Technical Manpower Training Strategies for Small and Medium Enterprises through Innovation and Incubation Centers-Taiwanese Experience

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ABSTRACT

Innovative service, research and development programs have been the winners’ key for global competition. In current world market, hi-tech products are short life cycle. New products are spur out speedy and constantly. Facing the fierce international competition, most of our small and medium enterprises are difficult to satisfy their long term innovative and R&D needs. The innovation or Incubation Centers are becoming the best strategy for them to develop new products or new technologies and to train well practical technical talents. In this paper, the author uses multiple research methods, including articles review, case study and expert interview to develop innovative services and R&D strategies through Innovative Center Program, Small and Medium Enterprise Incubation Center Program. Then, proposes some conclusions and suggestions for governments, educators and entrepreneurs to enhance innovative R&D abilities and technical manpower training strategies for small and medium enterprises.

INTRODUCTION

There were 1,232,000 SMEs in Taiwan in 2009, representing 98 percent of all business enterprises. 80 percent of these SMEs were in the service sector. The number of employed persons working in SMEs in 2009 was 8,066,000, it represents 77 percent of total employed persons. (MOEA, 2010) In the aftermath of the global financial crisis, the key issue facing SMEs as they seek to move back onto a growth path has been the question of how to leverage innovation, R&D and market development to strengthen the overall quality of business operations. SMEs managers, R&D personnel, and sales staffs need to be constantly thinking about how they can leverage the technology resources available to them in the development of new products and market segments, while exploring all the potential uses of the firm’s technology, so as to turn the crisis into an opportunity.

Taiwan’s economic system is typically small and open. Facing fierce international competition, most of our SMEs are difficult to satisfy their long term innovative and R&D needs. The Innovation or Incubation Centers are becoming the best strategy for them to develop new products or new technologies and to train well practical technical talent. The author tried to evaluate the effectiveness of present innovation and Incubation Centers with view to develop human resources for SMEs.
THE THEORETICAL FOUNDATION FOR INNOVATION AND INCUBATION CENTERS

We explore the human capital theory and the reason why the government should to strengthen the overall Innovation and Incubation Centers for SMEs’ R&D and manpower needs.

Human Capital Theory

Adam Smith proposed the thinking of human capital 200 years ago. He used Capital theory in the human resources development research, and made quantitative analysis in the cost-benefit of manpower development investment analysis and calculated the contribution of labor force for the economic advancement. Till the beginning of 1960s, Labor Economics has become an uprising branch of Economics research. 1961, the American Economist, Nobel Economics Prize winner, Prof. Schultz proposed Human Capital Theory. Five major components of the Theory include: 1) the importance of education: through education, we enhance the employment ability, the level of skill, and increase the national income and economic growth, 2) medical improvement: the medical improvement can keep the worker healthier, reduce illness, death rate, enhance and prolong the worker’ ability and energy, 3) the mobility of workers: the movement of workers may enhance the adjustment of regional labor supply and demand, 4) migration: the migration of foreign workers enhances the regional economic progress, and 5) gain information: in a modern society, the workers should have opportunity to get full information to utilize the available resources. Therefore, human capital can raise the worker’ ability and skill level, it is a dynamic power for national income progress and economic growth. (Chiang gin-ping, 2004)

The Theory for the Government to Support Innovation and Incubation Centers for SMEs

The reasons for the government to support Innovation and Incubation Centers are:

1. Market failure: the rewards for innovation and human capital investment are uncertainty and non-excludability. Most of the SMEs do not afford to spend the costly investment for innovation and manpower training.
2. Uneconomic scale for SMEs: most of SMEs, lack of capital and too small to invest innovation and manpower training. They emphasize short term reward instead of long term planning.
3. Small market within Taiwan: in the technology and capital intensive product and service markets, small country as Taiwan, easily to be push out by big technological countries or enterprises. The government should coordinate the utility of available resources to make a cost-effective decision.
4. Proper planning for technology import and manpower education and training: in order to prevent redundant investment for technology import and manpower education and training, the government should give SMEs sufficient technology import planning and manpower education and training services.
5. To prevent capital outflow: due to the appreciation of New Taiwan dollars and high cost of labor and land, many enterprises has moved out to mainland China and Southeast Asia countries. If government help them to develop new products or new technologies and manpower training, with the support from government, the SMEs may innovative their production methods to raise their total productivity, then they will need not to move outside. (Hui-lin Wu, 1999)
The Review and Revaluation for the Justification of Taiwan Government to Support SMEs

