovation policies are well prepared under the proper implementing organization, with strong support mechanisms such as legal backup and financial support. The Special Law for Balanced Development and Financial Support for Technology Innovation are the two most powerful mechanisms behind the success of institution for innovation in Korea. Innovation policy should be made based on regional characteristics and conditions.

4. Policy Recommendation: Institutional Reform to Promote Innovation Capacity in Costa Rica

4.1. Innovation Organizations

4.1.1. Central Government Organizations

Governance and management organizations at the top include the PCCI for governance, four ministries – MICITT, MEIC, MAG and COMEX – for management and CONICIT, CNP, PROCOMER and selected autonomous institutions to carry out innovation programs. The Innovation Council under the Office of the President manages innovation in Costa Rica in the role of a think tank. The main function of an innovation managing organization (board of directors) is to build consensus around policy priorities and offer guidance in designing and implementing effective policies.

4.1.2. Provincial Government Organizations

Offices for innovation policy implementation at the provincial government level could be managed more flexibly. Innovation policies could be handled with other policies together at a regular government office according to the conditions and situations of each provincial government.

4.1.3. Public-private Partnership Agencies

A regional innovation platform is a public-private partnership organization comprised of techno parks and planning board for strategic industries. The platform is an agency for coordination and negotiation between innovation-related organizations, provincial government offices and central government ministries. So setting up a demo techno park and planning board for strategic industries is strongly recommended.

Since innovation is generated more easily by private companies and provincial governments, the former and a regional platform should be included in implementing organizations. Yet provincial governments and private organizations seem disinterested in helping to build a national innovation system at the moment. So the innovation system of Costa Rica could start with top-level organizations in the beginning stage and offices at the provincial government level could be included when deemed necessary. But construction of at least a demonstration regional innovation platform such as Techno Park + δ (planning board for strategic industries) seems critical at this time.

〈Table 1-18〉 Roles & Functions of Organizations for Innovation in Costa Rica

Classification of organization			Main functions
Policy formulation	Committee	PCCI	- Build consensus around policy priorities & provide guidance in designing & implementing effective policies
	Ministry	MICITT	- Devise policy for sci-tech research & coordinate innovation
		MEIC	- Deregulate production & promotion of domestic SMEs
		MAG	- Set policy for innovation in agricultural production
		COMEX	- Formulate policy for foreign trade
	Agency	CONICIT	- Implement innovation policies established by MICITT
		CNP	- Implement agricultural policy
		PROCOMER	- Accelerate exports and FDI attraction
Policy implementation	Innovation-related office		- Carry out innovation policies for ministries
Coordination	Innovation platform	Techno park	- Support new tech-based startups, R&D & pilot production
		PBSI	- Connect & synthesize related programs for SMEs

Noting from the Written Demand Survey for 2014/15 KSP with Costa Rica and Former Minister Kopper's presentation during the Interim Reporting Workshop, the Costa Rican government prioritizes implementation as a key factor in institutional reform for innovation. Five categories of principles were recommended in designing the organization for innovation implementation.

A. Mission & Governance

The mission of the implementation agency is raising productivity in the productive sector through activities fostering entrepreneurship, business development and innovation. Four principles are suggested for governance. Four key ministries enjoy a rotating presidency in productive development policy. The equal participation of government and non-government stakeholders should be guaranteed, as well as the same for stakeholders from both established and new companies to avoid the bias of incumbents. A clear mechanism for coordination with the Trade Promotion Agency is required. And the power to approve and remove programs receiving support at will is a must.

B. Transparency & Accountability

A key factor is transparency to ensure perception as a growth strategy that offers opportunities for all. Decisions, use of funds and accounting should be shared with the public for transparency. Accountability to ministries by the board of directors is also important. Five principles were suggested for accountability. A program should have clear criteria for success based on productivity (e.g., benchmark relative to companies in the same industry). The external evaluation of programs is essential to avoid bias. A program should end after a preset period and require renewal to prevent fund waste. An evaluation should be conducted based on milestones and impact rather than tasks to encourage learning. And the principal targets for the percentage of funds that reach beneficiaries vs. intermediaries should be kept.

C. Funding, Human Resources & Organizational Structure for Efficiency

Funding mechanisms in certain areas should have broad flexibility for a more efficient implementation agency. Related sectors include the Ministry of Finance (direct transfer of national budget), other ministries and agencies (subcontracts), the public sector (for services offered) and the private sector (taxes not passing through the Treasury).

A flexible hiring structure will also ensure competence. Following the four principles of private sector, laws and freedom to use any incentive system, transparent and competitive hiring processes, ability to hire consultants as needed and authority to hire foreign nationals for capacity building, are the key factors to raising the agency's efficiency. A structure as determined by the board and the ability to collaborate with the Foreign Trade Promotion Agency in regions (one-stop shop) are two elements in raising the efficiency of organizational structure.

D. Possible Uses to Foster Productivity & Innovation

The fundamental conditions for choosing programs should be confined to three categories of activities: those that are new to the company or country, those that correct market or government failure, and others with clear spillover or demonstration effects.

Since a learning-focused approach is desirable, the following items should be considered in designing an implementation agency: potential of experimental programs with real risk of failure; space for iteration and pivoting through rapid feedback that minimizes the cost of failure; programs that encourage experimentation to give beneficiaries space to iterate and pivot at key milestones instead of committing to a specific course of action in the beginning; an institution

able to manage tax incentives; and no limit on specific items to be purchased by beneficiaries with funds (payroll, consultants and equipment).

E. Broad Range of Beneficiaries to Allow Flexibility in Targeting Market Failure

Flexibility should be allowed for the following actors in the process of conducting innovation:

People, startups, companies (SMEs, and companies that are not legally SMEs but still need support and large anchor companies), profit and non-profit companies and any legal entity in between, universities for innovation projects, investment for strengthening curriculum, bolstering licensing centers (national and international in all categories), stakeholders with important roles in supporting people, startups, companies, groups of companies and innovative NGOs regardless of their legal form, external evaluators and ministries belonging to the board of directors.

4.2. Innovation Policies

Costa Rica has two plans and six policies and programs for innovation, but lacks a hierarchy or links between innovation policies and programs. In addition, basic plan for innovation does not exists and there is clear lack of policy or program links between FDI and domestic companies for raising national competitiveness. No national policy for innovation that governs innovation content from a long-term perspective, and existing policies were made separately based on each organization's needs.

To set up the ideal institution for innovation, related policies or programs should be prepared under the guideline of vision, mission and strategic objectives of a basic innovation plan. Unfortunately, Costa Rica still lacks such plan at the moment. The following are innovation policy suggestions with minimum standards.

4.2.1. Policies for Enhancing National Competitiveness

Policies for enhancing Costa Rica's national competitiveness could be finding new growth engines, promotion of sci-tech competitiveness and promoting tech-focused domestic SMEs in collaboration with MNCs. Advanced economies have competitively expanded investment in reinforcing their sci-tech capacity, and built institutional settings to support sci-tech development in the belief that the sci-tech sector is the main source of national competitiveness in the era of a knowledge-driven economy.

FDI companies have played a key role in Costa Rica's economic growth over the last 30 years. Now, however, the emphasis should go to strengthening domestic

SMEs so that MNCs and domestic companies can compete and cooperate for mutual benefits. The country must rely less on MNCs and grow more independent in managing industrial development.

4.2.2. Policies for Building Regional Innovation Capacity

Rural or regional areas are not yet targets of governance in Costa Rica. San Jose and the Central Valley region has long served as the core area for development in many sectors such as education, politics, business and even manufacturing. Continuous concentration of investment in this region, however, will result in high cost and low efficiency because of the population density and rising housing costs. The imbalance between the Central Valley area and other regions will worsen and pose a major problem for Costa Rica. Preparing innovational policies for regional capacity building through strengthening regional strategic industries and setting up a coordination link among industry, academia and research institutes could be a good solution for this.

Two recommended policies for enhancing regional innovation capacity are those for balanced regional development and bolstering locally specialized industries. For example, the creation of self-run regional economic zones could come through the reinforcement of regional competitiveness by building a regional innovation system focused on strategic industries.

4.2.3. Policies for Other Innovation Capacity Building

The two policies Costa Rica should pursue are those for developing human resources and implementing regulatory reform. The policy for building up a skilled workforce is targeted toward two groups: universities and other agencies.

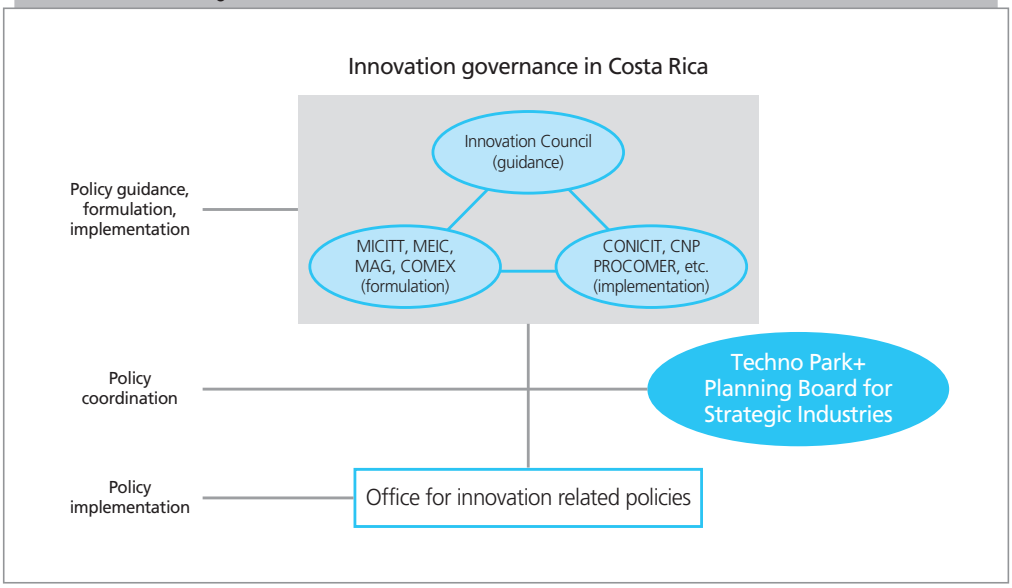
Korean economic growth is said to have been possible because of the heavy emphasis on education by Korean parents. Since the first and foremost asset in an innovation-driven society is human resources, Costa Rica should place top priority on fostering a talented workforce.

Regulations are necessary in certain fields such as the environment, safety and control of market failure but all barriers to entering a market and price and production should be abolished. Even if regulations are needed, low regulation and alternative options are essential. Deregulation often results in lower trading costs and recovery of market functions. Other benefits of deregulation include simplification of the startup process, no need for minimum capital and a certification process for setting up SMEs.

4.3. Innovation Governance

Innovation governance should feature a three-layer structure. Organizations on the top layer should be further divided into three categories and feature close working relations. Another must is forming an innovation platform through the construction of a techno park with a planning board for strategic industries or collaboration of academia and private industry. From a long-term perspective, the creation of an office for innovation policy implementation at the provincial government level is recommended. (Refer to Figure 1-5)

[Figure 1-5] Recommended Innovation Governance in Costa Rica



Innovation is initiated and managed by the private sector in many advanced economies. Building an innovation platform (establishing a techno park with PBSI or establishing a private business with academic collaboration) is one option for an innovation system with a private sector initiative. The four support mechanisms for SMEs under an innovation platform are internalization of SMEs for integration into the global value chain, technology innovations, human resource development and acceleration of startups.

Provincial governments are the frontline enforcers of innovation policies and projects, but in Costa Rica, all innovation affairs are managed by central governmental organizations only. MICITT says that since the country is relatively small in size and the functions of provincial governments are so limited, implementation offices for provincial governments are not so necessary at the moment. Given that

innovation can happen anywhere if needed, offices are needed over the long term to handle innovation policies and projects at the provincial government level. Innovation happens in the private sector and provincial government level more frequently, so the private sector must be included in the governance structure and a new office for implementation at the provincial government level is needed.

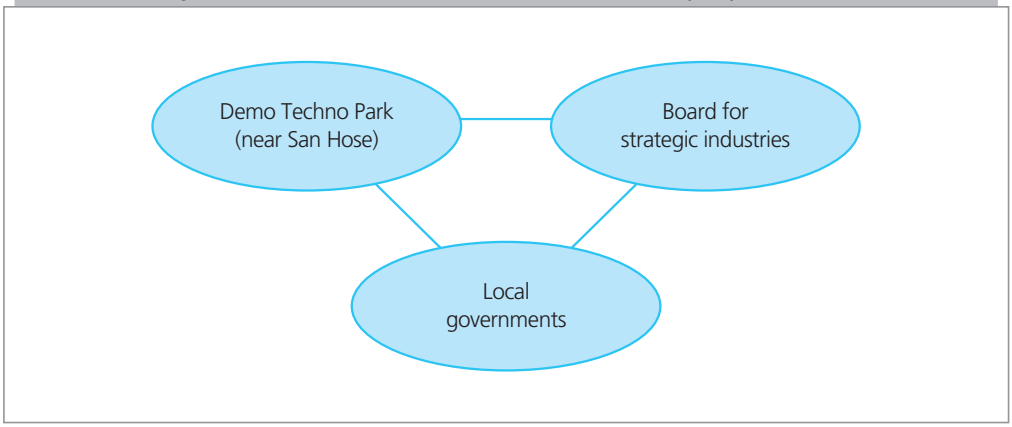
The final criterion of success in building an innovation system is the effectiveness of a public-private partnership initiative or private company focused on innovation governance. A necessary task in building innovation governance is creating the proper innovation platform. Principles in establishing such a platform for the operation and implementation of innovation policies are as follows:

- Innovation platform composed of two facilities such as techno park and planning board for strategic industries.
- Techno park functions are provision of space and technological support for companies located in the region, acceleration of network between companies and public and private organizations, and generation of innovation.
- Functions of planning board for strategic industries are selection of strategic industries via communication with related organizations and preparation of plan for developing strategic industries selected.

Techno parks and planning boards for strategic industries are autonomous organizations carrying out innovation policies from top-level organizations and connecting innovation policies from provincial governments; provincial governments conduct innovation policies as separate organizations for implementation.

Since large amount of funds are needed to build a techno park, a building-type techno park with a board for strategic industries is recommended in the beginning. (Refer to Figure 1-6)

[Figure 1-6] Governance Structure for Innovation Policy Implementation



4.3.1. Suggestions for Establishing Innovation Governance

The recommended structure of innovation governance in Costa Rica is through a central government initiative for innovation policies and plans, implementation of an initiative policy by provincial governments and companies, and an innovation platform centered on coordination and negotiation. Costa Rica has the capacity for building a national innovation system but is building a system for a central government initiative for an innovation system, so provincial government involvement will apparently take time. For now, it seems reasonable to build the innovation system on the one hand and establish an innovation platform on the other at the center of Central Valley (near San Jose), including a techno park and board of planning for strategic industries.

The following are five recommendations for building a desirable form of innovation governance structure in Costa Rica.

4.3.1.1. Form Inter-ministerial Task Force to Streamline Policy Cycle

Create a policy intermediation task team supervised by a thematic council composed of four key ministries: MICITT, MEIC, MAG, COMEX. Members should comprise a secretary and one other person from the Cabinet, one for defining, another for designing and one more for M&E. The council's main jobs are defining policy options, designing policy instruments and monitoring and evaluation. Among eight people from key ministries, inclusion of one close adviser to a minister or vice minister and a director of a relevant branch is critical.

4.3.1.2. Assign Specific Roles in Policy Intermediation for Task Force

Define policy options by analyzing policy options based on technical accuracy and political supportability and make holistic recommendations to the Cabinet. Design policy instruments by designing legal reforms as needed with key teams in the presidency and design (new and reformed) programs with implementation agencies and key experts from the consultation council. Monitor and evaluate through ensuring adequate monitoring and evaluation of legal reforms passed by the legislature and programs implemented by agencies.

4.3.1.3. Streamline Consultation Process

Integrate all consultations with non-government stakeholders through presidential consultation councils with the following modifications:

Assign the secretariat the responsibility of organizing the consultation process. Seek better alignment of two councils with economic and social councils. Competitiveness, innovation and human talent all seem to align better with the economic council. The social council has no forum for public consultation. Include all relevant political stakeholders in each consultation council and all relevant non-political stakeholders in the consultation council. Coordinate additional ministerial consultations through a task force (surveys, interviews, and committees).

4.3.1.4. Centralize Decision-making Process

Centralize decision making through the Cabinet with the following modifications:

Clarify the role of the Presidential Consultation Council in feeding the economic and social councils with political and technical opinions. Clarify the role of the social and economic councils as a space for ministers to reach a consensus on recommendations to the president in the Cabinet. Let the secretary of the inter-ministerial task force play an important role in reducing the degree to which ministries make decisions in isolation.

4.3.1.5. Create Mechanisms to Ensure Agile & Efficient Implementation

To create a more effective strategy to foster legal reforms, the following three things are recommended:

The task force should work closely with the presidential office to position needed reforms in the legislature. An inter-ministerial agency for productivity and innovation should be formed with the correct governance structure, flexible funding structure and proper hiring system for efficient implementation aligned with policy priorities.

4.4. Suggestions to Promote Innovation Capacity over Short & Mid Term

Costa Rica is not ready to build national and provincial innovation systems but an innovation system through a central government initiative is under construction. So the Costa Rican government can prepare for the system's establishment and build a demo innovation platform at the center of Central Valley (near San Jose) with a techno park and a board of planning for strategic industries.

Enacting laws on innovation is desirable but takes three to four years (per interview with Costa Rican experts on Feb. 9, 2015). The government has enough laws and regulations on innovation, so no more are required at the moment. Certain laws might need supplementation and others need amendment for the establishment of an innovation ecosystem.

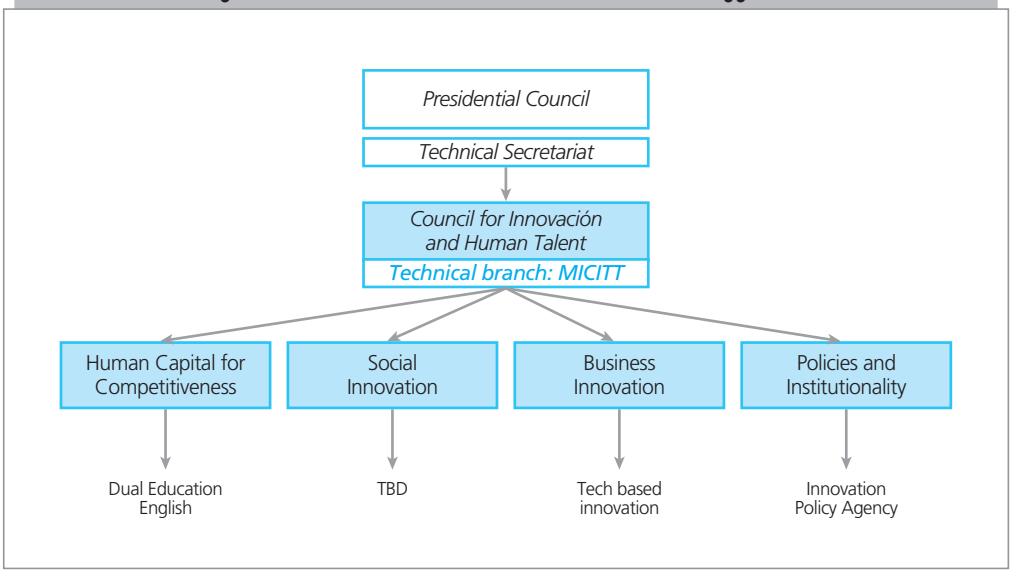
Government intervention in the market is necessary to turn Costa Rica's efficiency-oriented economy into one stressing innovation initiative. Restructuring government organizations, planning for innovation and preparing innovation policies are recommended short-term tasks, and mobilization of an innovation fund, enactment of laws and revision of related laws could be mid- term tasks to raise innovation capacity in Costa Rica.

4.4.1. Suggestions for Short Term

Working with the existing governance structure is recommended as a short-term policy to maximize resource utilization with three options.

The first option is strengthening the dynamics of the Presidential Council for Competitiveness and Innovation (PCCI) to foster intersectorial work geared toward solving government failures.

[Figure 1-7] Innovation Governance for Short-term Suggestions



The second option is using existing ministerial funds to run pilot programs to resolve market failures that affect important stakeholders, individuals, startups and established companies. Pilot programs such as those for technology innovation for SMEs, integrating SMEs into the global value chain, stimulation of startups and training high-end human resources are recommended.

The third option is establishing a basic innovation plan for Costa Rica. Vision,

missions and strategic objectives of innovation are different by country because of different traditions and cultural and historical backgrounds. So there is no such thing as a best innovation system for Costa Rica. But every country should have a vision, missions and strategic objectives in a basic innovation plan, and recommendations for Costa Rica are below.

A. Vision

Establishment of an innovation platform to promote research and business development and support sustainable SME growth by facilitating cooperation among research centers, universities, industries and governments within the framework of national and regional innovation systems

B. Missions

- Tech-based economic growth through creation and support of knowledge-based companies in Costa Rica and other countries
- Sustainable development of high-tech SME
- Settlement of regional innovation platform in Costa Rica (and Latin America)
- Building an innovation ecosystem

C. Strategic Objectives

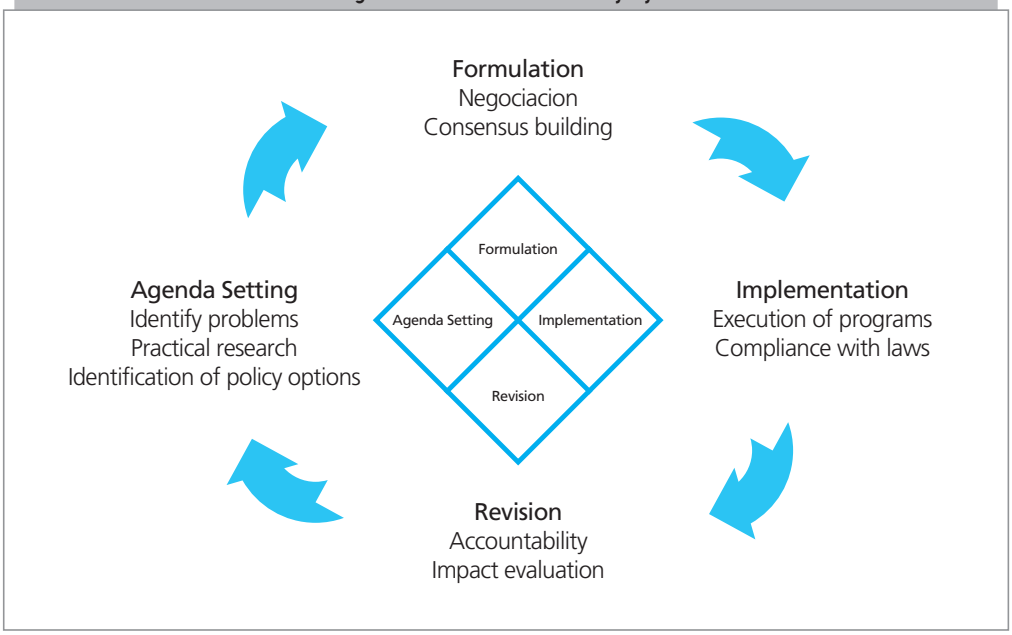
- Promote tech-based economic growth, job creation and innovation
- Facilitate high-tech SMEs through close cooperation among existing HEIs and public research centers with private industry.
- Strengthen links between MNCs and SMEs for integration into global value chain
- Support technology transfers and commercialization from HEIs and research institutes to productive sector
- Encourage formation of knowledge-based enterprises through knowledge and expertise available at R&D centers.
- Promote innovation capability.

