

行政院國家科學委員會專題研究計畫 期中進度報告

從國家學習體系到國家創新體系：台灣與南韓科技體制與轉變之比較(總計畫及子計畫二)(2/3)

計畫類別：整合型計畫

計畫編號：NSC94-2745-H-029-001-URD

執行期間：94年08月01日至95年07月31日

執行單位：東海大學工業工程與經營資訊學系

計畫主持人：劉仁傑

共同主持人：陳介玄，林灼榮，李文朗

計畫參與人員：王振寰、李明煌、徐啟升、洪堯勳、宋興洲、陳玉雪、吳翰有

報告類型：精簡報告

報告附件：出席國際會議研究心得報告及發表論文

處理方式：本計畫可公開查詢

中 華 民 國 95 年 5 月 29 日

本計畫共三年，國科會支持之總、子計畫共十件，由學校配合款支持之計畫共四件。各子計畫之期中報告，由各子計畫主持人上網繳交外，並附錄於後。本報告分兩部分，第一部份為總計畫，第二部分為子計畫二之期中報告。

壹、總計畫部分：

第二年的工作，協調各子計畫之進行，其中舉行三次計畫執行會議分享研究狀況，並舉辦兩場計畫內成員之國內 workshop 發表，本年度的主要重點在於六月中國際學術研討會之舉辦。分項說明如下：

一、研究計畫執行會議

於本年度分別召開三次計畫執行會議，會議內容如下：

(一) 94.09.23 第一次計畫執行會議

1. 會議參與人員

計畫主持人：劉仁傑

計畫成員：林灼榮、陳介玄、王振寰、張書文、黃延聰、
黃崇憲、李明煌、洪堯勳、宋興洲；

助理人員：陳玉雪、蘇振尉、楊建家、吳翰有、魏少君、徐子琳、
李筱茹、藍子麟、陳永順、盧韻后、陳玉芬、黃淑琴、
鍾侑倫、溫芮瑜。

2. 會議內容

- 介紹本計畫成員。
- 簡介本計畫內容。
- 說明本學年度計畫執行重點。
- 說明第一階段執行重點（網站加強整合計畫資訊）。
- 說明本季工作小組（助理人員）之工作執行重點。
- 說明國內學術研討會與國際學術研討會預定執行方式。
- 本學年度計畫執時程確認。

(二) 94.11.25 第二次研究計畫執行會議

1. 會議參與人員

計畫主持人：劉仁傑

計畫成員：劉仁傑、陳介玄、王振寰、張書文、黃崇憲、
李明煌、徐啟升、洪堯勳、宋興洲；

助理人員：陳玉雪、蘇振尉、楊建家、林純如、謝書民、
徐子琳、李筱茹、陳品均、邱敬賢、藍子麟。

2. 會議內容

- 計畫執行進度報告。
- 學術研討會等備與舉辦。
- 國際會議籌備進度報告。
- 網站介紹，第二年度網站新版上線。

(三) 95. 04. 28 第三次研究計畫執行會議

1. 會議參與人員

計畫主持人：劉仁傑

計畫成員：陳介玄、張書文、黃延聰、黃崇憲、徐啟升、洪堯勳；

助理人員：陳玉雪、蘇振尉、楊建家、吳翰有、徐子琳、李筱茹、
藍子麟。

2. 會議內容

- 感謝各位計畫成員對國內學術研討會的支持與投入。
- 五月底需要繳交期中報告給國科會，請老師留意。
- 國際學術研討會，籌備進度報告。
 - ✓ 以 keynote speech 擬訂兩大主講題目及 12 篇論文，分為 6 個場次，每個場次暫訂一個大主題。
 - ✓ 請所有計畫老師所屬研究團隊的博士班學生能全員參與此次研討會，亦請碩士班學生儘量配合出席。
 - ✓ 本次研討會將積極強化校外宣傳，並邀集後援企業，達到產學交流。也請各位老師邀請合作的企業加入，並推薦後援企業。
 - ✓ 國際學術研討會，請所有成員協助宣傳，透過 Email、傳真及郵寄，並請東亞中心及企業協同中心務必大力幫忙。
 - ✓ 國際研討會將酌收工本費，但老師們邀請的貴賓不收費。
- 明年展望性的討論。國科會年度結案及新年度如何運作，第三年著重在成果展現，國內研討會也一併蘊釀下一次的計畫。