The government has an idea to let Taiwan become 「An green silicon island」, it means technology and environment protection will be two major development policies. According to the major science and technology development project, government budget for R&D reached 307 billion NTD, 2.58 percent of GDP in 2006, (CEPD,2006) it will increase 10 percent annually, and reach 3 percent of GDP in 2012. (CEPD,2010a) Because innovation will be the key to keep the sustainable economic growth, Hi-tech will be the basis of Taiwan’s industrial development. The cooperation between universities and enterprises will be encouraged. The result of research by universities will be transferred to related enterprises. The Department of Education provides incentives to encourage the teachers and students to start enterprises. Let the universities become training institutions for continuous education. To develop Taiwan to become innovative R&D centers for international well-known enterprises. Because too many Taiwanese enterprises are doing OEM for international famous brands, we need to establish our own brands through innovation and R&D. We need to use Social Contribution index to examine the social responsibilities of technology workers. We need also to popularize science and technology education, to be concerned about social welfare, to raise the medical technology and to emphasis environmental protection and sustainable development. We use ICT technology to develop knowledge and technology based service industries, to create high value industries, and to increase more employment opportunities.

The government is enthusiastically helping enterprises to train high-tech and senior managers to use innovative operation systems and put available technology in use. The present industrial technology information service system will be strengthened to encourage SMEs investing in new technology. The government actively coordinates the enterprises and R&D institutions to cooperate research and development, enhance skill integration and SMEs incubation. The government is encouraging world well-known international enterprises to set up R&D centers in Taiwan. By the end of 2010, they are 25 international enterprises already set up 28 R&D centers in Taiwan. They are include: HP, SONY, Becker Avionics, AIXTRON, Dell, IBM, Microsoft, Intel, ERICSSON, Broadcom, PERICOM, Motorola, ATOTECH, FUJITSU, etc. (MOE, 2010) The government initiated a 50 billion NTD loan for SMEs R&D projects since 2005. There are 87 innovative R&D centers already set up by domestic enterprises. Most of the above enterprises already invited SMEs to be their cooperate plants. They cooperate in R&D, and share the result of industrial upgrading. (CEPD, 2006) Besides, in order to assist SMEs to start an enterprise, innovation, and train employees, the government began to set the incubation policy into action since 1996. The SMEs Incubation Centers integrate the resources of governments, universities and enterprises, to match up local industrial development needs, and to create new chance for local economic development.

According to Director Lai of SMEs Administration: technology innovation keeps enterprises continuous growth with advantage in business competition, but SMEs are lack of manpower, capital, facility and technology, they can not afford to do research or develop their own skills. If we help them to transfer new skill from other enterprises or research institutions, they can save much time and money to get competitive power. Recent years, the government enthusiastically to promote the cooperation between SMEs and universities, it main purpose is to help provide R&D resources for SMEs, and reduce their risk share. For the academic institutions, through the cooperation with enterprises, they have chances to realize their research result into practice. (see website: http://incub.cpc.org.tw/aboutcenter_z.htm.)