4.4.2. Suggestions for Mid-term

The KSP with Costa Rica's three suggestions for mid-term tasks are as follows:

A. Creation of an agency to drive productivity and innovation (National Agency for Productivity and Innovation). The ANPI's roles are classified into four areas: formulation, agenda setting, implementation and revision. Formulation requires negotiation between related agencies and consensus building for new

[Figure 1-8] ANPI in the Policy Cycle



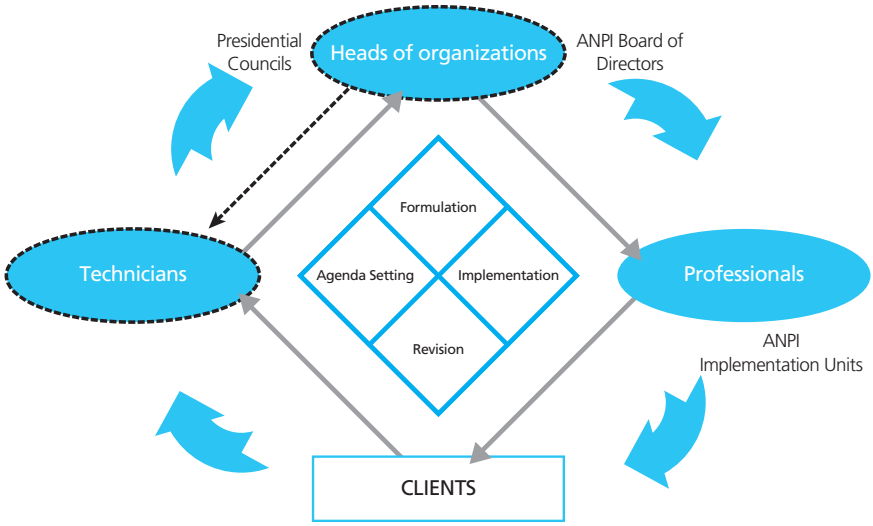
policy alternatives. Agenda setting involves identification of problems arising in the process of building an innovation system and identification of policy options to that end. Implementation is the execution of innovation-related programs and compliance with the law. And revision requires accounability and evaluation of the impact of innovation policies.

B. Redefine laws that map institutions for innovation, with Laws such as those for supporting collaboration between academia and industry, deregulation, fostering tech-focused SMEs and support for the acceleration of startups and recommended.

C. Interministerial effort to devise innovation policy for development. The KSP recommends policy formulation for building links between SMEs and MNCs, establishing a demo techno park near San Jose, forming business incubators at universities in collaboration with the private sector and expediting business startups via teamwork by four ministries and three agencies.

A steering committee for the implementation of innovation policies is recommended as mid-term task to enhance national innovation capacity.

[Figure 1-9] ANPI as Part of Institutional Governance for Innovation



〈Box 1〉 Governance Structure for Innovation in Korea

Korea's basic structure of innovation governance has three layers: management organizations at the top, public-private partnership organization in the middle and implementing organizations at the bottom.

① Management organizations at the top level

Two categories of organizations, innovation-related committees and major ministries for innovation, are at the top level. The three committees for innovation affairs are the Regional Development Committee, Committee on Green Growth and Advisory Council on Science and Technology.

The National Science and Technology Committee is in charge of coordination and negotiation of projects of national influence such as the Next-generation Growth Engine R&D Support Project based on efficiency, but project implementation lies with related department offices. The Regional Development Committee is the steering committee for setting guidelines for innovation based on competition and coordination.

The Ministry of Science, ICT and Future Planning (MSIFP) of Korea oversees innovation affairs like MICITT of Costa Rica.

② Management and implementation structure at the bottom level

No specific department or office implements innovation policies at the provincial government level but the offices of provincial governments differ according to their situations for the implementation of innovation policies from the central government.

〈Box 1〉 continued

③ Management & implementation structure at PPP level

A techno park and board of planning for strategic industries are corresponding organizations at the middle level. Eighteen techno parks connect the central and provincial governments and planning organizations for implementing innovation policies nationwide as platforms for such implementation. Techno parks provide synthesized and packaged support mechanisms including provision of technology and space to companies, and leads provincial industries with their respective governments by generating world-class innovation.

〈Box 2〉 Functions of Daejeon Techno Park in Korea

The Korean city of Daejeon the Department of Science and Special Districts and Department of Industrial Policy under the Bureau of Science, Culture and Industry, which is in charge of innovation policy implementation. The first department oversees innovation policies on science, creative economy and the International Science and Business Belts and supports R&D special zones. The Department of Industrial Policy is in charge of innovation policies for future industries and intelligent property.

The Planning Board of Strategic Industry under the Daejeon techno park prepares strategies to develop four industries, information and communication, bio animal, mechatronics, and high parts and materials, through discussion with many related organizations working toward the city's development. The board also devises long and mid-term development plans for the Daejeon region and a roadmap for the four strategic industries.

The Daejeon techno park aims to coordinate regional innovation projects by establishing a cooperation system among industries, universities, research institutes and government located in the Daejeon area. Other tasks include contribution to the regional economy and national development by accelerating technology enhancement of regional strategic industries and creation of tech-heavy companies as an innovation core.

The major functions of the Daejeon techno park are devising mid- and long-term development strategies and networking of Daejeon-based industries, attracting RTTC and implementing technology transfer projects, supporting star companies, start-ups and bio-nano convergence industries, assisting high-tech commercialization projects through cooperation among industry, academia and research institutes, and developing the renewable energy industry and human resource training.

〈Box 3〉 Vision and Goal of Regional Development Model in Korea

Korea has implemented the strategies of an "innovation-oriented regional development model" for a provincial area's prosperity and a "quality of life-oriented convergence model" for the prosperity of the capital region (ex: Five-year Plan for National Balanced Development in Korea)

The vision and goals of innovation should be decided first, then the related targets, organizational structure for implementation, financial resources and legal system should follow in phases.

〈Box 4〉 Five Innovation Related Laws in Korea

Korea's five innovation-related laws are the Special Law for Balanced Development, Basic Law for Science and Technology, Basic Law for Low Carbon and Green Growth, Law for Industrial Technology Innovation and Act on the Promotion of Technology Innovation for SMEs in Korea.

〈Box 5〉 Three Categories of Innovation Policies in Korea

Innovation policies in Korea are divided into three categories for the purpose of raising national competitiveness and building capacity in regional innovation and others. Policies for enhancing national competitiveness include acquisition of new growth engines and promotion of sci-tech competitiveness and green growth. The two policies for enhancing regional innovation capacity are for balanced regional development and fostering locally specialized industry. And the policies for building innovation capacity in other areas are human resource training and regulatory reform.

5. Conclusion

Costa Rica is the most innovative country in Latin America, ranking 39th of 142 countries surveyed on the Global Innovation Index (GII) 2013. The GII ranking is published every year by the European Institute of Business Administration, Cornell University and the World Intellectual Property Organization. The index assesses economies in 142 countries using 84 indicators to measure the relationship between innovation capability and measurable results. The public sector and public-private partnership organizations in Costa Rica are thus trying to reinforce innovation capacity, and people want related policies and organizations for the implementation of innovation.

Since the founding of the Costa Rican Ministry of Science and Technology (MICITT) in 1990, the promotion of science, technology and innovation (STI) has been a priority of the government's agenda. Several policies and programs were established in Costa Rica over many years. The Presidential Council on Competitiveness and Innovation was launched in 2010 to enhance the country's human capital for innovation. MICITT published the National Plan for Science, Technology and Innovation 2011-15 (MICITT 2011). A 100-member consultative group designed the plan in seven strategic areas: earth and space sciences, new materials, biotechnology, natural capital, health, alternative energy and digital technologies. In 2015, the new National Plan for Science, Technology and Innovation 2015-21, was announced. About 13,000 SMEs, 6,000 scholars, 300 MNCs, 50 NGOs and 20 civic groups took part in designing this new plan to improve the five key areas of education, water resources and environment, energy, health, and food and agriculture.

Despite a big push from the Costa Rican government, the results of policy implementation have fallen below expectations. The following are excuses for the unsuccessful outcomes of innovation in Costa Rica from an institutional perspective.

The first excuse is organizations and management methods in innovation policy implementation. Organizations for innovation are so autonomous that decision making is processed separately, so coordination between organizations is weak and innovation policies are implemented by so many agencies in isolation. No long-term vision for innovation exists because of no permanent body in charge of innovation. Ministries are not designed to implement innovation policies or programs and existing implementing agencies are ineffective. Intra-agency coordination is lacking because of a weak governance structure and the separate management of STI, business and entrepreneurship, foreign trade and agriculture.

The second excuse stems from innovation policy and programs. Costa Rica has two plans and six policies for innovation but lacks a hierarchy or links between policies, so no synergystic effect is expected from the status quo. Nearly all existing policies and programs were established by individual agencies in isolation as needed by each organization. A basic plan for innovation and an exclusive organization in charge of synthesizing all of the country's innovation policies would expedite innovation. To set up the ideal institution for innovation, related policies or programs should be prepared under the guideline of vision, missions and strategic objectives of a basic innovation plan. Unfortunately, Costa Rica still lacks such a plan.

The third excuse is related to innovation governance. Building an effective innovation governance structure is necessary for Costa Rica from a long-term perspective. A governance system requires vision, missions and strategies of achieving goals. The vision of innovation governance in Costa Rica could entail the formation

of an innovation platform to promote research and business development and support sustainable SME growth by facilitating cooperation among research centers, universities, industries and government organizations.

In addition to problems mentioned earlier, other obstacles include organizational rigidity, insufficient data on markets and technology, lack of access to finance, obsolete infrastructure and insufficient collaboration on innovation among government agencies and between companies and universities or public research centers. The innovative capacity of Costa Rica's private sector is also weak. In recent years, a few large multinational companies have pursued in Costa Rica advanced manufacturing in high-tech industries, upgrading the added value of their operations and increasing R&D investment. The vast majority of companies, however, especially SMEs, hardly invest in innovation.

So the immediate task for the Costa Rican government in institution for innovation is apparently setting up a steering committee to establish a basic innovation plan that includes related goals and strategies, organizations for management and implementation, legal and financial support systems, and policies to enhance innovation capability in major strategic areas of industry.

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2014/15 Knowledge Sharing Program with Costa Rica:
Strengthening Institutions and Support Mechanism to
Foster Innovation in Costa Rica

Chapter 2

Support Mechanisms for Small and Medium Enterprise (SME): Strengthening Innovative Capability and Establishing Links in Global Value Chain

Support Mechanisms for Small and Medium Enterprise (SME): Strengthening Innovative Capability and Establishing Links in Global Value Chain

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Summary

The ultimate goal of a company is to gain competitiveness and survive and grow in the market. For SMEs, the best way to achieve these goals is to be in global value chains (GVCs) given the weak market presence of SMEs. To do that, they need to raise innovation capacities in the capital, technological and human sectors. Support mechanisms for SMEs are formed under the following structure: SMEs enhance innovation capacity by strengthening industrial-educational networks, and are ultimately included in GVCs.

The productivity of the Costa Rican economy has decreased with time, its potential growth potential is down and competitiveness is falling. The proportion of manufacturing in economic importance fell from 19.3 percent in 1970 to 15.4 percent in 2012, and the industry no longer plays a leading role as a growth engine. SMEs in Costa Rica comprise 95 percent of all companies in the country and 46 percent of employment, but still account for 39 percent of production value and 15 percent of exports, suggesting that SMEs are mostly small. Foreign direct investment (FDI) has seen a clear rising trend in Costa Rica over the last 25 years, accounting for a stable 6 percent of GDP.

The main issues surrounding Costa Rica's support mechanisms for SMEs are classified into three agenda types: institutional, GVCs and SME's innovation capability. The four main issues are rigid regulations, inefficient finance system, insufficient

implementation level of governance system to support SMEs and low collaboration between academia and industry. The two main problems of Costa Rican SMEs participating in GVCs are weak links between MNCs and SMEs and poor participation of domestic firms in GVCs. Issues surrounding the improvement of SMEs' innovation capability are categorized into three agenda: low level of technological innovation capability, weak educational structure for HRD, and low entrepreneurship and innovation culture.

This study analyzed the governance system, action programs and main issues of each category to support SMEs in Costa Rica: integration into GVCs, technological innovation capability, human resource development and acceleration of startups. The main issues of each category are similar to the main problems above.

Per the same frame of analysis, this analysis covers the Korean experience in four categories of support mechanisms for SMEs and derives policy implications. The Korean government has pursued various policies to support SMEs to raise innovation capacity and boost exports in accordance with stages of economic development. Korean SMEs accounting for 47.7 percent of production cost and 45.7 percent in added value in 2012, thus they play an important role in the economy. Despite policies to support SMEs by the government and universities, the ratio of production and added value has gradually fallen, and this is why more policies are needed to support the competitive edge of SMEs. 10 ministries and 17 municipalities in Korea promote support mechanisms for SMEs and the related budget amount to 13 trillion KRW. For policies to support SMEs, that were combined in 2013, the Small and Medium Business Administration (SMBA) has taken a holistic approach encompassing startups, venture companies, SMEs, domestic businessmen and medium-sized companies after the Ministry of Trade, Industry and Energy (MOTIE) transferred the role to the SMBA.

Four features of policies to support SMEs in Korea allow effective planning and execution: policy planning and enforcement to promptly and effectively carry out policies; a systematic governance system leading to the operation of programs; structures implemented in a national and supportive way, policies based on industrial-academic cooperation; and full budget support. Many ministries in the Korean government such as the SMBA, Ministry of Science, ICT and Future Planning (MSIFP), MOTIE and Ministry of Education (MOE) have their own governance system to support SMEs. The governance system of each policy of supporting SMEs is systemized to efficiently and effectively implement pro-SME policies. Such policies are implemented and operated based on a strategy of industry-academia-government cooperation to promote SME policies and programs. The Korean government has allocated a large portion of budget to effectively implement policies to support SMEs, at the national and provincial levels.

This paper suggests an implementation strategy and action programs based on the main issues of Costa Rica and the Korean experience. To resolve institutional issues, the Costa Rican government needs to classify each strategy in four categories. It needs to deregulate a variety of obstacles to promote policies, and resolve the lack of access to financing innovative activities by improving the financial system. The Costa Rican government needs to change its governance system to increase the level of implementation and operation. Because academia-industry cooperation is a key strategy for improving innovation capability, the government needs to change the national academic system to facilitate better cooperation with industry.

To strengthen links between MNCs and SMEs and raise the marketing skills of SMEs, Costa Rica needs policies to improve the innovation capability of SMEs to bolster the connection between MNCs and SMEs. To improve the innovation capability of SMEs, the government needs to establish a regional innovation system (RIS), and to provide the high-quality human capital, innovation of the education system is required via academia-industry cooperation. Finally, another crucial step is setting up entrepreneurship programs to accelerate startups.

This paper suggests action programs for each big agenda item: improving the institutional system, integrating SMEs into GVCs and enhancing the innovation capability of SMEs. To improve the institutional system to support SMEs, Costa Rica needs to improve access to financing innovative activities by working on three fronts: promoting the implementation of Ley de Garantías Mobiliarias, reducing the cost of funding through lower interest rates and helping entrepreneurs with fundraising. Good coordination of efforts of all actors involved is needed in innovation processes to increase the level of policy implementation. This effort requires higher enforcement power by the Presidential Council for Competitiveness and Innovation (PCCI) to develop policy coordination among different sectorial ministries. The PCCI should identify an appropriate mechanism to channel the demand of the private sector and empower it with an agenda for priority setting and action definition (OECD, 2012). The council should work on improving university collaboration in innovation activities undertaken by companies, enforcing a culture of protection of intellectual property rights, strengthening financial instruments to support new ventures and innovations, and facilitating access to highly skilled workers by SMEs.

Also important to set up a strategy to implement actions to strengthen links between SMEs and GVCs: selection of and concentration on potentially capable SMEs, development of special programs to create links between SMEs and MNCs, expansion of export programs of PROCOMER, raising PROCOMER as an internalization platform and development of special programs to improve SMEs' marketing skills.

To enhance the innovation capability of SMEs, this research suggests a pilot

innovation platform to overcome the various weaknesses in developing an RIS. Short-run and long-run projects are also recommended. The long-run project should establish a pilot techno park as suggested in Chapter 1. So we suggest in this chapter a short-run innovation platform that can be funded by the Korean fund in the Inter-American Development Bank (IADB). To design and implement the project, we will take advantage of academic and technical cooperation agreements TEC has with both Chungnam National University of Korea (CNU) and the High Technology Advisory Committee of Costa Rica (CAATEC), a widely respected think thank with extensive experience in designing and implementing projects in the country.

Reflecting from the Korean experience, Costa Rica should increase R&D investment to about 2.5 percent of GDP to raise the technological innovation capability of SMEs. In addition, this research suggests several action programs for improving technological innovation: improving the financing system, encouraging more engineering majors to promote R&D among the majority of science majors, developing an incentive system for cooperating with industry, deregulation, revamping the evaluation system, changing the protective system for intellectual property rights and employing an IADB-funded innovation platform and pilot techno park (if established).

Because the main problem of human capital is the insufficient number of technicians, engineers and researchers, the Costa Rican government should encourage human capital development in the field. This research suggests several action programs for human resource development (HRD): establishing a technical high school for ICT and medical devices, raising the number of majors and students at technical colleges, encouraging more engineering majors, undergraduate and graduate students, and professors, and developing short programs at the National Learning Institute.

Fostering entrepreneurship and innovation culture should be the top priority in the Costa Rican policy of accelerating startups. Universities need to establish a large number of entrepreneurship classes and run programs to develop entrepreneurship such as startup clubs or contests. To technically accelerate startups, the government needs to expand CONICIT programs based on startup stages. Costa Rica also needs to expand the number of business incubators or accelerators.

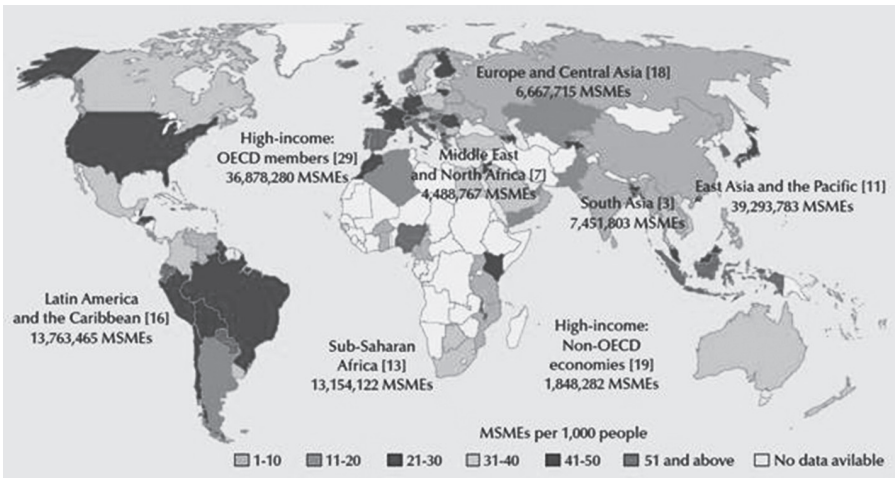
1. Introduction

1.1. Global Trends of SMEs

Small and medium-size enterprises (SMEs) are the core to lead economic growth not only in emerging and developing countries, but also in developed countries.

According to the OECD, SMEs play an integral role in most economies accounting for 95~99 percent of all companies and 60~70 percent of employment.

[Figure 2-1] Global Status of SMEs



Source: Khrystyna Kushnir, Melina Laura Mirmulstein, Rita Ramalho - *Micro, Small, and Medium Enterprises Around the World: How Many Are There, and What Affects the Count? 2010, p. 3*.

A total of 125 million SMEs are in 132 economies, 89 million of which are in developing countries. On average, the rate is approximately 31 SMEs per 1,000 people worldwide. SMEs have a direct impact on GDP growth, accounting for 60 percent of GDP in China, 65 percent in the U.S. and 52 percent in the European Union. They also greatly contribute to employment in a country. On average, companies that hire five to 250 people account for 66.8 percent of national employment. Furthermore, SMEs are creating 86 percent of jobs (Kushnir *et al.*, 2010). The growth of SMEs has a positive effect on creating jobs and promoting employment, contributing to growth around the world. So the economic competitiveness of SMEs equates to national competitiveness.

