



# A study of the SME Technology Roadmapping Program to strengthen the R&D planning capability of Korean SMEs

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## ABSTRACT

As many countries strive to bolster their respective economies and to minimize the repercussions of the global financial crisis, policies for strengthening the innovative capabilities of small and medium enterprises have emerged as an important means for pursuing these governmental efforts. In 2007, the Korean government designed its SME Technology Roadmapping Program to reinforce the planning capabilities of SMEs and began actively administering the program in 2008. This study analyzes the contents and effects of Korea's SME Roadmapping Support Program, which has yielded successful outcomes, for the purpose of illuminating various implications that can be learned from this program for future policies. Although the beneficiaries of Korea's support project were companies that are relatively smaller when compared to the participants in Singapore's OTR program, a greater amount of manpower and financial resources were devoted by Korea to build their mid-to-long term roadmaps. The SME technology roadmaps generated through the support of this program were found to have contributed to strengthening the capabilities of human resources, establishing mid-to-long term R&D strategies, developing technology, enhancing the success rate of commercialization, and identifying technology development projects.

In addition, this study explores directions for improving the program by analyzing the results of a survey conducted among the companies that completed roadmaps as participants in the program. According to my analysis of the Structural Equation Model (SEM) constructed from the survey, the level of satisfaction regarding the program declined in cases where the roadmap presented technologies that required a long time for development. From this observation, we derived the lesson that in order to improve the SME Technology Roadmapping Program in the future, it will be necessary to reduce the timeframe of the roadmaps from the conventional 3–5 years to 2–3 years.

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## 1. Introduction

### 1.1. Research background

As of 2010, small and medium enterprises (hereinafter referred to as SMEs) constituted 99.9% of companies and 87.7% of employment in Korea, occupying a central role in the country's economy. Despite their important presence in the Korean economy, however, the reality is that SMEs are at a

disadvantage compared to large corporations in terms of financing, securing sales outlets, and pursuing technological innovation, etc. The repercussions of the global financial crisis and the economic recession in Korea have impacted SMEs even more adversely than large companies, and the governmental efforts to address the difficulties confronting SMEs have become all the more important. The Korean government has prepared various policies to support SMEs and it is currently implementing measures such as tax relief and financial assistance, etc., but criticism has also been raised regarding the efficacy of some of these policies. In this context, the policy to support technological innovations that can fundamentally

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enhance the competitiveness of technologically driven SMEs has become established as a core of the SME development policy pursued by Korea's Small and Medium Business Administration (hereinafter referred to as SMBA). Among the SMBA's policies to support technological innovation, this study focuses specifically on the new efforts being made to foster R&D planning capabilities.

To improve the efficiency of R&D investment among SMEs, efforts to convert the R&D capabilities of SMEs into business opportunities are just as critically important as making efforts to ensure prudent investment decisions. In order to succeed in commercializing R&D achievements, it is critical to implement systematic planning and administration to oversee the serial R&D process, and technological roadmapping is one method that can be highly effective in reinforcing the R&D planning that takes place at the initial stages of this process. The government, various associations, and some large corporations have built and utilized conventional types of roadmaps, and it cannot be denied that the roadmaps created by these entities have made significant contributions to improving efficiency in the use of national resources and standardizing industries. However, such roadmaps based on a macroscopic perspective have failed to be of much assistance to individual companies, most particularly to SMEs. To address this shortcoming, Korea's SMBA targets technologically innovative SMEs driven by R&D and has planned and executed the "SME Technology Roadmapping Program" assisting the creation of technology roadmaps (TRMs) for individual SMEs that can be used for R&D planning to pioneer new future markets, thereby enhancing efficiency in the utilization of R&D resources and improving the success rate of commercialization.

This paper analyzes the SME Technology Roadmapping Program that was conceived and implemented to bolster the R&D planning capabilities of SMEs in this Korean context, for the purpose of identifying the significance and implications of this program as a policy promoting the National Innovation System (hereinafter referred to as NIS). Furthermore, this study includes a survey conducted among the companies that participated in the program up to 2011, in order to indicate the directions in which the program will need further improvement.

### *1.2. Current status of SME related policies in Korea*

As of late 2009, there are more than 3 million SMEs in Korea, employing more than 11.8 million workers. More than 60,000 companies were newly established in 2010, while only around a thousand companies declared bankruptcy, resulting in a continually increasing number of medium sized companies. Notably, the number of corporate bankruptcy has declined almost every year since 2003, demonstrating a relative stability in SME management conditions. As of 2010, the percentage of Korea SMEs in Korea who invested in technology development was 28.9%, 0.4 percentage point higher than in the previous year (28.5%), and the average amount of investment per company was 180,000 U.S. dollars, increased by 10.4% compared to the previous year (163,000 dollars). Among the companies that invested in technology development, the percentage of the amount invested in technology development relative to the amount of sales was 2.76%, higher by 0.26 percentage point compared to the

previous year. Also, the percentage of SME employees who were research staff had risen from 4.0% to 4.7% [1].

The support received from successful governmental policy can be regarded as a significant contributor to this strengthening of R&D among Korea's SMEs. In 2009, Korea's SMBA announced its SME R&D Support Plan for 2010 based on the 5 Year Plan for SME Technology Innovation, a plan which concentrated on lending support to fields of promising growth such as green and new growth generating industries. The SMBA disclosed that it had significantly raised its budget for supporting SME R&D in 2010 to 487.6 million dollars, which was 61.5 million dollars higher compared to 2009, for the objective of concentrating on fostering technology intensive SMEs to generate the momentum for future growth and building the foundation for sustainable, global growth [2,3].

In the aftermath of the global financial crisis, the task of fostering SMEs equipped with competitive technology has become all the more important for revitalizing the economy. However, the recent economic recession has stymied the ability of SMEs to invest in R&D. Addressing this challenge, the SMBA plans to actively support technologically capable SMEs by taking leadership in expanding investments at the governmental level so as to propel private investments. Through its 'Five Year Plan for SME Technology Innovation,' the SMBA has set out to expand its budget exclusively devoted to R&D among SMEs up to around 6% of the total governmental R&D budget by 2013. The enlarged budget allocated to SME R&D is being used for areas of promising growth potential such as green and new growth generating industries, for strengthening the linkage of technologically developed products to sales outlets, for reinforcing support for joint R&D involving the collaboration of industry and academia in order to enhance the technology innovation capabilities of regional SMEs, and for providing customized R&D support at each stage of growth, with beneficiaries ranging from companies in the early stages of establishment to globally leading companies [4].

The Korean government's policy for SME technology innovation is operated based on the macroscopic strategy embodied in the 'Five Year Plan for SME Technology Innovation,' framed by the National Innovation System (NIS), and it is implemented through R&D support programs, among which the representative example is the technology innovation development program administered by the SMBA. This study examines the Korean SMBA's SME Technology Roadmapping Program, a specialized program that focuses specifically on the R&D planning stage within the framework of the broader goal of supporting R&D among SMEs. The program was launched following a survey of demand and advance planning research conducted in 2007, and it has been implemented from 2008 up to the present as strategic niche program (policy experiment).

## **2. Preceding studies and existing case studies**

### *2.1. Preceding studies related to technology roadmapping*

By general definition, a "roadmap presents a method for pursuing the desired direction to achieve a specific goal" and the purpose of preparing a roadmap is to assist the organization in securing and utilizing the appropriate capabilities at the appropriate time in order to achieve its goals. However, because there is a wide variety among roadmaps being used, with

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