The functions and services provided by the SMEs Innovation and Incubation Centers are: 1) establishment of regional service locations: The Service Centers integrate local service network resources through the establishment of physical service locations in Northern, Central, Southern and Eastern
Taiwan, and the creation of regional service alliances to provide start-up new business guidance, 2) strengthening of regional start-up and innovation service teams to provide specialist consulting services: covering technology transfer, business matching, resource referral, start-up information and consulting/diagnosis, etc. to both SMEs and Taiwanese business people who have been operating overseas and are now considering investing in Taiwan, with the aim of providing meaningful value-added services, 3) strengthening start-up and innovation knowledge services: establishment and maintenance of the start-up and innovation knowledge and information platform, expansion of case-study databases and development of standardized operational and service procedures, with the aim of providing both SMEs and Taiwanese business people who have been operating overseas but are now considering investing in Taiwan with the start-up and innovation knowledge and information they need, strengthening the functionality of virtual service platforms, and enhancing the specialist capabilities of service personnel and to commercialize the R&D results, 4) Organizing and publicizing business start-up and innovation activities: holding of regular activities to showcase innovative new products, as well as business matching and promotion presentations; strengthening and promotion of start-up and innovation service business opportunities, establishment of industry-specific and cross-industry exchange platforms, promotion of business matching, and efforts to invigorate market transactions, and 5) Providing test service, speed the development of new products and to guide the SMEs about employee training, capital raising, information supporting, and consultation service for business management.

In 2009, the government launched The Start-up Guidance Plan, with the aim of creating a first-class environment for new business start-up, fostering the entrepreneurial spirit, building Taiwan into an entrepreneurial Society, and reinvigorating the Taiwanese economy. The government also launched the Value-added Plan for collaboration between Industrial associations and universities on new business incubation. One of the most important tasks to be undertaken within the framework of this plan is the promotion of industry-specific specialist incubation networks. In 2009, it was decided to implement incubation network plans targeting the biotech and healthcare industry, the green energy industry, the cultural and creative industries, and the information and communications technology (ICT) applications industry, in line with the “Six Key Emerging Industries” plan being promoted by the Executive Yuan. (CEPD, 2010b) In addition, the Female Entrepreneur Guidance Plan initiate by the SMEA, the “Free and Young Program” launched by the National Youth Commission and the Business Start-up Phoenix Plan initiated by the Council of Labor Affairs, provide women who are interested in starting their own business with access to managerial knowledge and resources, thereby reducing the time needed to get a new business off the ground, and strengthening female entrepreneurs’ capabilities to help them become outstanding female business owners. (Pei-Zu Tsai, 2005)

The Start-up Guidance Plan embodies three core strategies: 1) improving the start-up incubation environment, 2) building start-up knowledge information platforms, and 3) helping new businesses to secure seed capital. The aim is to provide would-
be entrepreneurs, owners of new business, and existing SMEs and microenterprises with the services they need. To implement the industrial restructuring required by the government’s new economic policies, and to help Taiwan’s SMEs to develop, SMEs Innovation and Incubation Centers have been established in Northern, Central, Southern and Eastern Taiwan. Starting in 2009, the SMEs Innovation and Incubation Centers in Northern Taiwan, Central Taiwan, Southern Taiwan, and Eastern Taiwan have been linked together to form an integrated network of physical service centers. The aim is to integrate the knowledge, human capital, funding and technology resources of each region, while linking together existing incubation centers and guidance measures relating to start-up funding, start-up knowledge, specialist consulting services, etc., so that the SMEs Innovation and Incubation Centers can play the role of local service network for the provision of government guidance resources and for the development of regional expertise, thereby facilitating the SMEs Innovation and Incubation Centers. The result that has been achieved through the implementation of the Start-up Guidance Plan can be outlined as follows: 1) by the end of June, 2010, business start-up consulting service was provided on 18,237 occasions, and guidance was provided to 3,688 enterprises, of which 1,316 were new start-ups, thereby leading to the creation of 7,959 new jobs and the maintenance of 32,772 existing jobs, and stimulating private sector investment worth NTD 12,367 million. In addition, a total of 368 industry-university collaboration projects were promoted, worth a total of NTD 149.81 million, 2) ongoing efforts will be made in line with the overall strategy laid down by the Executive Yuan’s Six Key Emerging Industries Plan and the Industry Innovation Corridor Project to integrate regional start-up and innovation guidance resources, strengthen the existing start-up incubation guidance system, promote the SME Innovative Service Certification System, help enterprises to strengthen their R&D capabilities through industry-university collaboration, promote the enhancement of SME competitiveness, stimulate continued economic growth in Taiwan, and boost the creation of new jobs.