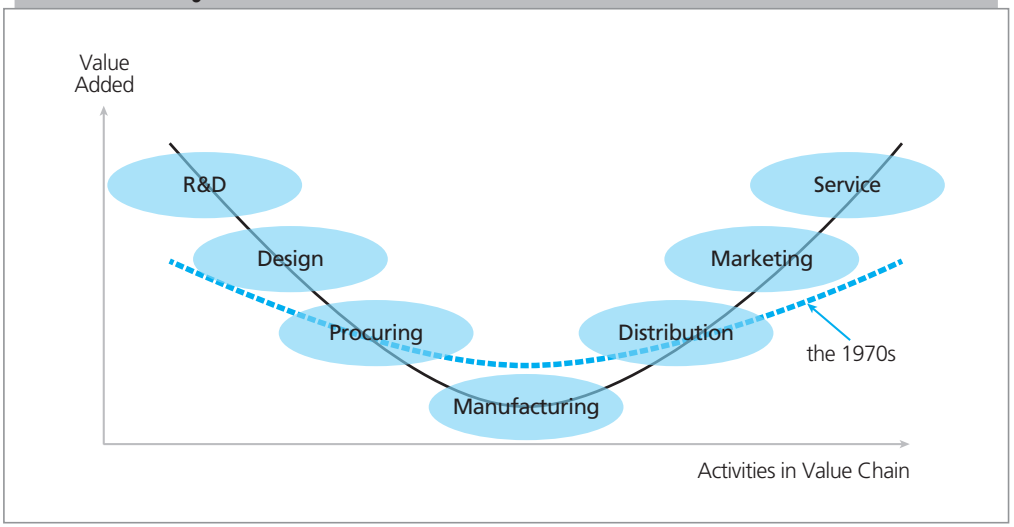
1.2. Concept of Global Value Chain & Global Trends

1.2.1. Concept of Global Value Chain

As barriers between countries break down, companies are expanding the whole process of value chains ranging from planning and production to sales on a global level. In other words, they distribute each stage of value chains in an area with comparative advantage, doing businesses at the global level. Such process is defined

as global value chains (GVCs). Multinational companies (MNCs) are driving the formation of GVCs, as they obtain and replace numerous activities at the global level in the whole process of corporate value chains except for core competence.

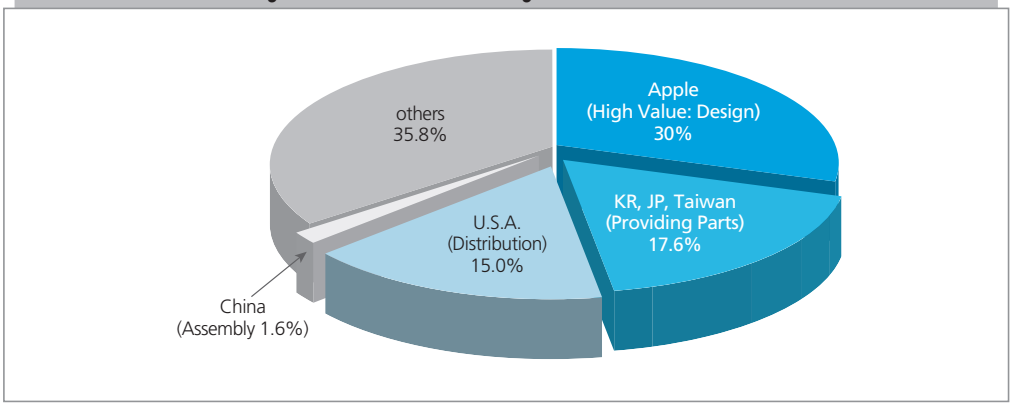
[Figure 2-2] Smile Curve & Distribution of Added Value in Value Chain



Source: R. Baldwin, "Global Supply Chains," Mimeo, 2013.

MNCs have secured R&D, design, marketing and customer services deemed in the category of added value areas in the smile curve, which suggests the amount of added value depending on the stage of the division of labor, and let SMEs take charge of low value-added parts. This is how they form global value chains. This type of GVC governance further expands the gap in a value chain depending on roles and functions, making the smile curve steeper (Youn, 2014).

[Figure 2-3] Revenue-sharing Structure of iPad (2010)



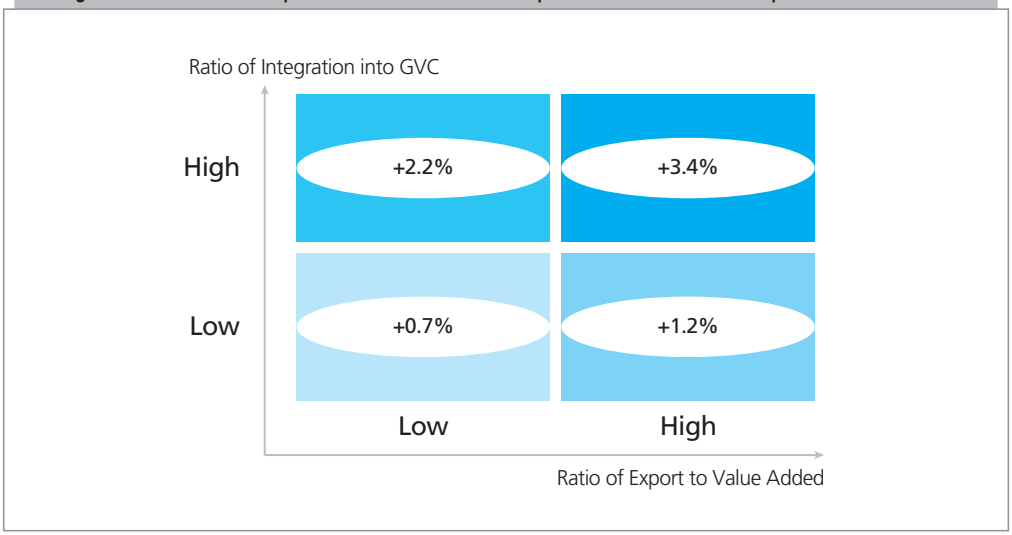
Source: Youn. Structural Changes in International Value Chains and Korea's Status, 2014.

Understanding the truth in trade statistics is possible only through precise comprehension of GVC governance. The GVCs of iPad driven by Apple show production in China for export and sale in the U.S.. At first glance, China seems like it is exporting a large volume of exports. But the real revenue structure is the opposite. Apple takes 18 percent of the sale price, and countries providing core parts such as Korea and Taiwan take 18 percent each. China's profit from assembly and export is only 2 percent of the sale price (Youn, 2014), and this is because China is responsible for the lowest part of the smile curve.

Only companies that understand GVC governance can survive in the global market. The type and characteristics of governance vary depending on industry, however, in order to enter into GVCs and survive in the global market, SMEs need to accurately understand such governance structure and enhance their competitiveness while improving innovative capacity.

1.2.2. Global Trends of Global Value Chain

[Figure 2-4] Relationship between Level of Participation in GVCs & Per Capita Income Growth



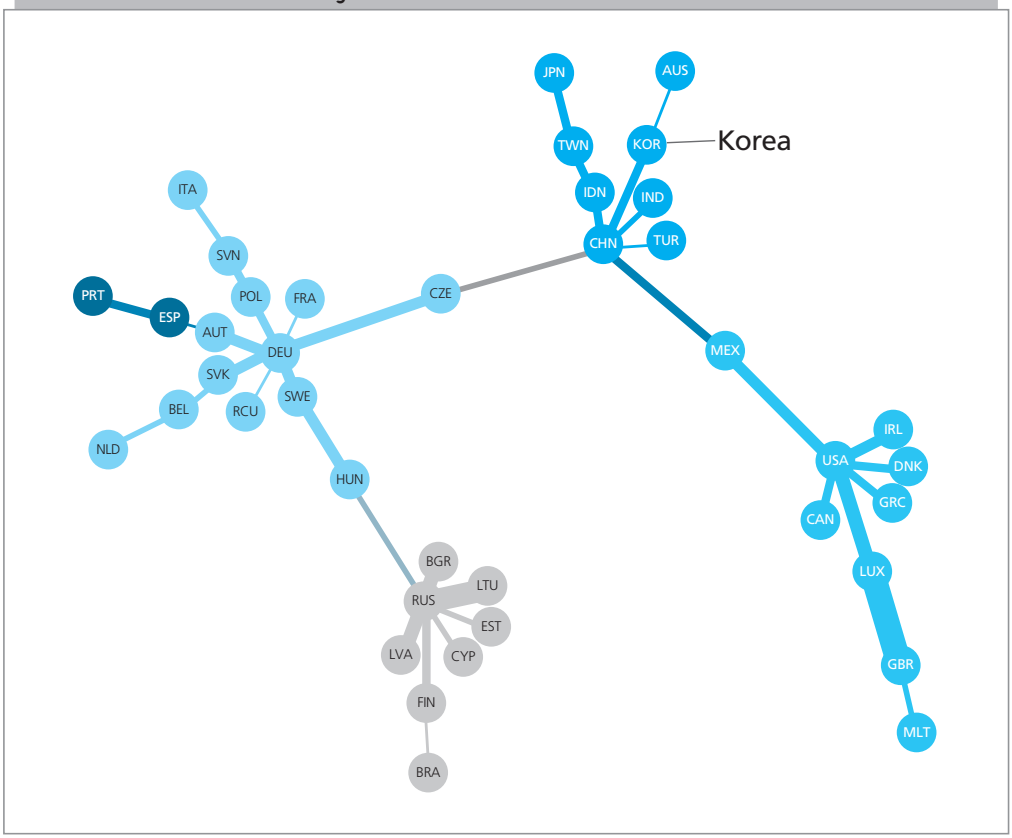
Source: UNCTAD, World Investment Report, 2013.

GVCs have been leading global trade over the past 20 years led by MNCs. According to UNCTAD (2013), GVCs of multinational companies led 80 percent of international trade in 2010 worth $19 million. As GVCs have grown more important, the status of a company and country in international trade is determined by the status of GVCs. As shown in [Figure 2-4], the success of industrialization in developing countries depends on active participation in GVCs and the ratio of domestic added value to exports. The leading examples are China and India, as these countries play

an important role in GVCs in the manufacturing and service industries and have seen continued high growth.

GVCs are differentiated in four continental areas as countries like China and Russia are newly emerging economies. Regionally, another four GVCs are differentiated and being developed; the EU value chains are based in Germany, North America's in the U.S., Asia's based in China instead of Japan, and the Baltic area's based in Russia (Youn, 2014).

[Figure 2-5] Global Value Chains in 2011



Note: The thickness of the connecting line displays a ratio of added value contributing to the overall exports of the other country (based on countries with high added value).

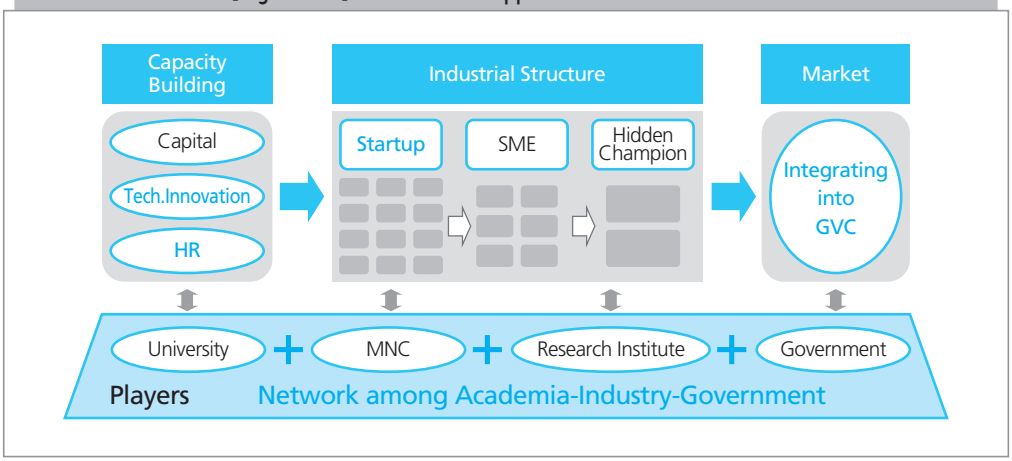
Source: Youn. Structural changes in international value chains and status of Korea, 2014.

1.3. Structure & Global Trends of Support Mechanisms for SMEs

1.3.1. Structure of Support Mechanisms for SME

The ultimate goal of a company is to gain competitiveness and survive and grow in the market. For SMEs, the best way to do this is to be in GVCs given their weak market presence. To do that, they need to enhance innovation capacity in financial capital, technology and human capital. SMEs cannot simply seek to possess innovative capacity based on their own knowhow. That is why they emphasize industrial-educational networks. In the industrial structure, it is essential to strengthen innovative capacity so that startups can develop into SMEs and hidden champions, as well as be included in GVCs. Support mechanisms for SMEs are formed under the following system structure; SMEs enhance innovation capacity by strengthening industrial-educational networks for eventual inclusion in GVCs.

[Figure 2-6] Structure of Support Mechanisms for SMEs



1.3.2. Global Trends of Support Mechanisms for SMEs

1.3.2.1. Globalization of SMEs

As GVCs get complicated, diversified and segmented, the approach toward globalization of SMEs should come in a complex and comprehensive way. While conventional globalization is limited to outward activities such as export or foreign investment and inward activities such as imports and attracting foreign capital, approaches to globalization have recently grown more holistic focusing on linked activities such as strategic alliances or cooperative manufacturing. Looking at the

ways SMEs are connected to the global market based on holistic approaches, most SMEs do not compete with MNCs rather they enjoy cooperative relations (Lee, *et al*. 2013). Due to this cooperative relationship, most countries have adopted a policy to incorporate SMEs in the GVCs of MNCs. If SMEs are included in cooperative GVCs, they can create higher added value as they can innovate capacity in human resources and technology by being exposed to the learning processes between partners. These processes ultimately enhance SME competitiveness and create an opportunity to enter a higher stage of added value in the smile curve.

1.3.2.2. Technological Innovation Policy

As technical innovation is essential to enhancing the competitive edge of SMEs, most countries are promoting policies for the R&D of SMEs while gradually raising support for industrial R&D. Governments are prioritizing the setup of innovative platforms for technical innovation to enhance R&D efficiency by systematically supporting manufacturers from product planning to production. To transfer technologies developed by these platforms to SMEs and raise the capacities of economic agents, technical innovation networks between industry and academia are encouraged.

1.3.2.3. Human Resources

In addition to technical innovation, human resources are deemed the foundation to enhance SME growth and sustainability. But numerous mismatches have occurred in most countries when it comes to SMEs trying to hire talented staff. That is why human resources are promoted to nurture talent suitable for the sector through industrial-educational cooperation and human resource policies that allow companies to take part in job training. To nurture staff suitable for the industry, the academic and corporate worlds as well as the government are increasingly enhancing job training to ensure professionalism and efficiency. They also are participating in vocational training while taking charge of internships and onsite training. Germany is one of the most successful examples of building a steady supply of skilled workers in manufacturing through onsite training. According to the German Small Business Administration, 21.7 percent of companies that provide social insurance participate in vocational training, and 83.2 percent of trainees are trained in SMEs. Features of job training in Germany are standardized and manual training. In 2011, Germany provided field-oriented job training to about 146 million people in 344 jobs from 45.5 million companies. Systematic job training in Germany is recognized as number one in the rich labor pool and productivity by creating a social atmosphere that favors skilled workers. Such training provides about 70 percent of the world's hidden champions by supplying skilled staff to SMEs (Hannam University, SME overseas support policies, 2013).

1.3.2.4. Policies to Accelerate Startups

Most important when bolstering SMEs is policies to promote startups since new industries and job creation can come from venture companies or SMEs. The core of pro-startup policies is to cultivate entrepreneurship and form a challenging environment through forming a culture of entrepreneurship. In particular, startups in the U.S. have become the driving force for enhancing economic growth, innovation, job creation, technological progress and productivity. Developed economies such as the U.S. and those in the EU include entrepreneurship in curriculum, solidifying programs to nurture entrepreneurs and companies. In the U.S., entrepreneurship originating from Silicon Valley has spread nationwide through the establishment of a regional innovation system.

An accelerator is a new information center for startups, showing rapid growth in promoting startups. An accelerator is a private organization that directly provides fund support, providing training and mentoring programs so that trainees can graduate from programs within three months and enter the market. These programs connect graduates to startups to solve the problem of information asymmetry between investors and start-ups.

2. Analysis & Key Issues of Support Mechanisms for SMEs in Costa Rica

2.1. Status of Costa Rica

2.1.1. Status of Economy & Industry

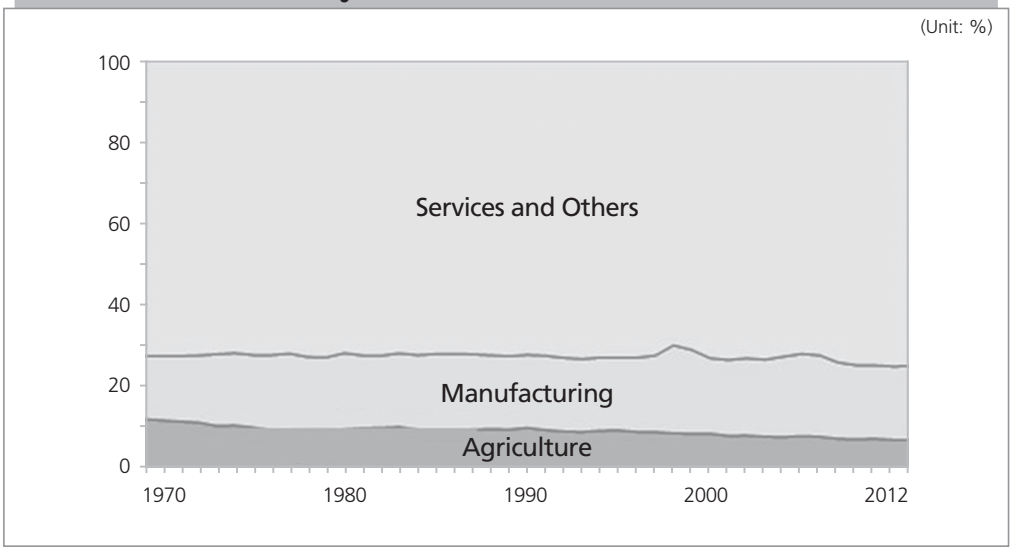
Costa Rica's economic growth in 2013 was 3.5 percent, with productivity decreasing with time, potential growth rate was reduced and competitiveness fell. Exports that year rose 4.1 percent and the growth rate decreased sharply from previous years. Investment in Costa Rica equaled 21.7 percent of GDP, of which FDI accounted for 26 percent. Unemployment rapidly increased to 8.1 percent in 2013 and this proved the importance of job creation.

〈Table 2-1〉 Economic Status of Costa Rica

Indicator	2012	2013
GDP (US$ billion)	45.1	49.6
GDP Real Growth	5.1%	3.5%
GDP / Capita (US$)	$9,753	$10,528
Total FDI (US$ billion)	2.3	2.7
FDI / GDP	5.2%	5.5%
Overall Exports (US$ billion)	16.8	17.6
Good Exports	11.3	11.5
Services Exports	5.5	6.0
Free Zone Exports ((US$ billion)	8.0	8.4
FZ Good Exports (US$ billion)	5.9	6.3
FZ services Exports	2.0	2.2
FZ Exports / Overall Exports	47.7%	47.9%
FZ Goods Exports / Overall Goods Exports	35.5%	35.6%
FZ Service Exports / Overall Service Exports	37.5%	35.9%
Investment's Share of GDP	21.7%	21.7%
Unemployment	7.7%	8.5%

Source: U.N. Statistical Portal (http://unstats.un.org/unsd/snaama/dnlList.asp).

[Figure 2-7] Trends of Industrial Sector



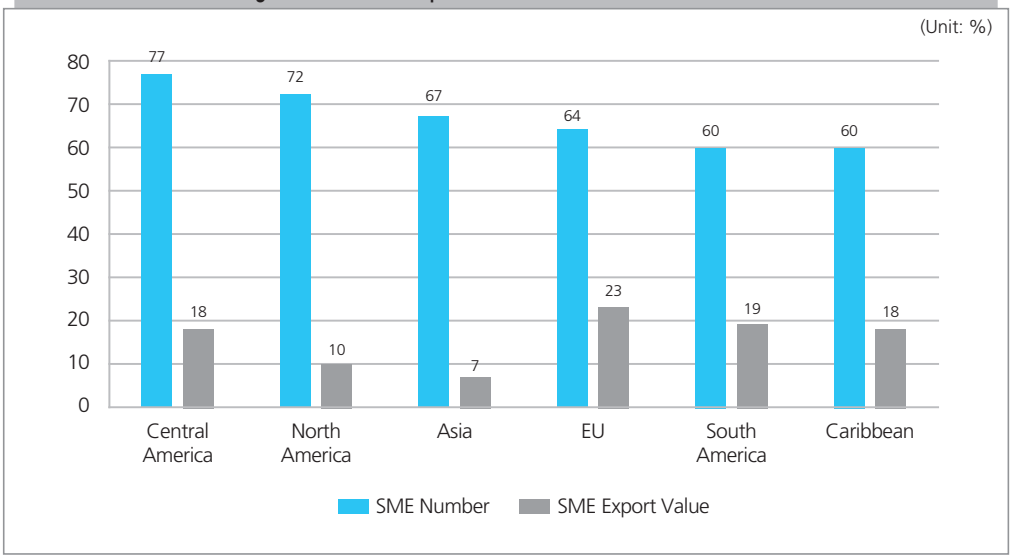
Source: *UN Statistical Portal*, http://unstats.un.org/unsd/snaama/dnlList.asp, 2012 quoted quoted in KDI, *Knowledge Sharing Program with Costa Rica: Harnessing the Potential of Innovation Policy Prescriptions for Competitive Costa Rica*, 2014, p.128

The proportion of manufacturing fell from 19.3 percent in 1970 to 15.4 percent in 2012, and the industry no longer plays a leading role as a growth engine. Though Costa Rican industry traditionally specializes in agriculture, the sector's share has constantly declined so innovation capacity building like technological innovation is required.

2.1.2. Status of SMEs & MNCs

SMEs in Costa Rica account for 95 percent of all companies and 46 percent of employment. Yet they account for 39 percent of production value and 15 percent of exports, suggesting that SMEs are mostly small. In particular, 52 percent of SME workers are in the service sector, 24 percent in trade and 12 percent in agriculture and fisheries. Just 7 percent are in manufacturing, which suggests limitations on nurturing SMEs driven by manufacturing. The main export markets for Costa Rican SMEs are Central America (77 percent) and North America (72 percent). In export value, the EU (23 percent), South America (19 percent) and the Caribbean (18 percent) account for the most.