二、學術研討會議程與成果

截止目前為止，為帶動研究風氣，累積與鼓勵計畫成員進行台灣產業創新相關研究，配合行政院國科會「提升私校研發能量整合型專案計畫」之執行，舉辦了兩次國內 workshop。

兩次學術研討會議程如下：

～學術研討會（上）- 2006.01.07～
第一場次 13:30~16:00 主持人：東海大學 國際貿易學系 林灼榮教授
題目：從 OEM 到 OBM~巨大機械產品開發能力的創發與存續 發表人：東海大學 工業工程與經營資訊學系 張書文副教授 評論人：東海大學 工業工程與經營資訊學系 劉仁傑教授
題目：從財務指標探討台灣資訊產業電子化供應鏈之經營意涵 發表人：東海大學 工業工程與經營資訊學系 洪堯勳副教授 評論人：台中技術學院 企業管理科 賴明弘副教授

題 目：The Emergence of Keiretsu-Guanxi Facilitated Joint Ventures in China

發表人：東海大學 工業工程與經營資訊學系 劉仁傑教授

評論人：東海大學 經濟學系 羅台雄教授

第二場次 16:10~18:40

主持人：東海大學 社會學系 陳介玄教授

題 目：Divergent Routes from Catching up toward Innovation South Korea and Taiwan Compared

發表人：政治大學 中山人文社會科學研究所 王振寰教授

評論人：東海大學 社會學系 黃崇憲助理教授

題 目：考量營運風險與廠商西進下微笑曲線之檢證

發表人：東海大學 國際貿易學系 林灼榮教授

評論人：東吳大學 商學院 邱永和院長

題 目：OEM on Trial

發表人：東海大學 社會學系 黃崇憲助理教授

評論人：逢甲大學 公共政策研究所 陳介英副教授

～學術研討會（下）- 2006.03.04～

第一場次 14:00~16:30

主持人：東海大學 工業工程與經營資訊學系 劉仁傑教授

題 目：策略機會矩陣模型之發現與應用

發表人：東海大學 國際貿易學系 李明煌副教授、許書銘助理教授

評論人：東海大學 管理學院 林財丁 院長

題 目：行銷能力之建構：臺灣廠商之實證研究

發表人：東海大學 企業管理學系 黃延聰助理教授

評論人：中興大學 企管系 方世榮 教授

題 目：科技創新對台灣光電產業財務績效之影響

發表人：東海大學 國際貿易學系 徐啟升助理教授、林灼榮教授

評論人：彰化師範大學 企管系 林哲鵬 副教授

第二場次 16:40~18:20 主持人：政治大學 中山人文社會科學研究所 王振寰教授

題 目：邁向世界第一：台灣企業製造力垂直整合模式之形成

發表人：東海大學 社會學系 陳介玄教授

評論人：東海大學 社會學系 陳維德 講師

題 目：東亞區域主義之探討

發表人：東海大學 政治學系 宋興洲教授
 評論人：東海大學 政治學系 王啟明 助理教授

國內學術研討會係以計畫內成員論文發表為主，並加強成員間的交流。

三、國際學術研討會議程

Branding with Innovation: Taiwanese Firms in the Age of Globalization

< June 16, 2006 >	
13:00 13:40	Registration
13:40 14:00	Opening Dr. Hai-Dung Chen 程海東, President, Tunghai University Dr. Chung-Hsien Huang 黃崇憲, Program Coordinator, Tunghai University
14:00 14:40	Keynote Speech I Branding with Innovation: Taiwanese Bicycles' Experience Mr. Antony Lo 羅祥安 / President of GIANT Inc.
Paper presentation—Session I (Taiwan's Challenge) Host: Dr. Jen-Teng Tsai 蔡禎騰 Dean of the Engineering College of Tunghai University	
15:00 16:20	(I) Asia's Rise in Innovation Offshoring—Causes and Policy Challenges ■ Presenter: Dieter Ernst, Senior Fellow East-West Center, Honolulu, Hawaii ■ Commentator: Shin-Horng Chen 陳信宏, Director Chung Hua Institution for Economic Research
(II)	Can East Asian Latecomers Catch up? ■ Presenter: Wan-Wen Chu 瞿宛文, Research Fellow Research Center for Humanities and Social Sciences ■ Commentator: Wei-An Chang 張維安, Professor Institute of Sociology, Tsing-Hua University
Paper presentation—Session II (Korean Experience) Host: Dr. Pao-Lung Chang 張保隆 Vice President of the Feng Chia University	
16:40 18:00	(I) When and how does Business Group Affiliation Promote Firm Innovation: A Tale of two Emerging Economies ■ Presenter: Sea-Jin Chang, Professor Department of Business Administration, Korea University ■ Commentator: Euntaek Oh 吳銀澤, Assistant Professor The Department of Japanese, Yu Da College of Business