To help SMEs get established and undertake innovation, since 1997 the SMEA has been working with other government agencies, research institutions, universities and private-sector companies to implement the government’s incubation center policy and encourage the establishment of new incubation centers. The Administration has used incubation centers to provide Taiwan’s SMEs with the technology, knowledge, funding and other guidance and assistance they need for new business development, and has sought to build up business start-up learning mechanisms to help forge a knowledge-intensive entrepreneurial society. An incubation center is a facility that cultivates new businesses, new products and new technologies, and help SMEs to upgrade and transform themselves. It provides a wide range of resources in an efficient, integrated manner, including the provision of office space, access to equipment, R&D technology, help in finding funding, business services, management consulting, etc., thereby reducing the costs and risk that new businesses need to bear in the start-up stage and in the early stage of R&D projects. By creating a first-class cultivation environment, incubation centers increase the likelihood that a new business will be a success. The current state of incubation centers operation in Taiwan, as follows: (MOEA,2010) 1) as of June 2010, there were a total of 122 incubation centers in Taiwan, located in 22 different counties and cities. Of this total, 65 incubation centers received subsidies from the SMEA in 2010; the combined total of subsidies received was NTD 2,202 million, 2) in line with government policy needs, the Ministry of Economic Affairs has been directly involved in the establishment of a number of incubation centers in both northern and southern Taiwan, including the Nangang Software Incubator, the Nangang Biotech Incubation Center, the Tainan Science Park Incubator, and the Kaohsiung Software Incubator, 3) trial operation of the Kaohsiung Software Incubator began on December 1, 2009; the Incubator was formally opened on February 3, 2010. A total of 27 enterprises
were selected to be allowed to locate them within the Incubator, filling the Incubator to 100 percent of capacity. It was estimated that the Incubator would create production value in excess of NTD 300 million in 2010, and would create at least 100 jobs. Planning is already underway for another incubation center: the Hsinchu Biotech and Healthcare Science Park Incubation Center, 4) Geographical distribution of incubation centers and distribution by incubation center type: As of June 2010, Northern Taiwan had the largest concentration of incubation centers, with total of 51 centers; Southern Taiwan had the next largest number of incubation centers, at 39. Taiwan’s incubation centers can be divided into four categories. Incubation centers attached to universities are the largest single category, with 96 centers; there are 10 incubation centers structured as independent foundations, and 14 centers that are run by government agencies, 5) Regarding the industries that individual incubation centers seek to support, 32 percent of Taiwan’s incubation centers are oriented towards supporting the information, communications and electronics industries, followed by the biotech and healthcare field (18 percent) and electromechanical equipment manufacturing (18 percent). Consumer goods and chemicals account for 6 percent of the total, environmental protection for 4 percent, tourism and leisure for 1 percent, culture and the arts for 7 percent, others for 14 percents, and 6) Incubation centers performance: In 2010, the government provided total funding of NTD 170 million to incubation centers. As of June 2010, Taiwan’s incubation centers had successfully cultivated 1,551 start-ups, including 874 innovation-oriented start-ups. The total number of people working at firms located in incubation centers was 27,324. The cumulative total of patents secured by firms located in incubation centers over the years was 2,428; there have been 1,118 instances of technology transfer. 52 firms that had been cultivated in incubation centers have secured stock market or OTC listing.

In 2008, the SMEA began implementation of a new “Creating Value through Industry-University Collaboration” plan. One of the key tasks to be undertaken under this plan was the promotion of networks of industry-specific incubation centers. In line with the Executive Yuan’s “Six Key Emerging Industries”, it was decided to focus on the creation of incubation networks for the biotech and healthcare industry, the green energy industry, the cultural and creative industries, and the ICT applications industry. The aim was to adopt an industry-specific approach towards encouraging individual incubation centers to collaborate and share resources with one another, strengthen incubation guidance capabilities, and provide firms at different stages of the incubation process with the specialist services they need in terms of technology R&D, IP strategy planning, market development, finance and financing, commercialization of R&D results, etc. The idea is that firms undergoing incubation do not need to move to another facility, or seek support from another organization, just because they have moved to a new stage in the incubation process; enterprises can obtain all the support they need from within the specialist incubation network. (MOEA, 2010)