[Figure 2-8] Main Export Markets for SMEs in Costa Rica

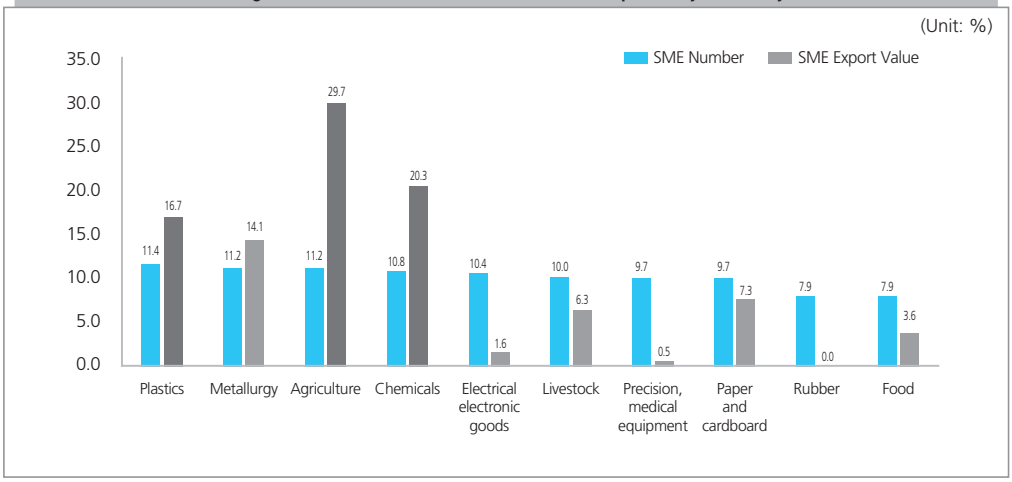


Source: CINDE based on data from INEC, BCCR, IMF, PROCOMER. 2014.

The relative contributions of SMEs to exports by industry have been calculated based on the number of businesses: plastics (14.4 percent), metallurgy and agriculture (11.2 percent), and chemicals (10.8 percent). Based on export value, agriculture (29.7 percent), chemicals (20.3 percent), plastic (16.7 percent) and metallurgy (14.1 percent) account for the most.

Unlike Latin American countries that tended to abandon industrial policies in the 1980s in favor of market-based mechanisms, Costa Rica never did so. Instead, the nation radically switched its orientation toward productive development policies to other instruments, sectors and target markets. This new set of policies acted through the provision of economic incentives, as fiscal credits and income tax exemptions were conferred to non-traditional exports and export processing zones (EPZ), which improved the basis for FDI attraction. Parallel to the export promotion strategy of the last two decades, FDI attraction has been a pillar of growth (Monge-Gonzalez, Rivera and Rosales, 2010). Indeed, Costa Rica has successfully attracted high-tech MNCs over the last two decades and kept them operating in the country as shows in [Figure 2-9].

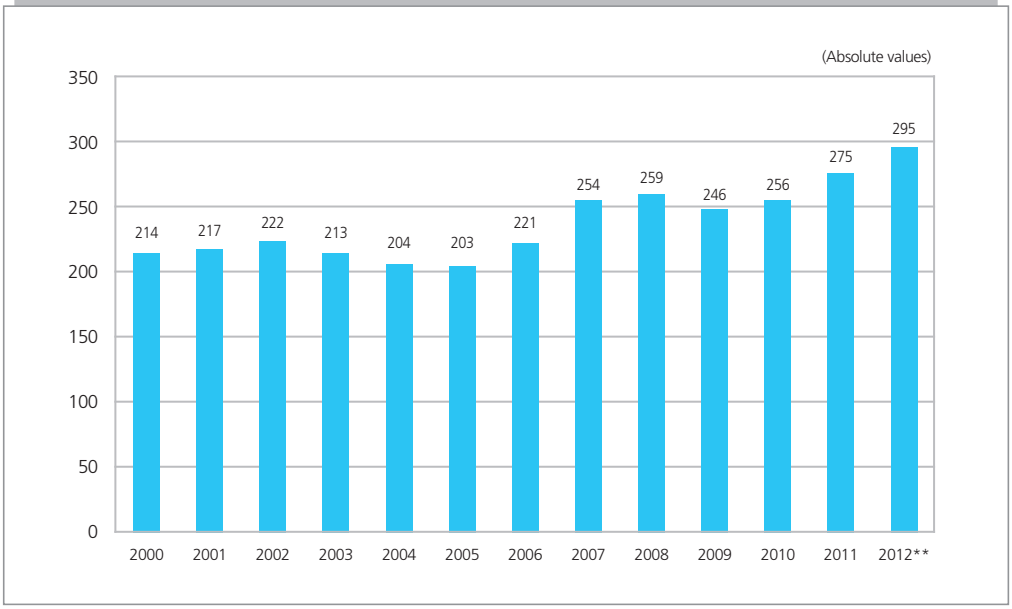
[Figure 2-9] Contributions of SMEs to Exports by Industry



Source: CINDE based on data from INEC, BCCR, IMF, PROCOMER. 2014.

The creation of CINDE in the early 1980s was a key achievement in this direction. The private organization is dedicated to attracting FDI and supporting the process of the new export-led economic model. A wide range of industries including electronic components and equipment, medical devices, software, chemical products, beverages and food preparation, tourism, financial services and call centers, have been growing and attracting significant foreign investment. FDI has seen a growth trend in Costa Rica over the last 25 years, reaching a stable 6 percent of GDP (Monge-Ariño, 2011).

[Figure 2-10] Costa Rica: No. of Active MNCs in EPZ, 2000-12



Source: PROCOMER.

2.1.3. Status of Costa Rica in Global Value Chains (GVC)

An important result from Costa Rica's development strategy based on export promotion and FDI attraction is the inclusion of the country in global programs for production sharing or global value chains (GVC). Indeed, Intel's decision to establish production facilities in Costa Rica in 1998 was the most important event in terms of insertion into GVC because it began to develop a solid export-oriented sector producing high-technology and sophisticated manufactures and services (CAATEC, 2011). Ever since Intel operated its factories in Costa Rica, FDI has contributed to strengthen and expand the scope of exports (CAATEC, 2011). Electronics was the first sector to integrate Costa Rican firms into GVC, and others, such as medical devices, have emerged more recently. In short, Monge-Ariño (2011) showed that 43% of Costa Rica's total exports are integrated into five GVC: aeronautic/aerospace, automobile, electronics, film/broadcasting devices, medical devices.

In a recent study by Gereffi, *et al*. (2012) on Costa Rica's participation in GVCs, the authors confirmed the participation of the country in the four GVCs identified earlier by Monge-Ariño (2011): medical devices, electronics, aerospace and offshore services. The authors found that such participation was thanks to MNC operations in the country, and claimed that the participation of domestic companies in GVCs was relatively low because of limited links with MNCs.

While Costa Rica mostly sent its exports to the U.S., they have been on the decline in America. Exports to Latin America are constantly increasing and account for the second spot next to the U.S.

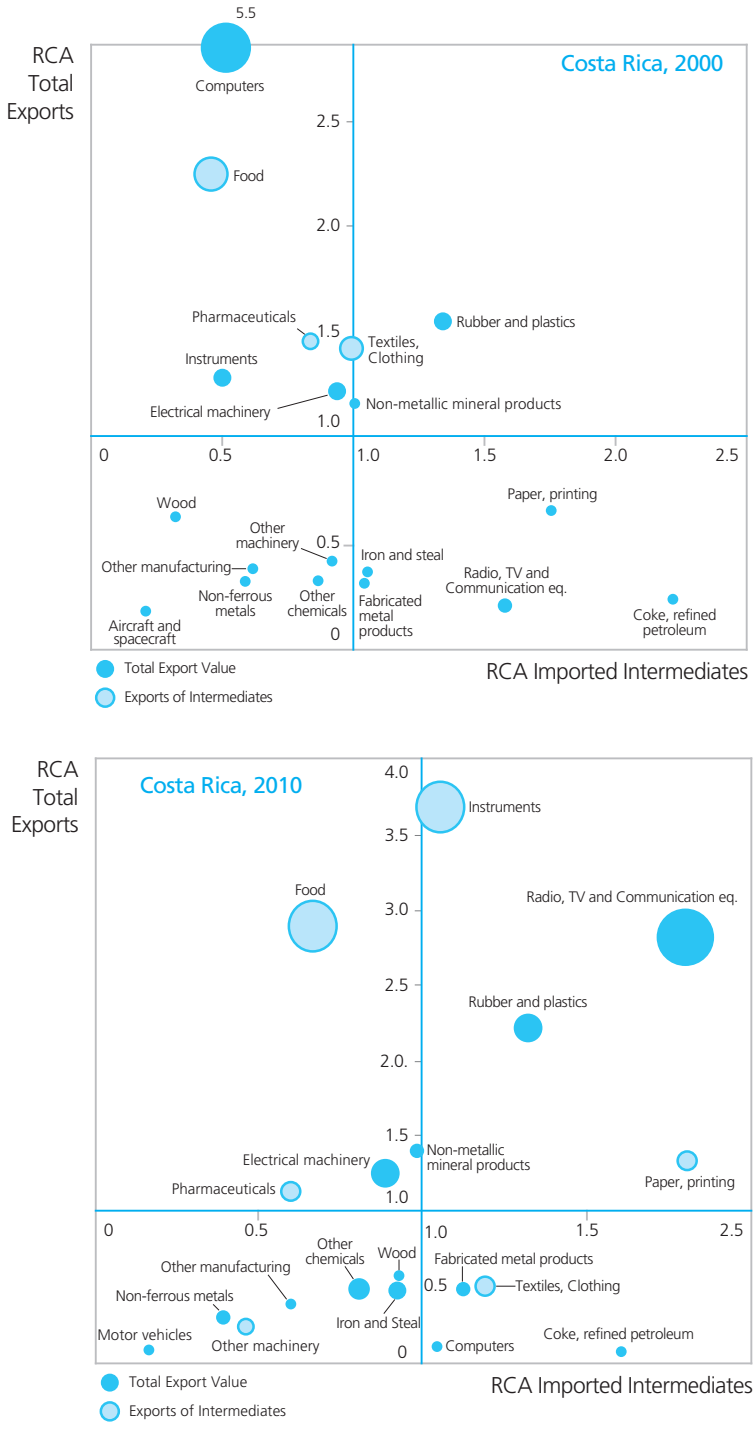
〈Table 2-2〉 Costa Rica's Main Export Destinations

Country/Region	1988	2005	2013
U.S.	46.6%	40.1%	37.4%
European Union	21.9%	16.4%	17.6%
Netherlands	3.7%	6.5%	7.2%
Belgium	1.7%	1.7%	2.7%
United Kingdom	4.0%	1.8%	2.0%
Italy	2.5%	0.9%	1.2%
Germany	4.1%	2.7%	1.0%
Central America	11.6%	17.0%	18.7%
Asia	6.9%	14.9%	14.4%
Hong Kong	1.0%	6.9%	5.7%
China	0.4%	3.5%	3.2%
Malaysia	2.1%	1.3%	2.4%
Other	13.0%	11.7%	11.9%
Overall Goods Exports (US$ billion)	5.9	7.0	11.5

Source: CINDE based on data from PROCOMER. 2014.

The OECD (2013) analyzed integration into GVCs with imports of intermediate inputs. The above-average import share of intermediates indicated revealed comparative advantage (RCA) in assembly operations. Revealed comparative advantage (RCA)'s exports indicated export competitiveness. Export volume increased exponentially in most industrial sectors. The production and assembly of intermediates accounted for a large share of exports. Export competiveness was closely linked to imports of intermediates. The domestic content of Costa Rican exports was 36 percent in 2011. Integration into GVCs has changed industrial specialization from traditional to high-tech industries.

[Figure 2-11] RCA Exports from Costa Rica 2000, 2010



Source: OECD. "Interconnected Economies: Benefiting From Global Value Chains", 2012.

2.2. Main Problems & Issues of Costa Rican Support Mechanisms for SMEs

The main issues in Costa Rican support mechanisms for SMEs are classified into three kinds of agenda: institutional, GVC and SME's innovation capability. The institutional agenda has four main issues, and the biggest problem in supporting SMEs is the excessive regulation that impedes business. The strongest request from companies is to remove the numerous obstacles to doing business. The second issue is lack of access to financially innovative activities of SMEs. This limit has two origins. First, many companies cannot bestow tangible assets as collateral for loans, only intangible ones that banks reject. Second, the lack of proper balance in public finances pushes up interest rates in the country and creates a crowding out effect in the private sector. This is a real problem for encouraging innovation activities since it suggests constrained financial markets for medium- to long-term lending and ultimately discourages borrowing for innovation, forcing reliance on self-financing that might not be generally available. The third issue is a governance system with an insufficient implementation level to support SMEs. The structures the governance system to support SMEs in Costa Rica features a planning policy level bigger than those of implementing policy and operating programs. This makes it difficult to implement policies and operate programs for supporting SMEs. Furthermore, SMEs are not interested in the policies because most policies are not planned based on industry demands. The final issue of institutional agenda is low collaboration between academia and industry in innovation activities undertaken by SMEs. The global trend shows that such cooperation is a key strategy to develop industry.

Costa Rican SMEs participating in GVC have two main problems. The first is weak links between MNCs and SMEs. Only 5 percent of MNCs have links with SMEs in Costa Rica. Because FDI has developed the Costa Rican economy, the strong links between MNCs and SMEs is crucial. The second is poor participation of domestic companies in GVCs. Key challenges in this regard are lack of access to finance due to underdeveloped capital markets and poor understanding by financial institutions of the value of intangible services; limited market access arising from information asymmetries; poor marketing skills of domestic companies; and limited scale, certification and managerial capability to meet MNCs standards.

The main issues in improving SME innovation capability are categorized into three agenda: low level of technology innovation capability, weak structure of the HRD education system and low entrepreneurship and innovation culture. The first problem is due to low investment in R&D (0.5 percent of GDP). This is surprising for two basic reasons. According to per capita GDP of Costa Rica and the social rate of return for R&D investment, the optimal level for this type of investment should be 2.53 percent of GDP. In other words, Costa Rica should invest five times more in R&D

(Monge-González, 2015). The second issue is caused by lack of an institute to support the technological innovation capability of SMEs.

Because the weak structure of the HRD education system due to lack of an academia-industry cooperation system, Costa Rican universities have not played key roles in developing high-quality innovative students. Another important challenge is the lack of human capital stock (meaning shortage of scientists, engineers and technicians) due to deficiencies in coverage and quality of the education system. This produces misalignment between education careers and the needs of the productive sector, a serious weak point for developing Costa Rican industry based on the Korean experience.

Startup acceleration is one of the most important ways to create jobs. Costa Rica, however, has a low entrepreneurship and innovation culture. More entrepreneurship programs are needed to accelerate startups. Costa Rica also lacks a "culture of innovation." That is, a climate that produces a collective enthusiasm for creativity, and glorifies productive innovators in the same way that the great artists or great sportsmen are glorified and that challenges people to take risks without fear of being stigmatized by failure. This lack of innovative culture largely explains the low number of researchers in per capita terms working in the country, and helps to explain why R&D investment is too low.

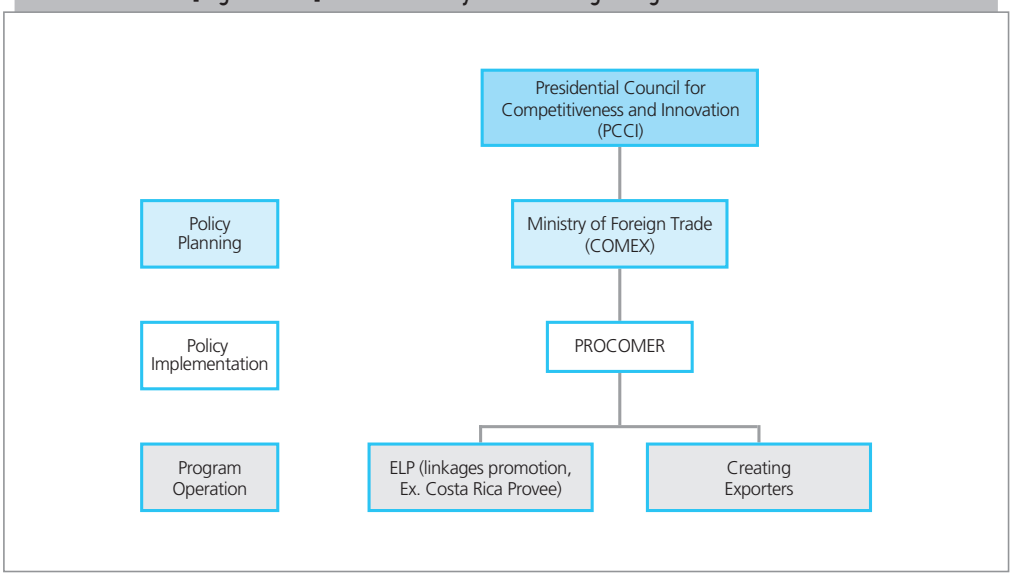
2.3. Costa Rican Support Mechanisms for SME

2.3.1. Globalization of SMEs to Integrate SMEs into GVCs

2.3.1.1. Governance System of Supporting Globalizing SMEs

The globalization of SMEs to integrate them into GVCs is the duty of the Ministry of Foreign Trade (COMEX, which coordinate its efforts with other public and private institutions through the Presidential Council on Competitiveness and Innovation, or PCCI). PLP (former CR Provee) operates the Productive Links Program, which aims at increasing links between MNCs and domestic suppliers in the country.

[Figure 2-12] Governance System of Integrating SMEs into GVCs



2.3.1.2. Action Programs of Each Support Policy of Globalizing SMEs

Since the export-processing zone (EPZ) regime was created at the beginning of the 1980s, the weak vertical integration of Costa Rican industry has made the promotion of productive linkages a subject of public interest (Monge-González and Rodríguez-Alvarez, 2013). Because of the National Program of Science and Technology 1986-1990, the government would develop the technological capacity of local suppliers and public R&D institutes to satisfy the demands of the private sector (Monge-González and Rodríguez-Alvarez, 2013). Baxter Health Care, Inc. which is one of the first important MNCs established in Costa Rica is a good example as part of the firm's business strategy for the country because it created a program of technical assistance to develop local suppliers in the mid-1990s (Monge-González and Rodríguez-Alvarez, 2013).

In 1998, CINDE, MICITT, PROCOMER, and Baxter created the Local Industry Improvement Program (Programa MIL) in order to help local SMEs do more business with high-tech MNCs (Monge-González and Rodríguez-Alvarez, 2013). Finally, the Supplier Development Project for High-Technology MNCs was created in 1999. This program stemmed from a previous assessment that found important limitations for SMEs in doing business with high-tech MNCs (Groote, 2005).

The Directive Committee transferred Costa Rica Provee to PROCOMER to continue the program through consolidation within a well-funded organization, and to strengthen indirect exports to MNCs in 2004 (Monge-González and Rodríguez-

Alvarez, 2013). In the recent years, the Costa Rican government reformed three important reforms to the EPZ Law to make the aforementioned mechanisms more flexible (Monge-González and Rodríguez-Alvarez, 2013). These reforms has contributed to increase the number of backward linkages registered by Costa Rica Provee. Between 2001 and 2011, the number of backward linkages increased from 1 (US$0.8 million in sales) in 2001 to nearly 248 (US$9.0 million) in 2011 (Monge-González and Rodríguez-Alvarez, 2013). Finally, Monge-González and Rodríguez-Alvarez (2013) found that CR Provee has positive and significant impacts on the their real average wages, labor demand, and exporting probability of beneficiary firms.

〈Table 2-3〉 Costa Rica's Main Programs for Globalizing SMEs

1980s	1990s	2000s
Creation of Export-Processing Zone(EPZ) Regime	Local Industry Improvement Program (Program MIL, 1998)	PROCOMER Programs (2004): consolidation within well-funded organization and strengthening indirect exports to MNCs
National Program of Science & Technology	Supplier Development Project for High-Technology Multinational Companies (1999)	Three important reforms to EPZ Law on links between SMEs & MNCs

2.3.1.3. Main Tasks for Globalizing SMEs

The most important task for integrating SMEs into GVCs is strengthening links between MNCs and SMEs because just 5 percent of them have such ties. The main obstacle to such links is the low capability of SMEs that fail to satisfy global standards. So integrating SMEs into GVCs requires improving the innovation capabilities of SMEs. For example, according to Monge-González and Zolezzi (2012), problems in Costa Rica's human capital need resolution to raise SME participation in GVCs.

The second issue of internalizing SMEs is to expand the export programs. The magnitude of Costa Rica Provee operations is very limited compared to the scale of the Costa Rican economy and MNC purchases. For example, operations promoted by Costa Rica Provee in 2007 accounted for only US$4.7 million (less than 1 percent) while total local purchases by MNCs in 2007 was US$591.1 million (Monge-González and Rodríguez-Alvarez, 2013). The Ministry of Finance of Costa Rica showed that the ratio of Costa Rica Provee beneficiary firms to all local suppliers of MNCs was only 4 percent. In order to to provide beneficiary firms with other financial and non-financial services, Costa Rica Provee is limited because of very low budget and a lack of institutional coordination (Monge-González and Rodríguez-Alvarez, 2013).

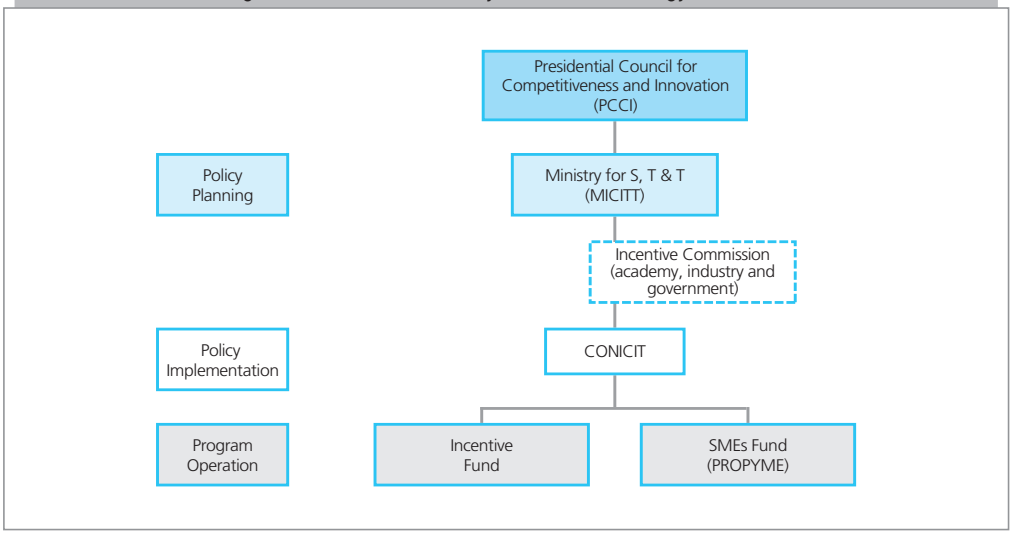
The third task is encouraging SMEs to join GVCs. Most SMEs in Costa Rica are not interested in advancing to the global market. So they are not aware of the programs of PROCOMER, which needs to find ways of encouraging SMEs to join GVCs.