		<p>From Catch-Up to Innovation: Technological Upgrading in South Korea, Taiwan and China</p> <ul style="list-style-type: none"> ■ Presenter: Jenn-Hwan Wang 王振寰, Professor Sun Yat-Sen Graduate Institute of Social Sciences and Humanities, National Chengchi University ■ Commentator: Ming-Chang Tsai 蔡明璋, Professor Institute of Sociology, National Taipei University
18:30 20:30	Dinner at the Howard Prince Hotel, Taichung	
< June 17, 2006 >		
08:10 08:40	Registration	
08:40 09:20	<p>Keynote Speech II</p> <p>Branding with Innovation: Taiwanese SME's Experience</p> <p>Mr. Aling Lai 賴春霖 / Chairman of the Thunder Tiger Company</p>	
09:30 10:50	<p>Paper presentation—Session III (Japanese Viewpoint)</p> <p>Host: Mr. Kuo-Chin Chuang 莊國欽 Chairman of the Logitach Inc.</p>	
	(I)	<p>Architecture-Based Competition and Alliance among Asian Manufacturing Firms</p> <ul style="list-style-type: none"> ■ Presenter: Shintaku Junjiro 新宅純一郎, Associate Professor Graduate School of Economics, University of Tokyo ■ Commentator: Lien-An Hsu 徐聯恩, Professor Center for Creativity and Innovation Studies, National Chengchi University
	(II)	<p>Competitiveness in Manufacturing: Technological and Social Conditions</p> <ul style="list-style-type: none"> ■ Presenter: Munakata Masayuki 宗像正幸, Professor, Dean Faculty of Modern Management Information, Osaka Seikei University ■ Commentator: Jong-Tsong Chiang 江炯聰, Professor Department and Graduate Institute of Business Administration, National Taiwan University
11:10 12:30	<p>Paper presentation—Session IV (Business Strategy)</p> <p>Host: Dr. Tsai-Ding Lin 林財丁 Dean of the Management College of Thughai University</p>	
	(I)	<p>Innovation, Leverage, and Firm Growth: Taiwan Evidence</p> <ul style="list-style-type: none"> ■ Presenter: Chi-Sheng Hsu 徐啓升, Assistant Professor Department of International Trade, Tunghai University ■ Commentator: Xin-Wu Lin 林欣吾, Director Research Division III, Taiwan Institute of Economic Research

	(II)	Strategic Options for Taiwanese Firms in an Age of Globalization <ul style="list-style-type: none"> ■ Presenter: Brookfield Jonathan, Assistant Professor Management Department, Texas A&M University ■ Commentator: Fu-Lai Yu 余赴禮, Professor Department of Economics, Feng Chia University
12:40 13:30	Lunch at the Tunghai University	
< June 17, 2006 >		
	Paper presentation—Session V (The Comparison of Taiwan and Korea) Host: Mr. Po-Chih Huang 黃博治 Chairman of the Taiwan Association of Machinery Industry	
13:40 15:00	(I)	Globalization and the Rise and Fall of South Korean Businesses <ul style="list-style-type: none"> ■ Presenter: Eun-Mee Kim, Professor, Dean Division of International Studies, Ewha Womans University ■ Commentator: Ming-Chi Chen 陳明祺, Professor Institute of Sociology, Tsing-Hua University
	(II)	Moving Toward to the World's Number One: The Formation of Vertical Integration for Taiwanese Manufacturing Capabilities <ul style="list-style-type: none"> ■ Presenter: Chieh-Hsuan Chen 陳介玄, Professor Department of Sociology, Tunghai University ■ Commentator: Mei-Lin Pan 潘美玲, Assistant Professor Institute of Sociology, Yuan Ze University
	Paper presentation—Session VI (Opportunities in China) Host: Mr. Chin-Huo Su 蘇錦夥 President of the Corporate Synergy Development Center	
15:20 16:40	(I)	The Emergence of Keiretsu-Guanxi Facilitated Joint Ventures in China <ul style="list-style-type: none"> ■ Presenter: Ming-Hong Lai 賴明弘, Associate Professor Department of Business Administration, National Taichung Institute of Technology ■ Commentator: Yukihito Sato 佐藤幸人, Research Fellow Institute of Developing Economic Japan External Trade Organization
	(II)	Taiwan-Suzhou: Industrial System and Cross-Border Regionalization <ul style="list-style-type: none"> ■ Presenter: Chuan-Kai Lee 李傳楷, Ph.D. Department of City and Regional Planning, University of California, Berkeley ■ Commentator: Kuo-Hsiung Chang 張國雄, Associate Professor Department of International Trade, Tunghai University
16:40 17:00	Concluding Remark Dr. Ren-Jye Liu 劉仁傑, Conference Chair, Tunghai University	