**Human Resources Development by the Innovation and Incubation Centers**

Innovation comes from human wisdom, therefore, we need to cultivate high quality talents in order to raise innovative and R&D abilities. According to the forecast of Council for Economic Planning and Development, we face the shortage of high-tech and senior managers 50 thousands annually, the enterprises feel the university graduates are not adaptable to workplaces, they need further on-the-job training. (CEPD, 2006) The government has set Hi-Recruit website to call for overseas talents to come to work for Taiwanese enterprises, research institutions or universities. If SMEs invite foreign specialist to work for them, they may apply to the Ministry of Economic Affairs to get salary subsidy. The Innovation and Incubation Centers may join the government overseas talents recruitment team to Japan,
U.S.A. Canada, or India to visit and recruit the talents every year. If the SMEs in the Innovation and Incubation Centers want to train their present employees, they have several channels to do so: (Dah-June Lin, 2005) 1) Sent them to universities or graduate schools: the Ministry of Education allows the academic institutions to have special classes for specific enterprises, through the special program, the students can get certificates from the universities or graduate institutions, 2) apply to the Council for National Science for research projects, the research projects will be assisted by university teaching staffs to do research with senior engineers or technicians to resolve the problems occurred from production process. The enterprises only pay small amount of money to get the research budget from the Council for National Science and get assistance from academic specialists. 2) Sent employees to 「SMEs Training and Research Centers」 set up by the Ministry of economic affairs and the Department of Education. They are three Centers in Northern, Central and Southern Taiwan. They are learning and training centers for SMEs, they investigate the training needs for SMEs, and then design the courses accordingly. 3) Sent employees to join the 「Taiwan-Germany cooperate training program」, with the help from Germany apprentice training programs, the enterprises pay the vocational schools tuition fee for the trainee, and guarantee their job. The trainee will get practical training from the enterprise, and also get formal vocational school education by: 1) sending employees to join the 「Human Capital Investment Programs」 set up by the Council for Labor Affairs, The government pay at least 80 percent of tuition fee, the trainee can learn practical skills to enhance their employment ability, 2) applying for 「Individual Enterprises Human Resources Improving Project」 set up by the Vocational Training Bureau of Council for Labor Affairs. According to the annual employee training plan, the Vocational Training Bureau will subsidy at least 80 percent of training cost to help the SMEs to have R&D and innovative training, information skill training, operation systems training, business management training, practical language training, etc., 3) applying for 「Small Business Innovation Research Program（SBIR）」 set up by the Ministry of Economic Affairs. It is to encourage and assist domestic SMEs to engage in active technology research and innovation or product development, the SBIR program has been launched in accordance with the “Incentive Schemes for Enterprises to Develop Industrial Technologies, MOEA”. Through grants and subsidies provided by SBIR, the risks and costs of SMEs engaging in innovation and R&D activities will be reduced. The program encourages SMEs to carry out active innovation and helps to expand private-sector investment in R&D so that the results and achievements will help the improvement of their manpower employment ability, 3) applying for 「Industrial Technology Development Program（ITDP）」 set up by the Ministry of Economic Affairs. It is to encourage enterprises to engage in technical innovation and research in applications, and to help enterprises build research capacity and institutions, nurture and utilize technology talents as well as to foster exchange and collaboration between the industry, academia and research communities, 4) applying for the service from local SMEs honorable volunteer advisors, set up by the SMEs Administration. They are business advisors (most of them own a profitable business advisor’s company) encouraged by local government and voluntarily formed an association to visit local SMEs, diagnose their management problems and give them advises. The associations also hold seminars for innovation and teach local SMEs how to cooperate with universities and R&D institutions. Applying for 「Innovation Voucher」 is a new program set by the SMEs Administration. 2011, the government will release 115 Innovation Vouchers, each Voucher values 300,000 NTD for SMEs to get the innovation service from universities or R&D institutions to help them to resolve the production problems, upgrade their skill and management abilities. (Association News, 2011)
Since China adopted reform and open door policy, many Taiwanese traditional labor intensive industry SMEs began and continuously moved to mainland China. In order to get industrial upgrade in Taiwan, most of the remains seek the government support their R&D talents and solve their technology bottleneck. Therefore, how to release the universities R&D capacity to enterprises has been an important issue. The enterprise give the chance for universities to realize their research result, it will benefit both sides, and contribute to industrial upgrade and development. Therefore, the SBIR programs are very helpful and welcomed by SMEs and universities. According to the statistics of MOEA, there are 375 cases already successful executed, the government spent 10.3 billion NTD, but it incurred the SMEs to invest 71.9 billion NTD. It is obviously a cost-effective and successful rich results government programs. Many SMEs benefited from these projects and they got R&D talents, skill upgrade, and value-added transformation. Therefore, they need not to move out to China or other East Asia countries to seek lower labor cost, the competition keeps them remain in Taiwan and seek worldwide market. (see website: http://doit.moea.gov.tw/files/Incentives/2009)