2.3.2. Improving Technology Innovation of SMEs

2.3.2.1. Governance System of Improving Technology Innovation of SMEs

The Ministry of Science, Technology, and Telecommunications (MICITT) is responsible for innovation policy design, implementation, monitoring, and accountability. In addition, the Ministry of Economy is in charge of a consultative body, and the National Council for Scientific and Technological Research (CONICIT) is responsible for monitoring and accountability issues as shows in the following figure.

[Figure 2-13] Governance System of Technology Innovation



2.3.2.2. Action Programs of Each Support Policy for Improving Technological Innovation of SMEs

The main action program of Costa Rica is to improve technological innovation of SMEs is the PROPYME program, which was created under Law 8262. PROPYME resources are financed by Costa Rica's public budget and the Incentives Commission at MICITT allocate annually its budget and are managed by CONICIT. The fund can be used to finance types of projects.

Between 2003 and 2011, 114 approved projects were finally funded. In short,

between 2003 and 2011, PROPYME supported 114 innovation projects carried out by 87 SMEs (Monge-González and Rodríguez-Alvarez, 2013). The number of technological development projects proposed were largest, while the number of human capital development projects financed were biggest (Monge-González and Rodríguez-Alvarez, 2013). There was no firm which requested funding for patents or technology transfers projects between 2003 and 2011 (Monge-González and Rodríguez-Alvarez, 2013). The absence of funded projects aimed at registering patents proves a clear limitation on innovation and productivity growth of Costa Rican firms (Monge-González and Rodríguez-Alvarez, 2013).

〈Table 2-4〉 Types of R&D Programs

Programs	114 Projects between 2003 & 2011
Technological development	Largest number of projects proposed
Innovation and patent creation	-*
Technology transfer	-
Human capital development	Largest number of projects financed
Technological service development	-
Combination or complementary pool of projects	-

Note: * not available.

Between 2003 and 2011, 114 projects were finally funded by MICITT, receiving an investment of 1.7 million USD over that period, with an average of 15,067 USD allocated to each company (Monge-González and Rodríguez-Alvarez, 2013). The average amount granted to technological development projects was 27,930 USD. Data for 2012 showed that the numbers of both approved and funded projects increased significantly during the year, and more than US$2.5 million was disbursed (Monge-González and Rodríguez-Alvarez, 2013).

2.3.2.3. Main Problems in Improving Technological Innovation of SMEs

The first problem in improving technology innovation of SMEs is the low level of investment in R&D (0.5 percent of GDP). This causes the little amount from the PROPYME program to improve the technology innovation capability of SMEs. Monge-González and Rodríguez-Alvarez (2013) showed that the Costa Rican grants of innovation and technological development projects for companies is very little compared to the amount of grants in other Latin American countries such as Chile, Panama and Uruguay. They suggested that Costa Rica should increase the amount of technology grants from 29,924 to 90,000 USD and innovation grants from 22,950 to 40,000 USD.

The second problem is how to change the university system to stimulate R&D. The role of a professor is heavily focused on education (80 percent) while research (20 percent) places a distant second. Furthermore, the number of engineering majors is small and the majority of students major social sciences, education and health sciences. Because of the existing university system for R&D, R&D has no incentives but only pressure. The lack of system for protecting intellectual property rights should also be improved to stimulate R&D.

The third problem is changing the existing university system for academia-industry cooperation, a key factor behind technological innovation in the world. Costa Rica's level of such collaboration is very low. For example, universities have no incentive system for cooperating with industry.

Finally, the Costa Rican government needs to establish an innovation platform to resolve the previous three problems in improving technological innovation of SMEs. As long as the key stakeholder for technology innovation is in place, a variety of programs can be effectively operated. For example, according to Monge-González, Rivera y Rosales (2010), the majority of managers in Costa Rican SMEs are unaware of the PROPYME program. Because PROPYME does not play the role of innovation platform, this poses a limitation to improving the technological innovation of SMEs.

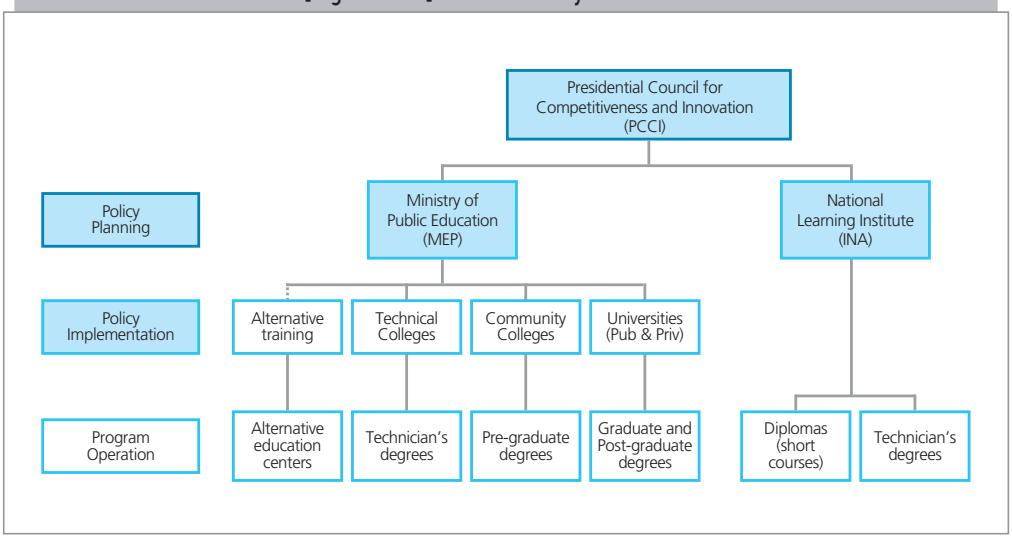
2.3.3. Human Resource Development (HRD)

2.3.3.1. Governance System of HRD

In Costa Rica, two main institutions are in charge of policy planning for human resource development: the Ministry of Public Education (MEP) and the National Learning Institute (INA). The first one handles planning of the formal education system, including the primary, secondary and tertiary levels. Other institutions in the country cannot be included in the traditional classification, according to CONARE´s (the National Rectors Council) nomenclature for degrees and diplomas (Monge-González and. González-Alvarado, 2007). The latter institution is referred to as an "alternative education center" as shown in [Figure 2-14].

Higher education is dominated by the four public universities: Universidad Estatal a Distancia (UNED), Universidad Nacional de Costa Rica (UNA), Instituto Tecnológico de Costa Rica (ITCR) and Universidad de Costa Rica (UCR). At the same time, the number of private universities has grown (51 in 2010).

[Figure 2-14] Governance System of HRD



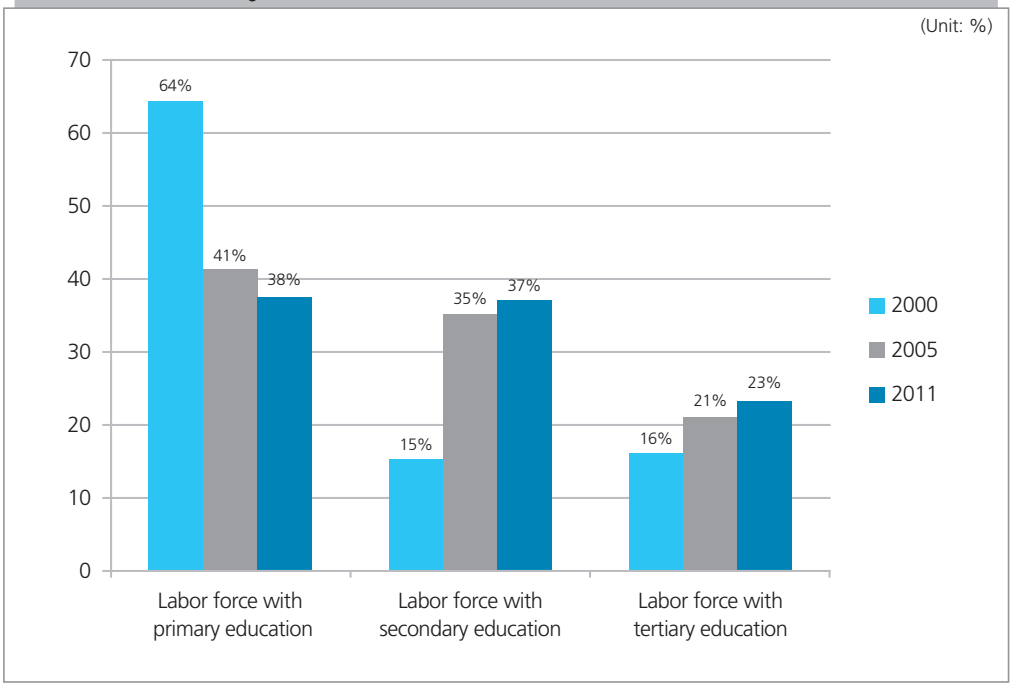
2.3.3.2. Action Programs of Each Support Policy for HRD

Even though Costa Rica has a relatively well-qualified workforce, Costa Rica need to resolve the low coverage in secondary and university education to develop human resource. While the secondary education completion rate was 65 percent in 2012, other countries with similar populations and/or human development indices had 100-percent coverage. In addition, university enrollment in Costa Rica is approximately half of what the country should have to maintain its human development level and achieve greater development (Monge-González and González-Alvarado, 2007).

In order to resolve these problems, Costa Rican authorities have launched a promotional campaign for all secondary school students. This campaign induces students to stay in school at least until the 11th grade by giving financial incentives for their families (Programa Avancemos) (Monge-González and González-Alvarado, 2007). Likewise, Monge-González and González-Alvarado (2007) emphasize that the existing scholarship system needs reform to finance university education for students with scarce resources. Under the administration of Chinchilla-Miranda (2010-14), the share of education spending was increased from 6 percent to 8 percent of GDP.

Costa Rica has also established a comprehensive education system that increases the number information and communications technology's (ICT) classes in the curriculum for more than 30 years. (Monge-González and González-Alvarado, 2007). Monge-González and González-Alvarado (2007) emphasize that authorities have made a tremendous effort to ensure that educational facilities produce properly

[Figure 2-15] Costa Rica: Labor Force & Educational Level



Source: World Development Indicators, World Bank.

skilled and knowledgeable workers and professionals to contribute to national development and inclusion in a knowledge-based economy. In 2002, the ECP started in secondary schools and by 2006 reached 197 educational centers and 130,615 students, or 69.9 percent of those enrolled in secondary education(Monge-González and González-Alvarado, 2007).

[Figure 2-15] shows the dramatic change in the Costa Rican workforce by academic level. This situation has changed for the better over the last decade; since 2011, the percentage of workers completing secondary education has more than doubled (37 percent) and the percentage with a university degree has significantly risen (23 percent).

2.3.3.3. Main Tasks for Human Resource Development

The main obstacle to developing human resources in Costa Rica is the small number of technicians, engineers and researchers. To develop high-skilled human resources, a two-track strategy is recommended. The first part is to establish regular programs such as establishing technical high schools and encouraging more engineering majors and graduate students. The second part is to make and operate a special program on academia-industry cooperation to develop human capital

oriented toward industry.

Because of few technical high schools, Costa Rica needs to train many technicians. The government has thus planned to increase the number of technical high schools. Furthermore, the number of junior colleges needs expansion to develop and provide highly skilled technicians.

The biggest problem of HRD in Costa Rica is the insufficient number of engineers despite high demand for them. The country has a high rate of enrollment in tertiary education (greater than 40 percent), but students are not graduating with degrees in fields with the fastest growing demand by companies. More than 70 percent of all students graduate with degrees in social sciences and education, while fewer than 13 percent graduate with engineering and technology degrees. This is mainly due to limited supply-side capacity stemming from lack of infrastructure and faculty. Just 1.1 percent of professionals in these fields hold graduate degrees, and Costa Rica's scientific community has limited capacity to train engineers and technology experts (Monge-González and Tacsir, 2014). The basic sciences represented only 2.5 percent of academic offerings and engineering 9.1 percent. Doctorates comprised 1.8 percent of careers at public universities and 0.9 percent at private universities (Estado de la Nación, 2010; Padilla, Gaudin y Rodriguez, 2012). For developing high quality engineers, the quality of IT engineering programs at private universities must be adjusted and improved. Most engineers from MNCs and SMEs that participate in GVCs come from two of the largest and most prestigious public universities in the country: Universidad de Costa Rica (UCR) and Instituto Tecnológico de Costa Rica (TEC). So private universities need to develop more engineering majors.

Costa Rica needs more researchers for R&D. Though certain high-tech multinationals (MNCs) in medical devices suggest that viable clusters are forming in Costa Rica and that they want to embark on more R&D related activities in this country, these MNCs have yet to do so because of lack of human capital, especially those with tertiary or higher degrees in statistics and material and biomedical sciences, not to mention a good understanding of the Global Standards Management Process.

The government needs to make and operate special university-industry programs to satisfy the demand of industry. The problem of human capital formation is that SMEs often lack relationships with universities and other training organizations. The education system, whether primary, secondary or tertiary, suffers from disconnection with labor and the real world. When such relationships exist, they are concentrated in training, information, organizational change consulting and to a lesser degree, technical assistance (Monge-González, and Hewitt 2008).

Costa Rica should move toward a demand-driven education system to guarantee an ample supply of human resources needed in the high-tech sector. In addition, the government must create, together with the private sector and educational institutions, strategies or programs to improve math skills in primary and secondary students, vocational orientation programs toward math and science, scholarships for outstanding high school students to study engineering and other programs with high demand, and graduate scholarships in key areas.

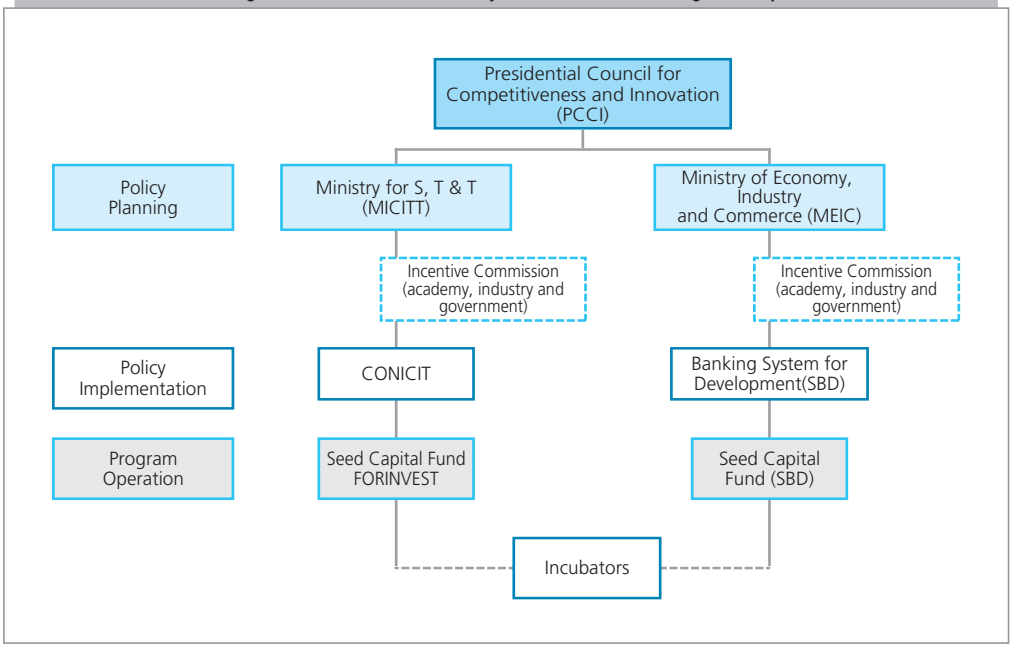
2.3.4. Startup Acceleration

2.3.4.1. Governance System of Accelerating Startups

In Costa Rica, support programs for startups and their acceleration are recent creations. The Ministry of Science, Technology and Telecommunications (MICITT) as well as the Ministry of Economy, Industry and Commerce (MEIC) are the two institutions in charge of this type of policy. The former has a seed capital fund (FORINVEST) that has sporadically supported incubators in the past, while the latter has a new seed capital fund that is the most important in supporting startups and their acceleration (SBD).

The following figure shows the governance system of accelerating startups in Costa Rica.

[Figure 2-16] Governance System of Accelerating Startups



2.3.4.2. Action Programs of Each Support Policy of Accelerating Startups

Costa Rica's shortage of venture capital is highly problematic. This type of capital is only available in the information communication technology (ICT) sector. In 2012, the SBD created a public seed capital fund (FCS), the first of its kind in Costa Rica. The Ministry of Economy, Industry, and Commerce (MEIC) manages the fund and the latter's main objective is to support tech-oriented startups in conducting R&D and commencing operations. As shown in <Table 2-5>, the FCS financed 48 projects undertaken by private firms between 2013 and 2014 and was supported by incubators/accelerators (Auge, Parquetec, Parque la Libertad, UNA INCUBA and Carao Ventures). The projects financed over the two years were concentrated in five areas: digital technology (23), biotechnology (13), clean energy (seven), new materials and nanotechnology (four), and electromechanical (one). The emphasis on digital technology was consistent with the growth of this sector in the Costa Rican economy in recent years. The volume of resources allocated in these two years through FCS to support the above projects was 2.3 million USD, or 48,000 USD per project. This amount was a little higher than in other Latin American countries such as Chile and Uruguay for the development of new ventures.

〈Table 2-5〉 Costa Rica: Projects Financed by Seed Capital Fund, 2013-14

Categories	Projects Financed	
	2013	2014
Digital Technology	20	3
Clean Energy	6	1
Biotechnology	11	2
New Materials & Nanotechnology	3	1
Electromechanical	0	1
Total	40	8

Source: Sistema de Banca para el Desarrollo.

2.3.4.3. Main Issues in Accelerating Startups

The main problem in accelerating startups is lack of an entrepreneurship and innovation culture in Costa Rica. So the government needs to create a favorable environment for innovation and entrepreneurship. One of the most important things to accelerate startups in developed countries is entrepreneurship education, something also important in Cost Rica. Teaching methodology in Costa Rica is still generally traditional and hardly encourages students to innovate and relate their studies to the productive sector. Higher education does not develop student ability

to transform their ideas into concepts and then into products, services or innovative production processes. Because the curriculum is usually rigid, locking students into passivity and limiting their capacity to innovate and relate their knowledge to the productive sector, the government must encourage universities to strengthen their entrepreneurship education. Teaching method has important consequences for the attitudes of future entrepreneurs and economic actors in countries like Costa Rica, particularly in the early phase of innovation (Dornberger, Suvelza and Bernal, 2011).

To accelerate startups, the government needs to expand programs to that end. Expanding CONICIT programs is a good example because CONICT has played a key role in accelerating startups. Yet it needs to develop acceleration programs by cooperating with industry. Most programs for that purpose are from public institutes without connection to companies. Perhaps the most important elements in creating links between the public sector and industry are 1) an assessment of the two programs that have supported start-ups and their acceleration in Costa Rica, including interviews with main stakeholders and beneficiaries; and 2) organization and financing of trips to state-of-the-art programs in this field around the world for civil servants in charge of designing and implementing the programs.

Costa Rican must expand its business incubators or accelerators to encourage startups. For example, expansion of CeNAT programs is preferred by encouraging people and companies to join this program.

3. Analysis of Korean Support Mechanisms for SMEs

3.1. Basic Structure

3.1.1. Status of SMEs

3.1.1.1. Korean Policy Development for SME

The Korean government has pursued various policies to support SMEs to enhance innovation capacity and boost exports in accordance with the stages of economic development. In the initial stage, the government promoted industrialization driven by large companies but simultaneously had policies for SMEs. After the Basic Law for SMEs was enacted in 1966, an SME corporation was set up in 1979 as an organization spun off from the Small and Medium Business Administration (SMBA), though it had little impact. In the 1980s, the government was in a much more aggressive mood to reduce the deepening gap between large companies and SMEs, as well as protect

and support SMEs. For example, the number of areas open only to SMEs was more than doubled from 120 to 250 and the Support for Small and Medium Enterprise Establishment Act and the Special Export and Import Act were enacted. After 2000, the government strengthened overall support systems for SMEs such as technology, labor force, capital and markets while advocating an economy driven by innovation and pacesetting. For pro-SME policies that were combined in 2013, the SMBA took a holistic approach encompassing startups, venture companies, SMEs, domestic businessmen and medium-sized companies after gaining the responsibility from the Ministry of Trade, Industry and Energy (MOTIE).

〈Table 2-6〉 Korean Policy Development for SME

Inception (1960~79)	Protection / Training (1980~99)	Conversion / Innovation (2000~)
To establish comprehensive plan for small business & their structural improvements	SME support & protection through regulation	Innovation & shared growth
- 1961: Small Business Cooperative Act, SME Banking Act enacted - 1966: SME Basic Legislation - Definition of SMEs, business / technology maps / training promote technology development / standardization - 1974: Centralized financing system, Credit Guarantee Fund established for SME credit enhancement - 1975: SME Integration Promotion Law enacted, SME sector-specific programs, SME products procurement system introduction / enforcement - 1979: SME corporation established	- 1980:Specify integration introduction, established small business long-term loans (1982-92) - 1982: Small Business Product Purchase Promotion Law enacted, promising SME operating system (1983) - 1984: Legislation on subcontracting trade process, practice SME sectors for fostering SME institutions first (1985) - 1986: Simplify small business start-up procedures through Act enacted, promoting professional workforce - 1992: Extended military service system to SMEs - 1996: Install small business promotion - 1997: Special law enacted on venture businesses - 1998: Established SMEs committee directly from Presidential ad hoc	- 2000: SME Development Vision 2010 established - 2001: Special law enacted for small businesses & related business support - 2002: Venture enterprise evaluation system, introduced Innobiz certification - 2004: Established SME competitiveness comprehensive plan & youth recruitment package projects - 2005: Union funds figuration, Business owners / market management agency established - 2009: Regulatory impact assessment, small business ombudsman operation - 2010: Shared growth for SMEs - 2013: Promote virtuous cycle approach for entrepreneurship, venture capital ecosystem

Source: NIPA, SME & venture company policy analysis of major countries, 2013.