四、計畫研究設備概況

(一) 資訊硬體設備

1. IBM X306 SERVER
2. HP PRESARIO SR1180AP 桌上型電腦
3. VIEWSONIC VE510S 15" LCD
4. PHILIPS 15" LCD
5. BENQ JOYBOOK 6000-T13 NOTEBOOK 兩台
6. HP SJ-2400C 彩色掃瞄器
7. SAMSUNG H350H 錄音筆
8. FUJI FINEPIX F420 數位相機
9. HP LJ-1300 雷射印表機兩台
10. 創見 256MB 隨身碟兩個

(二) 系統建置部分

1. Web server

- 研究計畫專屬，網站 <http://www2.thu.edu.tw/~ppurp>
<http://140.128.118.191>

- 國際學術研討會，網站 <http://140.128.118.191/seminar.htm>

3. 台灣經濟新報建置完成，網址 <http://140.128.118.191/tej.htm>

(本計畫共增購上市公司產銷組合資料、上市公司長期投資明細資料、上市上櫃公司大陸投資明細、韓國上市財務資料(四)及上市櫃董監事酬勞等五種資料庫)。

4. FTP SERVER — <ftp://140.128.118.191>

5. Remote SERVER

(三) 其他研究設備部分

1. 新增購外接硬碟 (使用人：王振寰老師)。
2. 圖書部分：已購入中文圖書(7冊)、西文圖書(20冊)。

貳、子計畫二：從國家學習體系到國家創新體系：台灣與南韓科技體制與轉變之比較

Abstract

The major purpose of this project is to compare the development of information technology in Taiwan and South Korea, asking the question regarding how and in what ways the technology regime in both countries shapes their different routes toward OEM in Taiwan and OBM in South Korea. In this year, the project has been done by collecting data on the national system of learning and innovation. It is found that South Korea's former high-debt and chaebol-dominated model favored its pursuit of scale-based technological development, while Taiwan's pro-stability, SME-based network model tended to favor it to pursue for a networked, clustered based type of catching up. These two countries' former national model has also largely facilitated their different routes toward technological innovation: this paper argues that the South Korea's former high-debt and chaebol-dominated model favoured it to pursue a Schumpeterian scale-based technological development, while Taiwan's former SME-based model tended to favour to emphasis on a neo-Marshallian network-based technological development. It argues that the Schumpeterian model favours South Korea to pursue for technologies that are

I . The theoretical perspective

There two major presuppositions regarding our research: the first is both South Korea and Taiwan are catching up economies that are in the stage of searching for technological innovation. The second is that our research is based on the institutionalist perspective that assumes national institutions will shape the ways in which firms learn technologies and evolve in path dependent manner. Innovation here indicates new and improved products and processes, or as Edquist (1997:18) claims, 'technological innovation is a matter of producing new knowledge or combining existing knowledge in new ways- and of transforming this into economically significant products and processes.' In this broader definition, innovation not only indicates new products, but also new process.

The industrial system or institutional arrangement of a late

industrializing country mainly involves the state's role, the patterns of interaction of R&D institutes and industrial firms which may facilitate technological learning, and the firms' organizational learning which will eventually enhance their technological capabilities. The different combination of these factors constitutes an economy's special features or can be called the national model which will also eventually more or less shape the ways in which it transforms (or not) from a catching up to an innovation based economy.