CONCLUSION AND SUGGESTIONS

In the era of knowledge economy, high quality and sufficient manpower is the springhead to create high value-added industry. Scientific talents are the precious assets for industrial innovation and R&D, related government agencies in Taiwan are trying there best to train or recruit overseas talents, it is the core task to raise newly high-tech industry’s competition. But, the R&D budget in the government and the enterprises, especially SMEs, and service industries are far from sufficiency. If SMEs want to recruit high quality talents, they need to improve living and working conditions for them. Right now, most of the SMEs are sparing to pay the training cost for training their own talents. When I visited a famous local, manpower service company, introduced the government’s “Individual Enterprises Human Resources Improving Project” for the general manager, he told me, although the government is willing to pay 80 percent tuition fee, but, who will pay the other 20 percent training cost. He also fears to lose the talent, after the investment in human capital, if the talent find a better job, he can not stop his leave. Therefore, most SMEs in Taiwan prefer vicious recruit the talent from their rival companies then training by themselves. If the SMEs in the manufacture or service industries want to get the entrepreneur or innovation ability, they need first to add R&D and training budget, they do not forget the chance to apply for the government subsidy projects, and seek the research partners from universities.

To join the local Innovation or Incubation Centers may be the best policy for them, because Taiwan economy needs further upgrade from labor intensive to technology intensive and high value-added entrepreneur and innovative industries. Innovation or Incubation Centers need to increase the training and start-up services for their customers. Through the mutual concern about innovation and incubation, the scholars in the center can learn practical operations, and the SMEs workers can learn the academic theories for their daily operation. (Smilor and Gill, 1986) Although the university in Taiwan is over supply, but the managers still feel shortage of talents, it reveals the gap between manpower supply and demand. Good vocational training programs will make up the gap. The SMEs bosses should know their employees are their precious assets and they are worth to invest in human capital. Good living and working conditions can remain their precious employees on the jobs. The possible strategies to satisfy talent needs include: 1) strengthening the start-up service: Recent years, the plural types of social and economic development and the consumer’ capricious needs, accompany the progress of ICT and websites, new service industries and the SOHO are prosperous. For the persons who have ambitious to start up
microenterprises or SMEs, the government had better to give them assistance, 2) enhancing the cooperation between universities and SMEs: the functions of present Innovation and Incubation Centers had better to be improved. Their abundant R&D and training capacity can make them self-sufficient entrepreneur organizations. The new Innovation Vouchers program is a good idea to be put into practice, 3) realizing lifelong learning : With population aging and the trend of fewer children, in addition to knowledge economy and the progress of high-tech industries, most of SMEs will face talents shortage. The present SMEs R&D and training centers should be expanded and their functions should be extended, 4) improving the practical training for university students and meet the need of enterprises: The university should review their departments periodically to adapt to the changing industrial environment. The teaching staffs should be encouraged to temporarily work for enterprises to learn the practical experience. The further cooperation between universities and SMEs can shorten the gap between theory and practice, and 5) improving vocational training: With the incentive form the Tax deductible for enterprises training cost, to encourage SMEs’ willing to invest in human capital. The training institutions had better to provide consulting service for SMEs how to train their employees, and how to utilize the present training facilities.

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