3.1.1.2. Status of SMEs in Korea

In 2012, SMEs in Korea accounted for 47.7 percent of production cost and 45.7 percent of added value. Despite policies to support SMEs by the government and universities, the ratios of production and added value of SMEs have gradually decreased, which is why more policies to support the competitive edge of SMEs are needed. Still, talented people are reluctant to work at SMEs and the core staff and technologies of SMEs are leaving the latter and flowing into large companies. The turnover rate of technical staff at SMEs increased from 2.1 percent in 2008 to 5.1 percent in 2010.

〈Table 2-7〉 Status of SMEs

(Unit: Trillion, %)

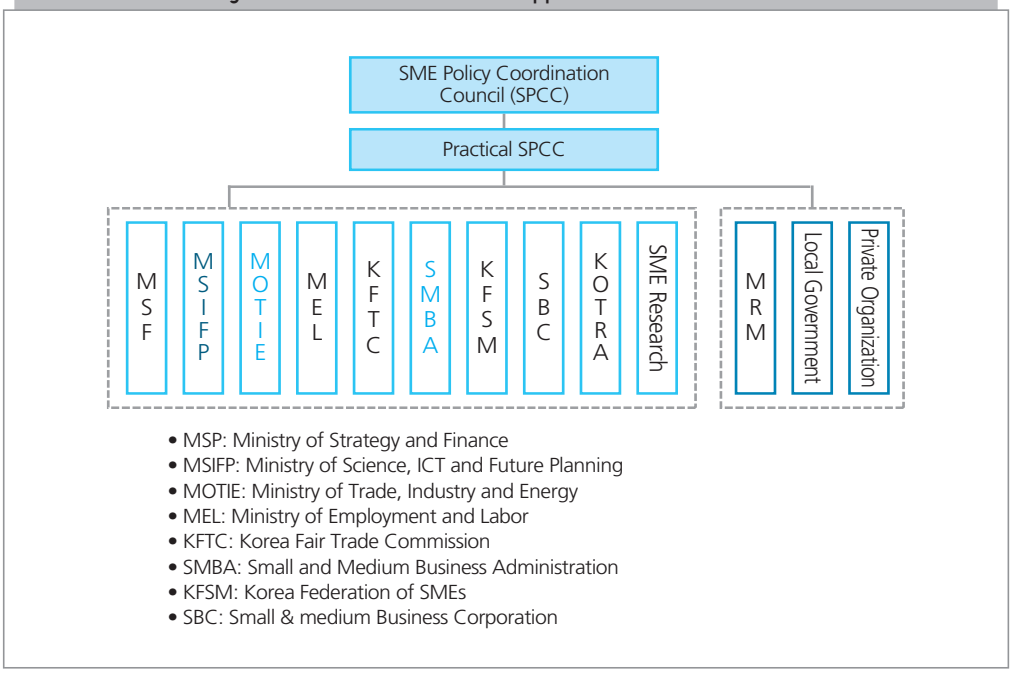
Category		2009	2010	2011	2012
Production	SME	555.9	651.4	726.4	717.2
	(Share)	47.6	47	46.6	45.7
	Large Company	612	735.2	833.6	851
	(Share)	52.4	53	53.4	54.3
Added Value	SME	198.2	215.7	237.4	239.3
	(Share)	50.5	47.4	47.3	47.7
	Large Company	194.5	239	264.2	262.9
	(Share)	49.5	52.6	52.7	52.3

Source: SMBA, SME statistics.

3.1.1.3. Status of Korean Support Mechanisms for SMEs

10 ministries and 17 municipalities in Korea promote support mechanisms for SMEs and the related budget amounts to 13 trillion KRW. The number of businesses to support SMEs is 1,301 (2013 news release). Korea's highest decision-making organization for SME policy is the SME Policy Coordination Council (SPCC), and the Practical SPCC coordinates and manages ministries and municipalities. The head of the SPCC leads the Office for Government Coordination and vice ministers of relevant ministries act as members to focus on support mechanisms for SMEs in a more government-wide level.

[Figure 2-17] Status of Korean Support Mechanisms for SMEs



Source: SPCC, Strengthening Capability of SME Policy Coordination, 2013.10.2.

3.1.2. Status of Korean Support Mechanisms for SMEs

3.1.2.1. Globalization of SMEs for Integration into GVCs

Due to the expansion of global value chains, Korea's exports are expanding on an external level but the country's creation of added value has fallen. Added value created in Korea went from about 76 percent in 1995 to 59 percent in 2009 with the rise in added value flowing in from abroad (Yoon, 2014). This is because Korean companies are expanding their business activities to other countries while responding to the expansion of GVCs. In the meantime, the government is pursuing a variety of policies that could globalize Korean SMEs so that they could join GVCs. Particularly, the government's support is not only for a low value-added stage in the smile curve but also for higher added-value stages such as marketing and design so that SMEs can be partners in supply chains. Yet policies to include large companies and SMEs in GVCs are in an immature stage. That is why programs to excavate and spread cases of accompanied inclusion are needed.

3.1.2.2. Technological Innovation

Korea is a prime case study of a country achieving economic development

through aggressive R&D policies. Domestic investment in R&D has been continuous, spending 4.15 percent of GDP in 2013 (first in the world) worth 5.93 billion USD (sixth). The number of researchers has continued to grow to 410,333 overall, also sixth in the world (up 2.1 percent year-on-year), of which 321,842 are full time (MSIFP, 2015). Higher R&D investment in Korea is the result of the government's aggressive R&D policies. The public sector has continued to expand R&D investment on the government level and invested 1.77 billion USD in 2014, up 4.9 percent year on year. Seoul adopted a strategy for companies to carry out R&D investment themselves, and as a result, the proportion and cost of R&D investment carried out by companies rose from 16.8 percent and 1.6 billion USD in 2007 to 21.7 percent and 3.5 billion in 2012.

3.1.2.3. Human Resource Development

Korea has a well-established culture to nurture talent thanks to the enthusiasm for education by the Korean people. The Korean government as well has actively sought to nurture talent in many areas for industrial development since the initial period of economic development. Particularly, the setup of technical high schools helped to produce skilled workers who were in great demand in the initial stage of industrial development. To keep development going, the government has established two-year colleges and Korea Polytechnics to train highly skilled personnel, as well as expanding engineering colleges, mostly at national universities, and this has been a major contribution to development. The Ministry of Education not only has regular programs as above, but also industrial-academic cooperation to train a customized workforce for industry. Leaders of Industry-University Cooperation (LINC) are the government's leading industrial- academic collaboration program.

3.1.2.4. Startup Acceleration

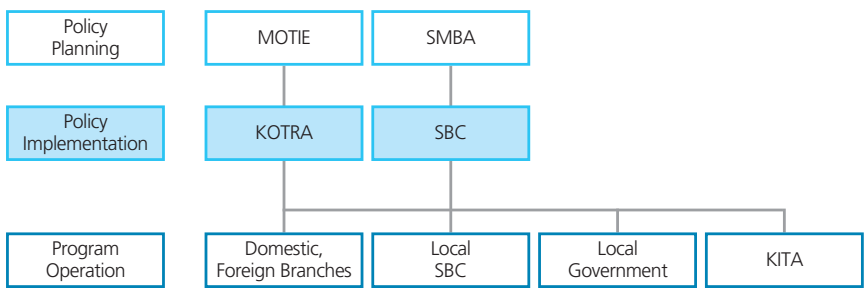
As seen in the growth of Samsung Electronics and Hyundai Motors, the entrepreneurial spirit in Korea is one of the most intense in the world. Entrepreneurship in the country, however, is among the lowest levels in OECD countries and the entrepreneurial spirit among young people has seen a gradual decrease. To overcome this, a variety of government policies seek to promote startups. In particular, the Park Geun-hye administration has established the Center of Creative Economy Innovation (CCEI) for promoting cooperation between large companies and the government led by the Ministry of Science, ICT and Future Planning (MSIFP). In addition, the SMBA has greatly expanded entrepreneurship education at graduate schools for startups, while the Ministry of Education has done the same through LINC projects. The Korean government has also promoted industrial-academic cooperation as a core strategy to bolster startups.

3.2. Strategies of Korea's SME Support Mechanisms by Factor

3.2.1. Strengthening Links to GVCs: Globalization of SMEs

3.2.1.1. Governance System for Globalizing SMEs

[Figure 2-18] Governance System for Globalizing SMEs



- KOTRA: Korea Trade-Investment Promotion Agency
- SBC: Small and Medium Business Corporation
- KITA: Korea International Trade Association

The features of SME policy in Korea are a well-established governance system in three stages: planning, execution and program operation. Globalization policies of SMEs are also based on the three-stage system. MOTIE and SMBA devise policies for SME globalization, while KOTRA and SBC, which are window agencies of each ministry, execute policies. To enforce effective globalization policies, the private sector takes charge of detailed programs. In other words, domestic and international branches of KOTRA, SBC and provincial governments are responsible for public agencies while KITA, a private organization, handles detailed programs.

3.2.1.2. Programs for SME Globalization

The SMBA has mainly promoted export support policies to incorporate in GVCs. Korea's export support policies have made great efforts to support GVC steps shown in the smile curve. Including SBC, KOTRA and Korea International Trade Association (KITA), various associations and public authorities and municipalities are providing programs for raising export quality, international marketing and sales infrastructure, and access to export markets.

SBC focuses on the preparation stage (capacity-building projects for exports) and that of entering foreign markets (export incubator and private networks abroad). KOTRA focuses on carrying out the export stage through trade missions, international exhibitions, business trips and projects for international branches. This is mainly due to the government's desire to unify the platform for international marketing in 2008, advising SBC to carry out domestic activities to support exports while KOTRA was assigned to do support activities abroad. Private organizations including KITA mainly concentrate on programs categorized into the execution stage (119 cases) such as international marketing. In other words, education in training, provision of buyer and international trade data (KITA), international exhibitions and dispatch of market pioneers (KITA and SMBA) are the programs being run.

〈Table 2-8〉 Export Support Programs for Globalizing SMEs

Programs	SBC	KOTRA	KITA
1. Trade Education & Consulting	Strengthening export capability		- Trade education - Trade consulting
2. Providing Information, Construction of Sales Infrastructure	- Strengthening export capability - Domestic sourcing of global buyer	- Analyzing foreign market - Information on global market expansion	- Foreign buyer information - Information on trade trends - Finding appropriate buyers (OKTA)
3. Export Design	- Strengthening FTA utilization capacity	- Developing product design	
4. Global Marketing	- Sending trade mission - Overseas exhibition - Sending delegation - Technology cooperation - Supporting Online export - Developing global brand	- Sending trade mission - Participation in overseas exhibition - Online marketing	- Participation in overseas exhibitions - Sending delegation for trade investment
5. Financing Export & Insurance	- Financing exports		- Export financing
6. Establishing Overseas Branch	- Export incubators - Overseas private network	- Consulting of overseas expansion	

Source: Hannam University, SME overseas support policies, 2013.

3.2.1.3. Outcome of SME Globalization

Given the nature of Korea's industrial structure with mostly growth driven by large corporations, the SME contribution to exports accounted for 39.8 percent in 2012. Yet exports from SMEs in the last six years has recorded an average of 8.9 percent annually, higher than that of large companies at 7.6 percent.

〈Table 2-9〉 SME Contributions to Exports

(Unit: $ billion)

	2007	2009	2011	2012	CAGR
Total	371.1	363.1	554.8	547.5	8.1%
Large Firms	228.6	228.3	350.1	329.3	7.6%
SMEs	1425	134.8	204.7	218.2	8.9%
Share	(38.4%)	(37.1%)	(36.9%)	(39.8%)	

Source: Korea Customs Service, trends of SME contributions to exports, 2013.

A steady increase has been seen in the performance of specific programs on international policies. For example, the number of companies supported by the Promoting Export Capability project nearly doubled from 927 in 2007 to 1,777 in 2013. While support for companies relying on the domestic market has steadily decreased, the success rate of such companies has consistently exceeded 30 percent.

〈Table 2-10〉 Results of Promoting Export Capability

Classification	2007	2008	2009	2010	2011	2012	2013
Support enterprise (#)	927	900	1,447	1,584	1,484	1,589	1,777
Domestic enterprises of support businesses (#)	388	331	549	508	356	343	342
Export success of enterprise depending on domestic market (%)	29.6	35	35	34.6	35.4	31.4	33.9

Note: A domestic enterprise is a company with a ratio of more than 50 percent of domestic sales to overall sales.
Source: Choi, A Study on SME Export Competencies and Policy Support Tasks, 2015.

Trade promotion, which started in 1998 to support SMEs' entry into foreign markets, had supported 26,927 companies by 2013, recording 103 million USD in export contracts. Due to these results, the budget to support SMEs expanded significantly from 10 million USD in 1998 to 13 billion USD in 2014.

〈Table 2-11〉 Results of Trade Promotion

Classification	2009	2010	2011	2012	2013
Overseas exhibitions	136 (2,367)	105 (2,202)	115 (2,277)	108 (2,026)	149 (2,711)
Overseas market pioneers	30 (815)	18 (372)	12 (317)	24 (382)	20 (228)
Export consortiums	20 (290)	23 (283)	14 (152)	13 (137)	26 (289)
Association of Co-Trade Promotion	-	5 (71)	6 (85)	14 (184)	15 (200)
Total	186 (3,472)	151 (2,928)	147 (2,831)	159 (2,729)	210 (3,428)

Note: A domestic enterprise is a company with a ratio of more than 50 percent of domestic sales to overall sales.
Source: Choi, A Study on SME Export Competencies and Policy Support Tasks, 2015.

3.2.2. Technological Innovation

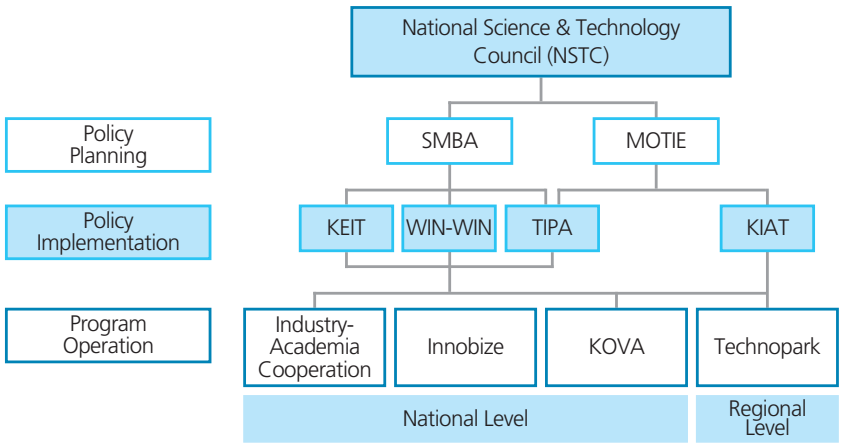
3.2.2.1. Governance System for Supporting Technological Innovation for SMEs

Support systems for Korea's technical innovation policy go through the planning, execution and program running stages. The National Science and Technology Council is the top control tower for technical innovation policy. While MOTIE and SMBA are responsible for planning technical innovation policy for SMEs, the SMBA is leading in such policy exclusively for SMEs. The organizations KEIT, WIN_WIN, TIPA and KIAT are responsible for implementing such policy. Public and private organizations share roles in program operations.

Each government agency, provincial governments, state organizations and associations related to SMEs comprise and operate the technical innovation support system for SMEs in Korea led by the SMBA. The Korean small business innovation research program (KOSBIR) was enacted in 1998 to draw efficient cooperation between ministries. This system obliges governments and public organizations to use a certain R&D budget to support and promote R&D of SMEs.

One characteristic of technical innovation policy in Korea is that policies are pushed ahead via categorization into national and provincial projects. Technical innovation policies for SMEs at the provincial level are usually being promoted by MOTIE as a provincial industrial policy while KIAT handles the whole process. And 18 techno parks in each region operate programs. Provincial governments participate in technical innovation policies by putting matching funds and the programs are based on the advantage of industrial-academic cooperation.

[Figure 2-19] Support Systems for Technical Innovation of Domestic SMEs (Promotion System)



- SMBA: Small and Medium Business Administration
- MOTIE: the Ministry of Trade, Industry and Energy
- KEIT: Korea Evaluation Institute of Industrial Technology
- TIPA: Korea Technology and Information Promotion Agency for SMEs
- KITA: Korea Internation Trade Association

3.2.2.2. Programs for Supporting Technology for SMEs

The program categorizes technical development, transfer and commercialization depending on the stage of technical innovation to enforce policies of each ministry. Programs to support SMEs' technical development and R&D are mainly categorized into R&D, loan, process and production, and technologies and have sub-programs. The R&D program runs sub-programs while categorizing them into short term (one~two years), mid-term (three~five years) and long term (five~10 years). Technology transfer and commercialization programs are separated by four categories, operating the specific programs in each area. Technology transfer is comprised of infrastructure programs such as transfer center and transfer program.

〈Table 2-12〉 Programs to Support Technical Innovation of SMEs

Stage	Type	Main Programs	Ministry
R&D	R&D	1. 1-2 years short-term technology development	SMBA
		2. 3-4 years mid-term development 3. 5-10 years long-term technology development	MOTIE
	Loan	1. Applied technology development	MSIFP
		2. Industrial technology development loan	MOTIE
	Process & Production Technology	1. Comprehensive technical support in material parts	SMBA, Local Government
Technology Transfer & Commercialization	Technology Transfer	1. Promoting technology transfer's commercialization 2. Diffusion research projects technology transfer	MSIFP
		3. Technology transfer center	SMBA
	Commercialization	1. Patent valuation 2. Facilitating international patents	KIPO
	Testing & Inspection	3. Test and evaluation capabilities & assimilation projects	SMBA
	Prototyping	4. Prototyping	SMBA

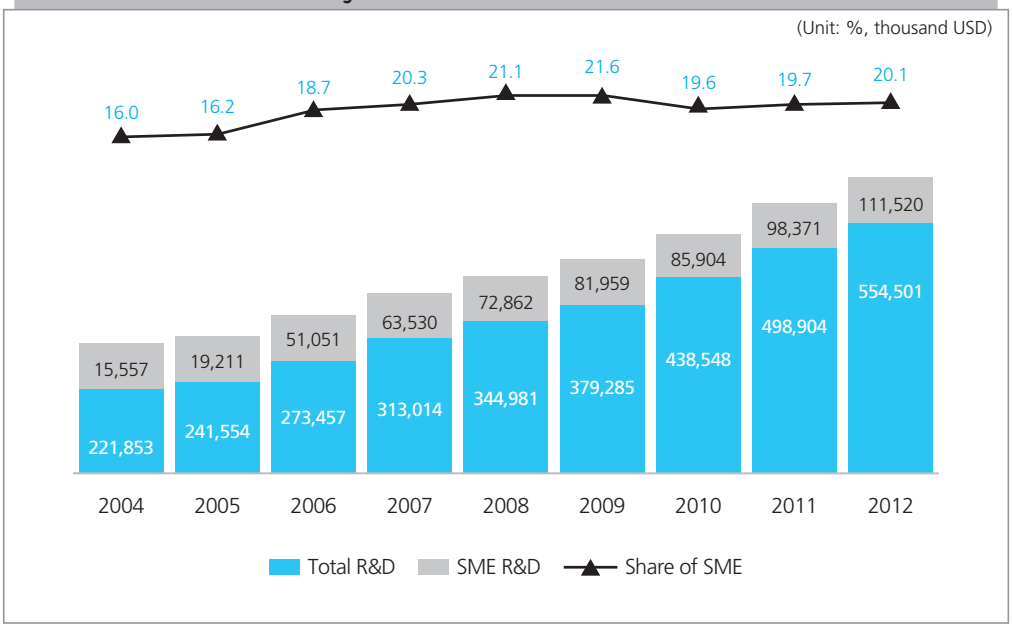
Source: SMBA, Programs to support R&D of SMEs by department, 2014.

3.2.2.3. Results of Supporting Technology Innovation for SMEs

R&D investment by SMEs in Korea accounted for 20.1 percent of R&D in 2012 with a value of 1.12 billion USD. The average annual growth of R&D investment by SMEs over the past 10 years was 15.4 percent, a high level compared to that of research institutions (11.2 percent), universities (11.6 percent) and large corporations (11.5 percent).

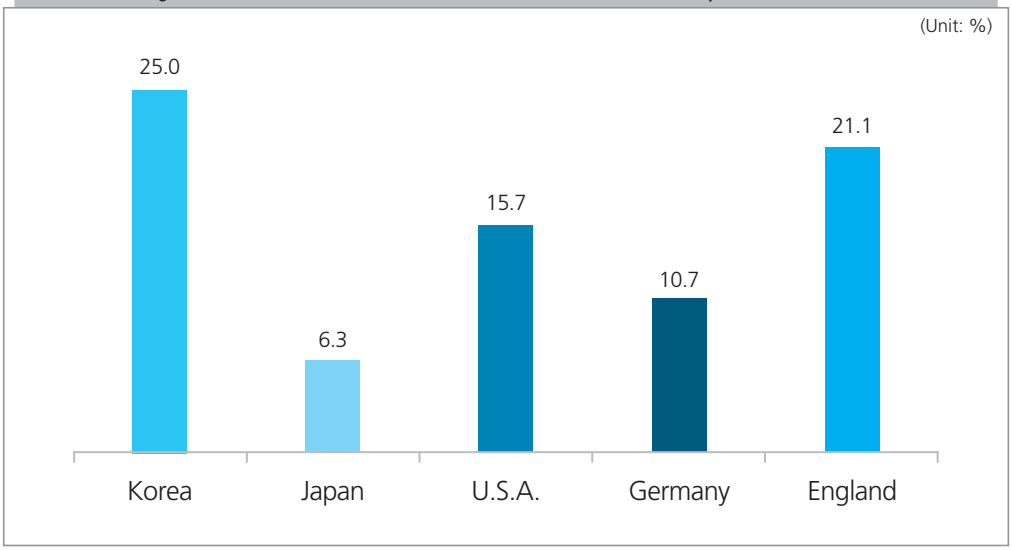
SMEs in Korea have made significant R&D investment for technical innovation compared to those in advanced economies. Korean SMEs accounted for 25 percent of corporate R&D in 2012, higher than that of the U.K. (21.1 percent), U.S. (15.7 percent), Germany (10.7 percent) and Japan (6.3 percent). Due to this significant amount of investment in R&D, the number of SME research centers jumped 2.89 times and that of researchers from such centers increased 1.96 times in 2012 from 2004.