There are two different views regarding the transition from a catch-up based to innovation-based economy. The first stresses the importance of economies of scale for technological innovation. In Schumpeter's (1950) view, large firms have a superior ability to generate technological and organisational innovation, due to their abundant resources. Secondly, there is a neo-Marshallian view that highlights the importance of the dense interactions among a large number of competing and cooperating firms that create an external economy favouring technological innovation and learning (Amin and Thrift, 1993). This view especially stresses the importance of 'collective efficiency' (Schmitz, 1995) and 'trust' that can amend the resource weakness of SMEs.

Nevertheless, this project is also intend to show that not all the existing institutions are beneficial to every kind of technology, a country's institutional arrangements may favor some but not all industries to develop. As Porter (1990:7) argues, "no nation can be competitive in everything". The technological trajectory of an industry, which involves inherent patterns of knowledge creation and production methods of an industry that over time evolves in certain directions and become relatively constant in specific ways (Dosi, 1988; Perez, 1985) tends to couple with certain kinds of social institutions in order to develop. For example, the DRAM industry required obtaining advanced design and process technologies, heavy R&D as well as huge capital investments in order to support continuous and volatile technological innovation. This type of technological trajectory therefore tend to favor large diversified companies that have the financial resources to make large investments in R&D and production facilities, and those that can weather temporary downturns in the market, such as the South Korean chaebol. On the contrary, the technological trajectory of the PC industry is characterized by an open architecture and modularized production method, with the possibility of continual upgrading and reconfiguration from the parts to the whole

system (Langolis, 1992). A decentralized industrial structure may be more favorable for the latecomer firms to catch-up.

Accordingly, the existing institutional arrangements or the national model of technological catching up may favour a late industrializing country to pursue for some types of technological learning than otherwise. This in turn will also largely shape the ways in which it moves up the ladder toward innovation following the path dependent manner. It is the purpose of this paper to decipher the institutional arrangements of technological catching up in South Korea and Taiwan and to analyze how they affect the ways in which technologies are learned and how innovation may occur or not.

II. Preliminary results of the research project

2.1 South Korea's route toward the Schumpeterian model

The South Korean model of catching up is characterized by economies of scale that have resulted from the state's strong support of its domestic firms. Basically, South Korea's economic development has been characterized by the developmental state's strong leadership and the dominance of the big conglomerates in the industrial structure (Amsden 1989; Kong 2000; Woo 1991; Kim 1998) prior to the 1997 financial crisis.

Due to the state's 'unlimited supply of capital', the South Korean industrial structure was highly concentrated. The result was that the economy became concentrated in and dominated by a few chaebol (Fields 1995; Woo 1991; Hamilton, et al., 2000). The high concentration of financial resources in a few national champions gave the chaebol the opportunity to build the capability to assimilate existing technologies rapidly, especially in the DRAM industry (Kim, 1997). The business strategy of these companies was to emulate the Japanese production method of producing high-volume standardized commodity products such as memory chips but at a lower cost. Because of the abundance of financial resources, the Korean chaebol were able to devote more resources to access new technologies through heavy capital investments, acquisitions of smaller foreign firms, the purchasing of licenses, recruiting Korean Americans, setting up outpost labs in both Silicon Valley and Tokyo, and devoting intensively on in-house R&D activities (Mathews and Cho 2000; Dedrick and Kraemer 1998; Kim 1997). Through these efforts, Samsung, Daewoo, Hyundai and Goldstar all in the process enhanced their technological capabilities and developed the DRAM technologies

independently.

Nevertheless, although the Korean firms' have made impressive progress in the DRAM industry, they are not very successful in the PC industry. According to Dedrick and Kraemer (1998), there are reasons that hindered Korean PC industry from becoming stronger competitor in the international market compared to its counterpart of the DRAM industry. First, the state's protective policy had prevented local firms from learning from MNCs and distanced itself from the most updated technology. Second, the Chaebol's organizational structure is highly rigid and hierarchical which is counterproductive with the PC industry that requires flexibility and close interactions with the customers. Third, the weak SMEs are also contributed to the Korean's weakness in the PC industry in that they are subservient to the lead company and rarely have grown into strong competitors in their own right. Finally, most of the Korea's leading computer producers are large electronics conglomerates, from whom computers make up only part of their revenues.

To sum up briefly, the Korean *chaebol* have transformed themselves from technological followers to technological innovators by taking advantage of scale economies and receiving heavy support from the state for their own R&D and for public R&D that they have included with their own. But this scale economy is not so good for the PC industry that needs flexibility and close cooperation with customers. Although the Korean state has expressed its intention to reduce the *chaebol's* influence by promoting IT start-ups and venture capital in the post-crisis era, it has not changed the tendency for the *chaebol* to dominate the industrial structure (KISDI, 2003:35). The Schumpeterian scale economies have steadily become the dominant production mode in the Korean model.

2.2 Taiwan's flexible production network model

The Taiwanese economy before 1990 was characterized by the leadership of the developmental state and a SME-based industrial structure (Wade, 1990; Weiss and Hobson, 1995). The competitiveness of Taiwan's SMEs relied largely on personal networks and trust relationships that resulted in the sharing of orders, production facilities, and personnel. This network type of industrial structure enhanced the SME's organisational flexibility and competitiveness in the world market (Hamilton, 1996; Fields, 1995). Due to the weakness of the SMEs' R&D capability, Taiwan's technological development depended much more on

external resources, such as the state-sponsored R&D institutes, transnational resources as well as flexible production networks (Amsden and Chu, 2003; Mathews and Cho, 2000; Chen, 2003). These features are best shown in the development of the PC and semiconductor industries.

Nevertheless, the success of Taiwan's PC industry benefited greatly from the achievements of Taiwan's semiconductor industry that was mainly created by the state (Mathews and Cho, 2000; Chen, 2003). The most significant feature of Taiwan's semiconductor industry was its business orientation – to become integrated circuit (IC) foundries rather than integrated device manufacturers, as exemplified by Taiwan Semiconductor Manufacturing Corp. (TSMC) and United Manufacturing Corp. (UMC). The establishment of TSMC became a catalyst that enabled many domestic fabless IC design houses to emerge and take advantage of existing fabrication facilities. The emergence of a vast number of small IC design houses led Taiwan to become the second largest IC design countries in the world that eventually caused Taiwan's semiconductor industry to concentrate on the area of application-specific integrated circuits (ASIC) that could be used in various areas of the PC system (Kanatsu, 2002). This in turn largely enhanced the competitiveness of Taiwan's PC industry. The success of Taiwanese PC firms and the foundry IC industry share similar characteristics, namely, dense networking and flexibility. Neither of them needs a huge capital investment, but they do need intensive interaction and flexible production methods to respond to the market's fluctuations (Fuller, *et al.* 2003).

Because of the disintegrated industrial structure, the Taiwanese transitional route from technological catching up toward innovation has the following characteristics. Firstly, the state still plays an important role in developing new technologies and transferring to local firms. Secondly, the smaller scale of Taiwanese IT firms has not hampered their technological development. On the contrary, Taiwanese IT firms exhibit a strong tendency toward innovation, which can be indicated by the U.S. patents granted to foreign nationals. Thirdly, it may be due to the smaller scale of the firms and the OEM approach, the development of Taiwanese DRAM industry has been very weak. Taiwanese semiconductor industry has been good at the foundry sector which then generated upward linkage to IC design and backward linkage to packing and testing sectors. Taiwanese firms did not have the patient capital to put into the DRAM industry so as to have enough capital investments to engender continuous

innovation as to stay competitiveness in the highly turbulent market. In the end, most of the Taiwanese DRAM firms depend on technological licensing from and joint ventures with foreign, especially the Japanese, firms (Mathews and Cho, 2000).

The Taiwanese transition from technology catching up toward innovation has been based on clustering and networking. This pattern is similar to the neo-Marshallian description of industrial districts that created external economies that thereby facilitated the SMEs' technological development. However, different from the Silicon valley that create the most advanced products through networking, the Taiwanese counterpart has been based on networking for fast learning and process innovation, in which the state plays a leading role in R&D and transferring technologies to local firms.

III: Further research issues

Our project has done so far is to investigate the catching up route and national models of South Korea and Taiwan. They are transitioning toward innovation based economy. The data and evidence show that both countries have learned technology very fast and effectively managed the technological diffusion. Nevertheless, both countries also meet new challenges for further innovation which may need deeper transformation of national institutions, especially the higher education system, its relationship with production system, as well as new mechanisms that may engender new creation and combination of knowledge. These will be our major subjects of our project of next year.