[Figure 2-20] R&D Investment of SMEs



Source: NSTC, "The third plan to promote technical innovations of SMEs", 2014.

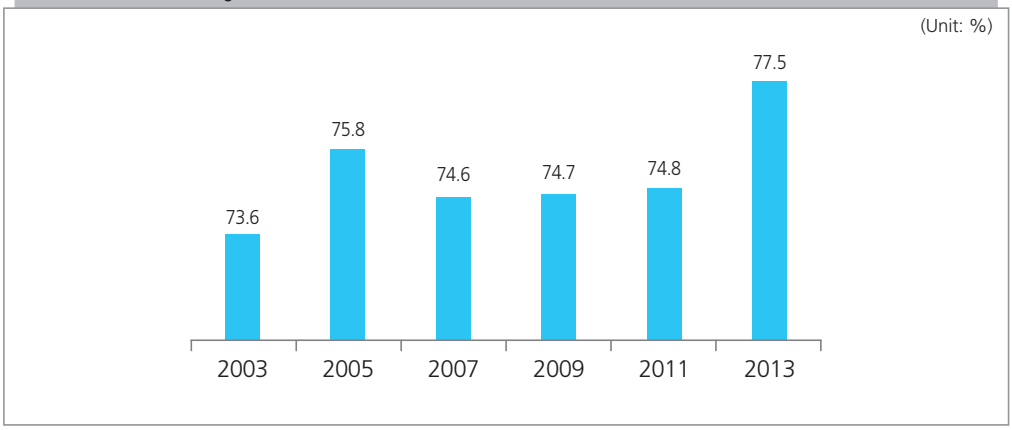
[Figure 2-21] Ratio of SME R&D of Countries to Overall Corporate R&D, 2012



Source: National Science & Technology Council, Third Plan to Promote Technical Innovations of SMEs, 2014

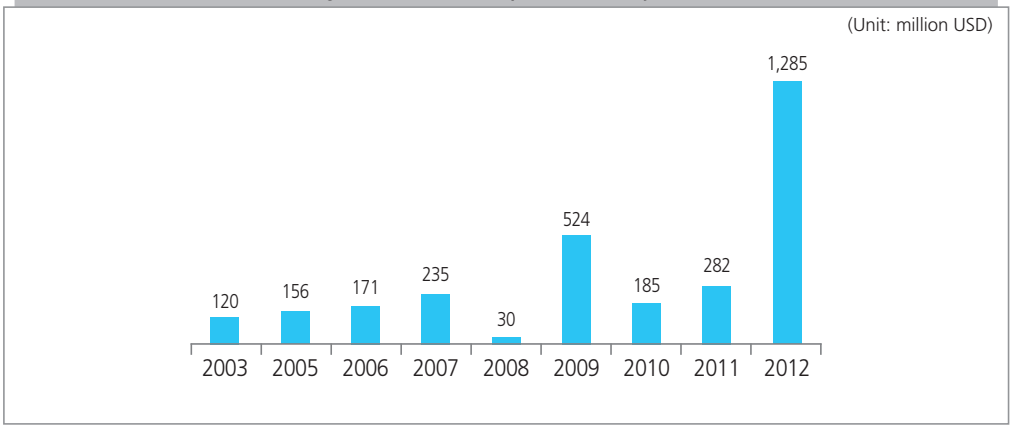
Because Korea's technological innovation capability and level have steadily increased, the technology level was 77.5 percent of the world's best technology. Furthermore, technology exports of SMEs have grown 25 percent over the past 10 years.

[Figure 2-22] Tech Level of Korean SMEs vs. World's Best Tech



Source: National Science & Technology Council, Third Plan to Promote Technical Innovations of SMEs, 2014.

[Figure 2-23] Tech Export Trends by SMEs



Source: National Science & Technology Council, Third Plan to Promote Technical Innovations of SMEs, 2014.

Innovative SMEs (venture and Inno-Biz) jumped in number from 8,839 in 2004 to 47,336 in 2013. And 1,009 companies among those listed on the tech-heavy KOSDAQ have grown through R&D support from the SMBA.

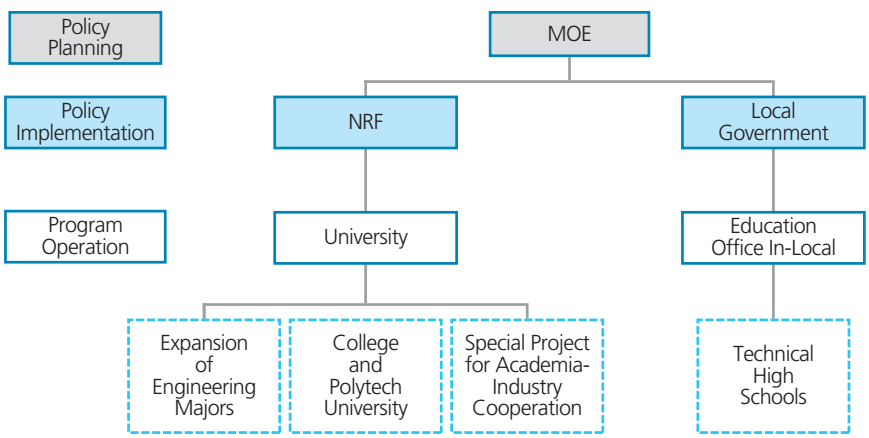
3.2.3. Human Resource Development

3.2.3.1. Governance System for Human Resource Development for SMEs

The driving force behind Korea's economic development is excellent human resources, and systems driven by the government which has made great contribution for the development. Policies to nurture talent for development are planned by the Ministry of Education, workforce for universities is handled by the National Research

Foundation of Korea (NRF) and high school education is supervised by education offices. Universities have greatly expanded engineering and science majors for industrial development and professional colleges and Korea Polytechnics seek to nurture an industrial workforce. To achieve industrial development and nurture a customized workforce for industry, programs for industrial-academic cooperation have been operated. The LINC project and BK21 are the government's leading industrial-academic cooperation programs that aims to foster the development of advanced researchers. Evaluation of the program is conducted by the foundation every year and the results are used to determine which universities should be included or excluded. Education offices manage industrial or technical high schools to train future workers in industry.

[Figure 2-24] Governance System for Human Resource Development for SMEs



• MOE: Ministry of Education
• NRF: National Research Foudation of Korea

3.2.3.2. HRD Programs

Policies to train human resources in Korea are categorized into those to produce technicians and advanced engineers based on regular curriculum and another for running an industrial-academic cooperation program.

A. Developing Technicians

The Ministry of Education established technical high schools nationwide because the most sought-after workers in the initial stage of industrial development are technicians. In particular, policies to foster technicians through such schools have

contributed to industrial development because they met the growing demand for technicians in accordance with the success of the heavy and chemical industries.

To ensure the graduation of highly trained technicians, two-year colleges and Korea Polytechnics were established. The latter, in particular, runs programs that meet the needs of advanced technicians in a number of fields in accordance with the stages of economic development as a public training organization. Its programs include those for nurturing talent for national infrastructure and new growth industries, advanced workers according to the changes in industrial development and lifelong development and training.

B. Developing Engineers

To go from the initial to mature stage of development, it is essential to develop engineers as well as technicians. The Ministry of Education has expanded engineering colleges mainly at national universities to produce more engineers. As for regional hub universities, a large number of students and professors are in engineering colleges. For example, engineering professors account for 25 percent of all professors. Policies to rapidly develop engineers can meet the growing demand for them at a time when industrial development has entered a mature stage.

C. Special Programs for Industrial- academic Cooperation to Foster Workers Customized for Industries

〈Table 2-13〉 LINC Programs: Special Project for Academia-Industry Cooperation

Classification	Programs
System	Change of University System
	• Making university system friendly toward cooperation with industry
	• Including cooperation outputs with industry in evaluation system
	• Hiring professors with focus on cooperation with industry
	• Restructuring university system by specializing in majors in regional specialties
	Strengthening Role & Topology of Foundation of University-Industry Cooperation
	• Making foundation network hub for cooperation with industry
	• Employing experts of university-industry cooperation such as patent attorneys
	Entrepreneurship Education & Internship Centers
	• Establishment of entrepreneurship education center & internship center
	• Employing experts of entrepreneurship education & internship
	Technology Infrastructure for University-Industry Cooperation
	• Establishment of labs for cooperation with industry
	• Purchasing R&D facilities for sharing with industry

〈Table 2-13〉 continued

Classification	Programs
Curriculum	Change Curriculum based on Industry demand
	• Develop specialized tracks based on regional strategic industries
	• Extending internship & Capstone Design
Link	Strengthen Cooperation with Companies
	• Establishment of university-industry cooperation association
	• Support technology development for companies
	• Provide business services such as consulting, marketing & design to industry

The Ministry of Education not only runs a regular curriculum but also has programs for industrial and academic cooperation to nurture personnel customized for specific industries. The leading examples of these are LINC, to foster customized workers, and Brain Korea 21 (BK21), to produce researchers.

LINC seeks to expand employment and drive industrial growth by fostering customized personnel for industries. To do that, the project pursues technical innovation and training of high-level human resources to meet industry demand by creating and expanding a variety of leading models for industrial and academic cooperation. To this end, sub-programs are run per category by separating categories into changes in the university system and curriculum, and association and cooperation between industry and academia.

BK21 supports efforts to produce world-class graduate students and researchers. As for graduate schools, the program strengthened the foundation for research-oriented universities with a quality-focused performance management system to enhance the quality of education and research. A number of programs seek to raise the quality of education and research at graduate schools. BK 21 has invested 3.5 trillion KRW through the first (1999-2005) and second stages (2006~12), and is being promoted under the name BK 21 Plus project.

3.2.3.3. Outcome of HRD

The first LINC project from 2012-14 costing 230 billion KRW in budget has received an evaluation of "very effective." The performance of industrial and academic cooperation was included in the evaluation of teaching staff and the hiring of professors dedicated to industrial and academic cooperation to nurture customized personnel.

As for the BK 21 project, 84 percent (22,475) of those who got graduate degrees went on to pursue a Ph.D, went to abroad for further studies or entered companies; 91 percent (7,357) of those who got doctorates went on to take post-doctoral courses, became full-time staff at universities or joined research centers or companies in their fields. This means the project achieved its purpose of producing skilled workers and encouraging further studies. For the specialized projects, 71 percent (1,818) of those who got graduate degrees and 65 percent (122) of those who got doctorates entered companies in their fields, suggesting that the projects' original goal to foster skilled professionals in new industries was met.

Ministry of Education policies to nurture technicians have greatly contributed to industrial development in Korea, while meeting changing needs in a timely manner. As the industrial structure grow more sophisticated, demand for skilled technicians grows. That is why the ministry set up Korea Polytechnics to meet such demand, as a sufficient number of technicians is an essential element to develop domestic industries to a more mature and innovative stage.

〈Table 2-14〉 Effects of Developing Technicians

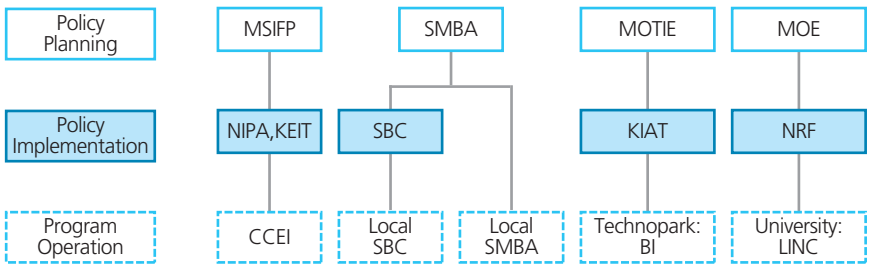
Classification	Policies	Accomplishments
Initial period of economic development: demand for technicians	• Nurture new technicians driven by gov't policy • Adopt policies requiring vocational training	• Nurture & provide technicians in timely fashion • Encourage companies to take part in personnel development
Spring period: Demand for highly skilled technicians	• Nurture talent with various functions & techniques • Enhance role of public training centers	• Nurture & provide technicians and highly skilled workers in timely fashion • Complement limitations of private organizations in HR training through public programs
Mature period: demand for highly skilled engineers	• Improvement training for employees • Secure social safety net via employment insurance	• Expand no. of skilled technicians • Overcome FX crisis via re-employment of unemployed
Innovative period: nurture talent customized for industries	• Secure systems to develop lifelong vocational skills • Develop customized workforce for underprivileged	• Expand subjects & ranges subject to vocational training • Implement policies for customer-oriented vocational training

Source: Kim Cheol-hee *et al*., The Impact of Korea Polytechnics on the National Economy, 2013.

3.2.4. Acceleration of Startups

3.2.4.1. Governance System of Accelerating Startups

[Figure 2-25] Governance System of Accelerating Startups



- MSIFP: Ministry of Science, ICT and Future Planning
- NIPA: National IT Industry Promotion Agency
- KEIT: Korea Evaluation Institute of Industrial Technology
- CCEI: Center of Creative Economy Innovation
- SMBA: Small and Medium Business Administraion
- SBC: Small and Medium Business Corporation
- KIAT: The Korea Institute for the Advancement of Technology
- MOE: Ministry of Education
- NRF: National Research Foundation
- CCEI: Center for Creative Economy and Innovation

3.2.4.2. Programs for Accelerating Startups

Policies to jumpstart startups, which was planned by four national agencies and five window units, are categorized accordingly to the stages of startup. The pre-BI stage has programs on entrepreneurship and related programs. In this stage, three national agencies except for the MSIFP are involved. The BI stage features programs for startups since this stage requires launch of a startup. Four government agencies are involved in this stage. The various programs in this stage include a startup academy for young people, encouragement of universities to pursue startups, and BI to support a business for start-up, help leading universities for startups and support construction of related infrastructure. In the post-BI and final stage, programs focus on further growth of startups, most of which are related to pro-startup policies by SMBA.

〈Table 2-15〉 Programs for Accelerating Startups

Stages	Policy Contents	Main Program	Ministry
Pre-BI	Entrepreneurship Education & Expansion	1. Entrepreneurship education	SMBA, MOE
		2. Developing entrepreneurship & atmosphere/ culture	SMBA, MOTIE, MOE
BI	Startup Establishment & Commercialization	1. Business incubator(BI)	SMBA, MOTIE
		2. Development project for leading university for startups	SMBA
		3. Youth entrepreneurship academy	SMBA, MOTIE, Provincial Government
		4. Development project for preliminary technical founder	SMBA, MOTIE
		5. Development project for preliminary founders in specialized type of researchers	MSIFP
Post-BI	Promotion of Startup	1. Loan & guarantee	SMBA
		2. Investment (investment promotion such as angel and venture funds)	SMBA
		3. R&D startup projects dedicated to start-up companies	SMBA

3.2.4.3. Results of Accelerating Startups

Startups in Korea have seen a gradual increase, with their number rising to 422,842 in 2011 from 134,980 in 2005, an indication of the vitality of startups.

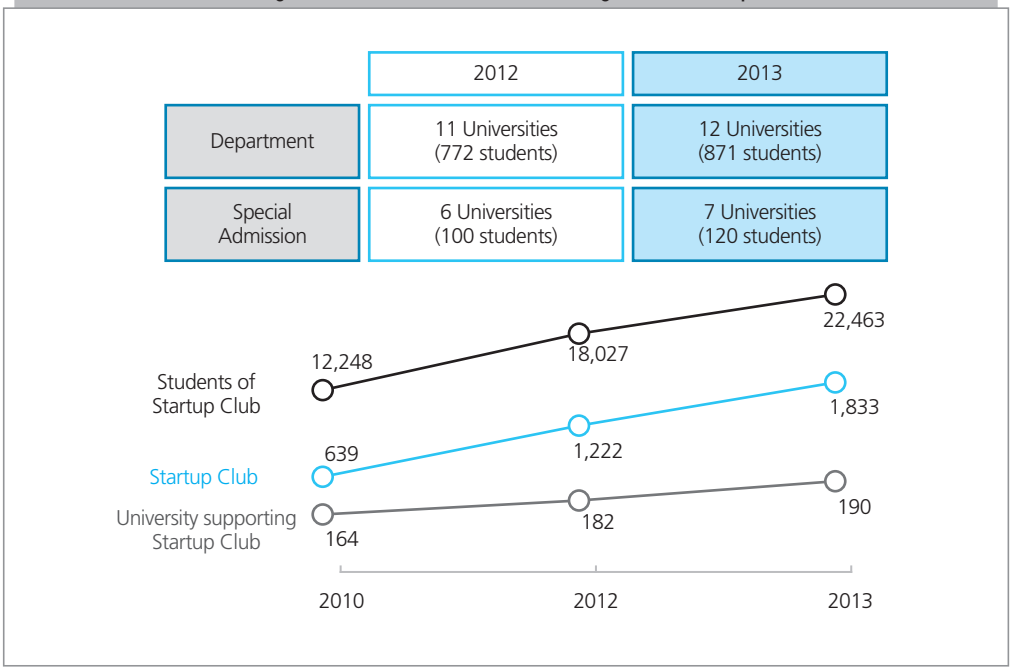
〈Table 2-16〉 Startups by Year

	2005	2006	2007	2008	2009	2010	2011
No. of Startups	134,980	149,239	162,676	195,687	245,741	327,574	422,844

Source: SMBA, 「A Study on the Status of Startups in 2013」, 2014.

The LINC and Entrepreneurship Leading Universities projects to activate youth entrepreneurship have shown good results. Twelve universities run entrepreneurship departments and seven universities select start-up students. Start-up clubs grew to 1,833 in number in 2013 from 639 in 2010. The number of students who founded their own startups nearly doubled in just two years, with 407 university students establishing 37 companies.

[Figure 2-26] Results of Accelerating Youth Startups



3.3. Summary & Policy Implications

3.3.1. Strategy of Korean Support Policy for SMEs

The four features of Korean government policies to support SMEs seek are: policy planning and execution to promptly and effectively carry out policies; a systematic governance system leading to the operation of programs; a structure implemented in a national and supportive way; policies based on industrial-academic cooperation; and full budgetary support.

Many ministry-level public agencies such as SMBA, MSIFP, MOTIE and MOE have their own governance systems to support SMEs. The governance system of each policy for supporting SMEs is systemized to efficiently and effectively implement such policies. The typical structure of a governance system consists of three steps. First, each ministry plans its own pro-SME policy. Second, the window agencies of each ministry implement such policies planned by the ministry. Finally, programs promoting institutions operate action programs to support SMEs.

All pro-SME policies are implemented based on the strategy of industry-academia-government cooperation to promote SME policies and programs. This strategy has enhanced innovation capability, technology innovation and human resources based on the needs of the rapidly evolving industry.

The Korean government is spending a large amount of budget to effectively implement policies to support SMEs, including 12 billion USD in 2014, a considerably high level compared to other countries.

Pro-SME policies in Korea are planned and executed at the national and local levels. The central government devises the policies for implementation at the national and local levels. Window agencies of each central government support and manage programs related to such policies for implementation at the national and local levels. Agencies running the programs are prompt and effective in running the programs at the national and local levels under a dual system.

3.3.2. Implications of Each Policy

The globalization of SMEs in Korea seeks to overcome the limits of a small domestic market and explore overseas markets. Several ministries operate a number of step-by-step programs for the smile curve.

Fourteen ministries participate in technological innovation, and each innovation agency runs a variety of programs.

HRD pursues a policy of regular courses (regular curriculum) to train technicians and engineers who form the basis for industrial development and promote programs on industrial HRD.

The most powerful program of this kind is start-up acceleration by sharing and collaboration in each ministry and characterized by a step-by-step policy that promotes entrepreneurship in Korea.

4. Policy Recommendation

4.1. Implementation Strategy

4.1.1. General Strategy to Implement Support Mechanisms for SMEs

<Table 2-17> shows the general strategy to implement support mechanisms for SMEs. To resolve institutional issues, the Costa Rican government needs to divide its

strategy into four categories, deregulate a variety of obstacles to promote policies and resolve lack of access to financing innovative activities by improving the finance system. For example, the government has a variety of public funds for the finance and loan system based on the Korean experience. The Korean government operates a variety of funds for innovative SMEs such as Korea Credit Guarantee Fund, Korea Technology Finance Corp. (KIBO) and Small and Medium Business Corporation (SBC). Costa Rica needs to change its governance system to increase the level of implementation and operation. Because academia-industry cooperation is the key strategy for improving innovation capabilities, Costa Rica needs to change the academic system to allow higher collaboration with industry.

To boost links between MNCs and SMEs and enhance SME marketing skills, the Costa Rican government needs policies to improve the innovation capabilities of SMEs and strengthen links between MNCs and SMEs. To raise the innovation capabilities of SMEs, a Regional Innovtion System (RIS) is needed. To provide high-quality human capital, the government must innovate its education system through stronger academia-industry cooperation. Finally, further development of entrepreneurship programs should be pursued to accelerate startups.

〈Table 2-17〉 General Strategy to Implement Support Mechanisms for SMEs

Classification	Main Issues	Strategy
Institutional Agenda	Regulation	Deregulation
	Lack of access to financing innovative activities	Improve finance system
	Governance system with insufficient implementation	Change governance system to increase implementation level
	Poor academia-industry cooperation	Change academic system to allow more cooperation with industry
GVC	Weak links between MNC and SMEs	Enhance innovation capabilities of SMEs to strengthen links between MNCs & SMEs
	Poor marketing skills of SMEs	
Innovation Capabilities of SMEs	Low level of technology capabilities	RIS to improve innovation capabilities of SMEs
	Weak structure of education system for HRD	Innovate education system via academia-industry cooperation
	Low entrepreneurship and lack of innovation culture	Add more entrepreneurship programs

4.1.2. Developing Regional Innovation System (RIS) in Costa Rica

Based on the success of Korea in designing and implementing innovation policies, the KPS would like to design and implement an initiative in Costa Rica to strengthen its development of new technologies and their translation into commercial products or processes. The goal is promoting competitive regional growth in economic, social and environmental sustainability.

Such an initiative could count on support from the national and provincial governments of Costa Rica, academia (two public universities) and the private sector, as well as from the Korea Development Institute and Chungnam National University.

The initiative is intended to form a supporting ecosystem for innovation through the development of three regional innovation systems (RIS) in Costa Rica. These systems will raise innovative capacity and foster strategic capabilities for regional and national competitiveness through interaction and close links among the government, R&D centers, think tanks, higher education institutions (HEIs), small and medium-sized enterprises (SMEs) and high-tech multinationals (a partnership of universities and industries supporting commercialization, marketing and financing).

The initiative's framework was developed by Korean researchers who worked on the 2014/15 KSP with Costa Rica, and first presented the idea during the project's Interim Reporting and Policy Practitioner´s Workshop in Seoul, Korea, in March 2015. The project also takes advantage of Costa Rica's strengths in three main regions where academia, provincial governments and the private sector (both domestic and multinationals) are working together to promote competitiveness. The first two efforts are taking place in special economic zones (SEZ) led by the Technological Institute of Costa Rica (TEC): one in the province of Cartago and the other in the San Carlos region. National Technical University (UTN) is leading the third effort in the province of Alajuela.

The three regions possess many of the key elements that enable the formation of knowledge-based regional high-tech clusters, but these efforts are not well coordinated. They also lack a clear vision of what is required to transfer knowledge and technology to SMEs at a regional level, and have them apply it productively. In order to launch and sustain high-tech SMEs and regional innovation clusters require action at the regional level to link entrepreneurial talent, technology, capital (human and financial) and business know-how, and market access to meet the needs of established, emerging and newcomer SMEs. Doing so will greatly stimulate the adoption of value-added technology by SMEs in each of the three Costa Rican regions mentioned above.

Costa Rica has several strengths that offer optimism over the potential for developing RIS in the country. These include:

- Highly qualified human resources
- Critical mass of high-tech & knowledge-based companies
- Strong professional support services (e.g. accounting, legal, investment)
- Leading sci-tech universities like TEC and UTN
- Quality support facilities
- Full support from central government
- Other agencies supportive of technological progress & entrepreneurship
- "Green resources" (botanical studies, tropical forests)
- Integration of three candidate areas for RIS with developed urban areas
- Availability of land for private knowledge-based enterprises (industrial parks)
- Good access to international airports and highways

The opportunities Costa Rica possesses in the global environment include:

- Large potential for international markets in high-tech industries (free trade agreements)
- Support from government and foreign agencies
- Strong potential for attracting more foreign direct investment (i.e. interest in Latin America as new emerging market in global context)
- Hosting of business incubators
- Strong support for technology commercialization
- Special economic zones
- Clear appreciation of the importance of these efforts by national leadership

Costa Rica's strengths constitute the basic elements needed to form innovation platforms for each of the three regions under consideration. But to achieve the objective of developing a regional innovation platform based on sci-tech development requires two things. The first is assessment of the effectiveness of each of the regional efforts in Costa Rica as instruments of regional innovation policy for stimulating tech-led economic development. The second is figuring out how government-academic-industry cooperation can be stimulated for regional innovation; in other words, how to implement the triple helix model of innovation in each of the three regions.

4.2. Action Programs

4.2.1. Programs to Improve Institutional System to Support SMEs

A crucial task is to improve access to financing innovative activities. In doing so, the PCCI can work on three fronts. First, it should promote the implementation of Ley de Garantías Mobiliarias so that companies, especially those based on technology

and knowledge, can offer intangible assets to banks to secure loans. Second, the PCCI should work to reduce the cost of funding (interest rates) through improving the fiscal balance. Third, given that Costa Rica has several incubators and business chambers, the PCCI should promote the design and implementation of programs that ease access to entrepreneurs through both domestic seed/venture capital and crowd funding. The latter mechanism facilitates entrepreneurial fundraising through individual contributions from thousands of small investors through websites like Kickstarter.

To take on the main challenges discussed above, Costa Rica needs a holistic approach and efficient coordination by all actors in innovation processes. A key organization is the Presidential Council on Competitiveness and Innovation (PCCI), which the OECD (2012) noted to strengthen political leadership and horizontal coordination as well as increase diagnostics capability. In doing so, the enforcement power of the PCCI needs boosting to elaborate on shared guidelines and priorities to foster policy coordination among ministries overseeing different sectors. Though the PCCI seems to enjoy the highest political support, it must be empowered to create consensus on objectives and align policy actions (OECD, 2012).

Additionally, the PCCI should ensure the implementation of and follow-up to decisions stemming from its discussions and deliberations (OECD, 2012). It should identify a proper mechanism to channel the private sector's voice and endow it with an agenda for priority setting and action definition (OECD, 2012). On the other hand, Costa Rica should raise diagnostic capability to improve priority setting, accountability and monitoring of outcomes. A useful step in this direction, following a recommendation by the OECD (2012), is to create a small and agile observatory-type institution operating under the PCCI in close collaboration with the national statistical office. This institution would be responsible for building an information system centered on production and innovation dynamics, including research centers, universities, and foreign and national companies. The observatory could help the study of market dynamics, including potential misalignment between demand and supply of skills.

As part of the PCCI's policy agenda, the council should work on improving university collaboration in innovation activities undertaken by companies, enforcing a culture of IPR protection by companies, strengthening financial instruments to support new ventures and innovations, and facilitating access to highly skilled workers by smaller companies.

4.2.2. Programs to Integrate SMEs into GVCs

A strategy is needed to implement a set of actions to strengthen SME links to GVCs:

- Identify capabilities of domestic companies; determine those with medium to high potential to participate in the respective GVC. The level of capability determines a company's sophistication in its product or service offerings as well as managerial knowhow.
- Further develop Propyme funds from MICITT. For example, establish a fund to support certification of domestic suppliers with the demonstrated capacity to work with MNCs.
- Expand PROCOMER export programs based on GVC steps
- Develop a platform to provide potential buyers with information on these capabilities, certifications and contact information. Ensure that this information is publicly available.
- Develop programs to help domestic companies to globalize their activities such as a shared sales and marketing platform in key buyer markets. Create opportunities for strong domestic providers to contact leading MNCs abroad that are considering operations in the country.
- Establish government procurement service to expand the domestic market for innovative SMEs.

〈Table 2-18〉 Process to Suggest Action Programs of Globalizing SMEs

Costa Rica's Main Issues	Korean Experience		Costa Rican Action Programs
Strengthening links between SMEs & MNCs	Strengthening Links between Korean MNCs & SMEs	⇒	- Selection & concentration on potentially capable SMEs - Developing programs to create links between SMEs & MNCs
Expanding export programs	Various export programs based on GVC steps	⇒	- Expanding export programs of PROCOMER - Developing PROCOMER as globalization platform
Encouraging SMEs to join GVCs by improving marketing skills	Public & private cooperation: SBC, KOTRA, KITA	⇒	- Developing programs to improve marketing skills of SMEs
Improving standardization of SMEs	- Establishing KRISS*, Operating variety of certification & standardization systems	⇒	- Establishing public institute for certification & standardization as long-term program - Creating pilot program for certification & standardization
Expanding domestic market	Government procurement service	⇒	- Establishing government procurement service

Note: KRISS stands for Korea Research Institute of Standards and Science.

4.2.3. Programs to Enhance Innovation Capabilities of SMEs

4.2.3.1. Establishment of Innovation Platform

The first action program suggested by this research is to establish a pilot innovation platform to overcome weaknesses in developing an RIS. The weaknesses include lack of managerial capacity for high-tech business development; poor networking between R&D centers, HEIs and industries; dependence on central government budget; old labs and facilities; insufficient infrastructure; and an insufficient system for protecting intellectual property rights (IPR).

We suggest one short-term and one long-term project. The latter is a pilot techno park as suggested in Chapter 1. Therefore, this chapter highlights setting up a short-term innovation platform funded by the Korean fund in the Inter-American Development Bank (IADB). To design and implement the project, Costa Rica will take advantage of academic and technical cooperation agreements TEC has with both Chungnam National University of Korea (CNU) and the High Technology Advisory Committee of Costa Rica (CAATEC - www.caatec.org) a widely-respected think thank with extensive experience in designing and implementing projects in the country. We propose that CAATEC act as the implementation agency for the project with the technical support of TEC, UTN and CNU, as well as support from the central and provincial governments, the private sector and other stakeholders. Resources from the Korean fund at the IADB could be used to finance this initiative. A formal proposal to the Korean fund will be jointly prepared by CAATEC (team leader), TEC, UTN and CNU, and presented to the IADB with support from both the Costa Rican and Korean governments.

Thus, the project we propose has the following strategic objectives:

- Developing technology based on economic growth, job creation, and innovation
- Facilitating creation and growth of high-tech SME via close cooperation among exiting HEIs, public research centers and the private sector
- Strengthening links between multinational corporations and SMEs for integration into GVCs
- Facilitating technology transfer and commercialization from HEIs and research institutes to the productive sector
- Encouraging the formation of knowledge-based enterprises assisted by research knowledge and expertise available at R&D centers
- Promoting SME capability to innovate
- Encourage opportunities for domestic industry to collaborate with each other through a trade association and joint ventures with global partners to achieve economies of scale required to become approved suppliers for global MNCs.

- Create an online public database of suppliers and subcontractors in Costa Rica to allow potential investors and companies to identify suppliers on their own without direct assistance from the Productive Linkages Program (former CR Provee).

4.2.3.2. Technological Innovation Capability

According to the Korean experience, Costa Rica needs to increase R&D investment to about 2.5 percent of GDP to improve the technological innovation capabilities of SMEs. The government should spend its R&D budget to set up an SME think tank and hire researchers. In addition, improvement is needed in constrained financial markets to encourage borrowing for innovation.

Because the main source of technology is universities, the government needs to change the university system to stimulate R&D. The majority of university majors are social sciences and education, so the number of engineering majors should be raised for encouraging R&D.

Costa Rican universities need to develop strong university-industry cooperation. Such cooperation requires an incentive system for cooperating with industry and

〈Table 2-19〉 Process to Suggest Action Programs for Technology Innovation Capabilities

Cost Rica's Main Issues	Korean Experience		Costa Rican Action Programs
Low level of R&D investment	R&D budget: 11% since 1999 R&D as share of gov't budget: 6% (2015)	⇒	- Increasing R&D budget - Improving financing system
Changing university system to stimulate R&D	Raising number of engineering majors	⇒	Producing more engineering majors for encouraging R&D
Improving university-industry cooperation	R&D Consortium, LINC	⇒	- Developing incentive system for cooperating with industry - Deregulating laws - Changing evaluation system - Revamping protecting system for intellectual property rights
Establishing innovation platform	Daedeok Innopolis Foundation, Technopark	⇒	- Establishing IADB-funded innovation platform as short-term project - Establishing pilot techno park as long-term project
Forming public think tanks	Variety of public think tanks: KIST, ETRI, etc.	⇒	- Forming pilot public think tank as long-term project

deregulation. Universities need to change their evaluation systems for professors by including cooperation with industry. Finally, the government must revamp the system for protecting intellectual property rights to have universities share such rights with companies.

Because the innovation platform plays a key role in technological innovation, establishing an innovation platform is a top priority. As suggested previously, the Costa Rican government needs to take a two-step strategy. After forming an IADB-funded innovation platform as a short-term project, it can establish a pilot techno park as a long-term project.

4.2.3.3. HRD

Because the main problem with human capital in Costa Rica is the small number of technicians, engineers and researchers, the government needs policies to raise these kinds of human resources through technical high schools and two-year colleges offering the training required for working in industry. To this end, the government needs to invite all key stakeholders including technical schools, universities, foreign multinationals, domestic suppliers, CINDE, COMEX and other state institutions to participate in an analysis of future skills needs for industry.

Costa Rica can fulfill its demand for a large number of engineers by increasing the number of engineering majors, students and professors, as well as getting graduate students to study engineering. Access to electronics and computer engineering degrees needs expansion and the quality of engineering programs in the country should be enhanced. Development of these programs should be done at more universities to drive interest in the sector among youth. Furthermore, career

〈Table 2-20〉 Process to Suggest HRD Action Programs

Cost Rica's Main Issues	Korean Experience		Costa Rican Programs
Increasing No. of technicians	MEISTER School	⇒	Establishing ICT, technical high schools for medical devices
Increasing No. of high-skilled technicians	Korea Polytechnics	⇒	Increasing No. of majors & students at technical colleges
Developing engineers	Expanding No. of engineering majors	⇒	Increasing no. of engineering majors, students & professors
Developing researchers	BK21	⇒	Increasing No. of graduate students
Short-term programs	LINC, CK	⇒	Developing programs of National Learning Institute

information available at technical high schools can effectively inform students about the long-term potential of entering these sectors.

Costa Rica needs short-term programs for academia-industry cooperation to satisfy the demand of industry, especially at provincial universities. It should also increase the number of technical high schools providing career tracks for priority sectors. Scholarship opportunities abroad will lead to upgraded skills over the near to medium term. These scholarships can apply to short certifications, diplomas or tertiary education. Additionally, the government should encourage the hiring of foreign consultants to run trainer programs in subjects with potential demand and areas with labor shortages. When universities create programs for academia-industry cooperation, the government needs to support alliances between domestic universities and foreign institutions to develop curricula and leverage e-learning opportunities. To stimulate university-industry cooperation, universities should foster forums to promote interaction among trade associations, individual companies and educational institutions. Universities should be encouraged to establish relationships with industry, and opportunities for corporate representatives to teach at universities and technical high schools are needed.

Finally, universities need to create flexible educational system to allow students to work or workers to study. Universities and employers need to offer flexibility for students who want to work, as this will increase the number of immediately available workers.

4.2.3.4. Acceleration of Startups

The hottest issue in startups and business in Costa Rica is the large number of complicated regulations and the time required to get through red tape. So the top priority for accelerating startups is deregulation. The Korea government has shortened the registration needed for startups, by simplifying the process of establishing a company and constructing a factory. Costa Rica needs to implement this lesson from the Korean experience.

The key factor behind accelerating startups is a strong entrepreneurship and innovation culture. Promotion of an entrepreneurial and innovative culture should be the top priority for the Costa Rican policy of accelerating startups. Universities need a large number of entrepreneurship classes and programs to develop entrepreneurship such as startup clubs and an entrepreneurship contest.

Furthermore, more investment is needed in other innovation activities. To do this, the number of scientists, engineers and technicians who can set up startups is needed. To produce more of these innovative people, Costa Rica needs to improve

the coverage and quality of its education system and create a culture of innovation at home. First, one must work with secondary schools and universities, both public and private, to better align studies with the real needs of the productive sector. Second, coordination with media and social networks could generate collective enthusiasm for creativity and innovation across the country. The government needs to organize and finance trips to cutting-edge facilities, universities and equipment manufacturers in different parts of the world.

To technically accelerate startups, Costa Rica needs to expand CONICIT programs based on startup stages. CONICIT needs to expand its programs to a variety of startup stages and develop programs from the pre-BI to post-BI stage. Especially, CONICIT needs to create programs to help failed entrepreneurs such as financing support, technology evaluation and patent assistance.

The government also needs to expand the number of business incubators or accelerators. It needs to develop financing programs to support the growth of high potential startups, such as incubators and programs to increase access to risk capital via angel investors, venture capital and private equity opportunities. To do this, it can expand CONICT BI as a short-term project and establish BI at universities by cooperating with industry as a long-term project.

〈Table 2-21〉 Process to Suggest Action Programs for Accelerating Startups

Cost Rica's Main Issues	Korean Experience		Costa Rican Action Programs
Deregulation of startup setup	Deregulating startups	⇒	Removing variety of regulations for & accelerating startups: - Shortening registration - Simplifying processes of establishing company & constructing factory
Lack of entrepreneurial & innovative culture	- Entrepreneurship education: startup graduate schools, startup leading university - Special programs for entrepreneurship (LINC)	⇒	- Establishing entrepreneurship classes at university - Operating programs to develop entrepreneurship: startup clubs in college
Expanding programs for accelerating startups	Programs of 4 ministries & 5 window agencies: Pre-BI ⇒ BI ⇒ Post-BI	⇒	- Expanding CONCIT programs based on startup stages - Forming programs to help failed entrepreneurs
Building more business incubators or accelerators	Establishing BI at universities, public research institutes, techno parks	⇒	- Expanding CONICT BI over short term - Establishing BI at universities by cooperating with industry

5. Conclusion

The main issues surrounding Costa Rica's support mechanisms for SMEs are classified into three agenda types: institutional, GVCs and SME's innovation capability. The four main issues are serious regulations, inefficient finance system, insufficient implementation level of governance system to support SMEs and low collaboration between academia and industry. The two main problems of Costa Rican SMEs participating in GVCs are weak links between MNCs and SMEs and poor participation of domestic firms in GVCs. Issues surrounding the improvement of SMEs' innovation capability are categorized into three agenda: low level of technological innovation capability, weak educational structure for HRD, and low entrepreneurship and innovation culture.

This study analyzed the governance system, action programs and main issues of each category to support SMEs in Costa Rica: integration into GVCs, technological innovation capability, human resource development and acceleration of startups. The main issues of each category are similar to the main problems above.

Four features of policies to support SMEs in Korea allow effective planning and execution: policy planning and enforcement to promptly and effectively carry out policies; a systematic governance system leading to the operation of programs; structures implemented in a national and supportive way, policies based on industrial-academic cooperation; and full budget support. Many ministries in the Korean government such as the SMBA, Ministry of Science, ICT and Future Planning (MSIFP), MOTIE and Ministry of Education (MOE) have their own governance system to support SMEs. The governance system of each policy of supporting SMEs is systemized to efficiently and effectively implement pro-SME policies. Such policies are implemented and operated based on a strategy of industry-academia-government cooperation to promote SME policies and programs. The Korean government is putting a huge budget to effectively implement policies to support SMEs, which are planned and executed at the national and provincial levels.

This paper also suggests suggests an implementation strategy and action programs based on the main issues of Costa Rica and the Korean development experience. To resolve institutional issues, the Costa Rican government needs to classify each strategy in four categories. It needs to deregulate a variety of obstacles to promote policies, and resolve the lack of access to financing innovative activities by improving the financial system. The Costa Rican government needs to change its governance system to increase the level of implementation and operation. Because academia-industry cooperation is a key strategy for improving innovation capability, the government needs to change the national academic system to facilitate better cooperation with industry.

To strengthen links between MNCs and SMEs and raise the marketing skills of SMEs, Costa Rica needs policies to improve the innovation capability of SMEs to bolster the connection between MNCs and SMEs. To improve the innovation capability of SMEs, the government needs to establish a regional innovation system (RIS), and to provide the high-quality human capital, innovation of the education system is required via academia-industry cooperation. Finally, another crucial step is setting up entrepreneurship programs to accelerate startups.

Furthermore, action programs for each big agenda issues are suggested: improving the institutional system, integrating SMEs into GVCs and enhancing the innovation capability of SMEs. To improve the institutional system to support SMEs, Costa Rica needs to improve access to financing innovative activities by working on three fronts: promoting the implementation of Ley de Garantías Mobiliarias, reducing the cost of funding through lower interest rates and helping entrepreneurs with fundraising. Good coordination of efforts of all actors involved is needed in innovation processes to increase the level of policy implementation. This effort requires higher enforcement power by the Presidential Council for Competitiveness and Innovation (PCCI) to develop policy coordination among different sectorial ministries. The PCCI should identify an appropriate mechanism to channel the demand of the private sector and empower it with an agenda for priority setting and action definition (OECD, 2012). The council should work on improving university collaboration in innovation activities undertaken by companies, enforcing a culture of protection of intellectual property rights (IPR), strengthening financial instruments to support new ventures and innovations, and facilitating access to highly skilled workers by SMEs.

It is also important to set up a strategy to implement actions to strengthen links between SMEs and GVCs: selection of and concentration on potentially capable SMEs, development of special programs to create links between SMEs and MNCs, expansion of export programs of PROCOMER, raising PROCOMER as an internalization platform and development of special programs to improve SMEs' marketing skills.

To enhance the innovation capability of SMEs, this research recommends a pilot innovation platform to overcome the various weaknesses in developing an RIS. Short-run and long-run projects are also recommended. The long-run project should establish a pilot techno park as suggested in Chapter 1. So we suggest in this chapter a short-run innovation platform that can be funded by the Korean fund in the Inter-American Development Bank (IADB). To design and implement the project, we will take advantage of academic and technical cooperation agreements TEC has with both Chungnam National University of Korea (CNU) and the High Technology Advisory Committee of Costa Rica (CAATEC) a widely respected think thank with extensive experience in designing and implementing projects in the country.

According to the Korean experience, Costa Rica needs to increase R&D investment to about 2.5 percent of GDP to raise the technological innovation capability of SMEs. In addition, this research suggests several action programs for improving technological innovation: improving the financing system, encouraging more engineering majors to promote R&D among the majority of science majors, developing an incentive system for cooperating with industry, deregulation, revamping the evaluation system, changing the protective system for intellectual property rights and employing an IADB-funded innovation platform and pilot techno park (if established).

Because the main problem of human capital is the insufficient number of technicians, engineers and researchers, the Costa Rican government needs to increase this type of human capital. This research suggests several action programs for human resource development (HRD): establishing a technical high school for ICT and medical devices, raising the number of majors and students at technical colleges, encouraging more engineering majors, undergraduate and graduate students, and professors, and developing short programs at the National Learning Institute.

Stimulating an entrepreneurship and innovation culture should be the top priority in the Costa Rican policy of accelerating startups. Universities need to establish a large number of entrepreneurship classes and run programs to develop entrepreneurship such as startup clubs or contests. To technically accelerate startups, the government needs to expand CONICIT programs based on startup stages. Costa Rica also needs to expand the number of business incubators or accelerators.

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